Dysart East Coal Project

Progressive Rehabilitation and Closure Plan

Environmental Authority: EPML01978714

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Abbreviations

Abbreviation	Full Description
2D / 3D	2-dimensional / 3-dimensional
3P grasses	Perennial, Productive and Palatable grasses for agriculture
ABA	Acid Base Accounting
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ALUM	Australian land use and management
AMD	Acid and metalliferous drainage
ANC	Acid neutralising capacity
ANZECC	Australian and New Zealand Environment Conservation Council
AQP	Appropriately qualified person
ARI	Average recurrence interval
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ASC	Australian Soil Classification
AS/NZS ISO 3001	Australian Standard/ New Zealand Standard 3001:2018 – Risk Management
bcm	Bank cubic metre. One cubic metre of material as it lies in the natural bank state.
BOM	Bureau of Meteorology
BMA	BHP Mitsubishi Alliance
BPA	Biodiversity planning assessment
BRB	Brigalow Belt
CHPP	Coal handling and preparation plant
DES	Department of Environment and Science
DoR	Department of Resources (formerly DNRM – Department of Natural Resources and Mines)
DRDMW	Department of Regional Development, Manufacturing and Water
DYE	Dysart East Coal Project
EA	Environmental Authority (EPML01978714)
EAR	Environmental Assessment Report
EC	Electrical conductivity
EIS	Environmental Impact Statement
EMOS	Environmental Management Overview Strategy
EP Act	*Environmental Protection Act 1994 (Qld)*
EPA	Environmental Protection Agency
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)*
ERA	Environmentally Relevant Activity
ESA	Environmentally Sensitive Areas
ESCP	Erosion and Sediment Control Plan
ESP	Exchangeable sodium percentage
FCCM	Fort Cooper Coal Measures
FOS	Factor of Safety
GARD	Global Acid Rock Drainage
GQAL	Good Quality Agricultural Land
ha	Hectare
ICMM	International Council on Mining and Metals
IRC	Isaac Regional Council
km	Kilometre
kV	Kilovolt
LOD	Land Outcome Document
LOM	Life-of-mine
m	Metres
MERFP Act	*Mineral and Energy Resources (Financial Provisioning) Act 2018 (Queensland)*
MCM	Moranbah Coal Measures
MIA	Mine industrial area
ML	Mining Lease
MPA	Maximum potential acidity
MSES	Matter of State Environmental Significance

Abbreviation	Full Description
MNES	Matter of National Environmental Significance
Mtpa	Million tonnes per annum
MVA	Mega volt amp
NAF	Non-acid forming
NAPP	Net acid producing potential
NC Act	*Nature Conservation Act 1992 (Qld)*
NEPC	National Environment Protection Council
NGO	Non-government organisation
NNTT	National Native Title Tribunal
NUMA	Non-use management area
PAF	Potentially acid forming
PAF-LC	Potentially acid forming – low capacity
PAWC	Plant available water capacity
PMLU	Post-mining land use
PoO	Plan of Operations
PRCP	Progressive Rehabilitation and Closure Plan
QA/QC	Quality Assurance/ Quality control
QLD	Queensland
QLUMP	Queensland Land Use Mapping Program
RA	Rehabilitation area.
RE	Regional Ecosystems
REMP	Receiving Environment Monitoring Program
rL	relative Level (m)
RM	Rehabilitation Milestone
RMP	Rehabilitation Management Plan
ROM	Run of Mine
RPEQ	Registered Professional Engineer Queensland
RPI Act	*Regional Interests Planning Act 2014 (Qld)*
RUSLE	Revised Universal Soil Loss Equation
SCL	Strategic cropping land
S_{CR}	Chromium Reducible Sulfur
SEP	Stakeholder Engagement Plan
SMU	Soil Mapping Units
TDS	Total Dissolved Solids
TEC	Threatened Ecological Communities
WONs	Weeds of National Significance
WMS	Water Management System
WQOs	Water Quality Objectives
WRD	Waste rock dump

3.0 Rehabilitation Planning Part

This transitional Progressive Rehabilitation and Closure Plan (PRC Plan) has been prepared for the Dysart East (DYE) Coal Project (the Project), in accordance with the amendments to the *Environmental Protection Act 1994* (EP Act) introduced through the *Mineral and Energy Resources (Financial Provisioning) Act 2018* (MERFP Act).

This PRC Plan has also been developed to meet the requirements of the Progressive Rehabilitation and Closure Plan Guideline (Queensland Department of Environment and Science (DES), 2021) as required by Sections 126C and 126D of the EP Act. This includes the development of a Progressive Rehabilitation and Closure Plan (PRC Plan), to plan for how and where activities will be carried out, in a way that maximises the progressive rehabilitation of the land to a stable condition. The PRC Plan is comprised of two parts:

1. A rehabilitation planning part
2. the PRC Plan schedule.

The purpose of the rehabilitation planning part is to support and justify the development of the PRC Plan schedule, and detail how progressive rehabilitation and closure will be carried out over the entire site and on a rehabilitation and improvement basis (DES, 2023). The PRC Plan schedule is approved by the administering authority and will become a legally binding and enforceable instrument with which DES must comply, operating in a complementary manner to the Environmental Authority (EA).

As stated in the PRC Plan statutory guideline (DES, 2023), "*the EA authorises the carrying out of an environmentally relevant activity (ERA) and includes conditions to avoid, mitigate, or manage environmental harm that could occur during an activity. The PRC Plan schedule contains milestones and conditions that relate to the completion of progressive rehabilitation and mine closure. Both the EA and the PRC Plan schedule apply to the entire life of the mining activities, irrespective of when the underlying tenure expires. As per section 202E of the EP Act, where there is an inconsistency between an EA and a PRC Plan schedule the EA prevails to the extent of the inconsistency*".

The PRC Plan schedule is provided separately to this document in the mandatory spreadsheet template provided by DES.

This PRC Plan applies to the Dysart East Coal Project (DYE), which is a new underground coal mine project. Although not yet developed, DYE qualifies for a transitional PRC Plan as it holds a current mining authorisation under site-specific EA EPML01978714, which came into effect 22nd March 2018. This transitional PRC Plan has been submitted in response to the transition notice issued by DES, dated 19th April 2022, and the transitional provisions under the MERFP Act have been applied.

However, it is also highlighted that because the mine has not yet been developed, all estimates of areas disturbed in this document and the associated PRC Schedule should be taken as conceptual only. Exact area dimension and details will need to be confirmed as the mining operation commences. It is highlighted that any disturbance for DYE will be in line with the existing arrangement and situation, and the approved environmental impact assessment completed.

As a transitional site, existing rehabilitation and closure outcomes in the EA and other land outcome documents (LODs), as defined under Section 750 of the EP Act, can be transitioned into the PRC Plan. DYE has relied on two LODs under the EP Act as part of the transitionary process; these are listed in Table 3-1 below, in hierarchical order, such that where there is an inconsistency between these documents the first document in the list prevails to the extent of the inconsistency (DES, 2023).

Table 3-1 Land Outcome Documents for Dysart East Coal Project (EPML01978714)

Legislative requirement	Land outcome documents
land outcome document, for land, means the following documents relating to the land—	
(a) an environmental authority for a resource activity on the land;	EA EPML01978714, dated 31/08/2016 (but in effect from 22/3/2018).
(b) a document made under a condition of an environmental authority mentioned in paragraph (a), if — (i) the document relates to the management of a void within the meaning of section 126D on the land, or the rehabilitation of the land; and (ii) the document was received by the administering authority before the assent date; and (iii) the administering authority has not, within 20 business days after the assent date, given notice to the holder of the environmental authority that the document is insufficient in a material particular relevant to a matter mentioned in subparagraph (i); and (iv) before the assent date, the document had not been superseded;	Not applicable to DYE, as EA only came into effect after the assent date.
(c) a document made under a condition of an environmental authority mentioned in paragraph (a), if — (i) the document relates to the management of a void within the meaning of section 126D on the land, or the rehabilitation of the land; and (ii) the environmental authority requires the document to be given to the administering authority on a stated day that is on or after the assent date, or does not state a day when the document must be given; and (iii) the document is received by the administering authority within 3 years after the assent date; and (iv) the administering authority does not, within 20 business days after receiving the document, give the holder of the environmental authority notice that the document is insufficient in a material particular [that is] relevant to a matter mentioned in subparagraph (i);	DYE Rehabilitation Management Plan, submitted in accordance with EA Condition H2 Submitted to DES on 20/03/2020, confirmed as approved 30/06/2020
(d) a report evaluating an EIS under the State Development and Public Works Organisation Act 1971, section 34D;	Not applicable to DYE.
(e) an EIS assessment report;	Not applicable to DYE.
(f) a written agreement between the holder of an environmental authority mentioned in paragraph (a) and the State that is in force on the assent date.	Not applicable to DYE.

3.1 Project Planning

3.1.1 Project Description

Bengal Coal Pty Ltd has an EA for the Dysart East Coal Project (DYE), for the development of coking and thermal coal resources, as a new underground coal mine located approximately five kilometres (km) north-east of the township of Dysart in Central Queensland. Dysart is located approximately 129 km north-east of Emerald and 719 km north-west of Brisbane, located in the Isaac Regional Council (IRC) local government area.

DYE is approved for the production of up to 1.9 million tonnes per annum of Run-of-Mine (ROM) coal, to be extracted using the bord and pillar mining technique. The current operating life of the mine is anticipated to be twenty-five (25) years from commencement; noting that development of the mine has not yet been initiated.

3.1.2 Mining Tenements

Mining Lease (ML) 70507 for DYE was granted 22nd March/1st April 2018 for a period of 21 years and spanning an area of 765 ha. ML70507 replaced former Mineral Development Lease (MDL) 450 for the same area. The associated EA was issued on 31 August 2016 (in relation to MLA70507) and took effect from the date that ML70507 was granted. ML70507 is held solely by Bengal Coal Pty Ltd.

Figure 3-1 shows the DYE site and tenement, as well as the underlying land tenure.

3.1.3 Land tenure

DYE comprises nine registered land parcels, and details of tenure and ownership of these parcels is provided in Table 3-2. Land tenure of the site consists of freehold, reserve and road reserve. Figure 3-1 shows property boundaries associated with DYE.

Table 3-2 Land Tenure and Ownership

Lot on plan	Tenure	Ownership / landholders
Lot 2 SP235303	Freehold	Bengal Coal Pty Ltd
Lot 1 SP190748	Freehold	Bowen Basin Coal Pty Ltd
Lot 2 SP190748	Freehold	Bowen Basin Coal Pty Ltd
Lot 5 SP235303	Freehold	Edward Thomas Murphy; Alison Isobel Murphy
Lot 2 SP161102	Freehold	Cradcorp Pty Ltd
Lot 10 CNS83	Reserve	Reserve Ergon Property
Lot 11 CNS373	Freehold	Powerlink Property
Dysart Connection Road (Golden Mile Road)	Road Reserve	Local Road
Silver K Road	Road Reserve	Local Road

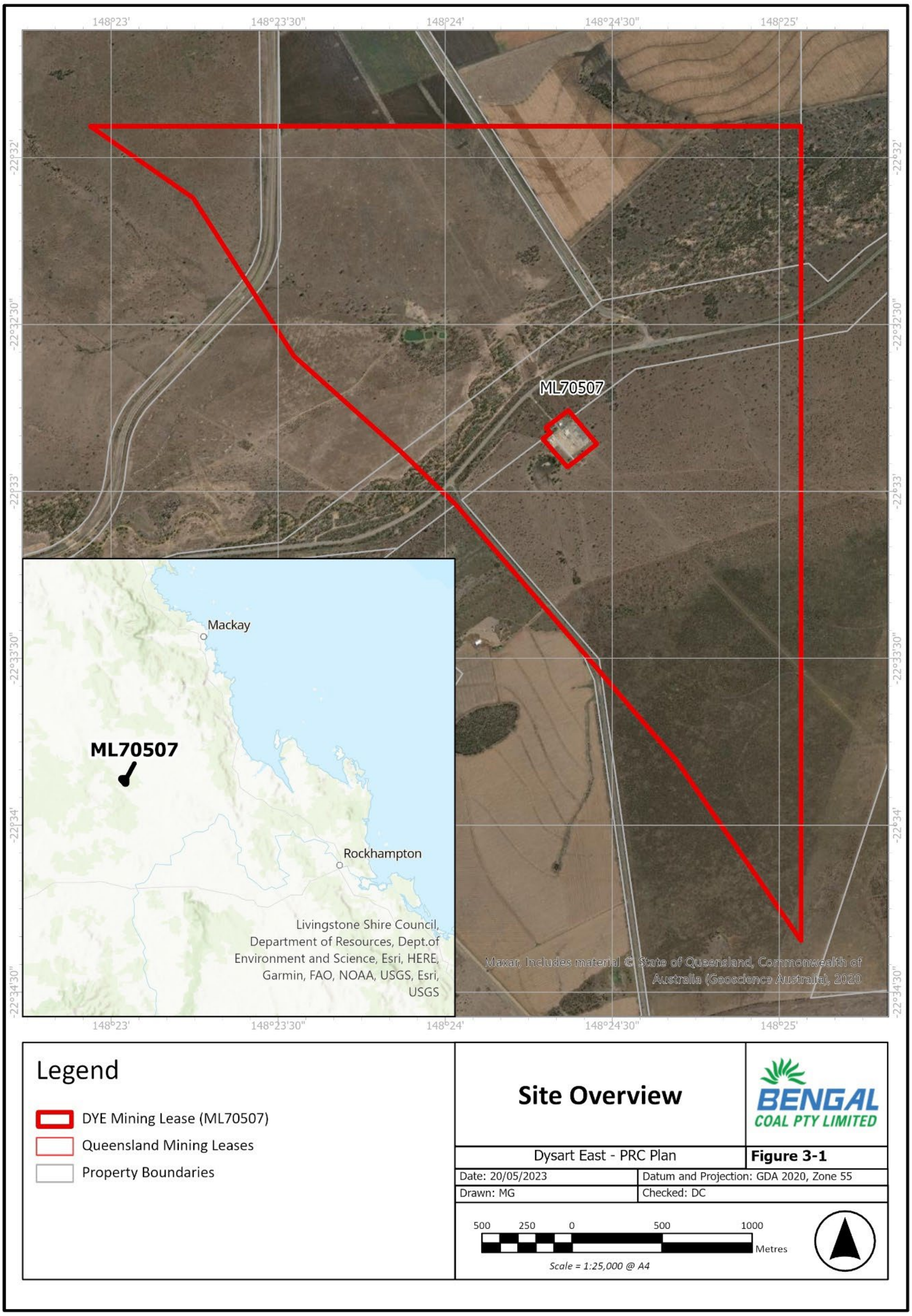

Figure 3-1 Site Overview

3.1.4 Primary Mine Features

DYE comprises development of a new underground bord and pillar mine, and associated infrastructure, over a greenfield site overlain by ML 70507. There is some surface infrastructure required, as well as access for the underground works. The expected coal extraction rate for the site is approved at up to 1.9 Million tonnes per annum (Mtpa) for a mine life of 25 years.

The main activities and features associated with DYE will be:

- underground coal extraction using the bord and pillar mining technique.
- transfer of coal from the underground workings to new ROM and Product stockpiles and coal handling and preparation plant (CHPP) area using a conveyor system
- provision of ancillary infrastructure (primarily relocatable and temporary) for communications, fuel storage, generators, power, maintenance facilities, water and wastewater handling
- ventilation supplied to the underground workings via ventilation fans and associated infrastructure.
- construction of a train load-out system and rail spur line to transport product coal off site
- development of two waste rock dump emplacements to contain the material sourced from the construction of new underground access infrastructure (a drift and underground mine entry tunnels) and rejects from the CHPP.

Environmentally Relevant Activities

Table 3-3 lists the environmentally relevant activities (ERAs), as defined under Schedules 2 and 3 of the Environmental Protection Regulation 2019, authorised by the DYE EA (EPML01978714).

Table 3-3 Environmentally Relevant Activities

Environmentally Relevant Activity	Location
ERA 13 Mining black coal	ML70507 footprint
ERA 15 Fuel burning – using fuel burning equipment that is capable of burning at least 500kg of fuel in an hour	See Figure 3-2
ERA 31 Mineral Processing – Threshold 2 processing, in a year, the following quantities of mineral products, other than coke – (b) more than 100,000t.	See Figure 3-2
ERA 63 Sewage Treatment – Threshold 1 operating sewage treatment works, other than no-release works, with a total daily peak design capacity of – (b) more than 100 but not more than 1500 EP – (i) if treated effluent is discharged from the works to an infiltration trench or through an irrigation scheme.	See Figure 3-2

Key areas and features for DYE are as shown on Figure 3-2, along with the location of each ERA proposed for the site. It is noted that ERA 13 (Mining black coal) has not been shown on the figure, as it is considered to apply to the whole of the site footprint.

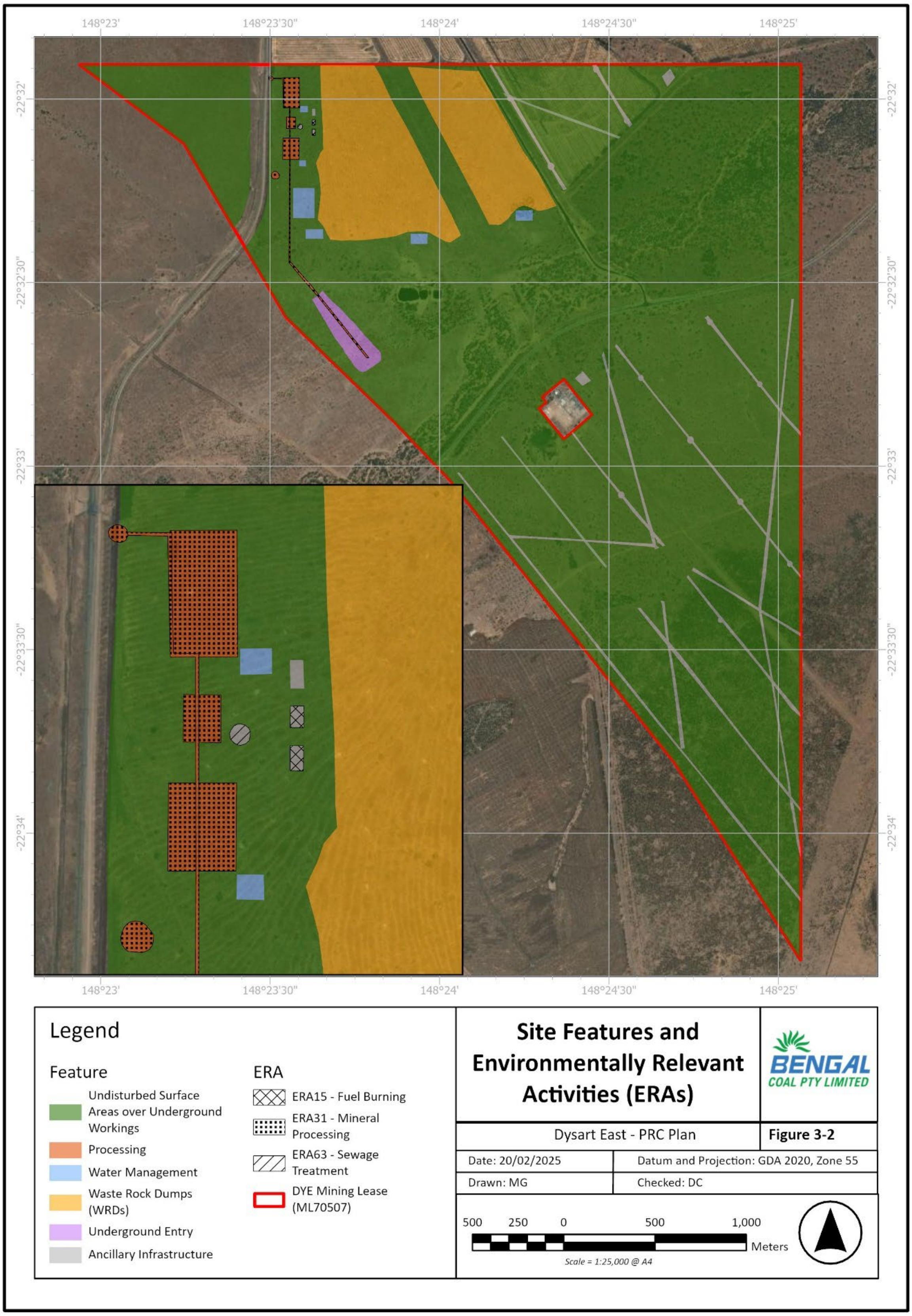

Figure 3-2 Dysart East – Site Features & ERAs (revised)

3.1.5 Proposed Duration and Type of Operations

The planned life of mine for the Dysart East project is twenty-five (25) years, however the mine has not commenced development at this stage. The DYE Later Development Plan provides an indicative development date of no earlier than 2026 (Bengal Coal, 2023), however highlights that the current circumstances for the site mean these development dates are highly uncertain.

As a result of the bord and pillar mining technique, relatively small footprints will require active rehabilitation works and it is anticipated that these areas will be in use until the end of the mine operating life (such as infrastructure and stockpile pads). This is as detailed as part of describing how DYE has been designed for closure (Section 3.1.7) and for shown for each Post-Mining Land Use as Figure 3-14.

3.1.6 Baseline information

Site Topography

The general topography of the area is flat to gently undulating with an overall easterly gradient from the Harrow Range to the Isaac River.

The geology of the area consists of re-deposited Tertiary sediments, basalt or shale. The subsequent partial or complete removal of the old Tertiary land surface and deep weathered zone determined the major characteristics of soils and the land in general within the region. The site has a maximum elevation of around 200 metres (m) Australian Height Datum (AHD).

Downs Creek runs across the centre of the site (west to east), and the entire site drains to this location, forming an undulating landscape plain consistent with floodplains. The northern and southern ends of Dysart East rise from this floodplain, although the topographic relief is gentle with just 26 m between the highest point on a low ridge in the south, and the lowest point in the bed of Downs Creek in the north-east.

Historically, the lowlands parts of the region (where the DYE is located) have been extensively cleared and utilised for beef cattle grazing, with some dry land cropping also occurring in suitable areas. Areas with more rugged topography do occur to the west, associated with the sandstone and metamorphic ranges, and remain relatively uncleared.

Prior to clearing, the original vegetation in the region likely consisted of open woodlands and low scrublands, mixed with areas of taller open forest. Mixed riverine woodland vegetation would also have occurred and remains as remnant vegetation in areas. The geology of the area consists of re-deposited Tertiary sediments, basalt or shale, with the subsequent partial or complete removal of the old Tertiary land surface and deep weathered zone determined the major characteristics of soils and the land in general.

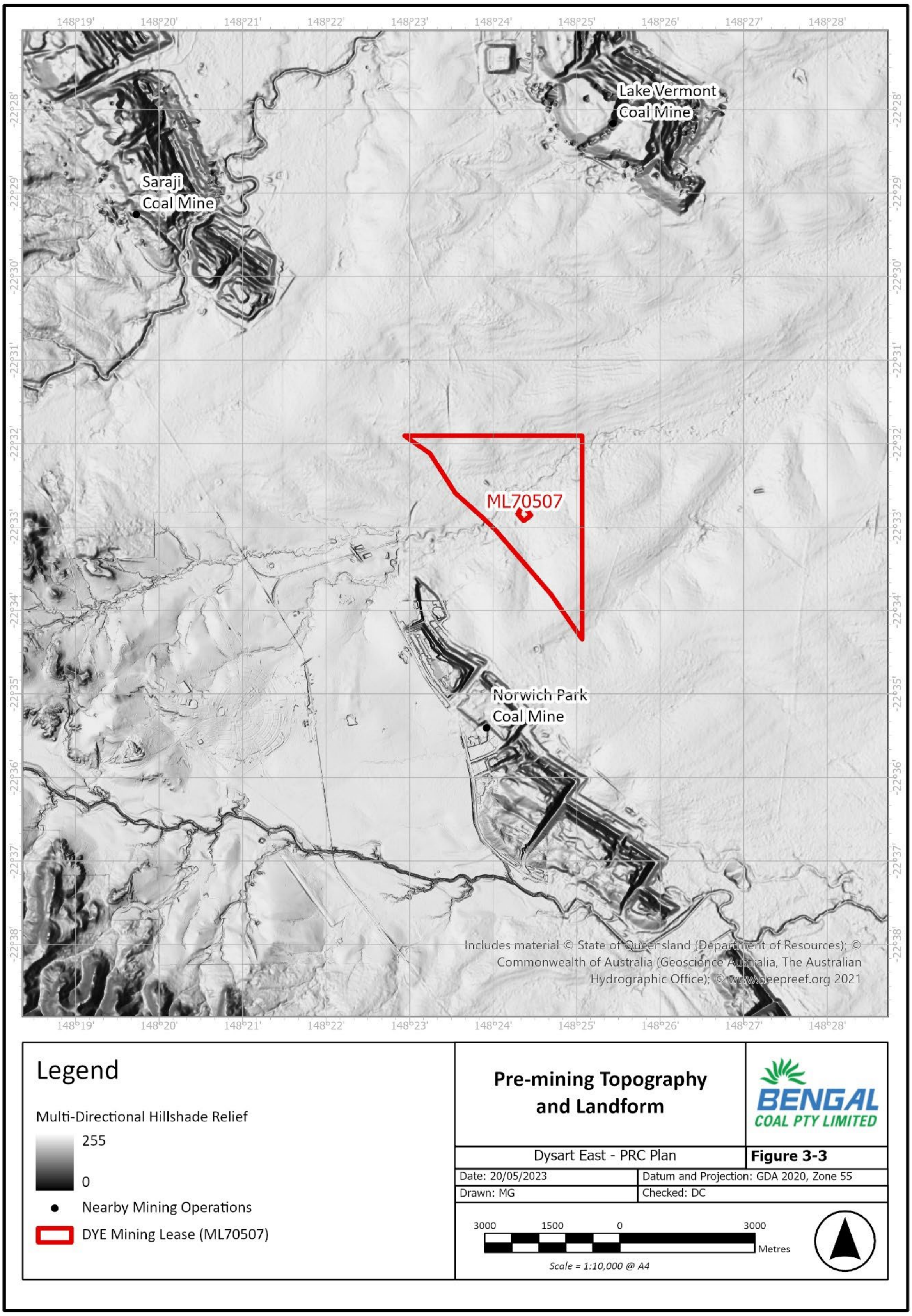

Figure 3-3 Pre-mining (current) Topography and Landform

Climate

Dysart has a humid subtropical climate with warm to hot summers and mild, dry winters. Average maximum temperatures range from 35 °C in summer to 24 °C in winter, while average minimum temperatures range from 22 °C to 9 °C. The long-term average annual rainfall is 636.4 mm (sourced from BOM stations #35109 and #34035, 2023). The long-term trending for both rainfall and temperature can be seen below in Figure 3-4.

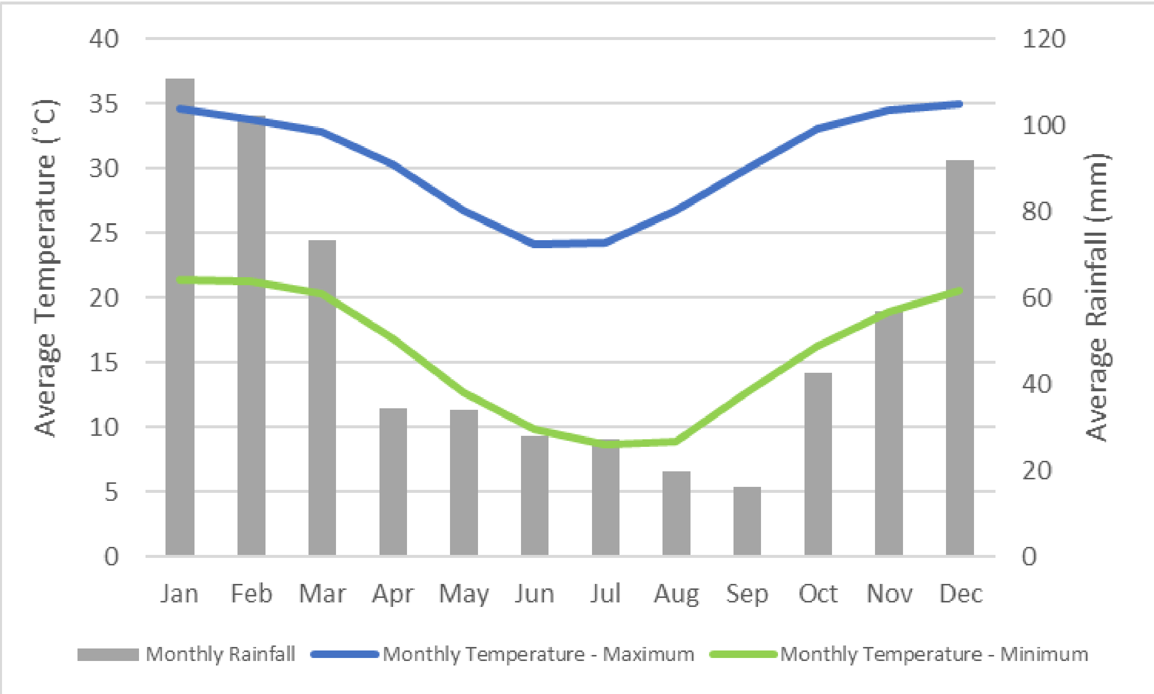

Figure 3-4 Long-term Rainfall and Temperature Trends

Considering the potential for the site climate to change, it is predicted for long-term decreases in winter and spring rainfall over the next 80 years to occur (CSIRO, 2015). Further, increases in the intensity of extreme rainfall events is also projected to occur, and the time spent in drought is projected to increase, suggesting extreme climatic conditions will occur more frequently. It is also predicted for annual average temperatures to be up to 1.4 °C warmer than past climatic conditions by 2030, and up to 5.0 °C warmer by 2090 (CSIRO 2015).

This predicted temperature change will be taken into consideration during the identification of species to be used in revegetation, as further detailed in Section 3.5.8.

Geology

Local and regional geology indicates that the site is located within the northern end of the Denison Trench, a broad structural depression within the geology of the region and is further located within the north-south trending, Early Permian to Middle Triassic geological Bowen Basin. The Bowen Basin covers an area of approximately 200,000 km^2 and is exposed for over 600 km from Collinsville in the north to Rolleston in the south.

At DYE, the Bowen Basin is characterised by typical basin-fill fluvial (and some marine) sediments, comprising mudstones, siltstones, sandstones and coal seams. The site is located along the western margin of the Bowen Basin and is underlain by the following units:

- Quaternary alluvium
- Tertiary Duaringa Formation sediments
- Permian coal seams and interburden of the Moranbah and, in part, the Fort Cooper Coal Measures.

The main coal-bearing formations at DYE are the Fort Cooper Coal Measures (FCCM) and the Moranbah Coal Measures (MCM). The Late Permian FCCM conformably overlie the MCM, and outcrop or subcrop in the centre of MLA 70507. A number of coal seams are contained within the FCCM but are typically non-commercial as the seams are typically highly banded with claystone, mudstone and siltstone. The MCM were deposited in a predominantly fluvial flood plain environment. The lithology of the MCM is generally characterised by interbedded fine-grained lithic sandstone, siltstone, mudstone, claystone and coal. The typical site stratigraphy for DYE is shown in Figure 3-5.

At the DYE site, the MCM comprises five coal-bearing intervals, which contain from one to four coal seams, named S Seam, R Seam, P Seam, H Seam and D Seam. The D (Dysart) Seam is considered the most important coal resource as it comprises clean, cleated coal of reasonable thickness. The D seam is approximately 170 m below ground level, and deepest near the eastern boundary (where it is approximately 360 m below ground level).

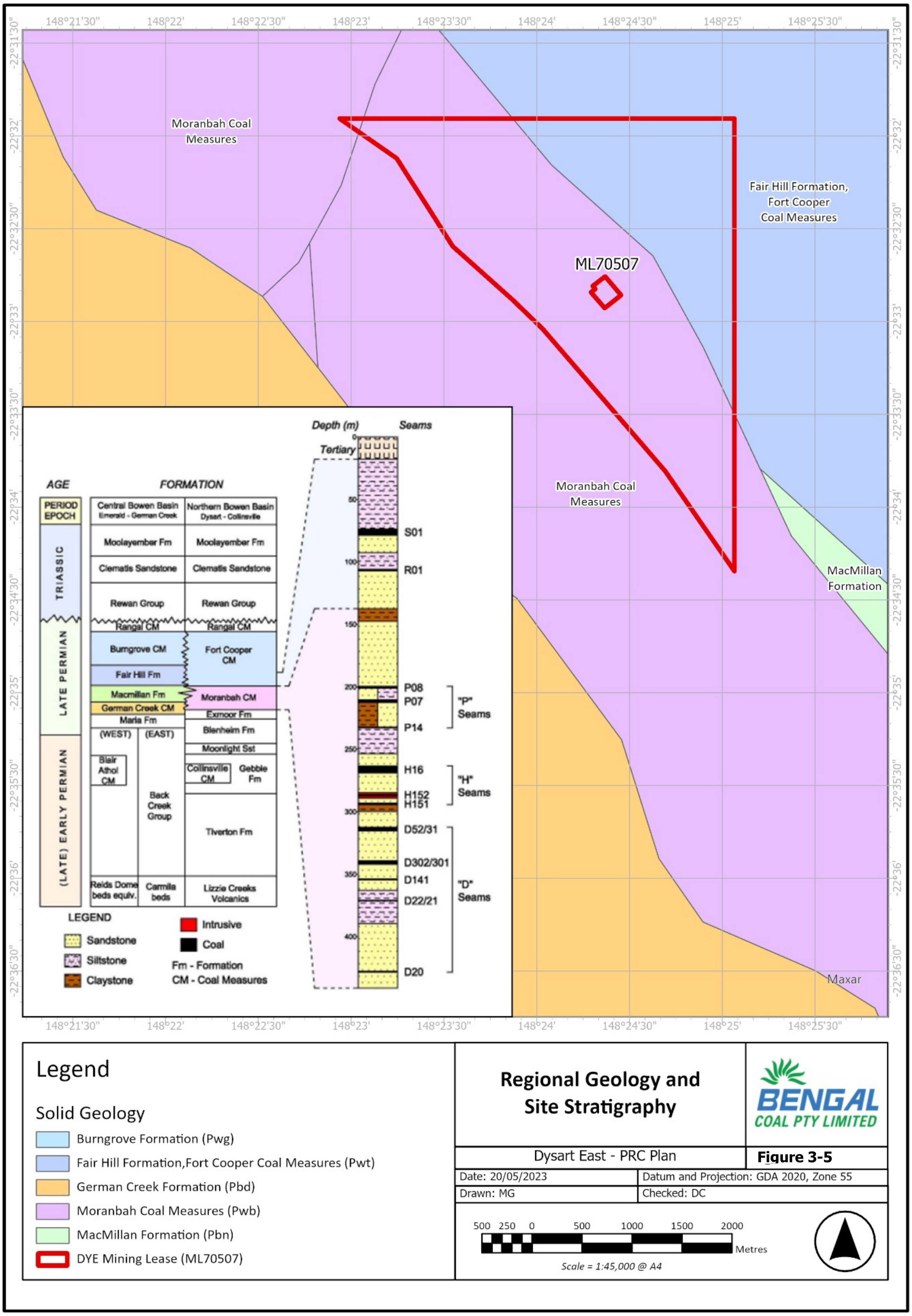

Figure 3-5 Regional Geology and Site Stratigraphy

Geochemical Characterisation

Potential for Acid Metalliferous Drainage

Mine waste generated from DYE operations has limited potential to generate acid and metalliferous drainage (AMD). As the underground operations use bord and pillar mining methods, waste rock materials (spoil) will only be removed during the construction of the surface drift entrance and underground mine roadways to access the target coal seams.

Waste generated from the processing of raw coal (i.e., ROM coal) by the relocatable modular CHPP is called rejects, comprising coarse rejects and dewatered tailings. Coarse rejects consist of coarse waste rock and nonsaleable quality coal. The dewatered tailings material is the fine waste material.

Geochemical assessment has determined the potential for spoil and rejects from coal processing to generate AMD and impact on the land environmental values, with samples collected from core drill holes located in the ML. Given the site is not yet developed, no actual reject material is available, therefore, materials located immediately above and below the coal seams were analysed as potential rejects. A total of 74 spoil samples and 4 potential rejects samples were collected for geochemical assessment. Total sulfur concentration data from 70 potential reject samples was also included in a broader geochemical assessment.

Eighty-eight per cent of all spoil samples tested were non-acid forming (NAF) and have low sulfur concentrations (≤ 0.1 %). A further 10 % of the spoil samples were classified as Uncertain but are expected to have limited acid generating capacity because they contain minimal sulfide-sulfur (SCR) concentrations (< 0.2 %) compared to the excess high acid neutralising capacity (ANC) of the surrounding bulk spoil materials. The remaining spoil samples (< 3 %) were classified as potentially acid forming (PAF), with no identifiable lithological characteristics to indicate their PAF nature. The geochemical classification was not correlated on rock type or sample depth.

Approximately 72 % of potential reject samples have total sulfur concentration values less than 1 %. The median maximum potential acidity (MPA) was low (4.3 kg H_2SO_4/t). On this basis, most potential reject materials are expected to have a low capacity to generate substantial acidity. Potential rejects samples with total sulfur concentrations greater than 5 % were typically associated with the D141 seam/ply (RGS-Terrenus 2012).

The limited sulfur concentration present in the spoil materials combined with ANC relative to the maximum potential acidity (MPA), indicate the spoil produced and disposed at DYE are not expected to have a high capacity to generate net acidity, under natural oxidation conditions. The low MPA generated by reject also indicated a low capacity for net acidity, due to mixing with NAF rejects and spoil containing excess ANC and emplaced within the WRDs. These findings are supported by the low AMD generation which is seen at the nearby Saraji Coal Mine and Norwich Park Coal Mine (RGS-Terrenus 2012).

Multi-element Composition and Water Quality

Selected composite spoil and potential reject samples were also analysed for total metals soluble metals and anions. The dissolved metal concentrations in many of the water extract solutions, based on a solids to deionised water ratio of 1:5, for spoil and potential reject samples were below the ANZECC and ARMCANZ livestock drinking water guidelines (ANZECC and ARMCANZ 2000).

The majority of dissolved molybdenum concentration were below the Australian livestock drinking guideline value of 0.15 mg/L. Most of the selenium in composited spoil samples were below the Australian livestock drinking guideline value of 0.02 mg/L, noting that two samples exceeded the guideline with a value of 0.04 mg/L.

The mine waste is not expected to generate significant salinity. The electrical conductivity (EC) measured in 1:5 solid to water extracts (EC1:5), for most mine waste samples (99 %) falls between 150 µS/cm and 900 µS/cm, which is classed as low to medium salinity according to the Queensland guidelines for the assessment and management of acid drainage (DERM 1995b). Composited spoil samples were between 302 µS/cm and 503 µS/cm, and potential reject samples were between 201 µS/cm and 309 µS/cm.

The measured EC from the mine waste samples is well below the guideline value recommended for livestock drinking water in Australia, which is 7,500 µS/cm (ANZECC and ARMCANZ 2000). It is also below the water quality guidelines for the protection of moderately disturbed aquatic ecosystems (720 µS/cm, during base flow conditions) in the Upper Isaac River catchment (EHP 2011).

Approximately 93 % of all mine waste samples tested are considered sodic with a high risk of dispersion (median Exchangeable Sodium Percentage (ESP) value of 17 %). Therefore, the mine waste (spoil and reject) materials are not suitable for use as a final cover material on surface disturbance areas without prior treatment or being overlain with a stable topsoil layer. Treatment of sodic spoil and reject materials may be required if they are used as a growth media source for revegetation.

An ongoing mineral waste management strategy will be implemented as the site is developed.

Groundwater Level and Properties

There are three groundwater aquifers associated with the DYE site, namely the Quaternary Alluvial, the Tertiary Sedimentary and the Permian Strata Aquifers. Information is provided for each aquifer in the subsections below.

Quaternary Alluvial

Within the DYE area, Quaternary alluvial deposits are associated with the ephemeral Downs Creek water course. This Quaternary alluvium is relatively thin (in the order of 1-2 m (AGE 2011)) and is not recognised to contain permanent groundwater. The alluvial aquifer is unconfined to semi-confined with storage provided by its primary porosity and strongly linked to surface water with recharge occurring during stream flow events.

A review of registered bores shows that several bores have been drilled along watercourses (as per Figure 3-7); however generally, these bores have been constructed within units that underlay the alluvium. This suggests that the alluvial deposits have been an initial targeted as a groundwater resource but were found to be dry, and that drilling has continued until water was intersected at some depth below the alluvium.

Many of the surface water rivers and creeks within the study area are ephemeral and recharge of the alluvium occurs due to recharge from surface water flow or flooding as well as due to surface infiltration of direct rainfall and overland flows where alluvium is exposed. Key discharge mechanisms include evapotranspiration from vegetation growing in the creek beds and along the banks as well as infiltration and recharge to the underlying older formations. More extensive alluvial systems occur outside the project footprint, associated with ephemeral water courses such as the Isaac River.

No site-specific water quality data is available due to the shallow dry nature of the alluvium. Based on regional information, alluvium associated with creeks and main river tributaries indicate that typically, the associated Quaternary alluvium has hydraulic conductivity values of 0.001 m/day, which are typical for silty clay. Further, available Department of Resources (DoR) groundwater chemistry data information for the Dysart area indicates this aquifer to be slightly to moderately saline.

Tertiary Sediment

Tertiary sediments consist of a sub-horizontal blanket up to 30 m thick of poorly consolidated clay, sandy clay, sand, and gravel, with clay potentially forming a paleochannel deposit at the base of the unit. More permeable sand or gravel higher in the Tertiary profile can contain perched groundwater. Tertiary sediments are not regarded as an important regional aquifer, though the aquifer may be locally significant. Exploration drilling data indicates that these sediments are often dry.

Based on groundwater yield data, the Tertiary sediments are not regarded as an important regional aquifer, though may be locally significant. Recharge processes in the Tertiary sediment aquifers are via direct infiltration of rainfall and overland flow where Tertiary sediments outcrop and no substantial clay barriers exist in the subsurface and from the overlying Quaternary alluvial aquifer.

Primary discharge mechanisms for this aquifer are expected to occur due to through flow into adjacent or underlying aquifers (via outcropping or sub-cropping coal seams), as well as evapotranspiration and direct extraction.

No site-specific testing of hydraulic properties was possible on the shallow Tertiary sediments. A review of bore logs within the DYE area show that the Tertiary sediments are dominated by low permeability and sandy clays with isolated areas of loose more permeable sand. Data from exploration drilling also indicates that these sediments are often dry, and occurrence of groundwater in these sediments is sparse. However, where the sediment is coarse in composition, the unit may have localised zones of enhanced hydraulic conductivity.

The chemistry results for the Tertiary monitoring bore (DMB04a) within the DYE site indicate that the salinity values are low, with electrical conductivity (EC) values < 1,000 µS/cm, and all metal/ metalloid concentrations are below livestock watering guidelines levels (URS, 2015a).

Permian Strata

Within the Bowen Basin, it is recognised that the coal seams are more permeable relative to the Permian materials, and bores are often drilled dry until a water-bearing coal seam is encountered, with groundwater rising in the borehole indicating confined conditions within the coal seam. The coal seams are typically dual-porosity material with primary-porosity provided by the matrix and a secondary porosity provided by fractures (joints and cleats). Natural fractures in the coal may be the dominant space for groundwater storage, and as a result, the principal pathway for groundwater movement can be highly dependent on fracture interconnectivity.

This can mean that Permian formations are highly heterogeneous, having discrete zones of higher permeability and conductivity over short distances that are associated with the fracture/fault systems. Much of the material will typically then have very low hydraulic conductivity. In-situ hydraulic testing of the S coal seam provided a range of hydraulic conductivity values, ranging from 0.09 to 0.16 m/day. Hydraulic testing of the inter-burden units revealed highly variable hydraulic conductivity from moderately pervious to highly impervious.

The coal seam aquifers are also confined above and below by very low permeability strata. The confining units are considered (based on piezometric pressure differences in the coal seams) to have very low vertical hydraulic conductivity (leakage). This limits vertical movement as well as recharge to the coal seam aquifers, which is considered minimal.

Primary discharge mechanisms include transfer to down-gradient outcrop areas, through-flow into adjacent coal seams or seepage into underlying aquifers (via structural discontinuities). Direct groundwater extraction also occurs due to nearby mine gas management and dewatering activities.

Due to the confining conditions (overlying clay-rich Cainozoic sediments) and low permeability of the coal measures groundwater, residence time is often long, resulting in occurrences of highly saline groundwater (e.g., EC >20,000 µS/cm) in some areas. However, it is more typical for the groundwater salinity to be lower, and is known that the S coal seam varies between 3,000 and 3,200 µS/cm.

Consideration of the regional Permian groundwater quality indicated that the groundwater within the project area is generally considered unsuited for potable use, however, it has a potential beneficial use for stock watering. Further, although the coal measures do not represent optimal quality or quantity in terms of groundwater resources, they are still locally important. This is because sometimes the coal measures are the only/first unit where useable volumes of groundwater are encountered when drilling.

Figure 3-6 shows a pre-mining conceptualisation of the hydrogeologic regime on site.

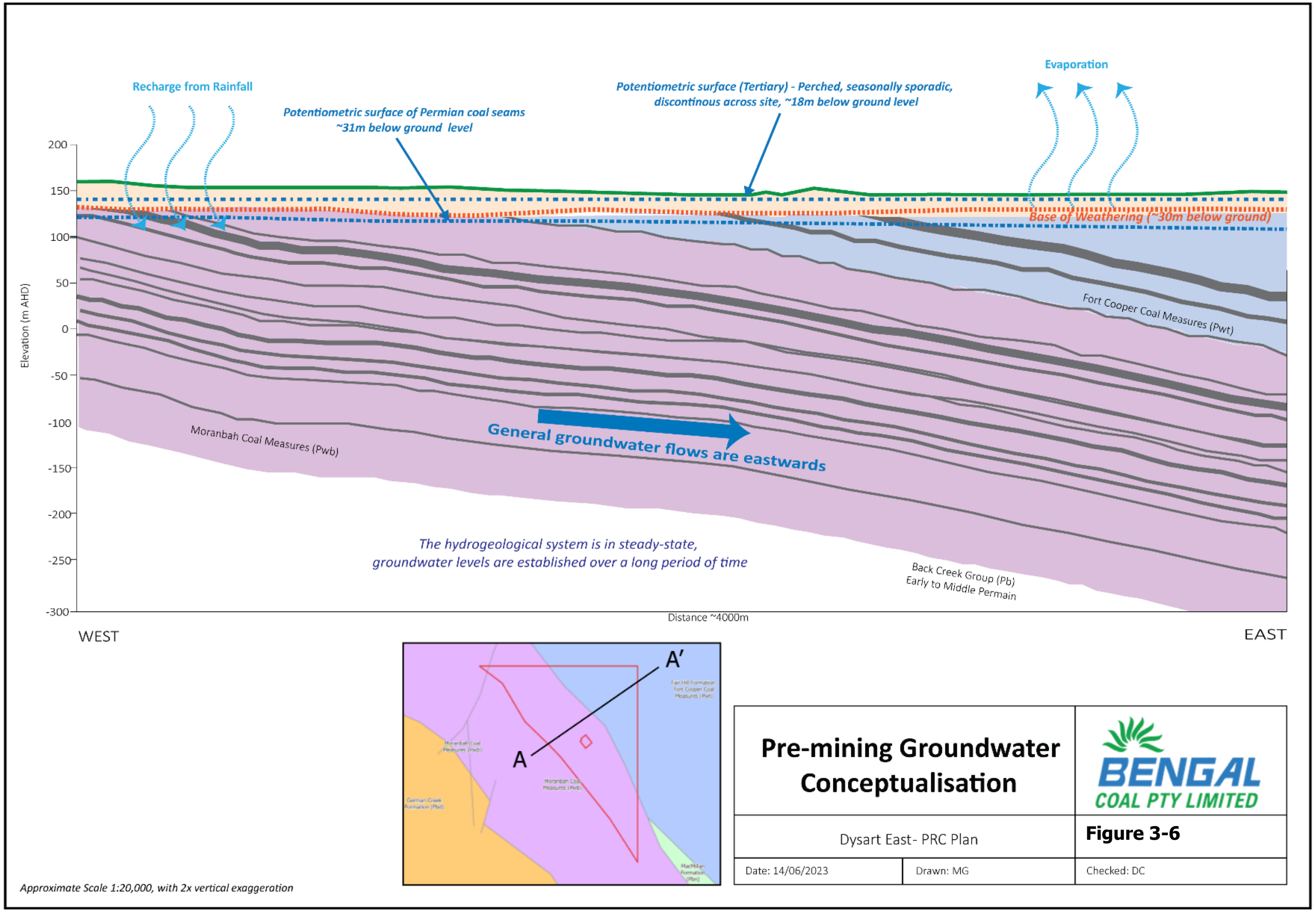

Figure 3-6 Pre-Mining Groundwater Conceptualisation

Groundwater Uses

It has been identified that groundwater resources at DYE have several potential uses. Groundwater contributes to the biological integrity of the surface aquatic ecosystems associated with moderately disturbed waters; and has value when used for stock (cattle) watering purposes.

There are three registered groundwater bores within the DYE site area (as indicated in bold in Table 3-4) and an additional eight bores within the site that are not registered but are monitored. In addition to this, there are an additional 29 registered bores in the surrounding area, as listed in Table 3-4. Agriculture in the surrounding area is likely to rely on surface water allocations for stock watering or irrigation requirements in addition to groundwater take. All monitoring bores are shown in Figure 3-7.

Table 3-4 Groundwater Users

Bore (RN)	Easting	Northing	Depth (m)	Quality comment	Formation (Fm)
37861	650015	7505297	81.00	Brackish	Blackwater Group
37862	650686	7505007	76.20	Poor	Unknown
38754	642607	7505004	48.76	-	Unknown
43639	638939	7511033	43.89	EC 7,300	Laidley Creek Alluvium
44337	637540	7499570	42.06	Suitable	Unknown
44625	650437	7509443	57.91	Good	Blackwater Group
57747	640392	7509441	126.49	-	Back Creek Group
67130	642432	7504723	55.00	Salty	Blenheim Formation
67423	650064	7496776	Unknown	-	Unknown
89454	653338	7513734	67.00	Salty	Blackwater Group
89467	652914	7507586	75.00	-	Unknown
89468	652072	7500792	83.00	-	Unknown
89469	647710	7504930	75.00	Salty	Fair Hill Formation
89470	647275	7504093	93.00	1,000 mg/L TDS	Undifferentiated
90013	646295	7502266	35.00	Salty	Undifferentiated
90014*	***645217***	***7505537***	***59.00***	***Brackish***	***Unknown***
90015	643905	7503341	52.00	Brackish	Undifferentiated
90016	641460	7499975	66.00	Brackish	Unknown
90017	640107	7500530	78.00	Potable	Undifferentiated
90436	649819	7508098	108.00	Potable	Blenheim Formation
90437	649085	7498072	42.00	Potable	Blenheim Formation
90472	653417	7512498	84.00	-	Blackwater Group
90473	651871	7512131	102.00	Brackish	Blackwater Group
90475	645463	7513291	76.20	-	Blackwater Group
132731*	***644569***	***7507274***	***28.00***	***Salty***	***Blackwater Group***
132732*	***645138***	***7506836***	***35.00***	***Salty***	***Blackwater Group***
132733*	***645138***	***7506836***	***35.00***	***Salty***	***Blackwater Group***
136091	650099	7508605	70.00	-	Blackwater Group
158011	640035	7514095	Unknown	Brackish	Fair Hill Formation
158220	639923	7801629	66.4	Brackish	Back Creek Group
158686	643499	7508708	Unknown	-	Unknown
158763	645904	7496037	148	Potable	Back Creek Group

**These are registered bores within the DYE mining lease area.*

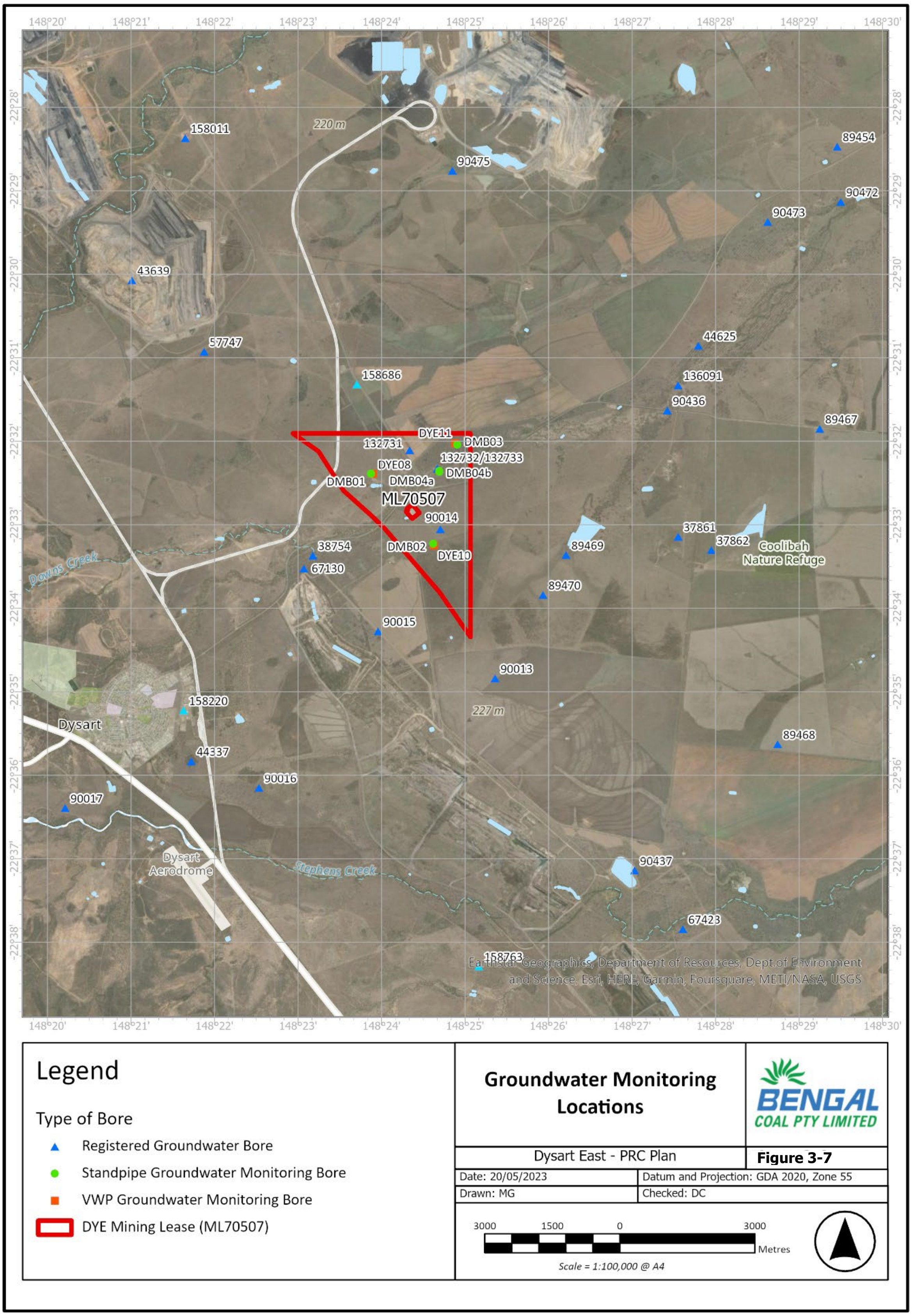

Figure 3-7 Groundwater Monitoring Locations

Site Hydrology and Fluvial Networks

The DYE area is located within the Isaac Western Upland Tributaries sub-catchment, towards the lower portion of the wider Isaac-Connors sub-basin. Downs Creek is the only designated watercourse within the DYE area and the dominant flow-path through the site; it is ephemeral and has a catchment of 24 square kilometres (km^2). The upstream catchment areas contributing to Downs Creek are approximately 45 km^2, with headwaters located in the Peak Range National Park. The catchment area extends a further 63 km^2 downstream, and drains into the Isaac River, indicating that DYE is located mid-catchment. There is also an unnamed tributary of Downs Creek that flows in from the south-east, and functions as an overland flow path.

Downs Creek is a small, low energy fluvial geomorphic system with channel characteristics typical of streams that flow through black soil plain landscapes. The creek channel is stable, with little evidence of landform change, such as channel erosion and deposition, despite variability in flows due to the ephemeral nature of the creek.

A stream diversion of Downs Creek also was constructed upstream of DYE in 2007 as part of the BMA Norwich Park Mine, and it is understood that BMA holds a water diversion licence for the diversion of Downs Creek and its tributary, Lotus Creek. A levee was constructed to protect the Norwich Park Mine against 1:100 Annual Exceedance Probability (AEP) flood events. The alignment of nearby Golden Mile Road was also altered as part of the levee construction works.

Geomorphology

The upstream reaches of Downs Creek rise in the tablelands of the Denham Range some 9 kms to the west of the site. These tablelands are at 340 – 400 m above sea level and are flanked by a 40 – 50 m high escarpment. Below the escarpment the slopes decline more gently, carrying drainage in a north-east direction towards the Isaac River which is about 25 km downstream of DYE. Through the site itself, topographic relief is gentle with just 26 m of relief between the highest point at 207 m elevation on a low ridge in the south, and the lowest point at 181 m in the bed of Downs Creek in the northeast.

The upstream catchment of Downs Creek is largely unmodified apart from ~3 km^2 of urban development in Dysart township (the whole town covers about 5 km^2), and 1.8 km^2 in Norwich Park Mine (which includes the aforementioned diversion).

Downs Creek channel does not extend as far as the main Isaac River channel, despite being a tributary. Just downstream of the site (~5 km to the south), the single channel splits into several distributary branches to become an anastomosing stream. This stream character continues for a further 6 km until the channels disappear in 'flood-outs' that are about 6 km west of the primary Isaac River floodplain.

Environmental Flows

Rainfall data (provided as Section 3.1.6) shows that the major distribution of rainfall at the site occurs within the months of January and February, and rainfall variability also increases during this time. Long term historical rainfall is also highly variable. Further, monthly evaporation is increased during the same summer months of December, January and February. It is notable that, at all times during the year, evaporation exceeds rainfall, which plays a key role in the hydrologic regime at the site and within the upstream catchment.

Flooding

Several major flood events have been recorded in the past for DYE (URS, 2015) and further flood events are reasonably expected to occur into the future. To further understand potential flood risk for the site, a modelling assessment of flood flows within the Downs Creek catchment was undertaken. Given that the site has not yet been developed, this represents the pre-mine flood condition. The assessment considered both a very frequent 'flood event, equivalent to a 1 in 2-year event, as well as progressively less frequent (and thus more severe) flood events, with results considered for a 1 in 50-year AEP, 1 in 100-year AEP, 1 in 500-year AEP and 1 in 1000-year AEP.

The flood modelling indicates that for common or minor 'flood' event (a 1 in 2 AEP event), which occurs with 58.5mm of rainfall over 3 hours, will result in peak flow of 61 m^3/s in Downs Creek. In contrast, a rare or extreme flood event (1 in 1,000 AEP), will occur with rainfall of 167.3 mm in 3 hours, and will result in more than an order of magnitude of flow, with peak flow of a 771 m^3/s in Downs Creek (at the DYE site).

The predicted maximum flood extent and depth for the 1 in 1,000 AEP event is as shown in Figure 3-8.

As part of addressing an RFI comment for the PRCP, an additional hydraulic assessment was completed to explore the probable maximum flood event (PMF) and understand flood risk and the potential for flood impacts to the site (ATCW, 2025).

This work determined that hydraulic connectivity along Downs Creek will be maintained post-mining, restoring the pre-mining hydraulic regime. The assessment also specifically considered how the WRD footprints would potentially interact with flood events into the future, during PMF events. The potential for flood impact, and how DYE will ensure its rehabilitation and closure activities response to this has been further considered within Section 3.5.2.

Water Quality

Environmental values (EVs) relevant to the site hydrology include the biological integrity of the aquatic ecosystems, human values such as irrigation, farm supply, stock water, drinking water, recreation, and cultural and spiritual values. Aquatic ecosystems associated with Downs Creek are slightly to moderately disturbed as per the ANZECC 2000 guideline criteria. Sampling indicates that certain existing water quality parameters may already exceed the published water quality objective (WQOs) namely EC, turbidity, TSS, nutrients and selected metals (URS, 2015a).

Consideration of water quality data from nearest DoR stream gauging stations on the Isaac River (at Deverill (130410A) and Yatton (130401A)) indicates that the levels of EC in the Isaac River at both locations are dependent on-stream flow, with median EC levels of around 250 - 300 µS/cm. Further review of water quality data related to other coal mines nearby indicate the following general surface water characteristics:

- neutral to slightly alkaline pH
- low salinity levels
- high levels of turbidity especially during periods of high flow.

The water management strategy for the site has been designed to contain all contaminated water produced by DYE, even under the most severe meteorological conditions. The hydrology assessment indicates that sufficient system containment capacity has been provided to prevent uncontrolled release (i.e., spillway overflow) of water from any of the site mine water storages.

It is noted that hydrocarbons and other chemicals will be used at DYE, however they will be managed through the water management strategy, so that there is no potential to impact on aquatic system or to result in contamination of waterways. DYE will also alter the surface hydrology due to the development of two waste rock dump emplacements to the north of the site.

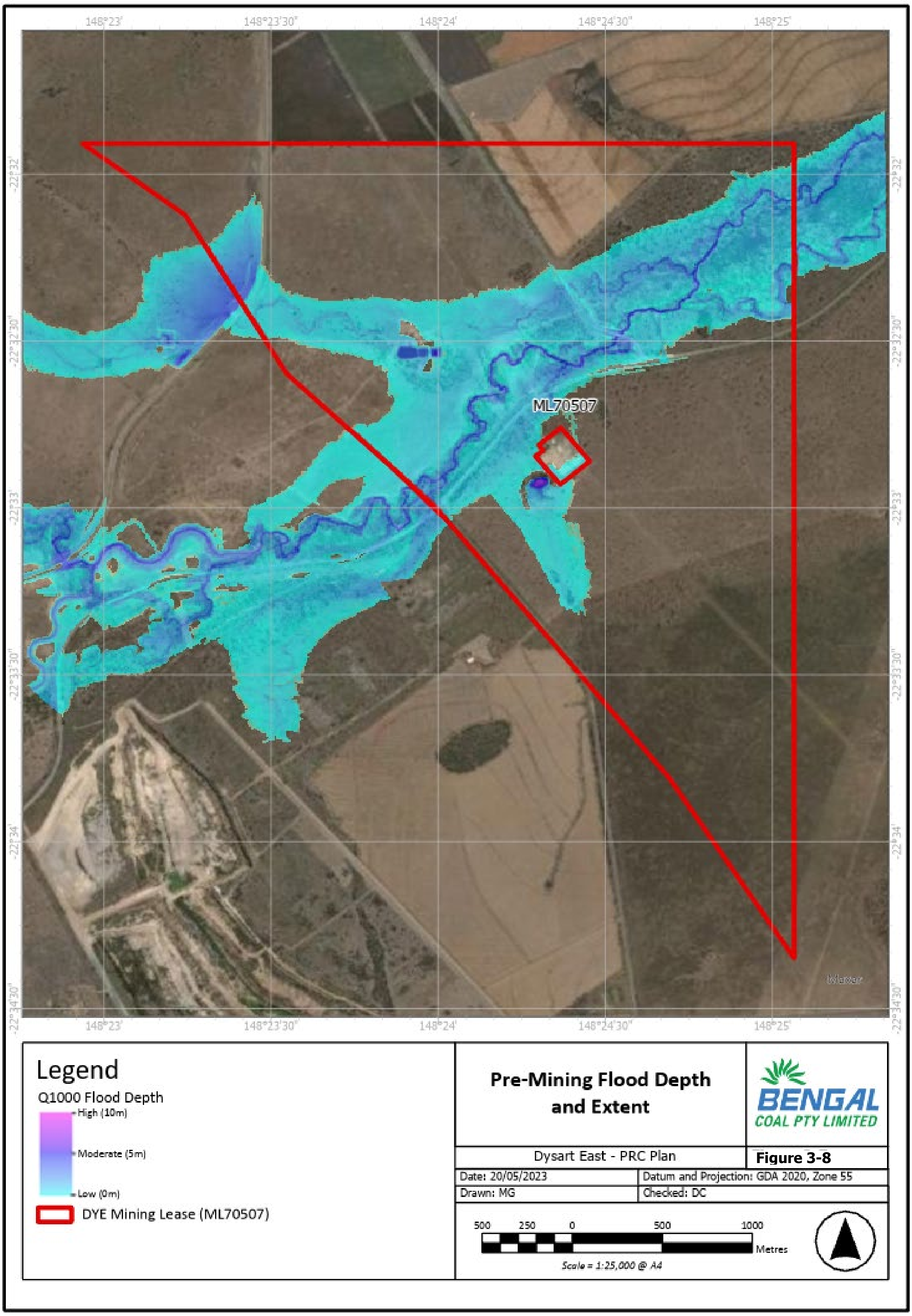

Figure 3-8 Pre-mining AEP Flood Extent and Depth (1 in 1000)

Soil Types and Properties

Six soil mapping units (SMUs) were developed based on similarity in morphology, laboratory chemical and physical data, vegetation, soil origin and topographic position. Significant portions of the study area include well-structured clays, which originated from basalt or fine-grained Tertiary shales, with good quality soils suitable for cropping and high value grazing.

Two major soil types dominate, these are referred to as Brigalow scrub and Mountain Coolibah downs soils. Both are deep, well-structured clays, while the central portion of the mining lease includes hard setting alluvial soils not suited to cropping. These are associated with the remnant riparian vegetation.

Table 3-5 below provides a summary of the soil mapping units described for the DYE; the extent of each soil type is as shown in Figure 3-9.

Table 3-5 Pre-mining Soil Types

Soil Mapping Units (SMU)	Name	Description	Occurrence at DYE
A1	Active creek lines with stratified sandy loam to clay loams	The surface is typically quite hard-set, and the sandy clays may extend down to two metres close to the creek line. The depth of useable topsoil is variable due to the hard setting properties of the surface soil.	This SMU occurs along the edges of Downs Creek which occurs across the central portion of the site.
A2	Old alluvial plain of non-cracking dark sandy clays or gradational soils	The soils feature shallow drainage lines and were quite wet when surveyed. As an alluvial depositional soil unit, vegetation and soil morphology is variable but generally deep, dark sandy to silty clays which do not crack and may have quite hard blocky subsoils. Vegetation includes Mountain Coolibah, Poplar Box, Moreton Bay Ash and Brigalow.	This is a significant soil which occurs between the sandy alluvial plain with A3 soils and the Mountain Coolibah uplands of dark cracking clays.
A3	Old alluvial plain of sandy duplex soils with mottled subsoils	The surface is that of a sandy loam to 30 cm thick overlying hard, mottled clay subsoils typical of Poplar Box vegetation in Central Queensland. Poor drainage is indicated by the presence of bleached A2 horizons and heavy subsoil mottling at some sites. Nutrient levels are low, but the area supports mixed pasture. This soil unit includes extensive areas of cleared land with some remnant vegetation and minor regrowth. The sandy surface layer is restricted in depth and will quickly dry out, and as such, is susceptible to erosion. Water tends to perch between the topsoil and subsoil layers which causes the soils to become quite boggy and saturated after rain.	This soil type occupies significant areas on the northern side of the site.
S1	Brigalow Softwood Scrub Soils	The soils are black cracking clay and are like SMU U1 in that they are deep, well-structured productive cropping land. The soil is a uniform Vertosol, with slightly heavier clay content than the adjacent Mountain Coolibah soils. Much of the area has been wholly or partially cleared of remnant vegetation, which would have included Brigalow, Belah, Yellowwood and other species commonly referred to a Softwood Scrub country.	This is an important soil type which occupies the southern portion of the site.
U1	Moderately coarse structured black	The soils are quite deep (>90 cm usually), dark cracking clays with a moderately coarse sandy clay granular surface over	This is a major soil type in the survey area, which

Soil Mapping Units (SMU)	Name	Description	Occurrence at DYE
	clay formed on calcareous sediments	moderately coarse to hard angular blocky subsoils. The soils are not mottled and are moderately well drained, having been regularly cropped in the past. When cultivated, the surface forms a fine sandy surface crust. Landforms are undulating plains open downs country with slope gradients generally in the order of 1 % to 2 %. Original vegetation was open Mountain Coolibah and Bloodwood. Extensive clearing or thinning of original vegetation has been done to develop cropping and beef cattle pursuits.	occurs across the northern portion of the site.
U2	Finer structured Black Clay formed on Calcareous Sediments	Essentially has the same landform as U1 but is differentiated based on finer, stronger structural attributes which suggests a slightly better growth medium for crop production than U1. The surface is soft, and the profile is alkaline with a well-structured medium uniform clay that persists to depth. The soil occurs along very gently sloping undulating plains with cracking clays overlying unconsolidated calcareous sediments. Original vegetation, which still exists in places, was open Mountain Coolibah woodland with scattered Bloodwoods with a generally strong pasture cover of Buffel grass.	A major soil type in the area which occurs on the southern side of the Golden Mile Road.

Strategic Cropping Land

Strategic Cropping Land (SCL) is land that is, or is likely to be, highly suitable for cropping because of a combination of the land's soil, climate and landscape features. Each soil type was evaluated against the SCL criteria. The three alluvial units (A1, A2 and A3) are all classed as non-SCL, with all three units failing the criteria for soil water storage and soil wetness. All the cracking clay units (S1, U1 and U2) are classed as SCL.

After a validation process, a total area of SCL associated with the DYE site was confirmed as 330.8 ha.

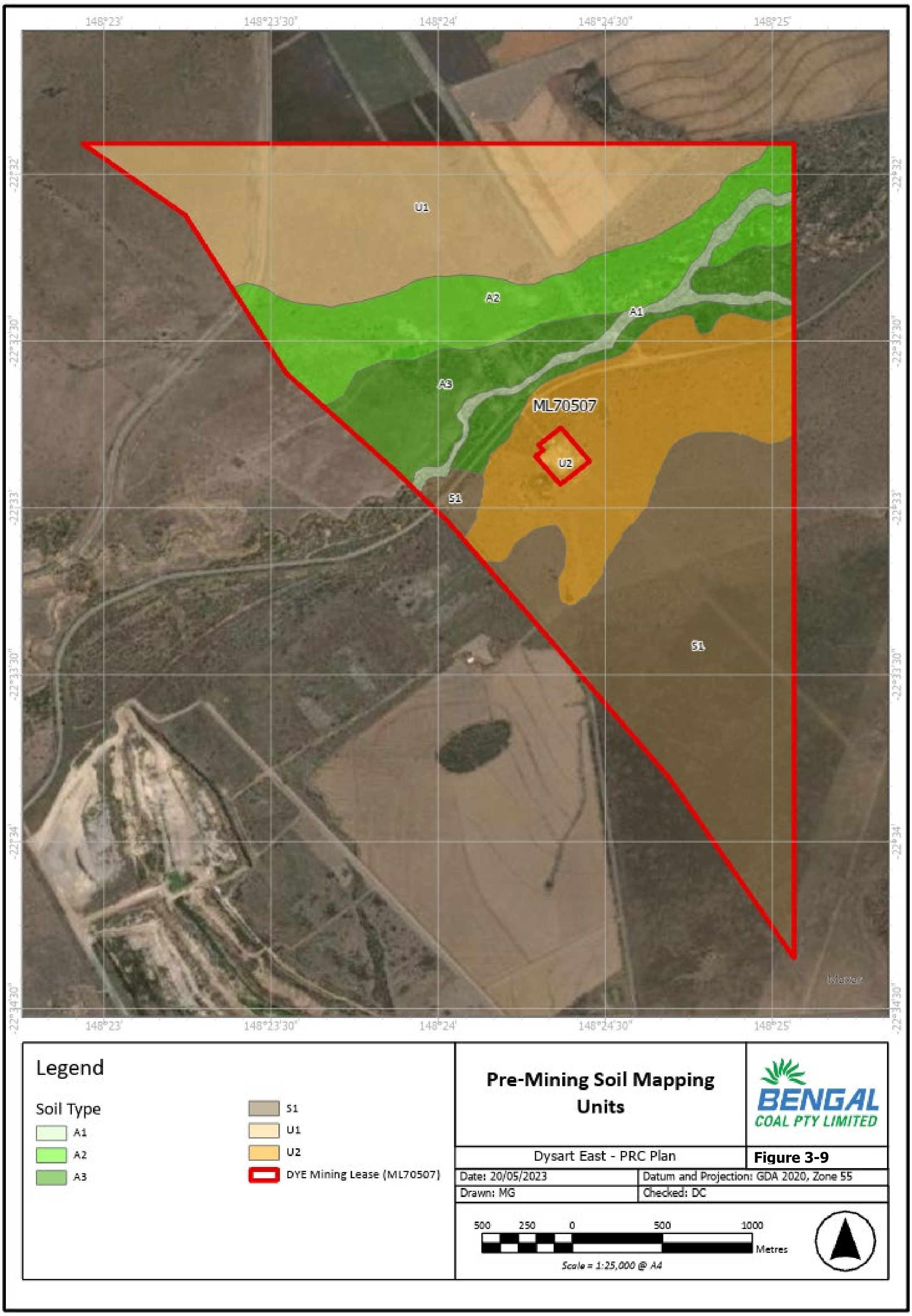

Figure 3-9 Pre-Mining Soil Mapping Units

Land Stability and Suitability

Pre-mining Land Use

The predominant land uses within the region include cropping, grazing and resource activities. The historic land uses within the DYE footprint include low intensity beef cattle grazing and limited dryland cropping. Much of the site is covered with non-remnant vegetation, however there are some areas of remnant bushland or native vegetation located along Downs Creek and isolated patches to the south of Dysart Connection Road. There are no pre-existing buildings or homesteads on the site, apart from the Dysart Substation, which is just south of the Dysart Connection Road, in the centre of the site. It is noted that this footprint has been excluded from the ML, and as such is not subject to this PRCP.

Agricultural Land Suitability

A dominant pre-mining land use for DYE has been beef cattle grazing. Although much of the site soils are suitable, variable and relatively low rainfall limits the suitability for permanent dry land cropping. Agricultural land suitability was assessed for dry land cropping and grazing based on the Technical Guidelines for Environmental Management of Exploration and Mining in Queensland (DME, 1995). This is as shown in Table 3-6. The Agricultural Land Suitability method classifies land into each of five land suitability classes for both cropping and grazing purposes (URS, 2015a). Soil types S1, U1 and U2 have better suitability for agricultural use.

Further to this, an assessment of the Good Quality Agricultural Land (GQAL) was also completed and has been mapped for each soil unit as per the table below. Aligning to the suitability class, the black cracking cray soils (S1, U1 and U2) are suitable for cropping. The non-GQAL areas at DYE are suitable for use as pasture lands.

Table 3-6 Land Suitability Classes

Soil Type (SMU)		Land Suitability Class	GQAL Class
A1	Active creek lines with stratified sandy loam to clay loams	Cropping – Class 5 Grazing – Class 4	Class C3
A2	Old alluvial plain of non-cracking dark sandy clays or gradational soils	Cropping – Class 4/5 Grazing – Class 3	Class C1
A3	Old alluvial plain of sandy duplex soils with mottled subsoils	Cropping – Class 5 Grazing – Class 4	Class C1
S1	Brigalow Softwood Scrub Soils	Cropping – Class 2 Grazing – Class 1	Class A
U1	Moderately coarse structured black clay formed on calcareous sediments	Cropping – Class 3 Grazing – Class 2	Class A
U2	Finer structured Black Clay formed on Calcareous Sediments	Cropping – Class 2 Grazing – Class 1	Class A

Subsidence

The underground mine workings for DYE have been designed and developed based on industry standard pillar design guidelines, coupled with conservative mine layout and associated risk management principles. Given that the DYE site has not yet been developed, there has been no historic subsidence impact already incurred. The approach to mine design adopted has aligned to the UNSW Factor of Safety (FOS) approach, whereby modelling is completed of the intended mine arrangement and iteration of design has occurred to ensure the operation will result in negligible surface subsidence.

The mine design will achieve this outcome by only partially extracting the coal resource, to eliminate overburden caving and provide for long term stable pillar systems. Threshold subsidence values for negligible effects can vary depending upon the type and sensitivity of the surface natural and built environment. For this project, ground movements are designed to be less than 100mm vertical subsidence, with associated tilts and strains at less than 5mm/m. This category of subsidence movement would not be expected to impact the serviceability of residential structures and is consistent with the lowest level of impact category, which is Category A – (MSEC 2007).

Adopting such an approach both preserves long-term pillar stability and ensures minimal surface or sub-surface cracking. Further, the Dysart substation will be designated as 'Restricted Land' and excluded from being undermined as an additional mitigation against subsidence for this area.

As a result, expected subsidence levels associated with the mining activities are planned and predicted to be less than typical seasonal soil movements (SCT, 2015) This essentially makes any minor subsidence imperceptible, and as a result, no change is anticipated to surface infrastructure. Similarly, no subsidence impact is expected to occur to the surface environmental values such as terrestrial or aquatic ecology, surface water resources, erosion and sedimentation, groundwater drawdown or land resources, or be relevant to progressive rehabilitation and closure.

Ecology and Vegetation Communities

The DYE site predominantly features non-remnant vegetation (approximately 80% of the site is degraded and highly disturbed), except for Regional Ecosystems (REs) located along Downs Creek and isolated patches to the south of Dysart Connection Road. Patches of regrowth vegetation are generally located adjacent to remnant vegetation. The riparian vegetation along Downs Creek also forms a bioregional wildlife corridor through the site and connects to remnant vegetation external to the site.

Two threatened ecological communities (TECs) exist on site as small patches of Brigalow (13.04 ha) and Natural Grasslands of the Queensland Central Highlands and the Northern Fitzroy Basin (0.77 ha). The only environmentally sensitive areas (ESAs) on site are Category B ESAs, represented by Endangered (biodiversity status) REs. No Category A or Category C ESAs are present on site.

The site supports a variety of fauna habitat types, albeit mostly in a degraded state. The site is largely disturbed through agricultural and grazing activities with better fauna habitat available within the relatively intact vegetation associated with Downs Creek and a few isolated patches of vegetation further across the site.

Figure 3-10 illustrates the ecological features and vegetation communities of relevance to DYE.

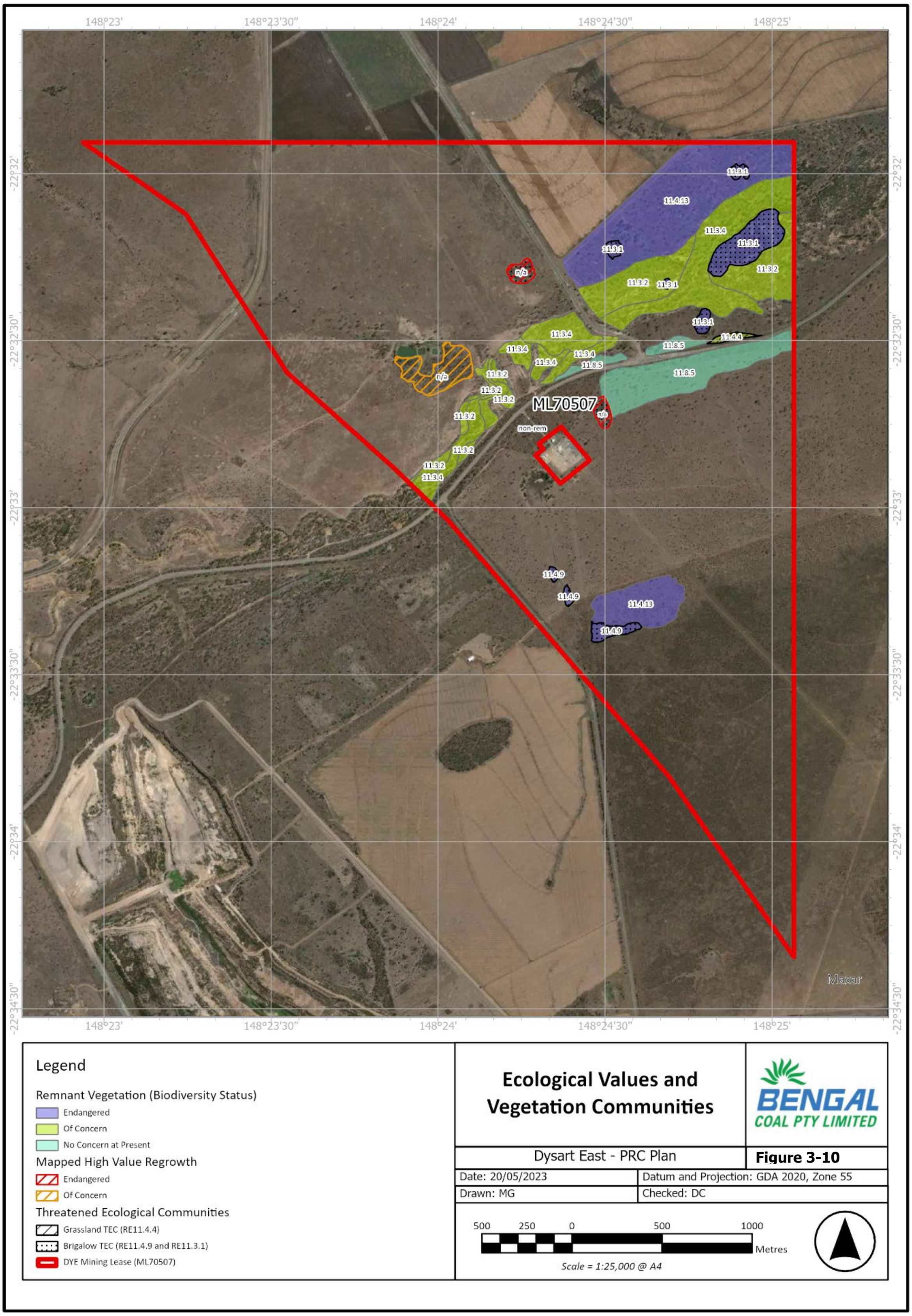

Figure 3-10 Ecological Values and Vegetation Communities

Conservation Significant Flora and Fauna Species

No conservation significant flora species were located or are considered likely to be present. Surveys have confirmed the presence of several conservation significant fauna species, as follows:

- little pied bat (*Chalinolobus picatus*), was found along riparian woodland vegetation. This species was formerly listed as Near Threatened under the NC Act but has now been downrated to Least Concern.
- squatter pigeon (*Geophaps scripta scripta*), listed as Vulnerable under both the NC Act and EPBC Act was found within the 'grazing paddock' along dirt tracks.
- koala (*Phascolarctos cinereus*), currently listed as Endangered Vulnerable under both the NC Act and the EPBC Act, was recorded (pellets) within eucalypt woodland by RPS (2013) and through a direct observation by URS (2013) within RE 11.3.4.
- rainbow bee-eater (*Merops ornatus*), a listed Migratory species under the EPBC Act, was found along the riparian woodland vegetation; and
- satin flycatcher (*Myiagra cyanoleuca*), a listed Migratory species under the EPBC Act, was found along the riparian woodland vegetation.

The site area supports a variety of fauna habitat types, most in a degraded state. Riparian vegetation along Downs Creek is primary habitat for hollow dependent fauna such as arboreal mammals, hollow nesting birds and microchiropteran bats. The riparian communities along Downs Creek also form part of a corridor connecting to larger patches of remnant vegetation to the west. However, wildlife connectivity throughout the remainder of the site area is low.

Introduced Species

Four introduced flora species were identified during baseline surveys within the DYE site, as follows:

- harrisia cactus *(Eriocereus martini*).
- prickly pear (*Opuntia stricta*).
- rubber vine (*Cryptostegia grandiflora*); and
- parthenium (*Parthenium hysterophorus*).

These species are currently declared as restricted or invasive plants under the Queensland Biosecurity Act 2014 but are not Weeds of National Significance (WONS). The DYE site is also considered highly likely to support movements of foxes, pigs, feral cats and dogs and cane toads (among others).

Aquatic Ecology

No wetlands of International Importance, World Heritage Properties or National Heritage Places occur within the site are. Baseline surveys completed (RPS, 2013; URS, 2015) highlight that aquatic habitat condition was minimal to fair with stream banks being well vegetated with a mix of native and non-native grass species recorded. Riparian vegetation was thin with a sparse canopy, with tree species sporadically occurring along the stream bank. The riparian canopy vegetation was dominated by River Red Gum (*Eucalyptus camaldulensis*) and Moreton Bay Ash (*Corymbia tessellaris*) consistent with RE 11.3.4. Disturbances such as minor erosion and cattle impacts were evident.

The Great Egret (*Ardea alba*) was the only aquatic species with potential to occur, with all other aquatic or semi-aquatic species deemed unlikely.

Underlying Landholders and Interests

The background tenure is shown in Section 3.1.3 (Table 3-2). It is noted that a significant portion of the tenement is freehold and owned by the mining lease holder or a subsidiary. There are also several properties which are owned by third parties, who are considered sensitive receptors and carry out commercial agricultural ventures at these locations (as shown on Figure 3-13). There is also a substation which is surrounded by ML70507, and a number of road and rail reserves. It is noted that this footprint is excluded from the ML, and as such is not directly subject to this PRCP.

DYE is in the vicinity of three other local mines – the Saraji Coal Mine (4 km to the north-west), Norwich Park Coal Mine (3 km to the south) and the Lake Vermont Coal Mine (6 km to the north). It is noted that the approval for the development of DYE pre-dates the nearby Lotus Pit extension which has subsequently been approved for Norwich Park.

The National Native Title Tribunal (NNTT) online Native Title Vision mapping identified no registered claims over the Dysart East footprint and did not identify any existing Indigenous Land Use Agreements (ILUA) over the site.

3.1.7 Design for Closure

Transitional PRC plans are not required to demonstrate how aspects of the mine have been designed for closure, where it relates to an existing or approved disturbance footprint as is the case for DYE (as per Section 3.1 of the PRC Guideline). It is noted that the design, construction, and operation of the mine has been planned to protect environmental values and avoid impact entirely, but also to design for closure, as extensively detailed in the Environmental Assessment Report prepared for the project approval (URS, 2015).

ERAs at DYE will be carried out in a way that maximises the ability for progressive rehabilitation to occur. It is noted that decisions to avoid impact entirely (such as avoiding open cut operations and preferentially adopting a low-intensity underground mining method) do limit the requirement and opportunities for progressive rehabilitation simply because the smaller disturbed areas tend to be essential for the full duration of the mining operation. A significant portion of the disturbance footprint (associated with the infrastructure and underground areas) will not be available for rehabilitation until the end of the mine life. Key aspects of relevance include the following:

- waste rock dump and infrastructure areas have been located to avoid the floodplain extent, as well as minimise clearing of remnant vegetation (and ensure protection of environmental values such as MNES and MSES.
- post-mining land-use categorisation has been informed by current/pre-mining and surrounding land uses, as well as land suitability for agriculture and proximity to sensitive receptors.
- the size, shape and design of key surface features (such as the waste rock dump) have been heavily influenced by visual amenity and surrounding landform arrangements to sit well within the post-mining landscape; and
- the underground bord-and-pillar mining method has been selected over alternatives (such as open cut or underground longwall) to preserve surface values, minimise groundwater impact, ensure negligible subsidence impact and minimise visual impact.

The key goal for rehabilitation and closure of the site is to achieve a rehabilitated landform, in a stable condition in accordance with the definition as per Section 111A of the EP Act (DES, 2014).

3.1.8 Rehabilitation and Improvement Planning

A rehabilitation hierarchy has been applied to DYE, in line with the Qld Mined Land Rehabilitation Policy in order of decreasing capacity to prevent or minimise environmental harm. How this has been applied to site is demonstrated in Table 3-7.

Table 3-7 Rehabilitation Planning by Hierarchy

Hierarchy level	Goal	Relevant Rehabilitation Area at DYE and proportion of total site area
1.	Avoid disturbance that will require rehabilitation.	RA4, RA5 and RA6 (86% of site area)
2.	Re-instate a 'natural' ecosystem as similar as possible to the original ecosystem.	-
3.	Develop an alternative outcome with potential for a higher economic value than the previous land use.	RA3 (<1% of site area)
4.	Re-instate previous land use.	RA1 (9% of site area) RA2 (5% of site area)
5.	Develop lower value land use.	-
6.	Leave the site in an unusable condition or with a potential to generate future pollution or adversely affect environmental values.	-

As minimal surface disturbance is required and no subsidence or groundwater impacts are anticipated, the aim of rehabilitation and closure for DYE is to '*avoid disturbance that will require rehabilitation'* for much of the site. For surface disturbance areas, the aim will either be to '*retain the infrastructure to preserve the higher economic value for a new land user*' or else to '*reinstate the previous land use*'. This equates to just 14% of the total site area.

Structured mine planning processes will be applied as the mine commences operations, to seek out opportunities for progressive rehabilitation. Current processes are considered basic given that the site has not yet been developed, however has still aimed to maximise progressive rehabilitation by scheduling the completion of rehabilitation as soon as practicable after land becomes available. Exact area dimension and details will be confirmed as the mining operation commences.

Rehabilitation Areas and Milestones

The opportunity to complete progressive rehabilitation is very dependent on the type and nature of disturbance planned to occur. Active works are planned to be completed as soon as possible after an area becomes available, however much of the site will not be available until the end of the mine life. Areas will be available as detailed below (and as shown in Figure 3-11):

- WRD areas will become progressively available, consisting of two small WRDs footprints for the site and operation – these become available as entire footprints as the operation is progressed (with one available in Year 7, and the other footprint to be utilised for the life of the mine).
- All infrastructure on the site will be required for the duration of the mine life, including the ROM and Product stockpile, TLO and rail spur, CHPP area, water storages, erosion and sediment control measures, groundwater bores, tracks and roads and other monitoring equipment (unless retained in agreement with stakeholders). Rehabilitation of these areas will occur as part of a closure campaign at the end of operations.

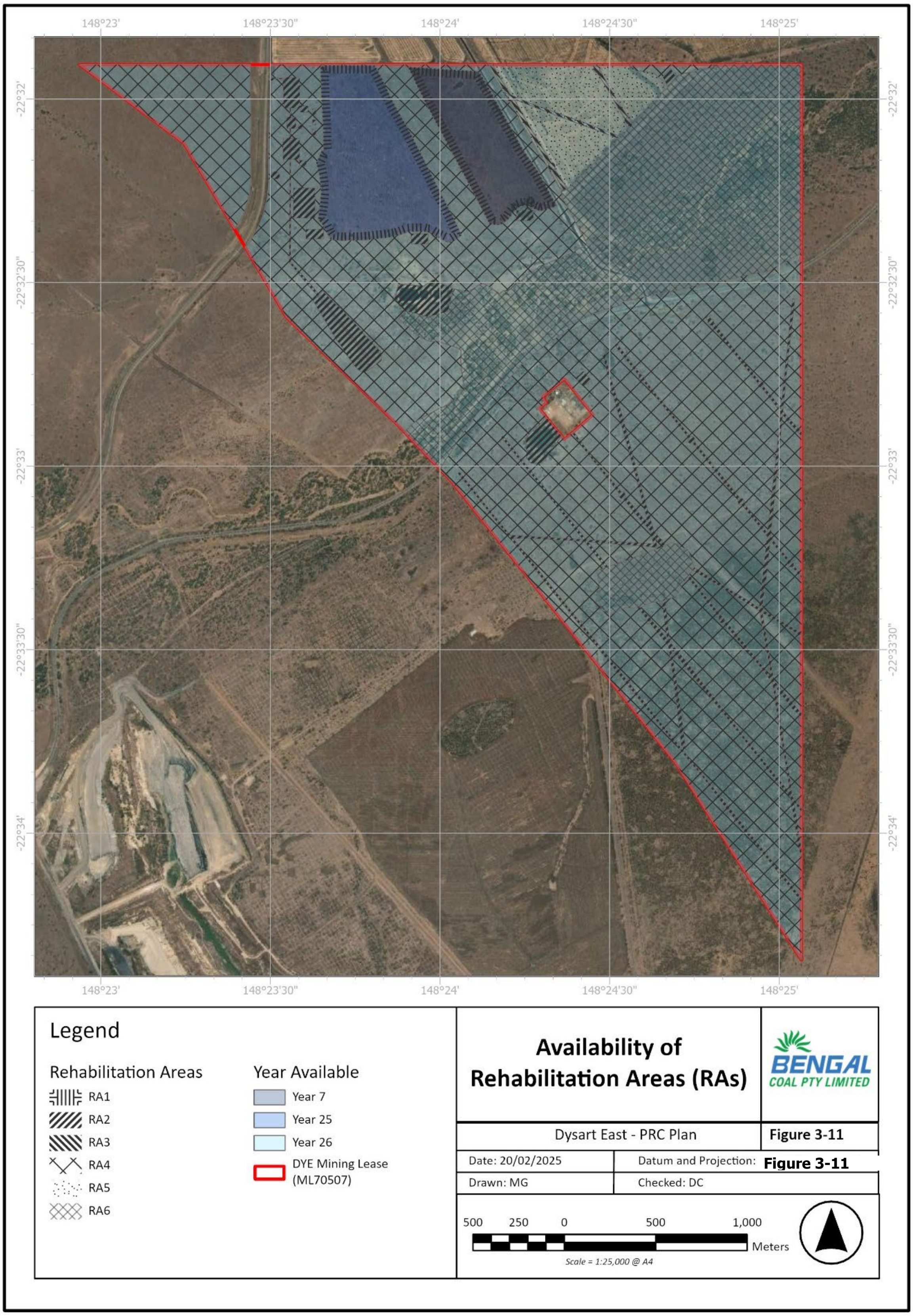

Figure 3-11 Availability of Rehabilitation Areas (revised)

Additional monitoring and maintenance activities will be required from the time that active rehabilitation activities have been completed, to confirm achievement of milestone criteria, with monitoring data used to support the certification of rehabilitation areas. The relinquishment process is expected to take approximately two years to complete post certification.

Figure 3-12 estimates the period required for each rehabilitation area to achieve the relevant milestone criteria, as well as show when areas become available.

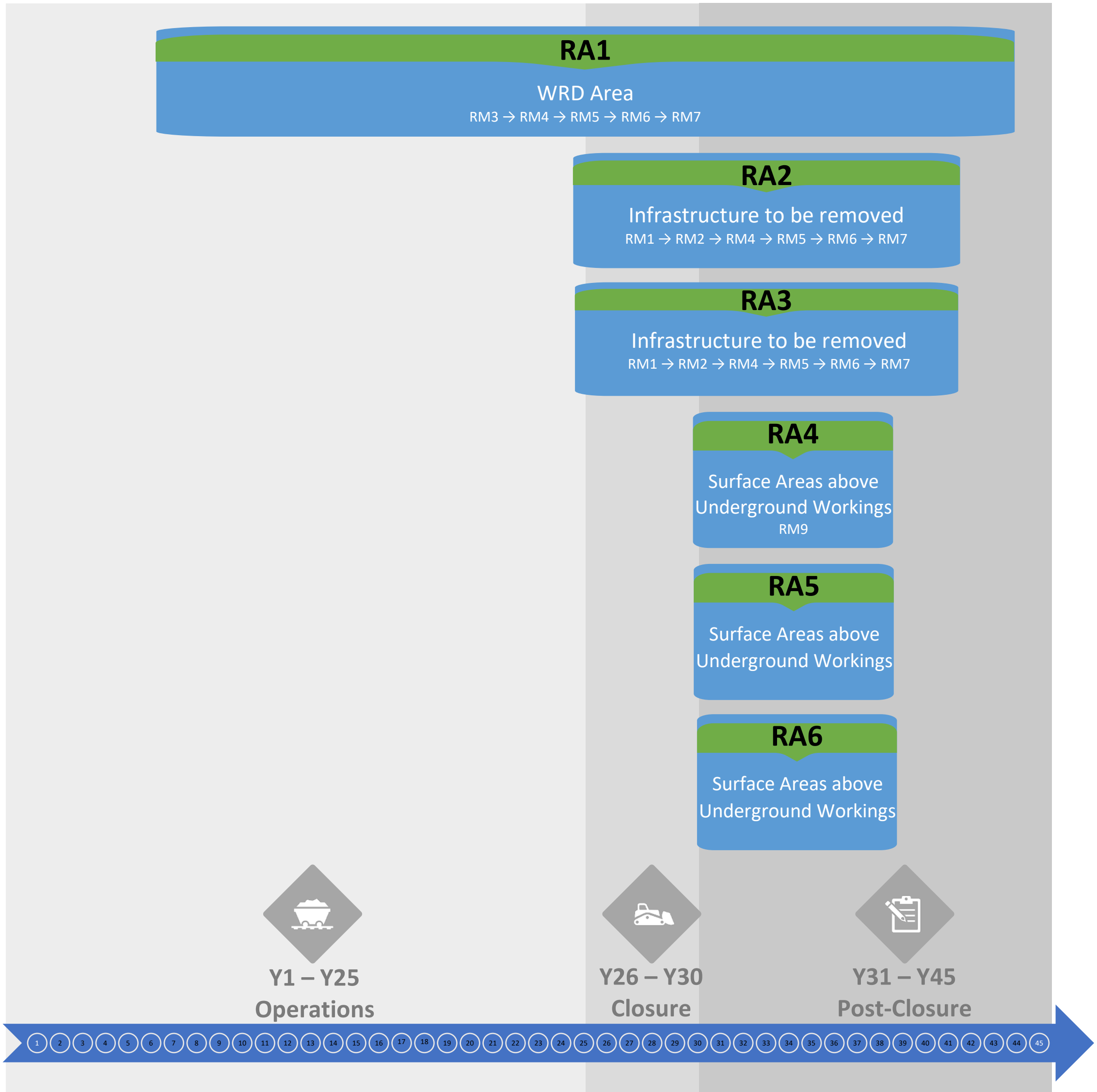

Figure 3-12 Rehabilitation Planning by Area (revised)

Existing Rehabilitation

DYE has not commenced development at this stage, and as such, no disturbance has occurred. As such, there has been no opportunities to complete rehabilitation activities.

3.2 Community Consultation

3.2.1 Overview of Community and Stakeholders

The background tenure is detailed in Section 3.1.3 (Table 3-2). It is noted that a significant portion of the tenement is freehold and owned by the mining lease holder or a subsidiary. There are several properties, owned by third parties, that are considered sensitive receptors and carry out commercial agricultural ventures at these locations (as per Table 3-8). There is also a substation which is surrounded by ML70507, as well as road and rail reserves.

Table 3-8 Stakeholders surrounding DYE

Stakeholder ID	Description	Distance to DYE site boundary (km)
R1	Residence to the north of the site	6.3
R2	Residence to the north-east of the site	2.6
R3	Residence to the east of the site	4.3
R4	Dysart Township fringe	5.0

DYE is also located in proximity to three other mines – the Saraji Coal Mine (4 km to the north-west), Norwich Park Coal Mine, now renamed to Saraji South (3 km to the south) and the Lake Vermont Coal Mine (6 km to the north). All parties who have been the subject of previous consultation, as described in Section 3.2.2, are also considered stakeholders.

These features are shown in Figure 3-13.

3.2.2 History of Consultation Completed

As previously described, DYE is not yet developed, so the history of engagement with the community has focused on those parties with potential to be impacted by the mine development. Further consultation has occurred primarily in response to direct regulatory requirements.

Key processes which have required consultation included as part of the:

- Dysart East Coal Project Environmental Assessment Report, which was finalised in 2015 and lead to the issuance of the EA (EPML01978714).
- mutually agreed Land access and compensation agreements, finalised in late 2016, with
  - Edward and Alison Murphy, and
  - Isaac Regional Council.
- Mine Lease 70507 application Objections which lead to negotiated, mediated land access compensation agreement, finalised in mid-2016, with:
  - Lake Vermont Resources Pty Ltd, Bowen Basin Coal Pty Ltd, and Aurizon Network Pty Ltd; and
  - a Co-Use Agreement with Queensland Electricity Transmission Corporation Ltd, and Ergon Energy Corporation.
- Dysart East RIDA application (RPI17/0004 Bengal Coal), which was finalised in 2017.
- Appeal by Cradcorp Corporation against Dysart East RIDA finalised in favour of Bengal Coal, by April 2021.

Whilst it is acknowledged that these are public notification and review processes have been required for other purposes, it is noted that they have also identified relevant community interests. They have also opened occasional conversation with stakeholders on a pragmatic and cooperative basis as required. For example, Bengal Coal has regular if infrequent contact with Ted Murphy, the Managing Director of Lake Vermont Resources, the Land Manager for BMA's regional holdings, and BMA's SSE for the Saraji and Saraji South (ex-Norwich Park) Mines.

It is noted that the nominated Post-mining Land Uses (PMLUs) are to be transitioned from land outcome document EA EPML01978714, and that much of the footprint of DYE will be rehabilitated to hold some value for cattle grazing which will both re-establish the pre-mining land use and is consistent with surrounding land uses.

The DYE project received its mining lease (ML70507) on April 1, 2018. Since then, no development has taken place. Since the ML was issued, there has been a loss of conventional fund-raising sources due to the general ESG corporate governance and anti-coal investing environment. Nevertheless, since April 2018 and up to date, Bengal Coal has unceasingly made every effort to raise funds. In the past 12 months, Bengal Coal has entered into a (at this stage) non-binding Terms Sheet with a large international steel maker.

In a two-stage process, the whole transaction calls for the investment of equity into Bengal Coal, being an equity contribution to the development of the Dysart East Underground Hard Coking Coal Mine in return for a shareholding in the company. The existing shareholders and the incoming shareholder have agreed to cooperate in raising any additional debt finance required to fund a currently estimated total project development cost of ~U$210m. Debt will form a minor portion of funding.

The first stage of the process will see the preparation of a Final Feasibility Study (FFS) which is intended to lead to a Decision to Mine, a Financial Investment Decision (FID). Bengal Coal expects delays such that end of FFS and FID is Q3 2024.

The second stage of the process, subject to an FID, is the preparation of Investment Agreements, plus a period of team and contractor mobilisation, including Front End Engineering Design, Final Design, procurement, pre-production drilling and seismic programme, early subcontractor involvement. Finalisation of port & rail arrangements, final marketing agreements, etc. This period is likely to last up to Q3/Q4 2025 with surface construction and decline development commencing at that time.

Since February 2023, deep and thorough technical and legal due diligence has been completed and the prospective incoming investor is currently seeking FIRB approval for the proposed transaction.

Only when the funds have been raised after a successful FID, will it enable development of the mine. At that time, Bengal Coal seek to engage further with the various stakeholders, and will specifically address the matters required by the PRCP guideline relating to community consultation. Undertaking any stakeholder engagement prior to having certainty around the development of the mine would likely be confusing to the community and may send an inaccurate message as to certainty of mine development overall.

Prior to the development of the mine and the commencement of operations, DYE will engage in further consultation with the community. This will allow anyone impacted by proposed rehabilitation and closure activities at the DYE site to have an opportunity to provide input to the planning process, in addition to establishing and maintaining productive relationships with neighbours.

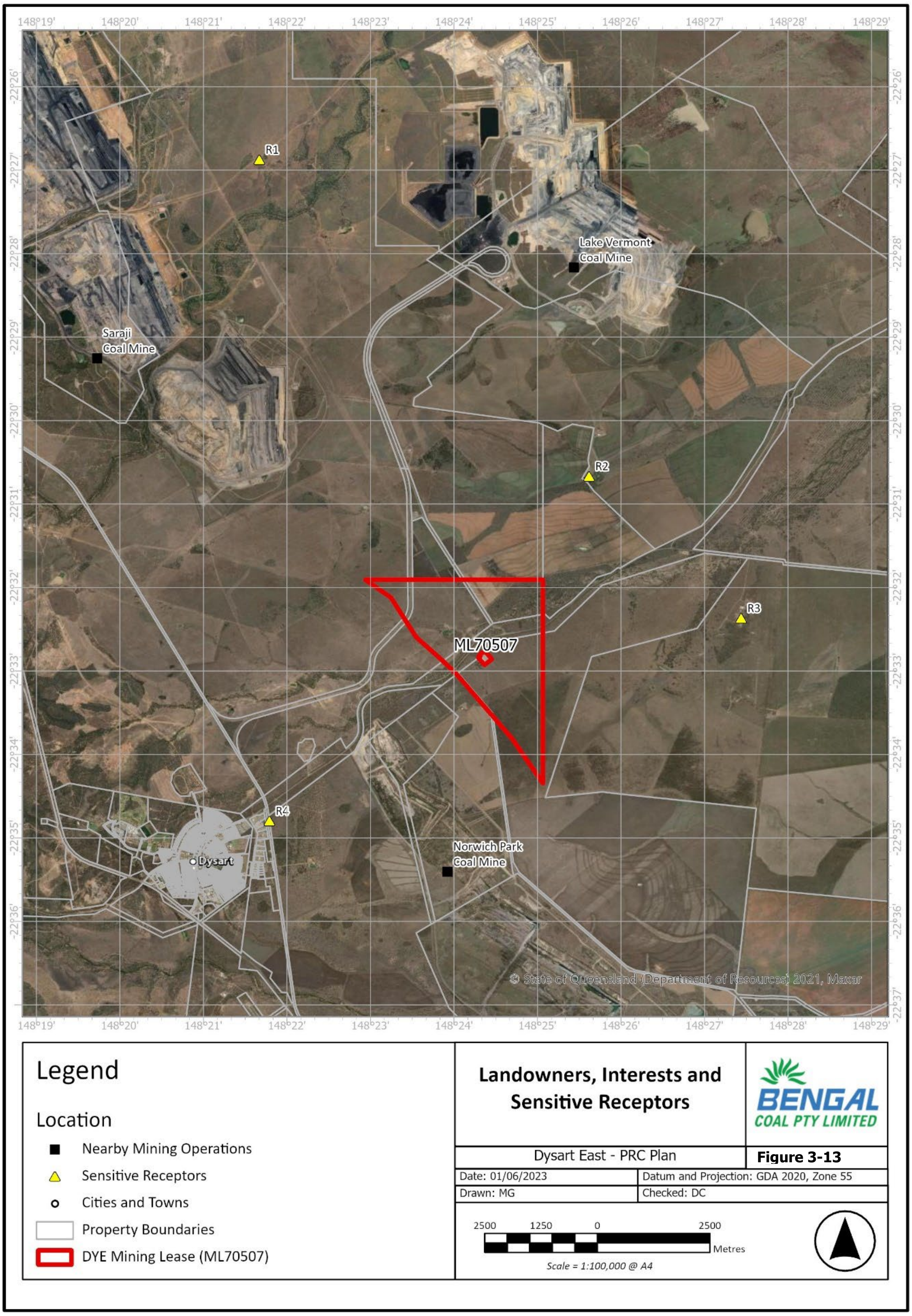

Figure 3-13 Relevant Landholders, Interests and Sensitive Receptors

3.2.3 Consultation Register

A consultation register that complies with Section 126C(1)(c)(iii) of the EP Act is included as Table 3-9. This format and detail will be reflected in management documents developed and actively maintained by DYE as it commences operations. The register will be a record of all consultation activities considering relevant parties, topics of discussion, outcomes, and ongoing commitments for any consultation undertaken.

The key targets of consultation include the following persons/entities, whom are Tier 1 stakeholders:

- The residents of Dysart Town
- Edward and Alison Murphy
- Isaac Regional Council
- Lake Vermont Resources Pty Ltd, Bowen Basin Coal Pty Ltd, and Aurizon Network Pty Ltd
- Queensland Electricity Transmission Corporation Ltd, and Ergon Energy Corporation; and
- Cradcorp Corporation.

Table 3-9 Community Consultation Register

Date	Stakeholder/ Interest	Consultation Type/ Format	Information Provided	Issues Discussed/ Raised	How Issues considered	Decision/ Outcomes of Engagement
2015 – current (as required)	• local landowners (potential directly affected parties)	• meetings • face to face discussions • phone calls and emails	• project description (incl rehabilitation) • high level final land-use (as domains) • information on potential environmental impact	• impact on their interests and property • operational impacts and timing (AQ and noise) • traffic impacts • final land use	• Confirmation of minimised impact provided through design • mine design review undertaken	• bord and pillar underground mine design amended to address concerns • agreed to continue consultation prior to mine development
2015 – current (as required)	• surrounding mining operations • infrastructure interests	• phone calls • meetings • emails • follow up letters • court mediated process	• project description (incl rehabilitation) • potential operational interactions due to mining • information on potential environmental impact	• impact on their interests and property • operational impacts and timing (AQ and noise) • traffic impacts • final land use	• Confirmation of minimised impact provided through design • Agreement to consider operational concerns	• mine design amended to address concerns (i.e to avoid Dysart Substation) • agreed to continue consultation prior to mine development
2015 – 2017	• Dysart township residents • Local council representatives	• presentation • meetings • face to face discussions • phone calls and emails	• project description (incl rehabilitation) • high level final land-use (as domains) • information on pre-mining land-use and capability • information on potential environmental impact	• contribution to local economy • impact on Dysart town infrastructure • operational impacts (AQ and noise) • traffic impacts • final land use and availability • cumulative impact	• mine design review undertaken	• mine design amended to address concerns • agreed to continue consultation prior to mine development • bord and pillar underground mine adopted to mitigate surface impacts • local sourcing and employment policy
2017	• state regulators (including DERM, DILGP and DNRM)	• presentations and meetings • face to face discussions • phone calls • follow up letters	• project description and extent including rehabilitation of WRDs • provision of spatial information for matters of interest	• impacts on SCL • permanent vs temporary impacts • underground impacts	• Confirmation that no remaining areas of concern due to further information provided	• mine design amended to address concerns • bord and pillar underground mine adopted to mitigate surface impacts • Adoption of conservative FOS

3.2.4 Community Consultation Plan

A Community Consultation Plan that complies with Section 126C(1)(c)(iv) of the EP Act was prepared to guide engagement activities associated with the ongoing project planning, commencement of operation and continuation of progressive rehabilitation and closure activities. This comprised the subsections below. This detail will be reflected in management documents developed and actively maintained for DYE as it commences operations.

The approach taken is based on locally-accepted standards of leading practice, international and Australian leading practices, such as methods outlined in International Council on Mining and Metals — Planning for Integrated Closure Toolkit (ICMM 2008) and the ICMM Community Development Toolkit (ICMM 2006).

Objectives

The overarching purpose of this consultation plan will be to identify, notify and engage community members who may be affected by the rehabilitation and closure of DYE. This will occur through the achievement of the following objectives:

- identify interests and concerns.
- inform of relevant activities.
- establish and maintain relationships.
- consider and address concerns where possible, as they arise.
- develop mitigation strategies to address concerns as feasible.
- provide timely, accurate and credible information.

Target of Consultation

An initial screening of all potential community members that have an interest in, or may be affected by, the DYE site has been completed, and can be made available on request by the regulator. These parties can be categorised into the following key groups:

- neighbouring landholders.
- adjacent mining/ Infrastructure interests.
- government stakeholders (commonwealth, state and local).
- community groups.
- non- Government organisations.
- internal.
- other interested parties (such as suppliers).

How and When Engagement will Occur

Consultation and engagement activities will vary according to the levels of interest in and influence that the community has in relation to the DYE site. Further, as relationships are built, different approaches will be employed for each community member according to their wishes and priorities.

Broadly, engagement will be classified into three tiers, according to level of influence, with the methods and frequency of consultation varying for each level, as detailed:

- Tier 1 — High influence. Consultation to collaborate, with direct engagement occurring, through face-to-face meetings, other direct dialogue, internal workshops, and supplementary email updates. Provision will be made to ensure feedback can be considered with iterative discussion and conversation maintained. The frequency of engagement is expected to be high once the DYE site is developed, with at least quarterly communications anticipated.
- Tier 2 — Medium influence. Consultation to consult, through the dissemination of targeted newsletters and other information and limited direct engagement as required. Provision will be made to ensure feedback can be considered. The frequency of engagement is expected to be moderate once the DYE site is developed, perhaps annually.
- Tier 3 — Low influence. Consultation to inform, primarily through dissemination of broad and publicly available information. The frequency of engagement for this tier will likely occur in response to a specific need to widely inform.

Information to be Released

Consultation should occur when planned rehabilitation and closure activities or schedule amendments are proposed, that are likely to impact the community. The register (Table 3-9) will be updated as consultation occurs. It is noted that ongoing community consultation is planned to occur through the stages of the mine life, once the DYE site is developed. As feasible, this will aim to effectively mitigate both any environmental and socio-economic impacts that may occur as a result of progressive rehabilitation closure activities.

How Feedback/ Comments will be Considered

Once feedback / comments have been received and logged from consultation activities, DYE will make an initial assessment to identify, classify and / or investigate the root cause of any concerns. Actions to address the underlying root concern will be developed internally, with DYE considering how (and if) it can satisfy the root concern in a feasible manner. Further consultation with the community will then occur to ask about their expectations, consider any mitigation measures and highlight other suggestions for resolution. DYE will directly report back to community members on how feedback is received and addressed, according to engagement tier, as detailed above.

DYE will continue to carry out consultation in relation to the activities carried out under the PRC Plan and Schedule.

3.3 Post-Mining Land Use

A PMLU is defined under Section 112 of the EP Act as "the purpose for which the land will be used after all relevant activities for the PRC Plan carried out on the land have ended". Determining the appropriate PMLUs is a critical first step in mine rehabilitation planning, given it heavily informs the rehabilitation and management methodology as well as the Schedule. Mining is a temporary land use, and therefore it is important to consider a future land use that aligns with social, economic, environmental expectations for the site, as per Section 126C(1)(d) of the EP Act.

The nominated PMLUs are to be transitioned from the key land outcome document EA EPML01978714, whilst also adopting refinements enacted through the Rehabilitation Management Plan for the site. Overall, much of the footprint of DYE will be rehabilitated to a grazing land use.

3.3.1 Key Regulatory Requirements

The EP Act and Regulation contain several additional Sections that need to be complied with, such as Section 111A of the EP Act, which outlines that for a proposed PMLU to be accepted, the Schedule must demonstrate that the land can be rehabilitated to a stable condition.

In this context, the definition of 'stable condition' means that:

a) the land is safe and structurally stable, and

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

c) the land can sustain a PMLU.

Further to this, the EP Regulation requires that each PMLU is viable, having regard to the use of land in the surrounding region, can deliver a beneficial environmental outcome, and is consistent with how the land was used before a mining activity was carried out on the land, or is broadly consistent with relevant approval relating to the land or otherwise permitted under state or federal law.

3.3.2 Transitional PRC Plan Context

For the DYE site, PMLUs have been previously identified in two specifically approved Land Outcome Documents (LODs) – namely the EA (EPML01978714) as well as the Rehabilitation Management Plan and can therefore be transitioned into this PRC Plan and Schedule.

There is consistency between the two documents, and although there have been some changes to terminology to be more focused on future land uses rather than operational site domains, the intent of the expected land uses to be supported after mining has been preserved. Other changes occurred with the development of the RMP to adopt additional PMLU in situations where the pre-mining land uses did not support the intended PMLU, or where surface disturbance was limited, and it was felt that more beneficial environmental outcomes could be achieved by modifying the PMLU.

Post-mining land uses at the site are generally aligned to the pre-mining land uses proposed. DYE is located within a predominantly rural landscape, with extensive agricultural areas such as grazing and cropping. Remnant vegetation areas occur in proximity to waterways. The PMLUs have been developed to reflect the wider landscape, within the constraints posed by mining related activities.

The current post-mining land use concept for the DYE site is as shown on Figure 3-14.

3.3.3 Land Use Context

Historical, Current and Surrounding Land Uses

For the DYE site, historic and current land uses have been strongly informed by publicly available mapping (i.e., the Queensland Land Use Mapping Program (QLUMP)). QLUMP assesses and maps land use patterns and changes across the state according to the Australian land use and management (ALUM) classification. In addition to this, remnant vegetation mapping and local knowledge supplemented this investigation with current and historic land uses. PMLUs were broadly aligned to the QLUMP mapping as appropriate.

Site Domains as per the Environmental Assessment Report (2015)

A conceptual final landform was developed as part of the Environmental Authority Supporting Information (URS, 2015a) which assigned the site to one of three domain types, namely Mine Infrastructure Areas/Infrastructure; WRDs and Drift or Un-disturbed Lease Area.

These domains were developed to reflect the history of the site as well as the type of disturbance planned to occur for the mine development. The Dysart East rehabilitation strategy (URS, 2015b) also makes clear that the previous domains and landform areas and associated completion criteria were developed to achieve a safe, stable, non-polluting and self-sustaining post mine land use. Further, the EAR indicates that an appropriate post-mine land use of low intensity grazing has guided the rehabilitation strategy, conceptual landform and domains.

Post Mining Land Uses as per the Rehabilitation Management Plan (2020)

As outlined above, the PMLUs specified for the site reflect previous work to determine domains for the site, based on the values identified on the site. A PMLU of grazing is appropriate for much of the site, however, there are also some smaller areas where alternate PMLUs have been determined.

The PMLUs proposed for the RMP are a refinement and rationalisation of the domain-based landform concept presented in the EAR report. It has been further informed by historic, current and surrounding land uses and seek to preserve environmental values whilst maximising land use opportunities. Most of the surface area across the site will retain the current/ pre-mine land use.

Rehabilitation Objectives

Rehabilitation objectives have been developed that clearly describe the desired rehabilitation outcomes for each PMLU, as shown in Table 3-10.

Table 3-10 Rehabilitation Objectives

<table>
<tr><th>PMLU</th><th colspan="4">Rehabilitation objectives</th></tr>
<tr><th></th><th>Safe</th><th>Stable</th><th>Non-polluting</th><th>Sustains an agreed PMLU</th></tr>
<tr><td>Retained Infrastructure (not used yet)</td><td rowspan="4">Safety hazards in rehabilitated areas are consistent with surrounding landscapes.
Site is safe for humans and animals, now and in the foreseeable future</td><td rowspan="4">Landforms and water storages are geotechnically stable with no major mining–related erosion features or subsidence related surface impacts.</td><td rowspan="4">Surface runoff leaving the PMLU area is non-polluting to the receiving environment.
No long-term discharges of groundwater to surface or drawdown. Potential pollution sources removed or contained and hazardous materials adequately managed.</td><td>Landholder utilises infrastructure for their beneficial use. Appropriate decommissioning by Bengal Coal if not required by a future landowner.</td></tr>
<tr><td>Grazing</td><td>Post mining land remains suitable for grazing.</td></tr>
<tr><td>Cropping</td><td>Post mining land remains suitable for cropping.</td></tr>
<tr><td>Native Vegetation</td><td>Remnant vegetation is preserved or re-instated.</td></tr>
</table>

Community Consultation

As was previously discussed in Section 3.2.2, the PMLU concept has been presented to external stakeholders for consideration and to confirm that the intended rehabilitation and closure activities are aligned to the expectations of the community post-mining. As part of initial approval activities, broad consultation has occurred to inform the mine development itself. In contrast, recent communications have been more targeted to confirm specific detail relating to the core PMLU concept and plans for the rehabilitated mining landforms.

Consultation has supported the approach adopted to incorporate other PMLUs (such as water management areas and retained infrastructure), where complementary to the main grazing outcome. These features were seen as a positive in enhancing the value of the land and supporting the future ability of a landowner to maximising the value of the PMLU for agricultural and grazing purposes.

3.3.4 PMLU descriptions

PMLUs for DYE have been developed to be appropriate for the region and site history. PMLUs are compatible with the use of land in the surrounding region; viable having regard to the use of land in the surrounding region and sustainable by not requiring significantly greater management to maintain the use in the long-term, compared to the management of land in the surrounding region.

A description of each nominated PMLU for the site is provided below, for the locations shown in Figure 3-14.

Grazing

A grazing PMLU will be applied to those areas which have already largely been subject to grazing by domestic stock on historically disturbed native vegetation. This represents much of the site and includes both areas overlying the underground workings, that will either not be disturbed at surface or subject to minor disturbance only, as well as the WRD emplacements. Further, infrastructure to be removed may be rehabilitated to a Grazing PMLU.

There has typically been limited or no deliberate attempt at pasture modification. Some change in species composition from historic vegetation assemblages may have occurred. Non-mining, ancillary infrastructure are expected to remain, such as fencing and access roads as consistent with this PMLU. These aspects can be used by the landholder to enhance the land use outcomes. It is expected that ongoing and relatively intensive land management will be required for these areas, such as fencing, maintenance of access roads and weed management.

Grazing areas account for 561.24ha, which is equal to 74% of the total site area. This will be applied for as Rehabilitation Areas 1, 2 and 4, with specific milestones considering the rehabilitation and closure requirements for this area. The milestones to be applied for this PMLU include RM1, RM2, RM3, RM4, RM5, RM6, RM7 and RM9, depending on the Rehabilitation Area.

Cropping

This PMLU has been applied to an area to the north of the site that is currently under cropping, and as such, has been designated to be retained as cropping land. This area will either remain undisturbed or else will be subject to minimal surface disturbance only, just that related to ancillary surface works associated with the underground. The pre-mining land use was cropping, and it is likely that this land has been subjected to rotation cropping practices and intensive agricultural management. Some areas with infrastructure to be removed may be rehabilitated to a Cropping PMLU.

This cropping area accounts for 31.98ha, which is equal to 4% of the total site area. This will be applied as part of Rehabilitation Area 3 and 5, with specific milestones considering the rehabilitation and closure requirements for this area. Milestones to be applied include RM2, RM8 and RM9.

Native Vegetation

The areas of remnant vegetation (identified in terrestrial vegetation surveys completed in 2014) and existing vegetation corridors associated with the riparian corridor of Downs Creek have been determined as remaining intact in the post-mining landscape and have been allocated as 'native vegetation' PMLU. This aligns with the pre-mining land use, described using the same terminology.

No surface disturbance is proposed within this area. Where appropriate, vegetation corridors align with the surrounding area.

This native vegetation area account for 160.34 ha, which is equal to 21% of the total site area. This will be applied as part of Rehabilitation Area 6, with specific milestones considering the rehabilitation and closure requirements for this area. The milestone to be applied for this PMLU is RM9.

Retained Infrastructure (potential future PMLU)

This PMLU has been included with reference to facilities associated with ongoing use such as a farm dam storage and other associated infrastructure. Infrastructure will only be retained where formal agreement with the relevant receiving parties is in place. As no agreements are in place, none of this new or existing infrastructure is proposed to be retained, however this may change in the future. For this reason, the PMLU has been described herein.

Further, there are also infrastructure items that are not controlled by DYE and will continue to operate independently from the mine site, including the Dysart Electrical Substation and the permanent rail transport tracks and corridor. These areas have been entirely excluded from this PRCP.

In addition to this, disturbance of new areas is anticipated to occur for the infrastructure required for the DYE mine site. This will be located predominantly in the north-west part of the site and will require clearing and leveling of areas to install mine processing and stockpiling, underground ancillary equipment, office and workshop buildings. Ancillary surface disturbance such as tracks, de-gassing wells and ventilation shafts will also be required across the underground mining footprint.

If there is opportunity to retain any of the new infrastructure installed, this will be agreed with a potential future landowner. However, at this stage, it has been assumed that all infrastructure areas will be rehabilitated to one of the other PMLU types otherwise detailed.

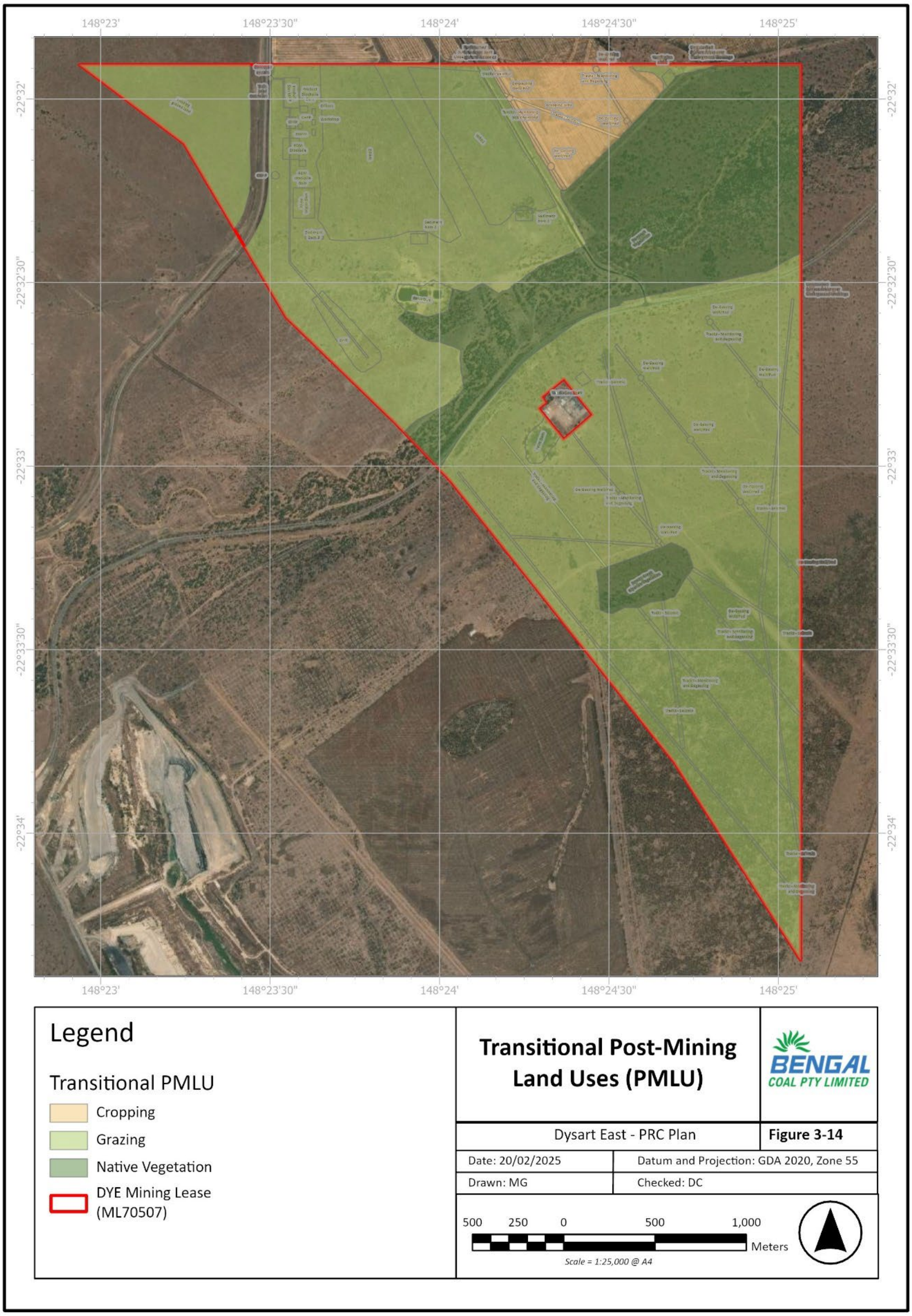

Figure 3-14 Transitional Post-Mining Land Use (revised)

3.3.5 Relevant Legislation, Plans and Strategies

Isaac Region Community Strategic Plan, Isaac 2035

The Isaac Region Community Strategic Plan, Isaac 2035, outlines clear goals and steps to improve the future of the Isaac Region and identifies four key themes for the region:

- Communities
- Economy
- Infrastructure
- Environment.

This PRC Plan has considered the aims of the Isaac Region Community Strategic Plan and aims to deliver a beneficial environmental outcome to the land of the DYE area.

Isaac Regional Planning Scheme 2021

The Isaac Regional Council Planning Scheme 2021 (the Planning Scheme) has been prepared in accordance with the Planning Act 2016 and came into effect on 1 April 2021. The scheme sets out the intent for development to 2036, under five themes:

- Liveable Communities
- Diverse Economy
- Protecting Natural Resources and the Environment
- Safety from Natural and Other Hazards
- Infrastructure for Communities.

This PRC Plan is consistent with the planning scheme, as it will enhance livelihood for regional communities providing future opportunities through rehabilitation and closure activities. It will also ensure beneficial environmental outcomes by maximising the potential natural value at the site. Further it will also support diversifying the local economy over the long-term by providing grazing uses after mining has ceased.

3.3.6 Statutory Constraints

There are no statutory constraints that would limit the ability of the DYE site to meet the intended PMLUs. A post closure land management plan may be needed to ensure the land is managed, by the future landowner.

3.4 Non-use Management Areas

There are no non-use management areas (NUMAs) proposed for the site. As such, the provisions of the guideline as they relate to NUMA have not been considered further.

3.5 Rehabilitation Management Methodology

This part of the PRC Plan outlines the rehabilitation practices, techniques and general methodology, to be applied at DYE to achieve a 'stable condition' for each proposed PMLU, as required by Section 126C(1)(e) and (i) of the EP Act. Further, for each technical area, milestone criteria have been identified that outline the key requirements which will demonstrate that a 'stable condition' has been achieved, as well as identifying which PMLU (and RAs) are of relevance.

As an overview, the core active rehabilitation methodology at DYE will consist of re-profiling and revegetating the surface disturbance areas, decommissioning and removing infrastructure and access tracks or roads (as required) and then monitoring across the site. Rehabilitation of disturbed land at the site will be conducted so that:

- suitable species of vegetation are planted and established to achieve the PMLU.
- potential for water and wind erosion is minimised.
- surface water and seepage released from the site is such that releases of contaminants are not predicted to cause unanticipated environmental harm.
- water quality of any residual water bodies meets regulatory criteria.
- final landform is stable, safe and not subject to slumping or erosion.

The following technical sub-sections have been developed specifically to provided information that will outline how the proposed rehabilitation or management methodologies have been developed, and how they will be implemented at DYE. This is intended to meet the requirements of Section 126C(1)(j) of the EP Act and support the PRC Schedule.

3.5.1 Hydrogeology

A summary of the site hydrogeology has been provided as part of the baseline information (Section 3.1.6). This section is now focused on how this hydrogeological setting may impact the success or otherwise of rehabilitation and closure, and highlighting any measures which are required to ensure successful outcomes.

Occurrence and Nature of Groundwater Systems
As detailed previously (as Section 3.1.6), at the DYE there are three key aquifers associated with the site, as summarised:

- Quaternary alluvial
- Tertiary sedimentary
- Permian strata aquifers.

The nature and occurrence of each of these aquifers is detailed in Section 3.1.6.

In summary, both the Quaternary alluvial and Tertiary sedimentary are dry within the site area, and the regional groundwater levels (within the Permian strata) are recorded to be at a significant depth below the base of the alluvium. The Tertiary sedimentary and Quaternary alluvial sediments are not in permanent hydraulic connection with the underlying coal measures (Permian strata) across the DYE site, although some recharge may occur via downward leakage following rainfall events. Additional monitoring completed in 2024/2025 to address the PRCO RFI re-affirms these conclusions.

Water Levels and Flow Characteristics

Although the Quaternary alluvial is considered dry overall, it is very responsive to the ephemeral surface water systems. Recharge to the alluvium occurs due to surface water flows or flooding, as well as surface infiltration of direct rainfall and overland flow. Discharge occurs primarily because of evapotranspiration to riparian vegetation, as well as short term and localised contributions to stream baseflows (where conditions support it). There is also infiltration and recharge to underlying formations where creek crossings support connectivity. Hydraulic conductivity is very low, in the order of 0.001m/day.

In contrast, the Tertiary sediments consist of a sub-horizontal blanket of clay dominated materials, which within the DYE area, can support perched groundwater with zones of enhanced hydraulic conductivity. These materials are limited, poorly connected and discontinuous, thus may be locally significant but have limited value regionally. Recharge occurs via direct infiltration of rainfall and overland flow, in addition to transference from the overlying Quaternary alluvial. Discharge occurs through flow into adjacent or underlying aquifers, as well as by evapotranspiration from deep-rooted vegetation. Localised groundwater extraction is also a relevant discharge mechanism for this aquifer.

Groundwater in the Permian strata aquifer is confined, with dual porosity material resulting in groundwater in both the matrix itself but also occurring within fractures in the strata. Typically, these conditions mean long groundwater residence time, which in turn can result in highly saline groundwater in some areas. Recharge occurs where coal seams outcrop or sub-crop beneath overlying sediments, however this is minimal. Discharge also occurs through down-gradient outcropping areas, as a result of flow into adjacent areas or seepage into very deep underlying aquifers (typically limited to structural discontinuities). Groundwater extraction also occurs, typically associated with mine gas management and dewatering activities. The general groundwater flow is eastwards, with variable hydraulic conductivity ranging from 0.09 to 0.16m/day.

Considering the potential for long-term impacts on groundwater levels, modelling has indicated that the mine workings will fill up and groundwater levels will recover over time upon completion of mining. Groundwater levels and piezometric pressures within the regional aquifers will, over time, attain a new equilibrium level. The bord and pillar underground workings and the mined-out voids will have different hydrogeological parameters and will be less confined than prior to mining. After equilibrium of the groundwater is reached, the groundwater system will readjust to the new (altered and enhanced) aquifer conditions within the DYE area. It is predicted that groundwater availability will increase locally from pre-mining characteristics.

Figure 3-15 provides a conceptual depiction of post-mining groundwater level conditions.

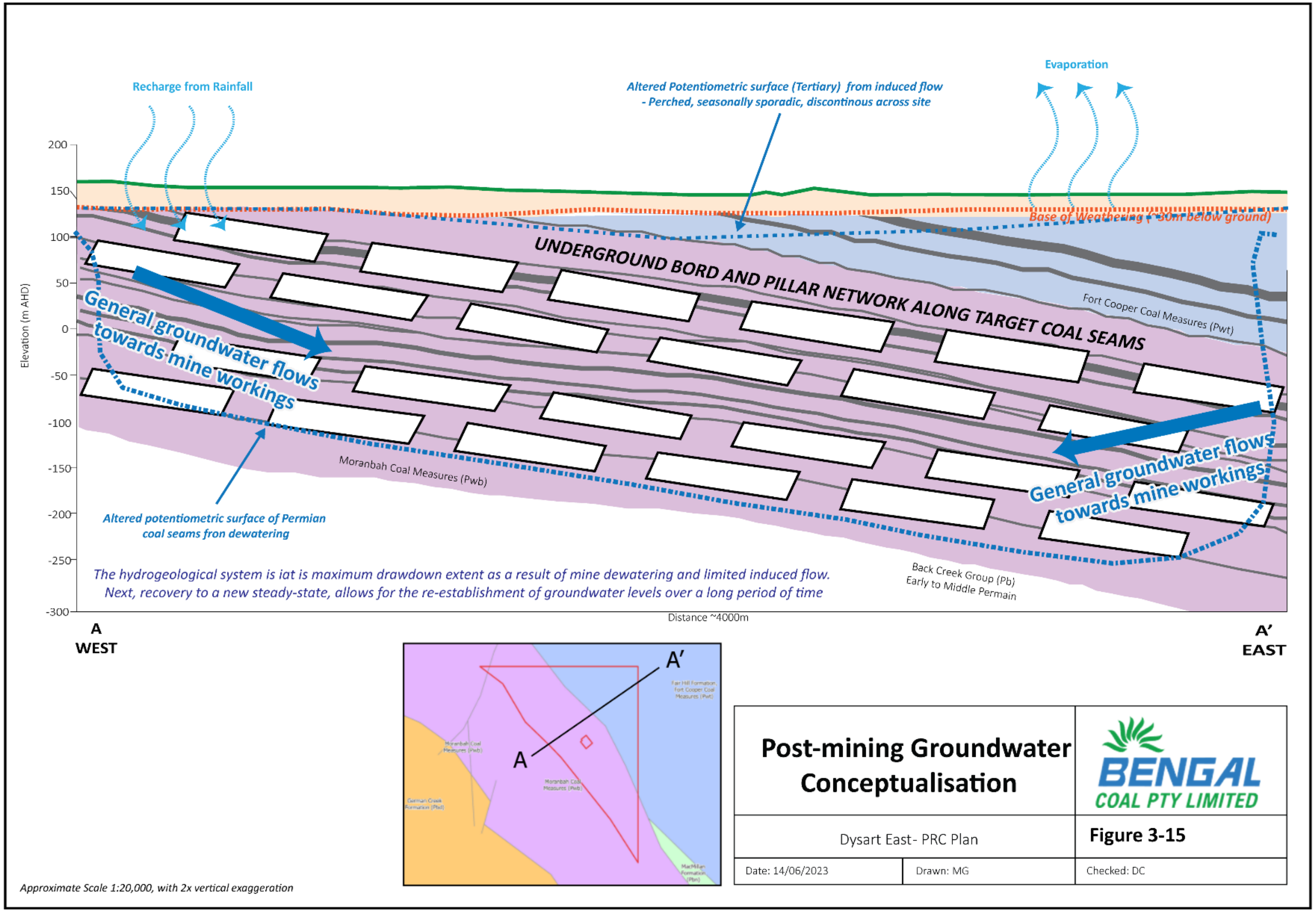

Figure 3-15 Post-Mining Groundwater Conceptualisation

Water Quality

Baseline studies indicate groundwater quality is not fit for human consumption but is suitable for livestock. Any inadvertent mixing of groundwater during and post mining by induced downward movement from the upper to lower aquifers is unlikely to result in a deterioration of groundwater quality in the Permian aquifers, given the small potential contribution of these upper aquifers in terms of volume. Further, any mixing of upper to lower aquifers as a result of the underground mining operations will be likely to improve the water quality in the lower aquifer.

Mine waste materials are unlikely to generate acid given the lack of oxidisable sulfur content, excess acid neutralising capacity and the existing alkaline pH of these materials. As the direction of groundwater flow will be towards the mine workings until equilibration occurs over the long-term, the buffering capacity of the groundwater is expected to neutralise any oxidation products of the coal seams due to mine dewatering, and any potential for the development of acid mine drainage is low.

There are no known or distinct surface expressions from groundwater (such as seeps and springs) which are likely to result in any changes to quality because of the DYE site, although it is known that the shallower aquifer systems are heavily influenced by the surface systems.

Drawdown, Recharge and Discharge Locations

The expected groundwater level drawdown due to mining activities for DYE have been modelled adopting conservative assumptions, and assuming all bores have been constructed within the coal seams (Permian strata aquifer). A 1-m drawdown from pre-mining groundwater levels was selected from which to identify potential at risk groundwater bores/ users. Based on this, there is the potential to impact on groundwater levels within an approximate 6 km radius of the mine.

This indicated that most drawdown occurs by the end of the mine operations phase (year 25), with drawdown extending slightly further in the north-east (down-dip) direction than in the south-west (up-dip) direction. This occurs because the coal seams act as conduits for groundwater flow due to the permeability contrast between the coal seams and the interburden. The coal seams are truncated as they sub-crop on the south-west side of the model, which acts to limit the extent of drawdown.

Modelling shows that groundwater levels rebound immediately after the cessation of mining, with recovery of groundwater occurring rapidly over the next 20 years or so. After this time, groundwater levels continue to consistently increase in a linear fashion until pre-mining levels are achieved by about 110 years following completion of operations. An equilibrium state is achieved at pre-mining groundwater levels over the long-term, as the system approaches steady state.

The 1-m maximum extent of drawdown contour (potentiometric mapping) is presented as Figure 3-16.

Cumulative groundwater level impacts have also been considered for DYE, given there are three open cut mines located within 10 km of the site. This include Norwich Park (3 km south/ south-west), Saraji (4 km north-west), and Lake Vermont (6 km north), whom have all been operating for many years. However, review of groundwater data indicates that the localised level in the Permian strata is historically similar to the level measured from site groundwater monitoring bores. Thus, groundwater levels do not appear to have been significantly impacted by the presence of coal mines in the area.

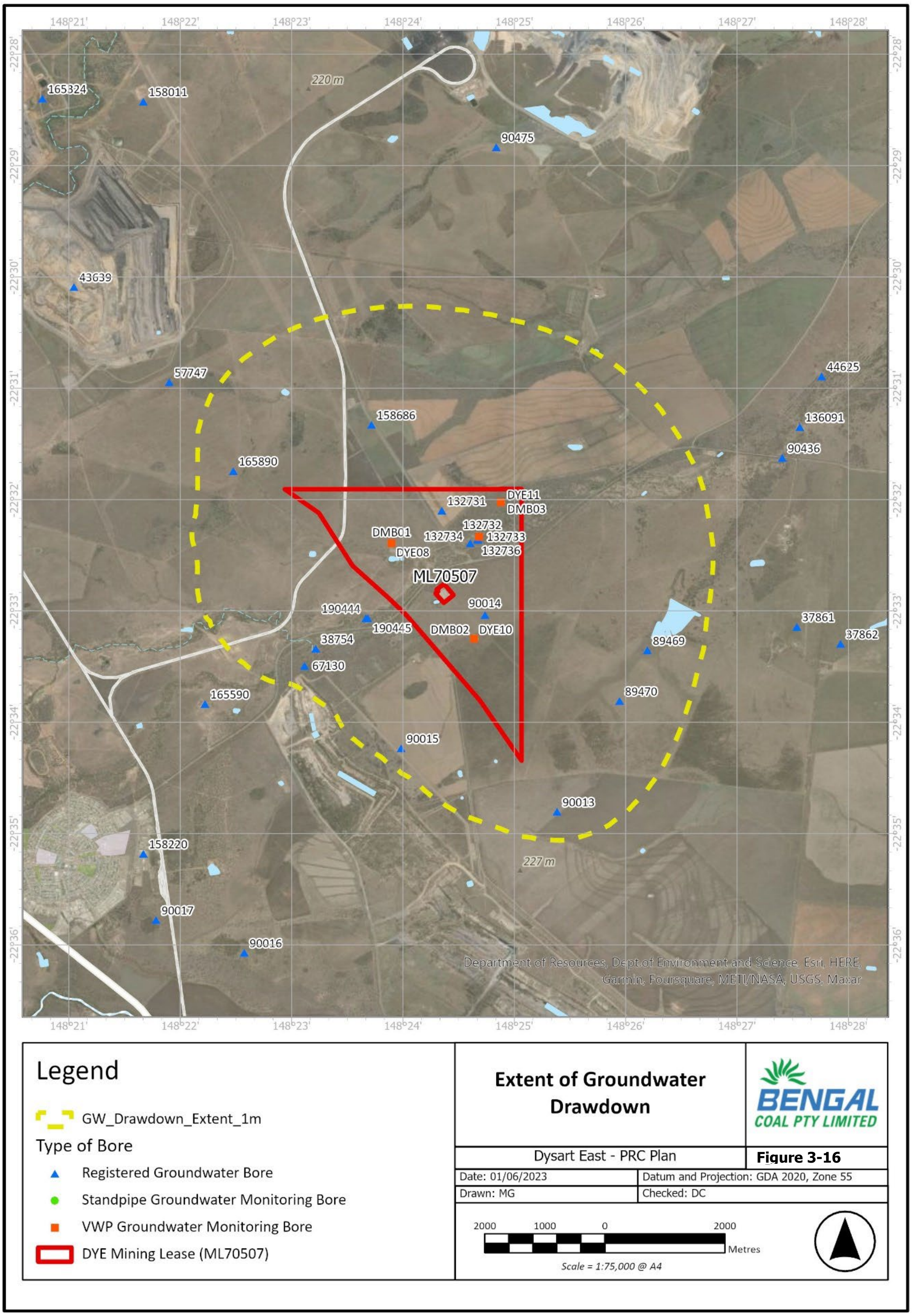

Figure 3-16 Maximum Extent of Groundwater Drawdown (1 metre)

Groundwater Use

There is the potential for drawdown within an approximate 6 km radius of the mine, however this will immediately begin to recover post-mining, until such time that groundwater levels reach a steady-state equilibrium.

It is expected that a maximum of 7 registered bores will be within this drawdown extent, and that landholders currently use the Permian strata groundwater primarily for stock purposes. It is expected that the future uses of groundwater will be similar to current use.

Predictive Modelling

Numerical modelling was undertaken as part of evaluation of the potential impacts on groundwater for the development of the mine (URS, 2015a). Although the geology for the DYE site is simple; the multiple target coal seams and sequential mine plan meant a more complex 3-dimensional predictive groundwater model was constructed and calibrated. Given that drawdown was predicted, modelling did not need to further consider contaminant transport.

The MODHMS© modelling package was selected for the predictive modelling. This predicted the rate and extent of change to groundwater levels, as well as groundwater ingress estimates and the zone of influence as a result of dewatering. Model domains included the mine site, with sufficient buffer to boundaries conditions to ensure adequate predictions and was constructed across an area of 280 km^2 (16 km x 17 km) with a radius of approximately 8 km from the centre of the mining area. The model had variable grid spacing with grid cells of 50 m by 50 m in the mining area and 200 m by 200 m in the outer area and included 160 rows, 138 columns, and 13 model layers.

Key Requirements to Demonstrate a 'Stable Condition'

This section discusses how hydrogeology may impact on the ability to achieve a stable condition for DYE over the long-term, and support how the proposed PMLU will be achieved. It is noted that no residual impacts related to hydrogeology have been identified for the DYE site, as a result of mitigation applied for the operation of the mine. Primarily, the underground and bord-and-pillar method of mining will mean no long-term modification of groundwater. As such, no specific rehabilitation is required to support the achievement of the rehabilitation milestones under the PRC Schedule.

As relevant, key requirements have for this technical area (hydrogeology) have been incorporated into Table 3-11 below and have been directly transferred to the PRC Schedule.

Table 3-11 Hydrogeology - Justification of Milestone Criteria

Relevant PMLU	Relevant RAs	Key Rehabilitation Methodology – Hydrogeology	Relevant Milestone to be achieved	SMART Measures for Milestone Criteria
Grazing	RA1, RA2, RA4	No impact expected to shallow aquifer, thus not relevant to this PMLU.	n/a	n/a
Cropping	RA3, RA5	No impact on this PMLU is anticipated from groundwater.	n/a	n/a
Native Vegetation	RA6	No impact on this PMLU is anticipated from groundwater.	n/a	n/a

3.5.2 Flooding

The DYE site is an underground mining operation with no open cut areas or voids, and as such, the requirements of the PRCP guideline that apply to voids located in floodplains are not relevant.

However, general flooding susceptibility and influence across the site has been assessed and is detailed in this section. As explored in Section 3.1.6, the Downs Creek watercourse traverses the site, and as such, flooding is a consideration. This section details how flooding may influence the long-term success and viability of rehabilitation and closure activities, and to highlighting any controls required to ensure successful outcomes.

Location of Flood Interaction Areas

For DYE, the part of the site where it is anticipated for flood interactions to occur are the pre-mining gentle slopes to the north, and adjacent to the Downs Creek riparian corridor. Surface disturbance has largely avoided the floodplain area, both because of potential floodplain interactions but also to preserve the remnant vegetation which occurs.

As such, key considerations are the underground mining activities which will occur beneath this area. The underground mine design (bord-and-pillar) has been developed to ensure 'negligible' surface subsidence across the mine lease area, including across the floodplain. Extensive investigations occurred as part of geotechnical assessments completed for development of the mine, namely a detailed subsidence assessment (SCT, 2015). This concluded:

> *"The key objective for the mine design is negligible surface subsidence. This has been achieved through a staged approach of elimination of mining in Restricted Land areas and applying an appropriate level of risk for design of the mine, based on the probability of pillar stability."*

Two WRDs will be placed to the north of this floodplain extent. These dumps will be progressively constructed and rehabilitated, with the Eastern Dump completed by years 6, followed by the Western Dump to be completed by year 25. As part of the design optimisation process, the two WRDs have been largely located out of the floodplain extent (defined as the Q1000 flood extent).

As a result, no direct loss of floodplain area will result from the mining operations. Further to this, no substantive or permanent mining operations are planned to occur inside the 1:1000-year AEP floodplain, so no geomorphologic changes are expected.

Further considering a PMF flood event, it is noted that there is some minor interaction between the southern parts of the WRDs and a flood event (ATCW, 2025), which has been further explored. This work highlighted that although hydraulic connectivity along Downs Creek will be maintained post-mining, during a PMF event, the southern extent of the WRDs may require specific erosion protection measures. In response to this, erosion protection measures will be adopted for high-risk areas, where PMF velocities are anticipated to be more than 2m/s. This has been incorporated as a Milestone Criteria for the RA relevant to the WRDs (RA1).

Alteration of Catchment Flows

The DYE operation will result in a minor reduction in catchment contributing to Downs Creek by 0.6% volume, due to runoff from the mining activities being contained wholly within the mine Water Management System (WMS). Consequently, there will a minor reduction in flow that is directly proportional to the reduction in catchment area.

No road crossings or levees will be installed along Downs Creek or its tributaries that may result in change to the flow regime. Some temporary disturbance to catchments will occur during operations due to the re-direction of clean water around the mine infrastructure, however all clean runoff will still discharge to Downs Creek as per the pre-mining situation. However, modifications will be restored to pre-mining drainage, thus impact will be limited to the mining footprint only.

At closure, it is planned for all modifications made, and structures installed, for mine water management to be removed and rehabilitated, so that over the long-term, catchment flows will be the same as the pre-mining condition.

Modelling of flood levels

Hydrological and hydraulic modelling has been completed to understand the flooding extent and peak flood levels (depth) respectively. The model also investigated velocity, shear stress and stream power across the floodplain. The effects of a range of design storm events were considered, including very common events (such as a 1 in 1 year event i.e., 100% AEP) to very rare (such as a 1 in 1000-year event (or 0.1% AEP)).

Further assessment has also been completed to develop a flood profile for the probable maximum flood (PMF) event (ACTW, 2025). The study involved a comprehensive hydrologic assessment using the Generalised Short Duration Method (GSDM) with a 2D hydraulic model developed using TUFLOW software to analyse the post-closure site conditions. This assessment meets requirements under Section 41C of the Environmental Protection Regulation and aligns with Australian Rainfall and Runoff (ARR) 2019 guidelines for flood estimation.

The PRCP Guidelines (Section 3.4) identify that the maximum floodplain extent is equivalent to the extent of inundation for a 0.1% AEP flood event – this is the area defined as ‘floodplain’. This is defined to inform the location of voids in relation to floodplains, however the logic has been applied at DYE to understand locations where flooding immunity should be considered. As shown on Figure 3-17, all mine related surface disturbance and infrastructure has been placed outside of this flood extent.

It is noted that the flood map shows there are three main areas in the region where existing culverts crossings appear undersized and are likely to be unduly affected by the tested design storms. This related to the culvert crossing of the rail spur, the culvert crossing of the Lake Vermont Mine access road and the Dysart Connection Road. If opportunity arises in the future to modify this exiting infrastructure, DYE will engage with the owners of the assets to consider improvement of flood performance.

Flooding Risk

The flooding risk profile for the DYE site is considered low, given the permanent structures have been located outside of the 0.1% AEP flood extent, and any temporary impact has been mitigated. Further assessment of the PMF flood event reinforces this finding (ATCW,2025) whilst also providing additional guidance as to localised areas that nay require some flood protection.

The PMLU relating to the floodplain will remain undisturbed at surface, and no subsidence impact is expected as a result of underground mining activities.

Key Requirements to Demonstrate a ‘Stable Condition’

Relevant information has been included herein to understand how flood risk may impact on the ability to achieve a stable condition for DYE over the long-term, and support how the proposed PMLU will be achieved. It is noted that the DYE site has been designed to ensure no residual impacts related to flooding will occur.

Key requirements have for this technical area (flooding) are summarised in Table 3-12 and have been directly transferred to the PRC Schedule.

Table 3-12 Flooding - Justification of Milestone Criteria

Relevant PMLU	Relevant RAs	Rehabilitation Methodology – Flooding	Relevant Milestone to be achieved	SMART Measures for Milestone Criteria
Grazing	RA1, RA2, RA4	Noted that WRDs are located largely outside of the 0.1% AEP flood extent. However, there is expected to be some interaction of these areas with a PMF flood event. Given that the toe of the southern face of these structures is within the PMF extent, further measures have been adopted for flood protection where identified by the PMF flood assessment.	RM3 – Final landform development	3.4 Rock armouring of the southern extent of the WRD footprints will occur for all locations where the PMF is expected to result in velocities being increased by more than 2 m/s (as detailed by the ATCW, 2025 PMF flood assessment).
Cropping	RA3, RA5	PMLU not within floodplain.	n/a	n/a
Native Vegetation	RA6	Not relevant as no mine surface disturbance anticipated.	n/a	n/a

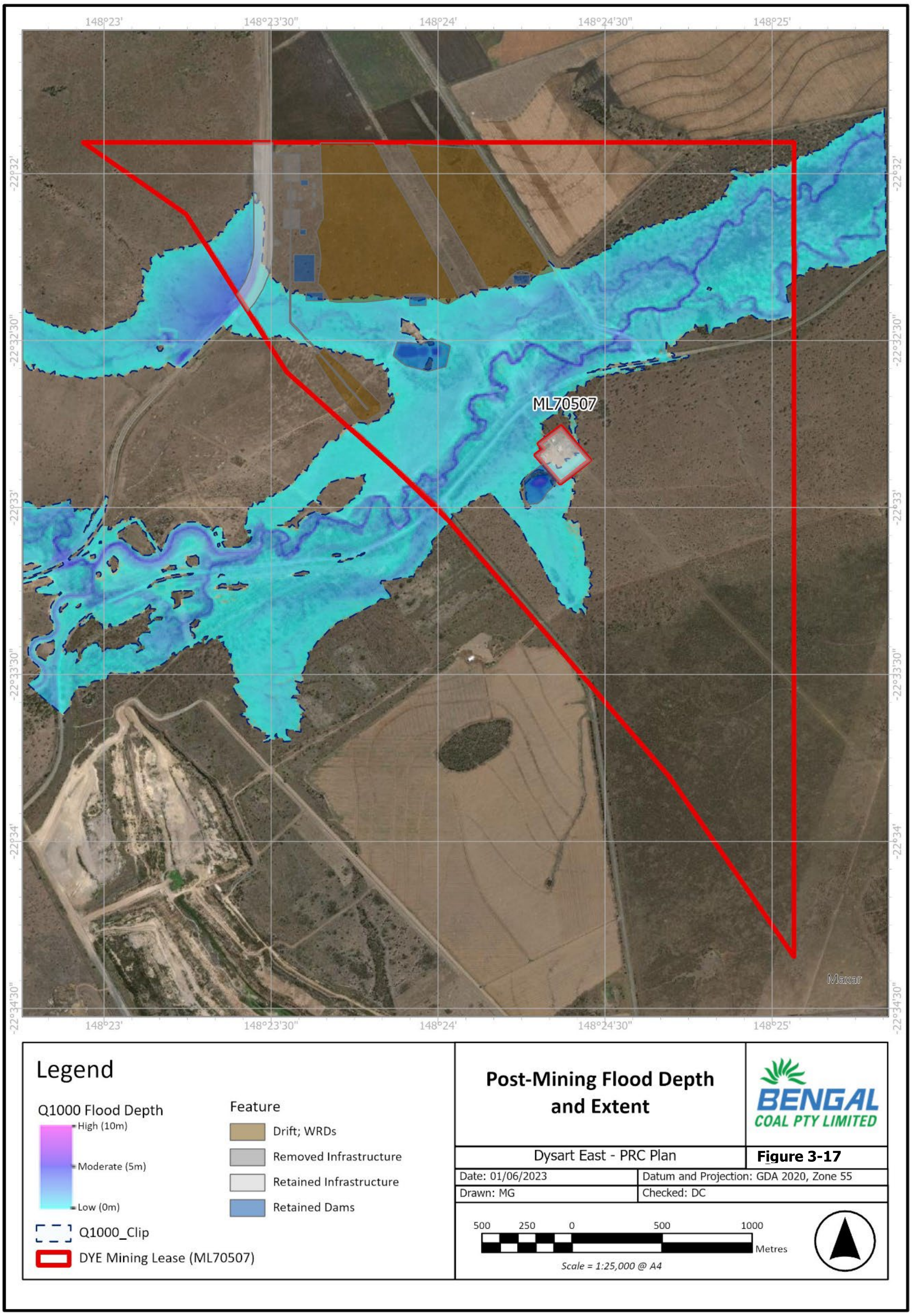

Figure 3-17 Post-mining AEP Flood Extent and Depth (1 in 1000)

3.5.3 Soil and Capping Material Assessment

Details have been provided here as to the soil assessment and conservation activities to occur to support the achievement of progressive rehabilitation and closure activities, as well as ensure the successful achievement of PMLU outcomes. Baseline information to describe the pre-mining soil resources and properties for the site have been provided (see Section 3.1.6).

Given that the DYE site is not yet developed, no disturbance of soil resources has occurred yet, and as such, there are no existing stockpiled topsoil resources. In addition to this, given that the site will be an underground mine, disturbance of surface (and as such soil materials) will be restricted to a limited footprint, and only topsoils associated with this area will be required to be disrupted and subsequently managed for mining operations.

The following details the quantity and quality of topsoil materials available to support the achievement of each relevant PMLU. This should be considered in concert with information provided on waste rock characterisation, to inform the ability of both the growth media and underlying spoil, to act as a suitable foundational material to support the relevant rehabilitation strategies.

Quality and Quantity of Available Resources

At DYE, the mining lease area supports significant growth media reserves that are highly suitable for rehabilitation, with materials available up to a depth of 100 cm for some soils. Suitable materials include both topsoil and subsoil materials. As detailed in Table 3-13, a total of 738,219 cubic metres (m^3) of suitable material will be disturbed for the surface requirements, depending on whether the full available depth of material is salvaged. However, only 266,130m^3 is required for the completion of progressive rehabilitation and closure, so the site has an excess of suitable material (noting that this estimate does not include any allowance for material swell or compaction at this stage). As the mine is developed, the inventory will continue to be updated, and topsoil will be managed to accurately strip the volume required (plus a buffer allowance) and leave the remainder of suitable material in-situ.

The suitable subsoils resources are mixed calcareous sediments of basaltic origins and are known to be strongly acid-neutralising/alkaline. As such, they are beneficial for rehabilitation of areas at risk of acid generation (i.e., areas containing rejects material). All soil units were assessed to be typically stable, non-sodic, with no to low subsoil salinity levels. An exception is the A3, alluvial duplex soil unit, which has a sodic subsoil and likely to be dispersive. This unit will not be disturbed for the development of the mine.

No other clay or rock materials occur at surface on the DYE site or are likely to be required for rehabilitation. Suitable underground resources will be considered as part of waste characterisation. Further, many of the topsoil materials may also represent suitable clay materials.

Table 3-13 Quality and Quantity of Available Soil Resources

Soil Type (SMU)	Suitability for Use	Total Volume In-situ (m^3)	Volume Disturbed (m^3)	Volume Required for Rehabilitation	Relevant PMLU / RA
A1	Hard-setting, depth of usable topsoil variable, around 20cm	37,581	0	n/a	n/a
A2	Deep and dark sandy to silty clays which do not crack, to 30cm	310,745	22,384	21,861 (@ 30cm depth)	Grazing (RA2, RA1)
A3	Sandy loam to 20cm thick, low nutrient levels	161,708	5,705	8,336 (@ 30cm depth)	Grazing (RA2)

Soil Type (SMU)	Suitability for Use	Total Volume In-situ (m^3)	Volume Disturbed (m^3)	Volume Required for Rehabilitation	Relevant PMLU / RA
S1	Deep, well- structured black cracking clay topsoil to 30cm. Subsoil to 90cm.	2,014,995	0	n/a	n/a
U1	Deep and dark cracking sandy clays. Topsoil to 40cm, subsoil to 100cm.	2,054,128	710,130	235,933 (@ 30cm depth)	Grazing (RA1)
U2	Similar to U1 but finer and stronger structurally. Profile is alkaline. Topsoil to 30cm, subsoil to 90cm.	1,198,059	0	n/a	n/a

Location and Accessibility of Cover Materials

The areas of surface disturbance for DYE are in close proximity to each other, the north of the mining lease, so that the maximum potential haul distance would be less than a 1km circuit and would use the existing tracks otherwise established for the site. However, an approach will be taken to stockpile materials immediately adjacent to the locations where they will be required to be re-spread for future rehabilitation activities.

Where possible, material will be directly placed for rehabilitation, however this is only likely to occur for the WRD areas (within RA1) and will be supported by coupling progressive expansion of the dump surfaces with rehabilitation activities. For the other locations (primarily the drift and infrastructure areas), stockpiling will be required with materials used during the closure phase. This will ensure materials are accessible when required to be used for rehabilitation.

Need for Amelioration and Enhancement

As detailed previously, all soils intended to be used for rehabilitation of the DYE site are stable and non-sodic, with no to low subsoil salinity levels. Those materials which have limitations as a growth media have generally not been disturbed or salvaged for use in rehabilitation. As a result, soils are generally high in nutrient levels apart from the soil type A3, which has lower nutrient levels but still supports mixed pasture now.

Some deterioration of the nutrient quality, organics and microbial viability is expected to occur with stockpiling of topsoils. Further validation of topsoil quality and amelioration requirements will occur for stockpiled materials prior to use in rehabilitation. This sampling of stockpiled material will guide exact application rates, as well as selection and specifications of ameliorants and fertilisers. For material that is directly placed, the information provided in the soil and land suitability technical assessment completed as part of the EAR (URS, 2015a) will be used.

Suitability of Soils to support PMLU Outcomes

As detailed above (Table 3-13), the PMLU that will require use of soil materials at DYE is limited to Grazing. As per Section 3.1.6, much of the topsoil materials to be salvaged for use in rehabilitation, have historically been supporting more intensive agricultural land use than intended for the DYE site, and are considered suitable for this land use.

Soil types A2 and A3 currently support beef cattle grazing (as a pre-mining/current land use), however, are currently considered as Class 4/5 and unsuitable for cropping due to hard setting subsoils which restrict effective rooting depth and plant available water capacity (PAWC), as well as limited moisture availability. They are however considered to be suitable for Grazing (Class 3/4 with limitations due to moisture availability and erosion risk in floodplain areas).

Soil type U1 is currently considered to be Class 3 for cropping with the major limiting factor being hard subsoil restricting PAWC and susceptibility to erosion. This soil type is considered highly suitable for a Grazing land use, at Class 2, with erosion being the key concern. Stocking rates of up to 8 ha/adult equivalent beasts is appropriate (URS, 2015a; Salva, 2012). As such, while rehabilitated soil may be different to the natural soil, this will not prevent the soil from being returned to a comparable productivity.

Key Requirements to Demonstrate a 'Stable Condition'

As detailed, there are few relevant growth media limitations may impact on the ability to achieve a stable condition for DYE over the long-term. Further to this, the area where rehabilitation activities will rely on topsoil materials to achieve the PMLU is also limited. However, the correct handling and treatment of materials is important for those areas of concern and are essential for ensuring that the PMLU is achieved. The completion of these relevant milestones can be tracked with the achievement of specific milestone criteria in which respond to the underlying technical concern of soil materials.

Key requirements have for this technical area (flooding) are summarised in Table 3-14 and have been directly transferred to the PRC Schedule.

Table 3-14 Soil and Capping Material - Justification of Milestone Criteria

Relevant PMLU	Relevant RAs	Rehabilitation Methodology – Soil and Capping Material	Relevant Milestone to be achieved	SMART Measures for Milestone Criteria
Grazing	RA1, RA2, RA4	• Ensure sufficient quantity of required soils are salvaged and stockpiled according to SMU. • Ensure prioritisation of best quality materials for use. • Ensure suitable guidance of amelioration and enhancement to maximise PMLU outcomes.	RM4 – Seedbed preparation	4.1 Soil assessment completed by an AQP to confirm quantity, quality, compatibility with rehabilitation methodology and PMLU, and guide amelioration of material. 4.2 The seedbed has been prepared for seeding and satisfies the below criteria for each applicable PMLU below: Grazing PMLU - All topsoil removed during development will be replaced on areas to be revegetated, to a minimum of 300mm depth. - Amelioration and other treatments have been applied as appropriate to ensure a suitable plant growth medium, as guided by AQP.
Cropping	RA3, RA5	Not relevant as no mine surface disturbance anticipated in this PMLU.	n/a	n/a
Native Vegetation	RA6	Not relevant as no mine surface disturbance anticipated in this PMLU.	n/a	n/a

3.5.4 Waste Characterisation/ Geochemistry

As DYE is an underground mining operation, there will be a period of time where waste materials are generated for the development of the mine, however after that, the waste materials will be limited to processing wastes.

Waste characterisation and management will continue to be an important contributing factor to ensure rehabilitation strategies and achieving stable associated PMLUs are successful.

The baseline information provided describes the potential for waste materials to result in concerns such as AMD, elevated and mobilised metals, as well as other concerns to surface water quality such as saline drainage. The content below explores the key aspects of concern for this technical area, details how waste materials may influence the long-term success and viability of rehabilitation and closure activities, and details controls required to ensure successful outcomes.

Mine Waste Contaminants of Concern

It is considered that mine wastes will have limited potential to generate AMD. This is because only small volumes of wastes will be removed from underground and relocated to the surface, in addition to the low inherent potential for the materials to generate AMD, and the presence of excess ANC within the materials. Geochemical assessment was completed with waste samples (both overburden and potential reject materials) collected from core drill holes located in the mining area.

The majority (98%) of spoil samples were NAF or Uncertain but were considered at low risk with limited acid generating capacity. The remaining spoil samples (< 3 %) were classified as PAF, however there were no clear lithological characteristics to explain their PAF nature. Approximately 72 % of potential reject samples were considered NAF-Barren, meaning that the geochemical composition of the material cannot generate acid. The remainder of reject materials were considered to have low capacity to generate substantial acidity, and as such have been classified as PAF-LC. It was suggested that rejects with total sulfur concentrations greater than 5 % were typically associated with the D141 seam/ply. However, given the limited sulfur concentration present overall, the high ANC relative to the MPA (>2) and the small proportion of materials, it is not anticipated for reject materials to generate net acidity under natural oxidation conditions.

The materials also pose little potential to result in elevated metals, as dissolved metal concentrations in most waste samples were below the ANZECC and ARMCANZ livestock drinking water guidelines (ANZECC and ARMCANZ 2000), where guideline values exist. There were low level instances of marginally elevated molybdenum and selenium, however they were both close to guideline values and did not occur as a pattern of elevation across all sampled materials.

The mine waste is not expected to generate significant salinity; most mine waste samples (99 %) fell between 150 µS/cm to 900 µS/cm, with spoil materially typically below 500 µS/cm, and potential reject below 300 µS/cm. Approximately 93 % of all mine waste samples tested are considered sodic with a high risk of dispersion (median ESP value of 17 %), therefore, the mine waste (spoil and reject) materials are not suitable for use as a final cover material on surface disturbance areas without prior treatment or being overlain with a stable topsoil layer.

Review of Sampling Regime

As part of exploration activities, RGS-Terrenus (2012) completed a geochemical assessment of the mine waste expected to be generated during mining. Sampling was completed to identify the number and type of lithologies in a representative manner to understand the underlying geochemical risk of the materials to be excavated or exposed to oxidising conditions.

This sampling identified the physical and chemical properties of material to be removed, disturbed or exposed to oxidisation, and developed a database of characteristics for each rock type to be mined. Potential rejects as well as spoil samples were collected from four core drill holes located across the mining area, with samples collected to a depth of 300 m. The sampling meets best practice standards as it is both spatially and lithologically representative of materials being mined and is consistent with sampling numbers recommended by the Global Acid Rock Drainage (GARD) Guide.

A total of 74 distinct spoil samples and 4 potential reject samples were collected for geochemical assessment. The spoil samples comprised a total of 48 sandstone, 12 siltstone, 5 siltstone/ sandstone, 6 claystone, 1 mudstone, 1 diorite and 1 claystone/siltstone samples. The potential rejects consisted of 1 coal roof (sandstone) and 3 coal floor samples (claystone/ sandstone, claystone and tuff). In addition, total sulfur concentration data for 70 potential reject samples collected from a coal quality testing program was also considered.

The geochemical characterisation was based on static geochemical test methods. This has included an initial screen for pH and EC based on a solid to water ratio of 1:5 (pH1:5 and EC1:5, respectively), with analysis of ANC, total sulfur, MPA and net acid producing potential. Based on the results of the initial screening tests and lithology, selected samples were further analysed for sulfide-sulfur dominance, based on Chromium Reducible Sulfur (C_{SR}). After completion of these initial geochemical test results, further samples were selected for additional testing of exchangeable cations, total metals, and soluble metals and anions.

No kinetic testing has been completed however it is again highlighted that the DYE site is not yet developed. At the time of drilling, a focus was on understanding the materials with static testing. The results have indicated that the materials posed very low risk of geochemical concern in the future and concurrent management measures to be employed. However, it is planned for kinetic testing of higher risk materials to occur as the mine is developed.

Classification of Mine Waste Streams

Sampling has indicated that the DYE materials pose a very low level of inherent risk in terms of geochemical factors, such as AMD and metalliferous drainage. The spoil materials show high and excess acid neutralising capacity to accommodate for the 3 % of PAF materials, which will be blended with the remaining 97 % of NAF materials. Reject materials approximately 72 % NAF, with the remainder classified as PAF-LC.

Figure 3-18 illustrates the proportions of mine waste streams being generated by DYE over the life of the mine, with reference back to the underlying risk classification. This also provides an estimation of the total volume of each mine waste stream to be generated for each level of geochemical risk. As can be seen from the figure, and explained above, the volume of NAF material is in excess and is expected to be sufficient to effectively neutralise the risk posed by the PAF-LC and PAF materials.

Long-term rehabilitation and closure requirements for the management of any exposed mine waste materials primarily relates to the two WRD structures and the backfill of the mine drift. For these locations, spoil and rejects materials will be blended to ensure neutralisation of PAF materials. It will further be covered by topsoil materials, which is known to have further acid neutralising capacity (as detailed in Section 3.5.3). This is also an essential rehabilitation requirement to protect against the sodic or dispersive nature of spoil and reject materials.

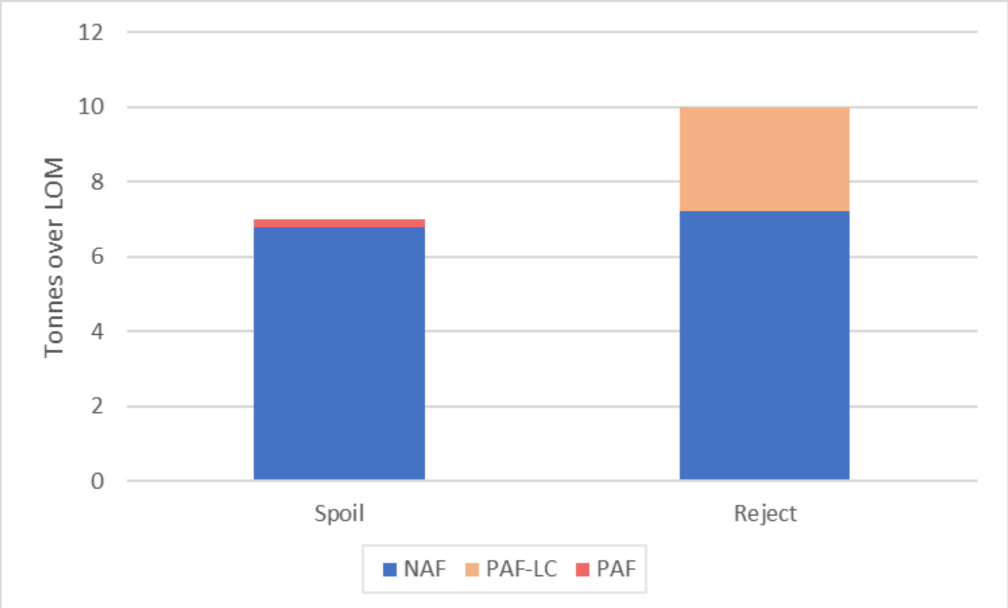

Figure 3-18 Classification of Waste Streams over LOM (as million Tonnes)

Management and Mitigation of Waste Streams

Management requirements have been included for waste streams, to ensure the underlying geochemical risk is considered for rehabilitation and closure of the DYE site. This includes the following key measures:

- Further evaluation of the geochemical characteristics of actual reject materials will occur as the DYE site commences operations, to re-confirm the overall NAF nature of materials, or delineate any PAF materials (this is a commitment made for the EA (EPML01978714) approval).
- Reject materials (both coarse rejects and dewatered tailings) from the CHPP will be combined and truck-dumped into the WRDs, where they will be mechanically mixed by dozer back into spoil.
- Weathered NAF spoil materials will be used to backfill the drift entrance (where compatible with the Underground Sealing Management Plan to be developed as outlined in Section 3.5.11), as well as for the final spoil surface of the WRDs. A minimum thickness of two metres of weathered and known NAF spoil material will be placed on the WRDs as a benign upper cover layer.
- Progressive rehabilitation of the waste rock dumps will occur as soon as practical. A suitable topsoil cover will be placed onto the profiled slopes and areas available for rehabilitation will then be revegetated to provide a safe, stable and sustainable post-mining landform.
- The WRD emplacements have been designed to minimise erosion potential associated with the dispersive materials. This includes ensuring gentle slope angles and smaller emplacements, adequate control of surface water runoff and having adequate topsoil coverage. Management measures associated with the landform design are further detailed in Section 3.5.5.

Conceptual Site Model for Mine Wastes

A conceptual site model has been developed for the site (see Figure 3-19), this includes the WRDs and shows how reject material will be treated for the site. This also shows how the site will interact with the surrounding land, air and water environment (considering source-pathway-receptor connections).

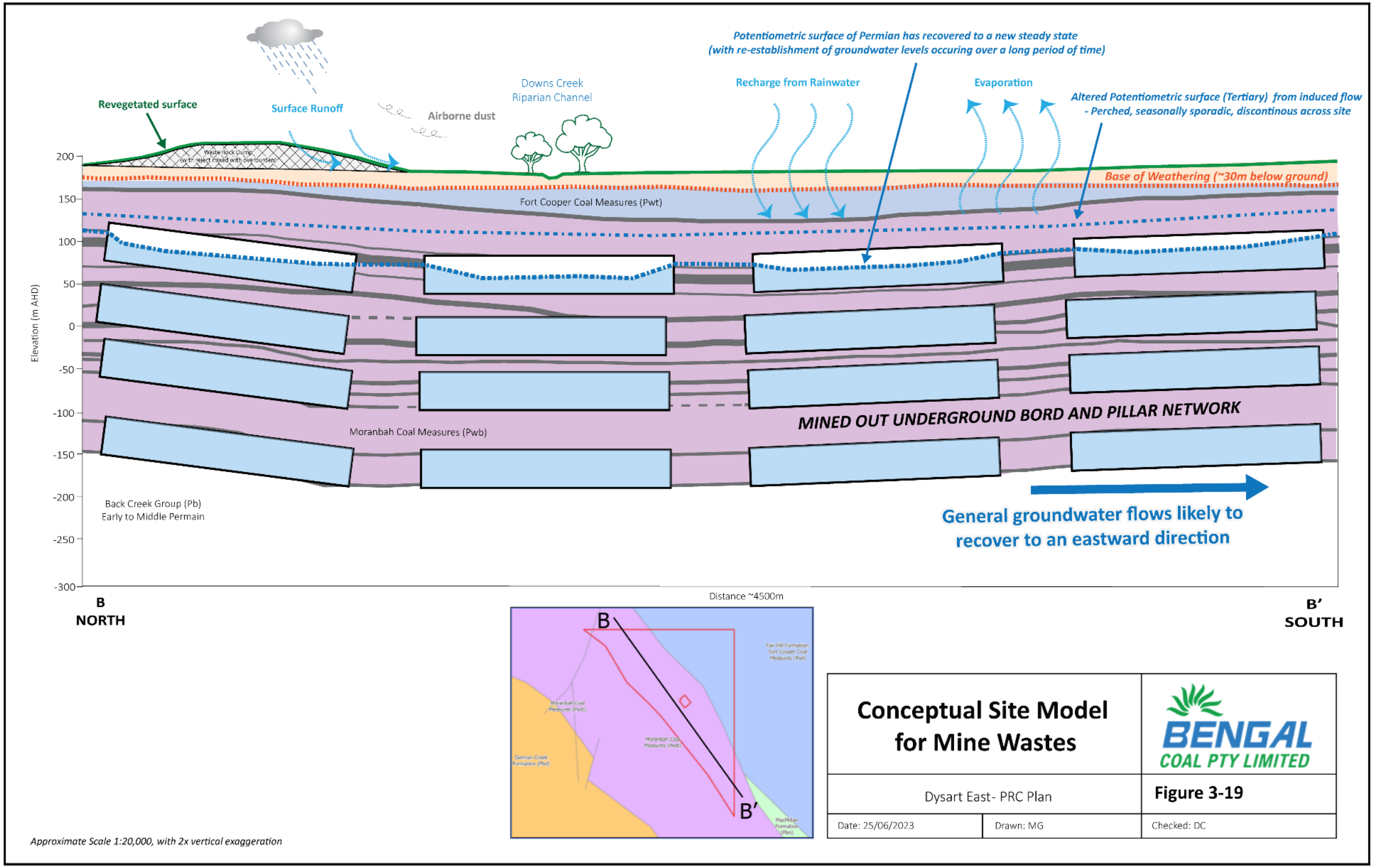

Figure 3-19 Conceptual Site Model for Mine Wastes at DYE

Key Requirements to Demonstrate a 'Stable Condition'

Information has been presented to show that the geochemical risk posed by materials on site is low. However, there are some important requirements that will be essential to managing that risk in the long-term and ensuring a stable condition can be achieved for the areas of relevance.

It is noted that the area where rehabilitation activities require management as a result of the waste materials is primarily limited to the WRDs, where correct handling and treatment of spoil and reject materials is important for those areas of concern and are essential for ensuring that the PMLU is achieved. The completion of these relevant milestones will be tracked with the achievement of specific milestone criteria in which respond to the underlying technical concern of waste materials.

The proposed criteria are summarised in Table 3-15 and transferred into the PRC Schedule.

Table 3-15 Waste Characterisation - Justification of Milestone Criteria

Relevant PMLU	Relevant RAs	Rehabilitation Methodology – Geochemistry	Relevant Milestone to be achieved	SMART Measures for Milestone Criteria
Grazing	RA1, RA2, RA4	• Continue to conduct further static and kinetic testing as mine is developed. • Ensure no spoil or reject materials remain exposed on surface of WRD (due to both geochemical risk and dispersive materials). • Ensure application of amelioration to spoil materials if required. • Ensure surface water runoff is non-polluting and is consistent with waste characterisation.	RM3 –Final landform development RM4 – Seedbed preparation RM7 – Achievement of a stable condition (Grazing PMLU)	3.1 Dispersive and PAF spoil and reject materials to be adequately buried, by 2m of weathered/known NAF material. 3.3 Soil ameliorants are applied as needed to address spoil limitations. 4.2 … All topsoil removed during development will be replaced on areas to be revegetated, to a minimum of 300mm depth (or as per the depth of removed profile). 7.2 No environmental harm caused by anything on or in the RA. Surface water runoff to receiving waters and complies with the following: - pH 6.5 – 8.5 - EC (salinity) <720 µs/cm - or as otherwise justified within future investigations or by setting site-specific water quality objectives.
Cropping	RA3, RA5	Not relevant as no mine surface disturbance anticipated.	n/a	n/a
Native Vegetation	RA6	Not relevant as no mine surface disturbance anticipated.	n/a	n/a

3.5.5 Landform Design

The DYE mine has been designed to minimise surface disturbance, and where disturbance has been necessary, mine design has been optimised to avoid high value areas. Rehabilitation will be designed to achieve a stable landform, compatible with the surrounding landscape. The key area where a landform will be created relates to the two WRD emplacements to be located to the north of the site. A standalone Landform and Cover Design Report has been prepared to accompany this PRCP.

Design Process

The WRD area will remain as a permanent landform, with a design basis established to ensure that the landform will be safe and structurally stable, in addition to supporting the required rehabilitation outcomes.

The landform concept for DYE has been developed through consideration of design criteria and appropriate standards at analogous locations, and published literature and guidelines. Relevant information on rehabilitation and landform designs from similar mine sites in Central Queensland was also utilised and coupled with understanding and review of site conditions. Further to this, the constraints and requirements of the site and operation has also been considered, to optimise the location and placement of the required landforms.

Key principles of relevance to development of the design include the following environmental factors:

- spoil type, placement and properties (and in particular the dispersive nature of spoil materials), with appropriate requirements for material management
- mitigation of long-term erosion risk posed by the landform.
- disturbance footprint, local topography and visual impact
- the location and behaviour of Downs Creek watercourse and floodplain and interactions
- long-term rehabilitation drainage and water shedding from the WRD emplacements.
- the ability of the landform to support an intended PMLU of Grazing, and to ensure that the post-mining land is suitable for this use.
- drainage in the surrounding areas, both on site and in the surrounding catchments.

Final Landform

In response to these principles and criteria, DYE has developed a final landform that supports the rehabilitation objectives of the site, will ensure successful achievement of the PMLU outcomes and aligns to the transitional land outcomes.

A high-level summary of the landform principles to be satisfied includes the following:

- no PAF spoil materials are to remain at the surface of the landform once the WRD has been reshaped, and a minimum 2m thickness of known NAF material to form the top of the WRD landform surface.
- average linear slope angle of no more than 10 % for both WRDs and average slope length of no more than 400 m
- a maximum height of 30 m for the WRD emplacements
- at least a 1 % longitudinal grade to be installed to ensure WRD surfaces are free-draining.
- the erosion and sediment control network in place for the DYE operations will remain in place until such time that adequate vegetative cover can be demonstrated.

The resulting final landform has been superimposed onto the region, with a 3D visualisation shown as per Figure 3-20. The location of the WRD landform can be seen.

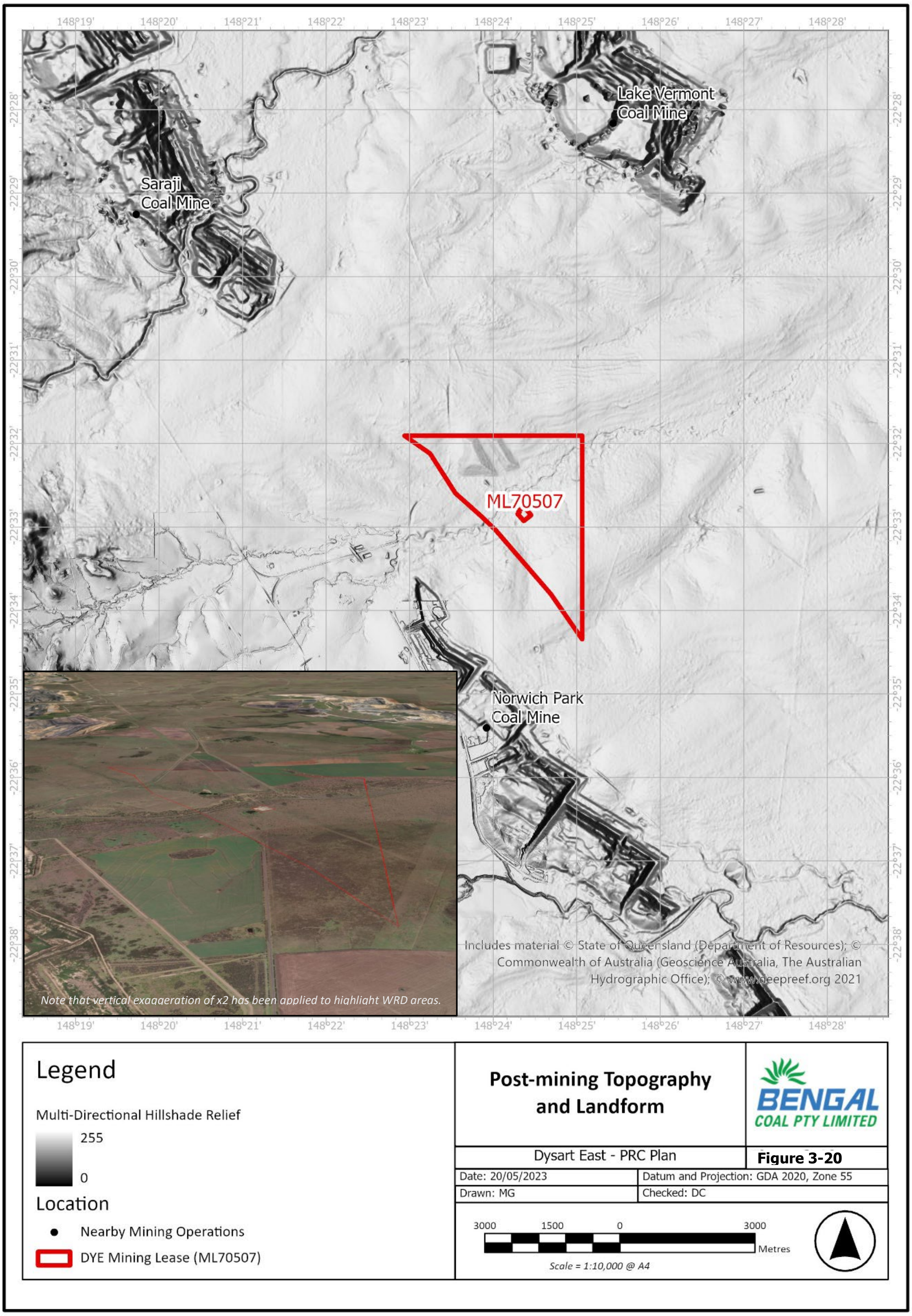

Figure 3-20 Post-mining Topography and Landform

Long-term Landform Stability

Given that the objective of final landform design is to achieve long-term stability, the WRD areas have been designed and assessed to predict their future stability against erosion into the future. Slope angle, length of slope and vegetation cover are important factors in the control of erosion and can be modified by design to manage the risk of erosion of the final landform. A range of modelling tools are available to obtain an understanding of potential annual erosion rate (t/ha/yr) when the key factors are varied, to inform the final landform design approach.

The Revised Universal Soil Loss Equation (RUSLE) was previously utilised to both inform the erosion risk of the pre-mining landscape, but also understand the potential for topsoil loss that that could be predicted to occur for different topsoil materials and slope angles applied to rehabilitation and landform arrangements (URS,2015). Calculated estimates across the DYE site for the pre-mining landscape ranged from low (2 t/ha/yr) to moderate (10 t/ha/yr).

These erosion rates reflect the variability of the natural landscape across the DYE site, from relatively flat to gently sloping landscape, as well as the relative physical stability of the different topsoil materials. It is noted that an outlier value of 36 t/ha/yr was also noted for a variant of the U1 soil, occurring on a slope of 4%, however this suggests that this topsoil material is not suitable for use and as such, has been excluded from the reference range. An upper limit of 10 t/ha/yr has been adopted as an appropriate benchmark for the performance of rehabilitated landforms.

The same tool was utilised to inform potential erosion risk for the WRD emplacements. The benefit of applying the RUSLE tool is that the parameters underlying the prediction are derived from site-specific information informed by in-situ soil sampling (URS, 2015a). This has been applied (see Table 3-16) to the proposed WRD landform arrangement, with average slope lengths and angles as per the design principles, using the intended soil materials and showing a range of different revegetation outcomes.

Table 3-16 Long-term Landform Erosive Stability

WRD1				WRD2		
Soil Type (SMU)	Vegetative Cover (%)	Annual Soil Loss (t/ha/yr)		Soil Type (SMU)	Vegetative Cover (%)	Annual Soil Loss (t/ha/yr)
A2	60%	24		A2	60%	21
	80%	7			80%	6
A3	60%	17		A3	60%	15
	80%	5			80%	4
U1	60%	8		U1	60%	7
	80%	3			80%	2
Average	60%	16		Average	60%	14
	80%	5			80%	4

As can be seen from Table 3-16, both the topsoil material used, and the vegetation cover achieved influence soil loss rates. Most topsoil materials available for use in rehabilitation are soil type U1, and a vegetation cover of 60% and over will achieve acceptable long-term erosion performance. Based on this design approach, both WRD areas are anticipated to achieve minimum annual erosion rates of between 7 and 8 t/ha/year.

Landform Rehabilitation Process

The selection of landform arrangement and resulting rehabilitation requirements has been strongly informed by knowledge and experience of regional practices in Central Queensland. The landform principles adopted are considered extremely conservative given successful rehabilitation practices elsewhere on similar materials, but with larger and steeper landforms. Further, a construction process has been developed, incorporating the following key steps:

- development of the landform surfaces with adequate mixing of waste materials and compaction as each subsequent WRD area is progressed to a final profile.
- placement of a final layer of known NAF spoil materials at a minimum depth of 2m to provide protective cover to the PAF wastes.
- completion of bulk earthworks to reshape materials to achieve the required slope arrangement, with time allowance for settlement of waste rock materials prior to the completion of further rehabilitation activities.
- bulk earthworks will ensure adequate fall to the landform to effectively shed surface water.
- minor earthworks may be required to ensure improved tolerance to design and to complete works which cannot be established with larger equipment.
- amelioration of spoil materials will be carried out if required.
- placement of growth media (topsoil and subsoil materials) with ripping to scarify the surface and key into the underlying landform materials, noting this should not exceed a depth of 50 cm.
- revegetation activities to promote the achievement of PMLU outcomes.

During this rehabilitation process, DYE will employ normal operational QA/QC processes to ensure that rehabilitation outcomes are successfully met, and quality requirements are achieved. This consists of 'conformance to design' processes, rehabilitation inspections during construction and rehabilitation performance reporting.

Key Requirements to Demonstrate a 'Stable Condition'

The landform design and performance aspects are essential to ensure successful rehabilitation outcomes for the site. Although only relevant to a small part of the site, this technical area is important for ensuring a stable condition is achieved.

The design principles and requirements represent the key rehabilitation outcomes as a result of the landform design, primarily for the WRDs, and are essential for ensuring that the PMLU is achieved. The completion of these milestones can be tracked with the achievement of specific milestone criteria which correlate to the landform design aspects.

A standalone Landform and Cover Design Report has been prepared to accompany this PRCP, with further detail for the key requirements relating to landform design. Proposed criteria are summarised in Table 3-17 and transferred into the PRC Schedule.

Table 3-17 Landform Design - Justification of Milestone Criteria

Relevant PMLU	Relevant RAs	Rehabilitation Methodology – Landform Design	Relevant Milestone to be achieved	SMART Measures for Milestone Criteria
Grazing	RA1, RA2, RA4	• Ensure no spoil or reject materials remain exposed on the WRD (due to both geochemical risk and dispersive materials) • Ensure linear slope angles and lengths, and maximum height of WRD aligns to design principles • Ensure WRD surfaces are free-draining • Ensure adequate vegetation cover for rehabilitation to achieve acceptable long-term erosive stability.	RM3 –Final landform development RM4 – Seedbed preparation RM6 – Vegetation establishment	3.1 Dispersive and PAF spoil and reject materials to be adequately buried, by 2m of weathered/known NAF material. 3.2 Landform has been established and satisfies criteria as per the requirements for the Grazing PMLU below: - Average WRD slopes to be less than 10 % with average slope length of no more than 400 m. - At least 1 % longitudinal grade to be maintained to ensure the WRD surfaces are free-draining. 4.2 The seedbed has been prepared for seeding and satisfies the criteria for the Grazing PMLU below: - All topsoil removed during development will be replaced on areas to be revegetated, to a minimum depth of 300mm. - Amelioration and other treatments have been applied as appropriate to ensure a suitable plant growth medium, as guided by an AQP. 6.1 Vegetation has established and satisfies the criteria for the Grazing PMLU below: - ≥60% established and persistent vegetative groundcover for all slopes (or 50 % if rocks, logs or other features of cover are present). - No bare surfaces >20 m^2 in area or >10 m in length down slope.
Cropping	RA3, RA5	Not relevant as no mine surface disturbance anticipated.	n/a	n/a
Native Vegetation	RA6	Not relevant as no mine surface disturbance anticipated.	n/a	n/a

3.5.6 Cover Design

A cover design is typically required for the surface treatment of a mine landform in circumstances which require control over the exposure of waste rock, low-grade ore or rejects materials due to geochemical concerns. This may be acidic, neutral or alkaline discharge with elevated metal or sulfate concentration. The management of waste material prevents release of contaminants to the receiving environment, legacy concerns, or direct impacts on rehabilitation success. Hence, the cover system design is a direct reflection of the type(s) of waste generated and reflect a risk-based approach.

As described in Section 3.5.4, at DYE it is considered that mine wastes will have limited potential to generate acidic, neutral metal or saline drainage under natural oxidation conditions. However, a portion of the waste streams are understood to be PAF and as such, will require encapsulation with NAF materials, with carefully management to ensure placement occurs within the WRDs in a way that does not generate geochemical concerns.

Thus, there are no mine related structures or activities for DYE that require a specific engineered cover system to be installed. However, a commitment has been made to place a 'cover' of weathered and known NAF material as a 'benign upper cover layer'. Whilst it is again argued that this is an encapsulation technique rather than an engineered cover, the requirements of the PRCP guideline as it relates to Cover Design has been addressed within the standalone Landform and Cover Design Report prepared to accompany this PRCP.

3.5.7 Water Management

There are known environmental values that are relevant to the surface water and groundwater systems surrounding the DYE site, including aquatic ecosystem as well as a wide range of human values, and the site activities have potential to impact on values. The local surface system is slightly to moderately disturbed, with some exceedance of water quality objectives apparent in the background information (detailed in Section 3.1.6).

DYE has developed a water management system to mitigate any potential impact to these values. Rehabilitation and closure activities will be designed to contain all potentially contaminated water produced by DYE, to minimise impact to the surrounding and receiving surface water and groundwater systems and ensure the background values are preserved. A key concern will be to continue to utilise operational erosion and sedimentation controls until such a time that the rehabilitation activities can assure stabilisation and can ensure no contamination of downstream aquatic systems.

Contaminants of Concern

Past sampling at the site shows that certain existing water quality parameters may already exceed the published water quality objective (WQOs) namely EC, turbidity, TSS, nutrients and selected metals (URS, 2015). Further, downstream median levels of EC in the Isaac River are approximately 250 - 300 µS/cm. Monitoring of local watercourses at the nearby coal mines indicate neutral to slightly alkaline pH, low salinity levels and high levels of turbidity especially during periods of high flow.

The key contaminants of concern that are relevant to rehabilitation and closure of DYE are:

- salinity, with the transport of salts due to water infiltration through the spoil materials within the WRDs, this may impact downstream aquatic environments and land receptors if there is excessive leaching from rehabilitated landforms.
- sediment, which may be mobilised as a result of active erosion processes on rehabilitated surfaces, deposition of sediment may alter the functioning of the landform design intention or impact downstream watercourses.

The risk posed by contaminants is explored in Table 3-18, with the source, pathway and fate of contaminants explored.

Environmental Fate and Transport Processes

Potential sources, pathways and receptor or fate of contaminants are considered in Table 3-18, with consideration of the potential impact to environmental values or harm to be caused, and proposed management requirements.

Table 3-18 Environmental Fate and Transport Processes

	Environmental Aspect	Contaminant of Concern	Potential for Environmental Harm	Management Strategies
Source	PAF material encapsulated in WRD	• Salinity • AMD • Other contaminants	Interaction of PAF material with water and oxygen resulting in mobilisation of AMD and other contaminants	• ensure progressive mixing and compaction of NAF and PAF material in WRDs • ensure minimum 2m depth of NAF placed as final layer of WRD surface • ensure minimum 300mm depth of topsoil over NAF material
Source	Point source contaminants from Infrastructure areas	• Sediment • Other contaminants	Mobilisation of sediment, salinity or other contaminants	• records of contaminants placement on site • complete contaminated land assessment process at closure, with remediation if needed
Source	Airborne dust from WRD surface	• Sediment	Mobilisation of dust particulates (settling as sediment)	• dust control during operations and rehabilitation • rehabilitate as soon as available to stabilise surface
Pathway	Runoff into surface water drainage features	• Sediment • Salinity • Other contaminants	Mobilisation of sediment, salinity or other contaminants	• direct WRD run-off into sediment dams • adoption of appropriate landform design criteria to ensure erosionally stable landform • adoption of water management features such as benches to prevent sediment laden runoff • monitor water quality in line with the Receiving Environment Monitoring Program (REMP) and manage if required
Pathway	Seepage passing from WRD into surface water system	• Salinity • Other contaminants	Interactions between WRD runoff and surrounding surface water environment	• monitor for seepage locations and manage if required • monitor water quality in surface water systems
Pathway	Contaminants migrating from underground workings in surrounding aquifers	• Salinity • Other contaminants	Mobilisation of salinity or other contaminants	• ensure adequate contamination control during operations, with records of any contamination that occurs • complete contaminated land assessment process at closure, with remediation if needed • Monitor groundwater quality as required by the EA.

	Environmental Aspect	Contaminant of Concern	Potential for Environmental Harm	Management Strategies
	Airborne particulates that are then deposited	• Sediment	Transport as airborne particulates	• dust control during operations and rehabilitation • rehabilitate as soon as available to stabilise surface
Receptor	Receiving surface water environment	• Sediment • Salinity • Other contaminants	Impact to sensitive receptors (human, animal or aquatic ecosystems) Deterioration of water quality within downstream surface water catchments	• development and implementation of REMP
Receptor	Surrounding groundwater system	• Sediment • Salinity • Other contaminants	Impacts to sensitive receptors (human or animal) Deterioration of water quality within groundwater systems	• monitor receiving groundwater (quality and level)
Receptor	Surrounding surface areas and dwellings	• Sediment • Salinity • Other contaminants	Impacts to sensitive receptors (human or animal) Deterioration of receiving environment, such as vegetation	• monitor sensitive receptors and dust deposition level

There are no areas or features where infiltration or seepage are expected to occur. If any patterns of seepage change over time, further consideration of the need for seepage intervention and collection systems may be required. This is considered a low contamination risk, given the landform design arrangement and the distance between source and potential receptors.

Long term Water Management

There are no surface water diversions proposed at the DYE site. There are no other long-term water modifications undertaken for the DYE site which are intended to be retained at closure.

The DYE site will generate Mine Affected Water (MAW), however storages have been designed to ensure full containment of MAW with inclusion of an appropriate Design Storage Allowance (DSA) and Extreme Storm Storage (ESS), and as such there is no need to release water to Downs Creek.

Surface water runoff is managed through the installation of three sediment dams. These function in concert with a catch drain network to collect suspended sediments and other potential contaminants in runoff from disturbed areas during operations, including infrastructure areas. Sediment is then settled out. Areas which are known to produce oil or chemical-affected runoff are further bunded to separate contaminants in accordance with relevant Australian Standards and runoff contained.

All DYE sediment dams as well as the mine water dam may be retained as infrastructure available to a future landowner. The need to remove sediment or other contaminants from the base of each dam will be considered during the site contaminated land assessment and remediation processes. Dewatering may be required to support decontamination activities for the DYE sediment dams and mine water dam prior to decommissioning and mine rehabilitation processes. Any dewatering is planned to occur as a result of reduced water inflow into the dam (as a result of the cessation of mine washing activities), transfer to underground water storage, additional use for dust suppression or for rehabilitation, or through evaporation.

There are also two existing farm dams (as pre-existing structures prior to the mine development) which will be retained after rehabilitation and closure of the DYE site. Both farm dams are in areas where there is no proposed surface disturbance.

Key Requirements to Demonstrate a 'Stable Condition'

Water management considerations may impact on the ability to achieve a stable condition for DYE over the long-term and how each proposed PMLU will be achieved. It is noted that the site has been designed to minimise impact to the surface and groundwater systems during operations, and these controls are equally applicable to the rehabilitation and closure activities. Key requirements for this technical area are summarised in Table 3-19 and transferred into the PRC Schedule.

Table 3-19 Water Management - Justification of Milestone Criteria

Relevant PMLU	Relevant RAs	Rehabilitation Methodology – Water Management	Relevant Milestone to be achieved	SMART Measures for Milestone Criteria
Grazing	RA1, RA2, RA4	Future landowners must accept responsibility for retained infrastructure. Rehabilitation and closure must consider land contamination from infrastructure uses at DYE. The WRD areas must be adequately stabilisation to support a grazing land use.	RM1 – Infrastructure decommissioning and removal RM2 – Identification and remediation of contaminated land RM3 – Final landform development RM6 – Vegetation establishment	1.2 All mine-related buildings, plant and equipment and infrastructure* removed, except that to be retained by landholder by formal written agreement and with consent from the administering authority where the landholder or landowner is the EA holder. 2.1 Contaminated land assessment by an AQP as evidenced by preliminary site investigation and report. 2.2 Remediation or management of identified contaminated land completed, evidenced by site validation report and site suitability statement issued by the AQP. 2.3 Removal of land from Contaminated Land Register as appropriate. 2.4 Removal of land from Environmental Management Land Register as appropriate. 3.1 Dispersive and PAF spoil and reject materials to be adequately buried, by a minimum depth of 2 m of known NAF material. 3.2 Landform has been established and satisfies criteria. Average WRD slopes to be less than 10 % with average slope length of no more than 400 m. 6.1 Vegetation has established and satisfies the below criteria. ≥60 % established and persistent vegetative groundcover for all

Relevant PMLU	Relevant RAs	Rehabilitation Methodology – Water Management	Relevant Milestone to be achieved	SMART Measures for Milestone Criteria
				slopes (or 50 % if rocks, logs or other features of cover are present).
Cropping	RA3, RA5	Not relevant as no mine surface disturbance anticipated.	n/a	n/a
Native Vegetation	RA6	Not relevant as no mine surface disturbance anticipated.	n/a	n/a

3.5.8 Revegetation

The detail provided below is intended to satisfy the PRCP guideline requirement for a revegetation plan, as it indicates activities to be completed to establish self-sustaining vegetation communities aligned to the relevant intended PMLU (primarily for the Grazing PMLU area, but also with some suggested activities to promote the Native Vegetation PMLU). The nature of revegetation undertaken is integral to achievement of the PMLU, therefore revegetation activities need to be carefully planned.

Revegetation activities are an essential first step in establishing a sustainable vegetative ground cover on land surfaces disturbed during mining operations, which is critical for ensuring suitable long-term erosivity outcomes (as described in Section 3.5.5). Longer-term, revegetation activities will be aligned to the requirements of the PMLU, and incorporate establishment of appropriate growth media, fauna habitat and other ecological services as relevant.

It is noted that revegetation of disturbed surface land will generally proceed within two years of the areas becoming available for rehabilitation. In areas where it is not possible for progressive rehabilitation to take place, due to integration into integral active mining activities, temporary rehabilitation methods may be carried out to provide short-term stabilisation. Results from successful progressive rehabilitation will be used to refine the ongoing methodology.

Revegetation Objectives

At DYE, revegetation has two overarching aims. Firstly, short-term stabilisation through revegetation is required to control erosion and promote landform development. Secondly, in the longer term, establishment and persistence of specific species and vegetation characteristics is required to align to the requirements of each PMLU.

Targeted objectives for revegetation at the DYE site include:

- minimisation of the potential for water and wind erosion through revegetation activities
- promote revegetation activities as a mechanism to protect long-term surface water quality and minimise the releases of contaminants.
- preventing slumping or geotechnical instability, to ensure that the final landform is stable and safe.
- ensure suitable species of vegetation are planted and established to achieve the PMLU in a manner which can be is demonstrated by the rehabilitation milestones.

Key Species of Conservation Significance

The DYE site predominantly features non-remnant vegetation (Section 3.1.6). The riparian vegetation along Downs Creek represents intact REs and forms a bioregional wildlife corridor and connects to remnant vegetation external to the site. There are some areas that are also considered to be TECs – namely small patches of brigalow and natural grasslands of the Queensland Central Highlands and the Northern Fitzroy Basin.

No conservation significant flora species are considered likely to occur. There is potential for several conservation significant fauna species, mainly within areas of remnant riparian woodland vegetation. The areas where the intact riparian vegetation occurs will not be subject to surface disturbance.

There is an area of existing dryland cropping land which occurs to the north-east of the DYE site, which is mapped as SCL with historic planting of sorghum. It is also noted that the area to the south of Dysart Connection Road is also mapped as SCL however appears to have been grazed only.

Fauna Habitat and Use Requirements

The site is largely disturbed through agricultural and grazing activities and represents degraded habitat. Better fauna habitat is available within the relatively intact vegetation associated with Downs Creek and a few isolated patches of vegetation across the site. Retention of this area as a Native Vegetation PMLU will support native fauna species movement in the landscape.

Enhancement of the area through passive regeneration as well as targeted revegetation will aim to further connect surrounding areas of natural habitat and augment habitat values. Where possible, habitat features such as felled trees, logs and other woody debris will be relocated into these areas to provide fauna microhabitat opportunities.

Seed Mixes

The primary PMLU where revegetation is planned is for the Grazing PMLU; a seed mix comprising key pasture species has been developed to achieve the PMLU outcomes. This seed mix is provided in

Table 3-20. This is a master list, from which options to build a seed mix can be developed on a year-to-year basis. A total seed sowing rate of 10-20 kg/ha should be achieved, and specific consideration should be given to the optimal sowing method for each species. This has been developed to accommodate changes in local and annual availability of seed, and to promote diversity of pasture species into the PMLU to enhance grazing outcomes. It also has a strong focus on incorporating 3P pasture species (productive, persistent and profitable) to ensure high quality grazing outcomes.

Where possible, seed mixes will be locally sourced, or at minimum, will aim to be sourced from suppliers that harvest from areas demonstrating similar environmental characteristics to that of the Central Queensland region. Supply availability and historical seed success performance/quality are noted as key factors driving seed sourcing.

The proposed seed species identified, and to be used in revegetation all have widespread geographic distributions (including hotter and drier locations than the site), and as such are expected to be resilient to climate change impacts.

Table 3-20 Key Pasture Seed Mix for Grazing PMLU

Relevant PMLU	Proposed Seed Species	Suggested Sowing Rate (kg/ha)
Grazing	Pasture Grasses and Forbs	
	barbwire grass (*Cymbopgon refractus*)	2.5
	berseem clover (*Trifolium alexandrinum*)	2.5
	black speargrass (*Heteropogon contortus*)	5
	brigalow grass (*Paspalidium* spp.)	1
	burgundy bean (*Macroptilum bracteatum*)	2.5
	cotton panic grass (*Digitaria brownii*)	1
	couch grass (*Cynodon dactylon*)	2.5
	forest bluegrass *(Bothriochloa bladhii.)*	5
	glycine (*Glycine* spp.)	2.5
	golden beard grass (*Chrysopogon fallax*)	2.5
	guinea grass (*Megathyrsus maximum*)	2.5
	hunter river lucerne (*Medicago sativa)*	1
	kangaroo grass (*Themeda australis*)	1
	mitchell grass (*Astrebla* spp.)	1
	native millet (*Panicum decompositum*)	2.5
	queensland bluegrass (*Dichanthium sericeum)*	5
	rhodes grass (*Chloris gayana*)	2.5
	rhynco (*Rhynchosia minima*)	2.5
	sabi grass (*Urochloa mosambicensis*)	5
	scented top (*Capillipedium parviflorum*)	5
	stylo mix (*Stylosanthes* spp.)	2.5
	tall cup grass (*Eriochloa crebra*)	1
	windmill grass (*Chloris* spp.*)*	2.5
	windmill grass (*Enteropogon* spp.)	1

Relevant PMLU	Proposed Seed Species	Suggested Sowing Rate (kg/ha)
	wire grasses *(Aristida* spp.)	1
	Cover Crop	
	japanese millet (*Echinochloa esculenta*)	10

Although targeted revegetation of the riparian Downs Creek corridor (Native Vegetation PMLU) is planned, it is not desirable for seeding to be undertaken given the potential for de-stabilisation of the riparian corridor as a result of necessary ground preparation works. Instead, it is planned for selective infill tubestock planting to occur, to reflect the native vegetation community assemblage of the surrounding area. It is expected that planting will occur with native species reflective of REs 11.3.1, 11.3.2 or 11.3.4, as available commercially.

Site Preparation Strategies

Revegetation will achieve two sequential outcomes. Firstly, stabilisation through revegetation is required to achieve a groundcover capable of controlling soil loss by water erosion to sustainable levels. This may be achieved in some instances using an annual cover crop, in addition to longer-lived grasses and forbs. Secondly, in the longer term, establishment and persistence of specific pasture species are required to align specifically to the requirements of each PMLU.

Many of the prescribed strategies to prepare an area for revegetation follow basic conservation principles, and some are specific to the PMLU. However overall, many of the activities outlined in Table 3-21 should be completed sequentially to promote revegetation success.

Table 3-21 Site Revegetation Preparation Strategies

Activity	Description	Indicative Timeframes	PMLU, RAs and Milestones
1. Ripping/ Scarification	• All areas will be shallow ripped/scarified along the contour prior to the spreading of topsoil (RM 4.1). • Ripping will aim to create a well-prepared seed bed that is loose and friable, with micro-niches to enable good contact between soil and seeds.	Progressive rehabilitation and active closure. Years 7 to 30	Grazing PMLU for WRDs (RA1) and Infrastructure to be removed (RA2). RM4 Seedbed preparation.
2. Topsoil Spreading	• Topsoil will be spread at a minimum depth of 300mm (RM 4.3) • Sufficient material is available on site to meet revegetation requirements. • Only suitable growth media materials will be used (all materials to be stripped can support the intended Grazing PMLU for revegetated areas). • Topsoil depth has been informed by pre-mining topsoil depths for the mining lease area and surrounds, and for complementary land uses. As such, it is expected to ensure revegetation success and sustainable PMLU outcomes. • Prior to use, a soil assessment will be completed by an AQP to confirm quantity, quality and compatibility of material with rehabilitation methodology and PMLU (RM 4.2).	Progressive rehabilitation and active closure. Years 7 to 30.	Grazing PMLU for WRDs (RA1) and Infrastructure to be removed (RA2). RM4 Seedbed preparation.
3. Amelioration	• Detailed soil assessment completed by an AQP will guide specific amelioration prescriptions (RM 4.2), such as:	Progressive rehabilitation	Grazing PMLU for WRDs (RA1) and

Activity	Description	Indicative Timeframes	PMLU, RAs and Milestones
	o types and application rates of physical and chemical ameliorants, fertilisers and other growth media supplements and additions. o the application of seed, fertiliser and other treatments. • Understanding and managing soil limitations promotes revegetation success. Testing ensures the correct fertilisers and ameliorants are applied.	and active closure. Years 7 to 30.	Infrastructure to be removed (RA2). RM4 Seedbed preparation.
4. 'Walking' of Slopes	• Slopes will be 'walked' with a tracked implement after placement of topsoil and completion of amelioration (RM 4.1). • This will gently 'soften' the previous ripping and key the topsoil and ameliorants together prior to seed sowing. • This enhances the suitability of the seedbed environment, encourages water infiltration in the soil and reduces runoff.	Progressive rehabilitation and active closure. Years 7 to 30	Grazing PMLU for WRDs (RA1) and Infrastructure to be removed (RA2). RM4 Seedbed preparation.
5. Rock Removal	• Large rocks will be removed from the ripped/scarified soil surface prior to sowing (RM 4.3).	Progressive rehabilitation and active closure. Years 7 to 30.	Grazing PMLU for WRDs (RA1). RM4 Seedbed preparation.
6. Seeding	• The seeding will be undertaken as soon as possible after the previous preparation steps (1-5) in order to limit surface crusting and sealing. This will enhance the likelihood of successful seed germination. • Rapidly growing annual cover crops will be used to provide quick effective groundcover until the native pasture species are established (RM 5.1). • Revegetation with suitable seed material will take place in late spring or early summer, immediately following early wet season rainfall. • Species to be seeded will be selected from • Table 3-20, or as otherwise deemed suitable by an AQP. This seed mix includes suitable pasture grass and forb species and should include at least four different 3P species (RM 5.1). • Seeding should occur at a rate of between 10-20kg/ha, depending on the exact species in each mix (RM 5.1). • It is essential for good quality seed to be used, with consideration of purity and germination success.	Progressive rehabilitation and active closure. Years 7 to 30.	Grazing PMLU for WRDs (RA1) and Infrastructure to be removed (RA2). RM5 Revegetation activities.
7. Weed Control	• Preliminary ground preparation works will be undertaken to minimise the potential for weed invasion. • Weeds will be minimised by careful use of fertilisers, controlling weeds generally at the DYE site, ensuring ameliorants and additions are weed free, inspecting machinery prior to entering site and ensuring seed sowing occurs quicky to prevent weed establishment. • Weed species will be comparable with surrounding areas, as evidenced by analogue sites (RM 7.4)	Progressive rehabilitation and active closure. Monitoring. Years 1 to 45.	Grazing PMLU for WRDs (RA1), Infrastructure to be removed (RA2). RM7 Achievement of a stable condition.
8. Long-term Irrigation	• The use of irrigation may occur to support the establishment (RM 5.1) of germination of pasture seeding. This may be applied where seed is applied with less-than-ideal climatic conditions.	Progressive rehabilitation and active closure. Years 7 to 30.	Grazing PMLU for WRDs (RA1) and Infrastructure to be removed (RA2).

Activity	Description	Indicative Timeframes	PMLU, RAs and Milestones
			RM5 Revegetation activities.
9. Ongoing Management	• Stock will be excluded from all revegetated areas until monitoring demonstrates revegetation has been successful (RM 7.3).	Progressive rehabilitation and active closure. Monitoring. Years 7 to 45.	Grazing PMLU for WRDs (RA1) and Infrastructure to be removed (RA2). RM7 Achievement of stable condition
10. Monitoring and Review	• All rehabilitated areas will be monitored to ensure the long-term success, resilience and natural regeneration of the planted vegetation (RM 7.4). • Revegetation techniques will be continually developed and refined over the life of mine through an ongoing process of monitoring at site.	Progressive rehabilitation and active closure. Monitoring. Years 7 to 45.	Grazing PMLU for WRDs (RA1), Infrastructure to be removed (RA2). RM7 - Achievement of a stable condition.

Monitoring of Revegetation Success

A program to monitor the success of revegetation will be established, both to guide the revegetation methodology but also to ensure the areas that are progressively rehabilitated are achieving their intended milestones. This will include reference to analogue sites, likely aligned to locations monitored as part of pre-mining survey efforts (as per URS, 2015a). Consideration will also be given to the feasibility of off-lease analogue sites.

Analogue sites will be selected to compare the soil, land area, land suitability and the land use. Analogue sites will also be selected to host comparable vegetation form and species assemblage.

Key Requirements to Demonstrate a 'Stable Condition'

Information has been presented to show that revegetation activities have been carefully considered to ensure successful rehabilitation outcomes and to ensure that a stable condition can be achieved for the areas and PMLU of relevance.

The completion of these relevant milestones can be tracked with the achievement of specific milestone criteria which correspond to the underlying technical concern of revegetation. Proposed criteria are summarised in Table 3-22 and transferred into the PRC Schedule.

Table 3-22 Revegetation - Justification of Milestone Criteria

Relevant PMLU	Relevant RAs	Rehabilitation Methodology – Revegetation	Relevant Milestone to be achieved	SMART Measures for Milestone Criteria
Grazing	RA1, RA2, RA4	• As per revegetation preparation strategies detailed in Table 3-21.	RM4 – Seedbed preparation RM5 – Revegetation activities.	4.1 All areas will be shallow ripped/scarified along the contour prior to spreading topsoil, and then 'walked' after spreading of topsoil to prepare for seed sowing. 4.2 Soil assessment completed by an AQP to confirm quantity, quality, compatibility with rehabilitation methodology and PMLU, and guide amelioration of material.

Relevant PMLU	Relevant RAs	Rehabilitation Methodology – Revegetation	Relevant Milestone to be achieved	SMART Measures for Milestone Criteria
			RM7 – Achievement of a stable condition (Grazing PMLU)	4.3 The seedbed has been prepared for seeding and satisfies the criteria for the Grazing PMLU below: - All topsoil removed during development will be replaced on areas to be revegetated, to a minimum depth of 300mm. - Amelioration and other treatments have been applied as appropriate to ensure a suitable plant growth medium, as guided by an AQP 5.1 Seed sown and/or tubestock planted at appropriate rates as determined by an AQP for the Grazing PMLU, using the below as a guideline: - 3P pasture species mix (as per Table 3-19 of PRC Planning Part) with a minimum of four pasture grass and forb species sown at a final rate of between 10-20kg/ha. - AQP to confirm that seeding mix comprises species suited to the soil, slope, aspect, climate and other factors relevant to the site. 7.3 The RA can sustain the PMLU, the following measures will be implemented: - Assessment from an AQP that the relevant surface areas have not declined from pre-mining condition, in terms of Land Suitability Class (as defined in the Guidelines for Agricultural Land Evaluation in Queensland (State Department of Queensland 2013) or most recent equivalent). The Regional land suitability framework outlined in Short (2023), and in particular indicators identified in Table 15 of this document, will be used to complete a land suitability assessment. - Assessment from an AQP that the RA does not exhibit erosion greater than 20 % of that exhibited in the comparable surrounding areas. 7.4 Vegetation meets the following criteria: - ≥60 % established and persistent vegetative groundcover for all slopes. - At least four perennial species established. - Weed species are comparable with surrounding sites.
Cropping	RA3, RA5	Not relevant as no mine surface disturbance anticipated.	n/a	n/a
Native Vegetation	RA6	Not relevant as no mine surface disturbance anticipated.	n/a	n/a

3.5.9 Tailings Storage Facilities

There are no dedicated or traditional tailings storage facilities proposed for the site.

As detailed in Section 3.1 (description on project description and activities), coarse and fine reject (waste) material will be dewatered and placed within the WRD emplacement. Consideration of the geochemical aspects of this waste is included in Section 3.5.4. Landform design and erosional stability aspects of the WRD emplacements is provided in Section 3.5.5. Thus, the requirements relating to tailings storage facilities are not relevant to the site and have not been considered further.

3.5.10 Voids

There are no residual voids proposed for the site. As such, the provisions of the guideline as they relate to voids have not been considered further.

3.5.11 Underground Mining

At DYE, the underground operations will be developed using the bord and pillar methodology. It is proposed for three continuous miners to work together to allow for efficient coal extraction, creating a network of 'bords' or rooms, which typically result in a grid pattern. Pillars, composed of residual coal, are then left as support for the roof of the mine and to control air flow at intervals designed to ensure the structural integrity of the underground workings. Each bord is alternated with pillars of varying strength to ensure adequate structural support, and if further required, roof supports (such as bolts) may also be installed. This is as shown on Figure 3-21.

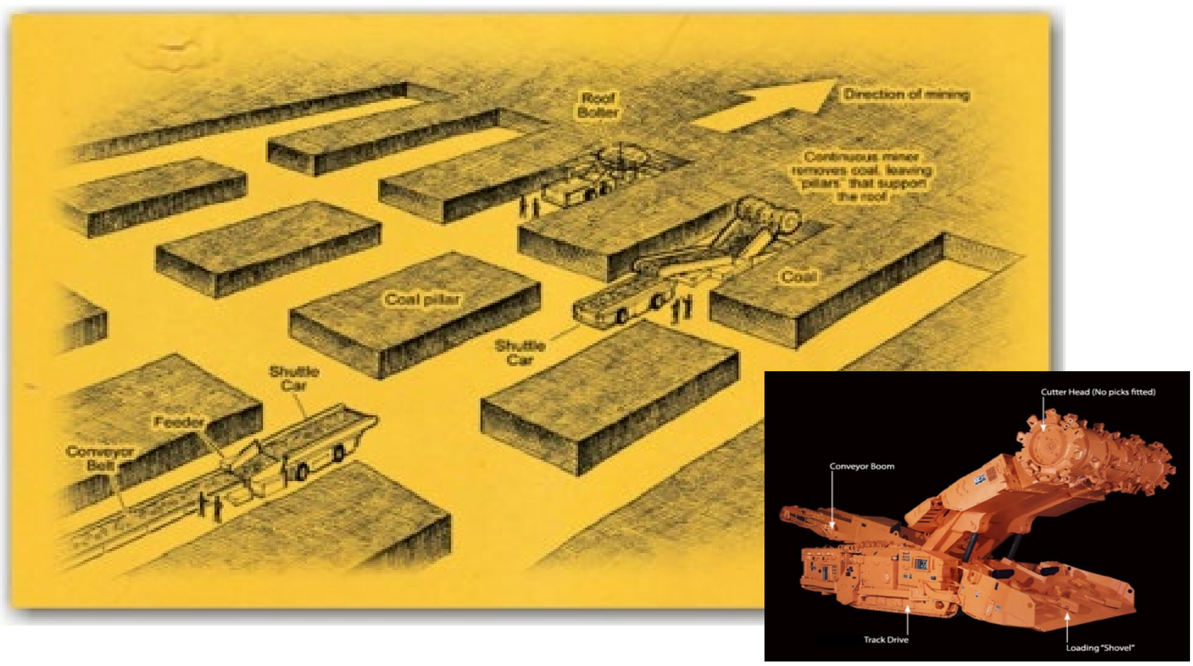

Figure 3-21 Underground Mining Methodology and Machinery

A total of five (5) seams will be targeted as follows, from shallowest to deepest:

- P seam (P08) – between 50 and 220m below ground level – Years 1-8
- P seam (P07) – between 63 and 230m below ground level – Years 2-12
- P seam (P14) – between 85 and 250m below ground level – Years 12-22
- Dysart seam (D53) – between 175 and 330m below ground level – Years 12-21
- Dysart seam (D300) – between 185 and 345m below ground level – Years 20-25.

The mine will extract the first workings only, with no secondary pillar extraction, which will provide for long term stable pillars. The mine has been designed to provide for negligible subsidence, through the application of industry standard pillar design guidelines (UNSW FOS approach), appropriate mine layout and associated risk management principles. Further, mining exclusion zones will be established for nominated infrastructure.

The area to be mined will be subject to short term surface disturbance. The requirement to drill bore holes for geotechnical, seismic surveys, coal quality, gas extraction, mine inertisation, groundwater and operations monitoring and service holes will continue for the life of the mine. Once a drill hole is finished, the bore and the areas disturbed by these activities are rehabilitated and returned to previous land use. This will be consistent with the rehabilitation milestones under the PRC Schedule for the relevant rehabilitation areas, namely RA2 or RA3.

Exploration and underground service holes are not included in future disturbance or rehabilitation planning. These holes are temporary in nature and rehabilitated upon closure of the hole. Planned disturbance for the drilling of these holes is yet to be confirmed and will be based on a series of environmental and operational factors, which are outside of the current EA authorisation.

Geotechnical

Extensive geotechnical assessment has occurred (SCT, 2015; SCT, 2014, SCT, 2013, GeoTek Solutions, 2012), to design the mine to maximise stability and avoid or minimise surface impact and subsidence.

The stability of the bord and pillar mining is related to a number of rock mechanics factors, such as pillar width-to-height ratio, mass coal strength, host rock stiffness, rock / coal interface properties as well as bord – pillar configuration. Instability can still occur as a result of these factors, however typically even where pillars fail, in contrast to high-extraction mining techniques (e.g., longwall), areas of failure that involve pillars are not devoid of support. The pillars tend to resist formation of a goaf with significant voids and instead the overburden has a propensity to 'sit' en masse on the failing pillars (URS, 2015a).

The mine plan comprises three underground working zones with pillar design responding to the need to manage stability and subsidence risks, as detailed:

- 1: Restricted Land Zone – no mining to occur (below Dysart Substation)
- 2: Critical Protection Zone – designed for very high FOS (below Downs Creek and rail lines)
- 3: General Surface Protection Zone – designed for standard FOS (below all other surface areas).

The adoption of an industry standard Factor of Safety (FOS) from the University of New South Wales mechanistic empirical pillar stability database was applied to the two pillar design approaches:

- Critical Protection Zone. With a FOS of 2.11 (1 in 1,000,000 probability of failure) the highest pillar stability rating within the database for mining below Downs Creek and below rail lines.
- General Surface Protection Zone. With a FOS of 1.63 (1 in 1,000 probability of failure) for general bord and pillar operations that are not mined below infrastructure. This FOS is considered to equal a 99.9% probability of pillar stability.

Outer barrier pillars (located at the edges of the mining lease extents) will also form part of the mine plan in order to isolate panels to manage the risk of possible regional subsidence. Barrier pillars are designed to prevent propagation of pillar failure to confine the failure to one panel; an additional precautionary design above appropriate FOS already included in the mine design to obtain negligible surface subsidence (SCT, 2015).

The application of conservative FOS and appropriate probability of pillar stability, coupled with the barrier approach mean that subsidence is unlikely to occur (SCT, 2015). As underground mining is not anticipated to cause any discernible surface impacts, no rehabilitation activities are planned to occur.

Underground Hydrogeology

Section 3.1.6 of this PRC Plan outlines the occurrence and nature of groundwater systems at DYE, with the view that the Permian strata aquifer, associated with the coal seams themselves, is the key aquifer system of relevance. This is particularly applicable to the underground operations given the depth of workings compared to the location of groundwater and the limited recharge that occurs to the deeper regional aquifer; there is negligible risk of groundwater discharge to the surface.

Long-term, modelling predicts the mine workings will fill up and groundwater levels will recover over time upon completion of mining. It is predicted that the regional aquifer system will exhibit different hydrogeological parameters and will be less confined than prior to mining. As a result, long-term groundwater availability is predicted to increase locally from pre-mining characteristics, as detailed in Section 3.5.1. Numerical modelling has been completed to support an understanding of the hydrological evolution within the underground workings prior, during and post closure.

Potential subsidence related to mine dewatering was also assessed as negligible. This is due to relatively shallow depth and small mine footprint within a large coal field. Removal of target coal seams will also occur concurrently with dewatering, will reduce the weight of rock overlying the aquifer and mitigate upwards pressure. It is expected that as dewatering occurs the confined aquifers will not remain confined.

The risk of undesirable geochemical outcomes is discussed in Section 3.5.4, with the conclusion that mine wastes have a low inherent potential to generate AMD. The risk is posed once the coal materials (and overburden) are disturbed, as a result of significant exposure of spoil and coal materials to air. Therefore, the risk of AMD generation is primarily related to material that will be mined and transported to surface (and has been considered in other parts of this document).

A post-mining hydrogeological conceptual model is provided (Figure 3-15), this includes detail of the underground hydrological processes expected to occur post-closure.

Surface Impacts

DYE has been designed with the objective of negligible subsidence, predicted to be less than typical seasonal soil movements, making the subsidence immeasurable. As such, it is not expected for any initial nor post-closure residual surface impacts to occur.

Given that no surface impacts are predicted, the provisions of the guideline as they relate to subsidence have not been considered further.

Sealing and Stabilisation Requirements

On completion of mining operations, it is planned to seal all openings to the underground environment in line with mine design guidelines and industry best practice (as per SCT 2014, 2015 and 2016). It is planned for a detailed Mine Sealing Management Plan to be developed at least 5 years prior to the portal becoming available for rehabilitation.

The exact sealing process will be further detailed after the mine has developed and operated for at least 10 years, so that the benefit of site-specific information and knowledge can support a detailed risk assessment, and development of a strategy.

It is anticipated that, as a minimum, all life of mine seals will be a Type D rated to 345 Kpa (50 psi), however this will be confirmed through the risk assessment outcomes. It would also be assessed to determine if the seals would also need to hold a water head rating. All seals used would be required to have a certified RPEQ qualified engineer rating certificate.

The Sealing Management Plan is to be developed approximately 5 years prior to the end of mine life, using the guidance of the updated version of the following documents as a minimum:

- Queensland Coal Mining Safety and Health Regulation 2017
- Coal Mining Safety and Health Act 1999
- DNRM Inspectorate Compliance Checklist
- Recognised Standard 9 - The Monitoring of Sealed Areas; and
- MDG 6001 Guideline for the Permanent Filling and Capping of Surface Entries to Coal Mines

The plan will specify requirements for sealing off surface openings to underground workings and include geotechnical assessments of bulkhead materials, competency and stability of the ground containing the bulkhead. Any post-closure stabilisation of underground workings will also be considered to manage any residual potential for unplanned surface subsidence and ground collapse such as sinkholes and pot holing.

As part of this process, the underground mine drift entrance will be infilled in line with the surrounding landform (with select benign or NAF materials in mine with the management strategies detailed in Section 3.5.4). This will prevent any future flooding impact (noting that the draft is located outside of the Q1000 extent) as well as preventing future ingress and egress.

Key Requirements to Demonstrate a 'Stable Condition'

An understanding of underground mining impacts is essential to ensuring successful rehabilitation outcomes for the DYE site. The mine design and method has ultimately avoided much of the potential impact from underground operations resulting in there being a very low risk to achieving a stable condition; the key requirements relate to maintenance of current pre-mining conditions. Proposed milestone criteria developed for the relevant PMLUs to ensure this outcome are summarised in Table 3-23 and transferred into the PRC Schedule.

Table 3-23 Underground - Justification of Milestone Criteria

Relevant PMLU	Relevant RAs	Rehabilitation Methodology – Underground	Relevant Milestone to be achieved	SMART Measures for Milestone Criteria
Grazing	RA1, RA2, RA4	• Underground workings underlie this RA, so there is a need to ensure baseline conditions are maintained with respect to safe, stable and non-polluting aspects of the natural landscape.	RM7 – Achievement of a stable condition (Grazing PMLU) RM9 – Achievement of a stable condition (Underground Mining Surface Areas)	7.1/9.1 The RA is safe, with safety hazards in rehabilitation similar to surrounding unmined landscapes, to ensure no significant difference as defined in AS/NZS ISO 31000:2018 Risk Management. 7.2/9.2 No unauthorised environmental harm is caused by anything on or in the RA. Surface water runoff to receiving waters is non-polluting and complies with the following: - pH 6.5 – 8.5 - EC (salinity) <720 µs/cm - or as otherwise justified within future investigations and by setting water quality objectives.
Cropping	RA3, RA5	• Underground workings underlie this RA, so there is a need to ensure baseline conditions are maintained with respect to safe, stable and non-polluting aspects of the natural landscape.	RM9 – Achievement of a stable condition (Underground Mining Surface Areas)	9.1 The RA is safe, with safety hazards in rehabilitation similar to surrounding unmined landscapes, to ensure no significant difference as defined in AS/NZS ISO 31000:2018 Risk Management. 9.2 No unauthorised environmental harm is caused by anything on or in the RA. Surface water runoff to receiving waters is non-polluting and complies with the following: - pH 6.5 – 8.5 - EC (salinity) <720 µs/cm - or as otherwise justified within future investigations and by setting water quality objectives.
Native Vegetation	RA6	• Underground workings underlie this RA, so there is a need to ensure baseline conditions are maintained with respect to safe, stable and non-polluting aspects of the natural landscape.	RM9 – Achievement of a stable condition (Underground Mining Surface Areas)	9.1 The RA is safe, with safety hazards in rehabilitation similar to surrounding unmined landscapes, to ensure no significant difference as defined in AS/NZS ISO 31000:2018 Risk Management. 9.2 No unauthorised environmental harm is caused by anything on or in the RA. Surface water runoff to receiving waters is non-polluting and complies with the following: - pH 6.5 – 8.5 - EC (salinity) <720 µs/cm

Relevant PMLU	Relevant RAs	Rehabilitation Methodology – Underground	Relevant Milestone to be achieved	SMART Measures for Milestone Criteria
				- or as otherwise justified within future investigations and by setting water quality objectives. 9.4 Assessment by an AQP confirms: - Subsidence has been minimal, with <1m difference from pre-mining ground level. - Long-term stability of the underground mine layout with a minimum Factor of Safety of 1.6 under ML70307. - All life of mine seals meets the requirements dictated in the Coal Mining Health and Safety Regulation 2017, or a more current version.

3.5.12 Built Infrastructure

All built infrastructure will be decommissioned, demolished, salvaged and/or disposed of (unless it is being formally retained in agreement with the landholder) to achieve an appropriate PMLU. All retained infrastructure has been grouped into a single PMLU (of Retained Infrastructure) for ease of administration at closure.

Table 3-24 provides a description of all infrastructure relevant to the DYE site (ML705057) and identifies the fate of infrastructure and methods for decommissioning. All specific mining-related buildings, plant and equipment and infrastructure will either be decommissioned, demolished, salvaged and/or disposed. Any infrastructure to be retained post rehabilitation, such as dams, roads, powerlines and other structures will be subject to formal agreement with the relevant stakeholder, where consistent with the PMLU land outcome.

Management of potential contamination will be applied to both removed and retained infrastructure as a part of normal site rehabilitation and closure activities. Demolition planning and execution will be undertaken in accordance with relevant standards, policies and legislation requirements, and will include a detailed investigation of the site and surrounding aspects and investigation of the structures to be removed.

Table 3-24 Built Infrastructure Register for DYE

Fate	Infrastructure	Description	Decommissioning Methodology	Ongoing Maintenance
Decommissioned	Buildings	• Workshops • Offices • Warehouse	All buildings will have services terminated prior to removal from site for sale or salvage and scrap value.	N/A
	Foundational	• Concrete Footings and Pads • Stockpile Areas	Concrete foundations, driveways, pathways, and similar non-hazardous wastes will be disposed of underground. Coal material will be disposed of underground.	N/A

Fate	Infrastructure	Description	Decommissioning Methodology	Ongoing Maintenance
	Services	• Electrical Reticulation • Communications • Underground Services • WTP and STP	Concrete foundations, driveways, pathways, and similar non-hazardous wastes will be disposed of underground.	N/A
	Processing and Operational	• Conveyors • Mobile CHPP • Mining Machinery • Fuel and Oil Farms • Generators • Rail Load out • Haul Roads	All equipment will be de-oiled, isolated, and depressurised prior to sale for overhaul and reuse, or salvage and scrap value. All mobile equipment will be removed from site. Coal material will be disposed of underground.	N/A
	Water Management	• Sumps and Tanks • Washdown Facilities	All chemical agents will be extracted for recycling or disposal. All infrastructures will be removed from site for sale or salvage and scrap value. Concrete foundations, driveways, pathways, and similar non-hazardous wastes will be disposed of underground.	N/A
	Underground	• Mining Machinery • Drift / Entries • Ventilation System	All equipment will be de-oiled, isolated, and depressurised prior to sale for overhaul and reuse, or salvage and scrap value. All mobile equipment will be removed from site.	N/A
Retained	Services	• Powerlines • Electrical reticulation	N/A	Ongoing maintenance aligned to current operating practices, as per relevant utility/operator. Note that the Rail loop and Lake Vermont Spur Railway and Dysart Substation have been excluded from the ML.
	Water Management	• Mine Water Dam • Sediment Dams	N/A	Decontamination to occur at closure by DYE, with maintenance of dams to become the responsibility of future landholder.
	Land Management	• Fencelines • Minor Roads and Tracks • Farm Dams	N/A	Maintenance to become the responsibility of future landowners, in line with anticipated land use.

3.6 Risk Assessment

As per the requirement of 126C(1)(f) of the EP Act, a risk assessment has been included to identify the risks of the DYE site and rehabilitation not achieving a stable condition for land, and not achieving intended PMLU outcomes. The risk assessment includes information to demonstrate how these risks will be managed or minimised and is aligned with Section 3.5 (Rehabilitation Management Methodology).

As required by the PRCP Guideline, the risk assessment has been completed in accordance with AS/ISO 31000:2018 Risk Management – Guidelines (Standards Australia, 2018), which describes risk assessment as requiring the following key process steps:

- risk identification
- risk analysis and evaluation
- risk treatment.

These steps are discussed further below.

3.6.1 Key Process Steps

Risk Identification

The first step involves identification of the risks/unwanted event, areas of impact, cause(s) of the event, potential maximum consequences, current controls in place, and current risk control effectiveness. These were determined based on:

- risks commonly encountered in mine rehabilitation as documented in the Guideline: Rehabilitation Risk Assessment (NSW Resources Regulator 2021)
- risks identified throughout this PRC Plan and in the technical materials compiled for approval of DYE's EA (URS, 2015a).

Risk Analysis and Evaluation

The risk analysis step involves developing an understanding of risks identified and then determining risk causes and sources. The assessment considers potential consequences and the likelihood that those consequences may occur. A risk evaluation is completed, comparing the level of risk found and determining the need for further risk treatment and supporting the need to manage and prioritise different risks.

Options for addressing the risks are selected for implementation where relevant. The most appropriate risk treatment options are selected after consideration of multiple factors including cost benefit, regulatory obligations, social responsibility and protection of the surrounding environment.

Risk Treatment

The risk treatment step details a justification for selecting the treatment option, detailing proposed activities, identifying parties responsible for implementation as well as resources required. Performance measures and constraints are highlighted, reporting and monitoring requirements outlined, and detail provided on timing and scheduling of each risk treatment option. The risk treatment options will consider the need for rehabilitation trials to be completed as relevant, to improve the chances of achieving a nominated future outcome, whilst managing and minimising the risks of a stable condition not being achieved.

3.6.2 Risk Assessment Outcomes and Management

There are no significant risks that will prevent DYE from achieving a stable condition for rehabilitation of land and achieving the intended PMLU outcomes (as per the Schedule, Milestones and Milestone

Criteria outlined in this PRC Plan). The results of the detailed risk assessment, with consideration of all process steps, is provided as Appendix 0.

For DYE, a total of 22 risk scenarios were identified and assessed resulting in no risk scenarios classified as 'critical'; two risk scenarios classified as 'high'; fourteen classified as 'moderate'; and six classified as 'low'. Following further consideration of the risk scenarios classified as high, a number of additional requirements in terms of rehabilitation methodology have been specified (and reflected as milestone criteria) to ensure these risks can be reduced further, and as low as reasonably practicable.

A summary of these potential risk events is as follows:

- not constructing water management features as per design, or features not performing as predicted, resulting in increased erosion or landform failure, and
- significant weed incursion reduces value of grazing areas.

3.6.3 Rehabilitation Trials

There have been no opportunities yet to complete rehabilitation trials at the site. Given the small footprint and staggered nature of rehabilitation activities required (primarily RA1 and RA2), there are likely to be few opportunities in the future to conduct trials. The proposed methodology follows tried and established rehabilitation methods already in use in the Bowen Basin, adopts a conservative approach wherever possible and responds to the underlying environment risk factors.

DYE will also adopt a systematic approach whereby management practices are incrementally improved over time, by learning from the outcomes of past and current practices. Implementation of recommendations will occur from rehabilitation management reviews, monitoring reports and other processes to assess the outcomes of rehabilitation and adapting past rehabilitation in accordance with new learnings. If applied rigorously, this is anticipated to be an effective approach to reducing risk where there is uncertainty about rehabilitation outcomes.

3.7 Monitoring and Maintenance

Details of monitoring and maintenance program is provided in this section that identifies and describes the processes and systems to be implemented to demonstrate that each milestone, and each milestone criteria, have been achieved. Monitoring will be undertaken to develop a concise and targeted rehabilitation dataset using scientifically robust and repeatable methods, to demonstrate that PMLU outcomes have been achieved, and support relinquishment of all approvals. The monitoring program will also help identify and quantify problems, risks and opportunities for maintenance, corrective actions and adaptive management.

Monitoring at the site will be undertaken for a range of key technical aspects, including for progressive rehabilitation, groundwater, surface water, erosion, soils, vegetation and geotechnical aspects. Some of these activities are requirements of the EA (or other regulatory requirements). Monitoring data will be used to support achievement of the milestones, and to show that controls have been effective to manage the risk of rehabilitation failure to as low as reasonably practicable.

3.7.1 Monitoring Program and Schedule

Each milestone and associated milestone criteria, requires a different set of monitoring methods to demonstrate success, with survey and data being collected at different locations and times. For each milestone, the SMART framework has informed the milestone criteria, which have been underpinned by, and will continue to be informed by monitoring information.

It is noted that there are several advantages of adopting the SMART framework of developing criteria, but also highlighted that the specific operational and site context is a key deciding factor in how and when SMART criteria should be applied. A stepwise, rather than simultaneous, application of the SMART criteria may be necessary and appropriate (Bjerke and Renger, 2017).

Learning from the literature, it may be that DYE would benefit from additional time to confirm certainty around operational timeframes, and to develop further baseline information (from monitoring) to inform the 'achievable' and 'timely' program objectives. The literature suggests that the initial step may be more focused on ensuring criteria are specific, measurable, and relevant with acknowledgement that criteria may need to be revised and adjusted in the future.

Once progressive rehabilitation has commenced for the site, Bengal Coal will commence monitoring of rehabilitated areas according to the timing and frequency of monitoring outlined in Table 3-25. It is anticipated that some monitoring, of variable scope, will be completed every year throughout the operations and closure periods. Monitoring will continue throughout the post-closure period but will likely be at reduced frequency.

Table 3-25 Schedule of Milestone Monitoring for DYE

Milestone	Milestone Criteria	Key Monitoring Methodology	Location, Frequency and Timing
RM1 - Infrastructure decommissioning and removal	RM 1.1 RM 1.2	• Land contamination • Surface water • Groundwater	RA2 Annually for the Closure period (Years 30 - 35)
RM2 - Identification and remediation of contaminated land	RM 2.1 RM 2.2 RM 2.3 RM 2.4	• Land contamination • Surface water • Groundwater	RA1, RA2, RA3 Annually for the Closure period (Years 30 - 35)
RM3 – Final landform development	RM 3.1 RM 3.2 RM 3.3 RM 3.4	• Geochemical • Landform and Erosion • Topsoil	RA1 Annually for the Operations and Closure period (Years 7 - 31)
RM4 – Seedbed preparation	RM 4.1 RM 4.2 RM 4.3	• Landform • Topsoil	RA1, RA2 Annually for the Operations and Closure period (Years 7 - 32)
RM5 – Revegetation activities	RM 5.1	• Vegetation	RA1, RA2 Annually for the Operations and Closure period (Years 7 - 32)
RM6 – Vegetation establishment	RM 6.1	• Vegetation	RA1, RA2 Annually for the Operations and Closure period (Years 7 - 31)
RM7 - Achievement of a stable condition (Grazing PMLU)	RM 7.1 RM 7.2 RM 7.3 RM 7.4	• Hazards • Surface water • Land suitability • Vegetation	RA1, RA2 As required for the Post-Closure period (Years 31 - 45)
RM8 - Achievement of a stable condition (Retained Infrastructure PMLU)	RM 8.1 RM 8.2 RM 8.2 RM 8.4	• Hazards • Surface water	RA3 As required for the Post-Closure period (Years 31 - 45)

Milestone	Milestone Criteria	Key Monitoring Methodology	Location, Frequency and Timing
RM9 - Achievement of a stable condition (Underground Mining Surface Areas PMLU)	RM 9.1 RM 9.2 RM 9.3 RM 9.4	• Hazards • Surface water • Land suitability • Landscape (Underground)	RA4 As required for the Post-Closure period (Years 31 - 45)

3.7.2 Description of Monitoring Methodologies

A range of key technical environmental areas are required to be monitored, each with specific methodologies, as detailed below. For each area, monitoring methodologies have been developed based on past survey work at the site and historic information available, with reference to best practice standards available.

Issues that are considered relevant to the DYE site for rehabilitation monitoring include landform erosive performance, geochemistry, topsoil physical and chemical properties, suitability of revegetation methods used (e.g., site preparation, sowing methods and times), suitability of species mix and seed quality, vegetation establishment, weed incursion and other general environmental influences such as climatic conditions.

Rapid Rehabilitation Inspection (Year 1 - 32 (within 1 year of rehabilitation works)

The purpose of the rapid inspection is to provide an observation-based assessment of newly completed rehabilitation areas. The inspection aims to identify all rehabilitation failures or maintenance issues that if left unchecked could hinder rehabilitation progress or result in expensive remediation. The inspection will include focus on identification of:

- erosion (rill, gully and tunnel)
- stability and functioning of erosion and sediment control and water management structures.
- visual assessment of vegetation cover, species diversity, vegetation health and growth rates
- identified contamination / nutrient deficiencies.
- presence of weeds and pests
- areas of bare ground
- mine rubbish and other waste.

Detailed Rehabilitation Assessment (Year 2 – 35)

As rehabilitation activities progress through the established milestones, they will require further detailed monitoring to demonstrate successful achievement of milestone criteria. This will depend on the nature of rehabilitation area being completed, but is expected to involve monitoring some, or all, of the range of technical monitoring assessments as summarised below:

- Land contamination is required to be assessed after completion of investigation and remedial activities, to verify that no residual contaminated matters remain.
- Landform performance and erosion risk will require monitoring, with use of a standardised rating system to inform performance of rehabilitated landforms in terms of erosion (with consideration of sheet, rill gully and tunnel erosion). Visual estimates are considered appropriate and should also be applied to non-rehabilitated areas of the mining lease being monitored.

- Geochemical monitoring will consist of targeted geochemical characterisation of materials, with static and kinetic testing completed.
- Topsoil depth and quality requires monitoring, to ensure sufficient depth but also understand whether any limitations to revegetation occur. It is considered acceptable for sampling to occur primarily in response to observations of bare ground in rehabilitated areas and should include a standardised investigation of parameters such as salinity and sodicity, major cations and anions, nutrients and major metals.
- Surface water quality monitoring will consist of sampling and analysis of runoff (and seepage if observed) including pH and EC, sediment, major cations and anions, nutrients, hydrocarbons and major dissolved metals.
- Groundwater monitoring will involve routine analysis of water levels and quality, with consideration of parameters sampled for surface waters.
- Vegetation monitoring will typically require the completion of botanical transects (or similar) to collect information on vegetative cover and biomass, species dominance and richness as well as weed species and cover. Monitoring should be established to be consistent with baseline information available.
- Land suitability assessment will be required after the completion of rehabilitation activities, informing post-rehabilitation Land Suitability Class (as per the Guidelines for Agricultural Land Evaluation in Queensland (State Department of Queensland 2013) or equivalent).
- Hazard assessment is to occur across the mining lease, to verify that each rehabilitation area is safe, with residual safety hazards (as observed) similar to the surrounding unmined area, to ensure no significant difference as per AS/NZS ISO 31000:2018 Risk Management.

Detailed Rehabilitation Assessments will be undertaken from the first year after the commencement of progressive rehabilitation activities. They will then continue for a period of five years after the completion of rehabilitation activities, or as otherwise required to demonstrate achievement of milestone criteria and support relinquishment of the DYE site.

Benchmarking with Analogue Sites

Analogue sites will be selected for each PMLU (to represent pre-mining disturbance) and provide benchmark conditions as a reference point for rehabilitation areas. Comparison of rehabilitation outcomes will occur against analogue locations for technical monitoring assessment as appropriate.

3.7.3 Quality Assurance and Data Management

Monitoring data will be reviewed by an AQP and evaluated for the completeness, general appropriateness and to conduct overall suitability analysis. Data will be stored in a management database. Data will be evaluated for the purposes of trending, reporting, and future reference.

Quality assurance and review processes (QA/QC) will be completed to identify the inherent quality of data collected, as well as provide assurance that relevant internal checks and balances are in place to consider and review summary statistics that indicate the suitability of sampling resolution and number, spread of data, repeatability over time/space as well as use for predicting the future trajectory of rehabilitation performance.

3.7.4 Data Analysis and Interpretation

All monitoring data will be subject to detailed analysis to reveal trending and patterns within both time and space as relevant to the DYE site, this will include statistically valid methods, such as routine or descriptive statistics, analysis of significance, comparison with benchmark values and consideration of the trajectory of data against the achievement of milestone criteria.

Data analysis will aim to understand the data primarily in terms of whether the rehabilitation area is on track to achieve the milestone criteria, or whether further intervention is required. The DYE site will adopt a rating system for all monitoring and technical assessments a to understand the performance of an area. Broadly, this will include a rating 'major/remedial rehabilitation activities required', to 'minor maintenance required', to 'additional monitoring data required', to 'achieves milestone criteria'.

3.7.5 Reporting and Review

Analysis and reporting of rehabilitation monitoring will determine if measured and indicators are on a trajectory to achieve milestone criteria. It should also form a feedback loop by which rehabilitation practices can be optimised over time. Reporting will also identify the maintenance activities to be implemented for each area monitored.

The results of each additional year of monitoring will be compared to previous years to show trending in relation to the achievement of milestone criteria. Should reporting indicate that a criterion is not on track to achieve the required completion criteria values, then corrective actions and / or maintenance tasks will be planned as appropriate, and additional monitoring will be completed.

3.7.6 Corrective Actions and Adaptive Management

If monitoring data indicates milestone criteria at risk of being met in the required timeframes, corrective actions and contingency strategies shall be considered, this may include:

- re-evaluation of monitoring data
- additional monitoring
- amendments to rehabilitation planning and activities
- supplementary or additional rehabilitation activities being undertaken.
- maintenance of rehabilitated areas
- modification of the schedule timeframes or milestone criteria.

3.8 Reference Materials

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4.0 Appendices and attachments

4.1 Final Site Design

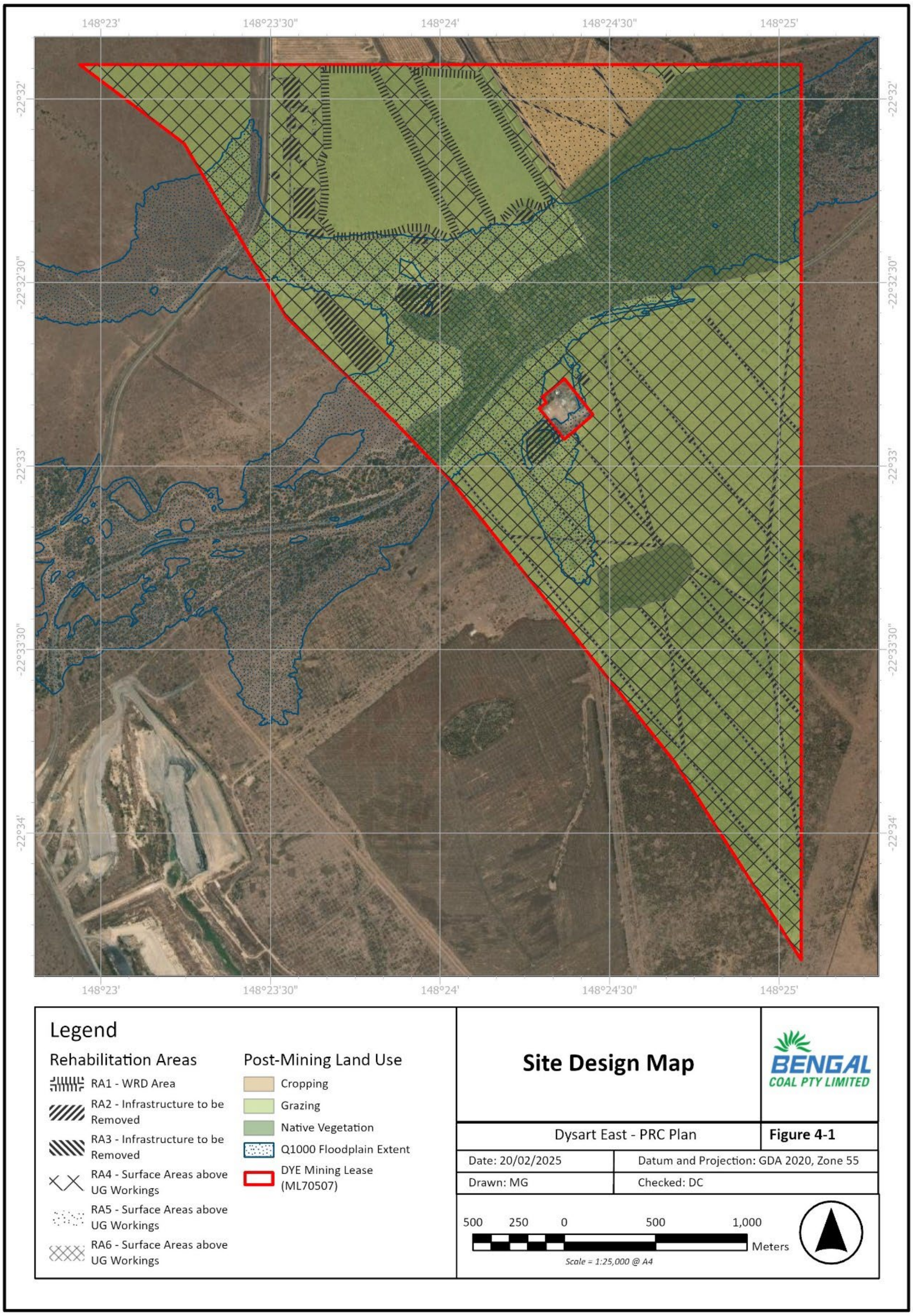

Figure 4-1 Site Design Map for DYE (revised)

4.2 PRC Schedule

Native excel version of the schedule and spatial information have also been provided separately.

Post-mining land uses (PMLU)						
Rehabilitation area	RA1 - WRD Area					
Relevant activities	Mine Domain 1 - Overburden/waste rock dump areas, including overburden emplacement areas associated with development of underground, plus and ongoing reject and overburden material associated with underground mining. *(as per Figure 4-2 Rehabilitation Area 1 (RA 1)*					
Total rehabilitation area size (ha)*	69.71					
Commencement of first milestone: ***<RM3 - Final landform development>***	1/01/2035					
PMLU	Grazing					
Date area is available	1/01/35	1/01/38	1/01/53	1/01/56	1/01/61	1/01/64
Cumulative area available (ha)	26.88	26.88	69.71	69.71	69.71	69.71
Milestone completed by	10/12/36	10/12/39	10/12/54	10/12/57	10/12/62	10/12/66
Milestone Reference	**Cumulative area achieved (ha)**					
RM3	26.88		69.706			
RM4		26.88		69.71		
RM5		26.88		69.71		
RM6			26.88		69.71	
RM7						

**All estimates of areas disturbed in this PRC Schedule are conceptual only. Exact area dimension and details will need to be confirmed as the mining operation commences.*

Figure 4-2 DYE WRDs: Rehabilitation Area 1 (revised)

Post-mining land uses (PMLU)					
Rehabilitation area	RA2 - Infrastructure to be Removed				
Relevant activities	Mine Domain 2 - Infrastructure areas to be removed after mining ceases, including surface disturbance for processing, water management as well as ancillary surface disturbance required for the UG mining footprint (such as tracks and de-gassing wells).				
Total rehabilitation area size (ha)*	37.02				
Commencement of first milestone: <RM1 - Infrastructure decommissioning and removal>	1/01/2054				
PMLU	Grazing				
Date area is available	1/01/54	1/01/56	1/01/58	1/01/63	1/01/69
Cumulative area available (ha)	37.02	37.02	37.02	37.02	37.02
Milestone completed by	10/12/55	10/12/57	10/12/58	10/12/64	10/12/70
Milestone Reference	**Cumulative area achieved (ha)**				
RM1	37.02				
RM2		37.02			
RM4			37.02		
RM5			37.02		
RM6				37.02	
RM7					37.02

**All estimates of areas disturbed in this PRC Schedule are conceptual only. Exact area dimension and details will need to be confirmed as the mining operation commences.*

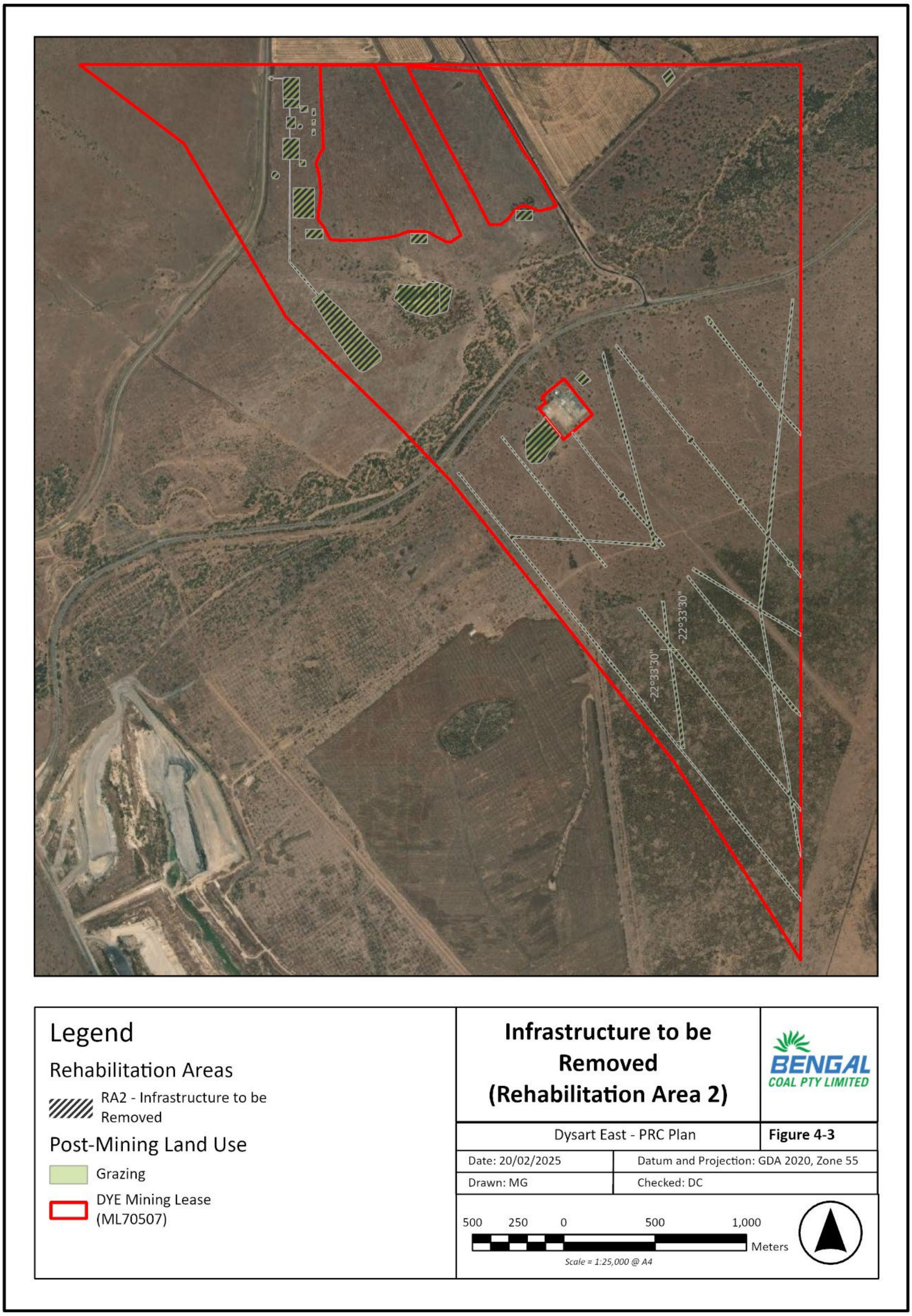

Figure 4-3 DYE Infrastructure to be Removed: Rehabilitation Area 2 (revised)

Post-mining land uses (PMLU)		
Rehabilitation area	RA3 - Infrastructure to be Removed	
Relevant activities	Mine Domain 2 - Infrastructure areas to be removed after mining ceases, including ancillary surface disturbance required for the UG mining footprint (such as tracks and de-gassing wells). *(as per Figure 4-4 Rehabilitation Area 3 (RA 3)*	
Total rehabilitation area size (ha)*	2.47	
Commencement of first milestone: ***<RM2 - Identification and remediation of contaminated land>***	1/01/2058	
PMLU	Cropping	
Date area is available	1/01/54	1/01/57
Cumulative area available (ha)	2.47	2.47
Milestone completed by	10/12/55	10/12/58
Milestone Reference	**Cumulative area achieved (ha)**	
RM2	2.47	
RM9		2.47

**All estimates of areas disturbed in this PRC Schedule are conceptual only. Exact area dimension and details will need to be confirmed as the mining operation commences.*

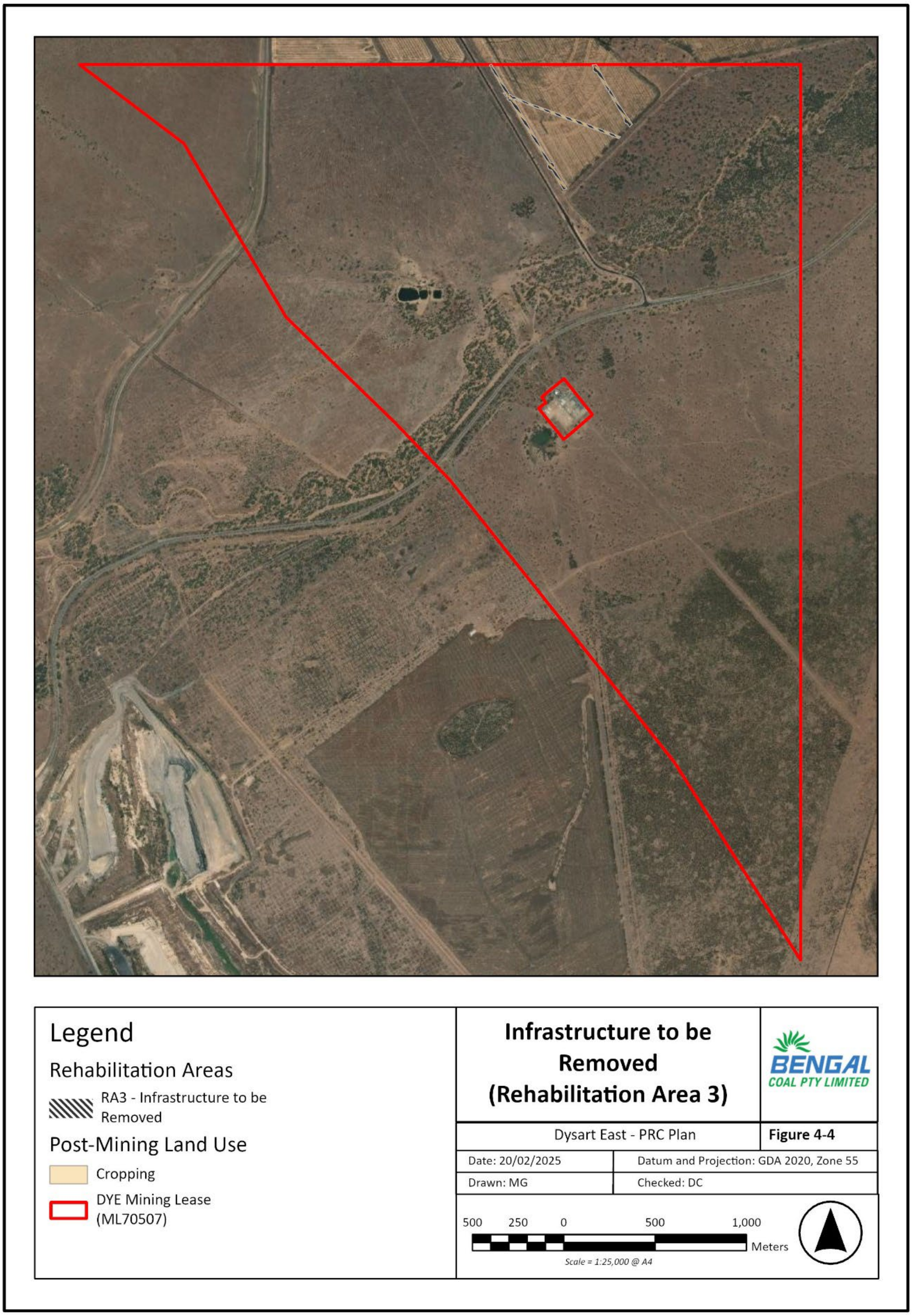

Figure 4-4 DYE Infrastructure to be Removed: Rehabilitation Area 3 (revised)

Post-mining land uses (PMLU)

Rehabilitation area	RA4 - Surface Areas above Underground Workings
Relevant activities	Mine Domain 4 - Surface areas that overlie underground bord-and-pillar workings. No direct surface disturbance is planned to occur. *(as per Figure 4-5 Rehabilitation Area 4 (RA4)*
Total rehabilitation area size (ha)*	454.51
Commencement of first milestone: ***<RM9 - Achievement of a stable condition (Surface Areas above Underground Workings)>***	1/01/2058
PMLU	Grazing
Date area is available	1/01/58
Cumulative area available (ha)	454.51
Milestone completed by	10/12/63
Milestone Reference	**Cumulative area achieved (ha)**
RM7	454.51

**All estimates of areas disturbed in this PRC Schedule are conceptual only. Exact area dimension and details will need to be confirmed as the mining operation commences.*

Figure 4-5 DYE Surface Areas above Underground Workings: Rehabilitation Area 4 (revised)

Post-mining land uses (PMLU)	
Rehabilitation area	RA5 - Surface Areas above Underground Workings
Relevant activities	Mine Domain 4 - Surface areas that overlie underground bord-and-pillar workings. No direct surface disturbance is planned to occur. *(as per Figure 4-6 Rehabilitation Area 4 (RA5)*
Total rehabilitation area size (ha)*	29.52
Commencement of first milestone: ***<RM9 - Achievement of a stable condition (Surface Areas above Underground Workings)>***	1/01/2058
PMLU	Cropping
Date area is available	1/01/58
Cumulative area available (ha)	29.52
Milestone completed by	10/12/63
Milestone Reference	**Cumulative area achieved (ha)**
RM9	29.52

**All estimates of areas disturbed in this PRC Schedule are conceptual only. Exact area dimension and details will need to be confirmed as the mining operation commences.*

Figure 4-6 DYE Surface Areas above Underground Workings: Rehabilitation Area 5 (revised)

Post-mining land uses (PMLU)	
Rehabilitation area	RA6 - Surface Areas above Underground Workings
Relevant activities	Mine Domain 4 - Surface areas that overlie underground bord-and-pillar workings. No direct surface disturbance is planned to occur. *(as per Figure 4-7 Rehabilitation Area 6 (RA6)*
Total rehabilitation area size (ha)*	160.33
Commencement of first milestone: ***<RM9 - Achievement of a stable condition (Surface Areas above Underground Workings)>***	1/01/2058
PMLU	Native Vegetation
Date area is available	1/01/58
Cumulative area available (ha)	160.33
Milestone completed by	10/12/63
Milestone Reference	**Cumulative area achieved (ha)**
RM9	160.33

**All estimates of areas disturbed in this PRC Schedule are conceptual only. Exact area dimension and details will need to be confirmed as the mining operation commences.*

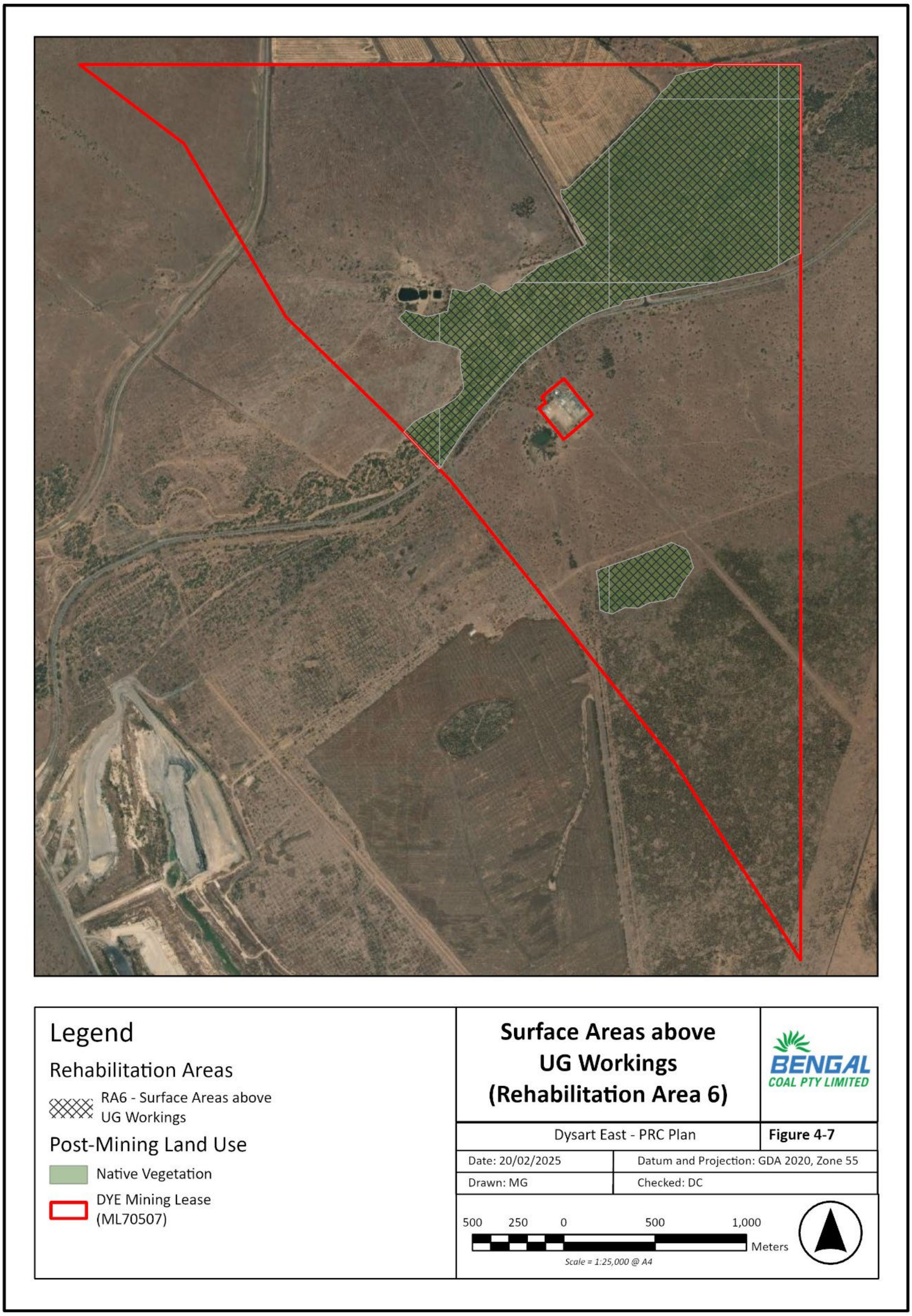

Figure 4-7 DYE Surface Areas above Underground Workings: Rehabilitation Area 6 (revised)

4.3 Detailed Risk Assessment

4.4 Environmental Assessment Report with appendices (2015)

Has been provided separately.

BENGAL COAL PTY LIMITED

Dysart East Coal Project

Landform and Cover Design Report

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1. Introduction

This document has been developed to accompany the transitional Progressive Rehabilitation and Closure Plan (PRC Plan) prepared for the Dysart East (DYE) Coal Project. It is noted that DYE is a new underground coal mine project that is not yet developed, but holds a site-specific EA EPML01978714, which came into effect 22nd March 2018. This short report has been developed to address 'Request for Information' (RFI) items identified by the administering authority as part of an approval process for the transitional PRC Plan.

1.1. Purpose and Scope

The purpose of this report is to address the requirements of the PRC Plan statutory guideline, and specifically, PRCP RFI items for Dysart East. This short report will assess existing knowledge and data related to the landform design process for DYE.

This document covers all areas and activities related to DYE and focuses on the landform design aspects relevant to rehabilitation and closure of the DYE mining lease. A rehabilitation landform concept is in place for the mine, which is anticipated to be refined as the mine is developed.

2. Development of Design Concept

The landform design for DYE is currently conceptual only, as the mine has not yet been developed. The mine has been designed generally to minimise surface disturbance, and where disturbance has been necessary, mine design has been further optimised to avoid high value areas. Rehabilitation will be designed to achieve a stable landform, compatible with the surrounding landscape. The mine is approved as a primarily underground operation, so the landforms to remain permanently on the surface are limited to two small Waste Rock Dumps (WRDs) located to the north of the site.

The overarching design basis established has been to ensure that the landform will be safe and structurally stable, in addition to supporting the required rehabilitation outcomes. The landform concept for DYE has been developed through consideration of design criteria and appropriate standards at analogous locations, and published literature and guidelines. Relevant information on rehabilitation and landform designs from similar mine sites in Central Queensland was also utilised and coupled with understanding and review of site conditions. Further to this, the constraints and requirements of the site and operation has also been considered, to optimise the location and placement of the required landforms.

The landform design concept for these areas sought to optimise the landform height, slope gradients and vegetation covers to achieve acceptable long term erosional stability. Figure 2-1 below illustrates the final landform concept proposed within the Environmental Assessment Report (EAR) provided in support of the EA application. Some points made in the EAR (and Appendix H – Rehabilitation Strategy) relating to development of the landform design, and objectives for rehabilitation, include:

- Achievement of acceptable post-disturbance land use suitability – Mining and rehabilitation will aim to create a stable landform with land use capability and/or suitability similar to that prior to disturbance (if possible).

- The decided post mining land use will ensure that the rehabilitated areas, be used only in accordance with the limits of the agreed post mining agricultural suitability class in order to sustain the land use without degradation.
- Creation of a stable post-disturbance landform – Mine wastes (a mixture of spoil and rejects) and areas of disturbed land, will be rehabilitated to a self-sustaining condition or to one where maintenance requirements are consistent with the agreed post-mining land use(s).
- Preservation of downstream water quality – potentially contaminated water originating from the mining lease, will be captured and treated in appropriately engineered structures before being re-used or stored. Current and future water quality will be maintained at required regulatory levels.

Rehabilitation planning is noted to be an ongoing process, dynamically updated in response to operational activities and mine planning processes. As such, this landform design report may be updated and may change over the life of the mine.

2.1. Design Methodology

Initial design development occurred as part of the EA approval process. This developed an overall landform concept and considered surface drainage, with drawings developed for the final rehabilitated footprint. The design leveraged industry knowledge and experience as well as from practices from analogous situations.

Concerns around the potential for flood interactions with the final rehabilitation landform has also identified the need for additional flood protection as part of the southern toe of the two WRDs where they interact with the floodplain.

The concept will continue to be refined in a continuous improvement loop drawing on observations of landform and rehabilitation performance as the site is developed. This will continue for the remainder of the mine life as additional data is collected.

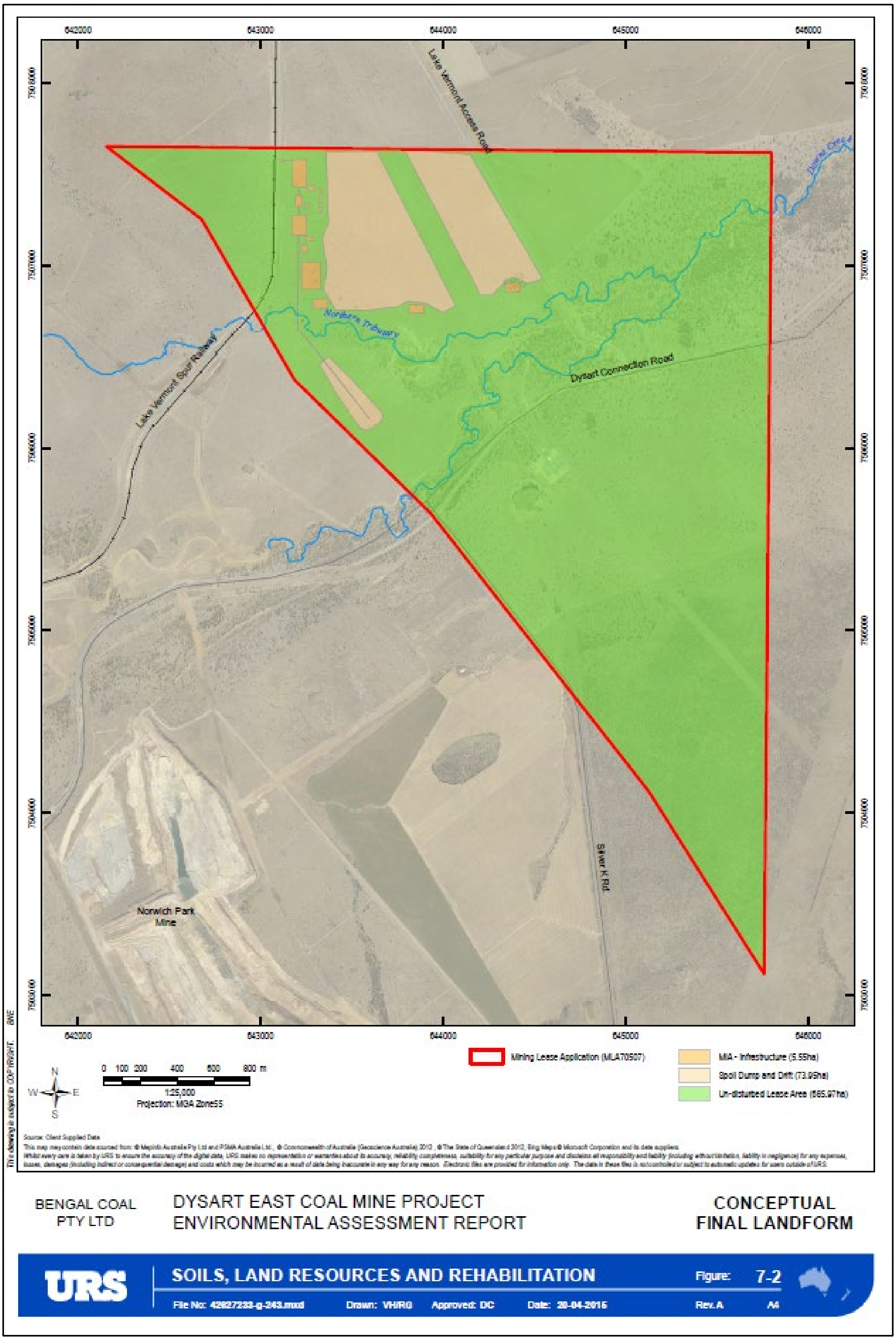


Figure 2-1 Proposed final landform concept for DYE

3. Key Design Principles

As detailed, there are only two small surface landforms planned to remain after rehabilitation and closure of DYE. This consists of two WRDs located next to each other along the northern boundary of the DYE mining lease. Further detail of these areas is provided in Section 4, with key guiding design principles provided below.

A key guiding principle overall is to ensure that all surface areas significantly disturbed by mining activities be rehabilitated to a safe, stable and non-polluting landform, with self-sustaining vegetation cover. No residual voids are to remain. These requirements have been incorporated into the landform design concept as appropriate.

A wide range of technical and environmental factors and constraints have been distilled to provide guidance to the design concept, informing the key design principles. In this way, underlying factors have been addressed through design, but also the rehabilitation and landform design has been able to respond to any specific requirements of DYE to ensure long-term environmental control and adequate performance.

Key factors have typically driven the design concept outcomes and have been grouped into the following areas, with further detail provided below:

- Environmental constraints and factors
- Earthworks design and considerations
- Water management requirements.

3.1. Environmental Factors

Key environmental factors of relevance considered in the landform design include:

- Ensuring that the material characteristics for the planned WRDs are compatible with the intended land use, but are also assured to be safe, stable and non-polluting. This requires consideration of how the landforms may need to be developed to be compatible with a Grazing PMLU, and ensuring the land suitability requirements can support these outcomes.
- Minimising the total disturbance caused by DYE and avoiding land clearance where possible. In particular, high-value areas were prioritised for avoidance.
- Ensuring that the landform design concept sought to optimise the landform height, slope gradients and vegetation covers to achieve acceptable long term erosional stability. This has also required an understanding of the physical and chemical nature of the spoil type, placement and properties (to ensure long-term erosionally stable landforms).
- Understanding that most of the waste material is clean and suitable for use across the site. However, a small proportion of materials require specific handling and placement strategies (requiring encapsulation within the WRDs).
- Considering the location and performance of the adjacent Downs Creek watercourse, and surrounding catchment areas as well as floodplain interactions, and how these factors may require mitigation and protection through design.

- Ensuring adequate provision for long-term rehabilitation drainage and water shedding from the WRD emplacements.
- Noting that, community and stakeholder consultation has informed the landform design with consideration of all matters of relevance.

3.2. Earthworks Design

Key factors of relevance to be considered for earthworks component of the rehabilitation design include the following:

- Integration and harmonising with the natural surface surrounding the mine as best as possible, and looking at surrounding areas to inform an appropriate nature reference point.
- Ensuring high-level consideration of balanced 'cut and fill' for material movements.
- Adopting conservative design surfaces to support long-term erosional stability and positive revegetation and land-use outcomes (10 m lifts above natural surface to a maximum height of 30m), consisting of an overall gentle slope of 10%.
- Ensuring each lift will include a contour bank of 5 m width, with at least 1% fall running back towards the dump so as to be free-draining.
- Ensuring that all sections of the WRDs will have a minimum of 1% longitudinal fall along the slope, again to enable free-draining environments.

These design criteria have been shown at other locations in Central Queensland that they will result in rehabilitation that is erosionally stable over the long-term; and otherwise, be considered successful.

3.3. Water Management

The landform design concept has considered high level water management designs that indicate general drainage directions, the installation of contour banks and longitudinal cross-fall to ensure the WRD surfaces are free-draining. Ponding of water will be avoided on all rehabilitated landforms.

As further rehabilitation activities are progressed, concept drainage designs will be further developed to a detailed level. It is expected that the primary contaminant from newly rehabilitated landforms will be sediment, and therefore all runoff from rehabilitation areas will have sediment controls in place for the initial period whilst revegetation is establishing. It is noted that a network of sediment dams will be in place during operations, and these will be retained until the rehabilitated landform is well established.

Further design principles of relevance to water management include:

- Contour drain dimensions are to be defined by further detailed design, but will generally be 'v' shaped with 1:10 side slopes and a minimum of 1% fall (or 1:100 longitudinal slope).
- Contours will typically be at least 1 m deep. A minimum freeboard of 300 mm is to be provided from the design water level to the top level of all drains.
- Contour drainage will be designed to effectively convey the runoff from a 1% annual exceedance probability (AEP) flood event. Any requirements for modification of the base width, or further treatment (such as rock armouring) will be determined during detailed design.

4. Final Rehabilitation Design Concept

In response to the principles and criteria outlined in Section 3, DYE has developed a final landform that supports the rehabilitation objectives of the site, will ensure successful achievement of the PMLU outcomes and aligns to the transitional land outcomes. A high-level summary of the landform principles to be satisfied includes:

- no PAF spoil materials are to remain at the surface of the landform once the WRD has been reshaped, and a minimum 2m thickness of known NAF material to form the top of the WRD landform surface.
- average linear slope angle of no more than 10 % for both WRDs and average slope length of no more than 400 m.
- a maximum height of 30 m for the WRD emplacements.
- at least a 1 % longitudinal grade to be installed to ensure WRD surfaces are free-draining.
- the erosion and sediment control network in place for the DYE operations will remain in place until such time that adequate vegetative cover can be demonstrated.

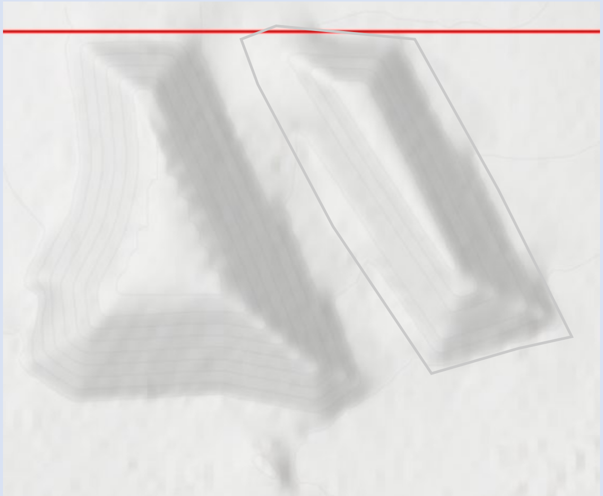
A 3D design visualisation has been developed for the two WRD emplacements for DYE, with an overarching closure visualisation also provided within the main PRCP Planning Part as Figure 3-20 of that document. Whilst the location of the WRDs can be seen, it is noted that they blend into the surrounding environment very well in these images and are not particularly distinct. This is by design.

Further detailed visualisation has also been provided below to illustrate the WRD landforms with a range of different perspectives and with additional detail to visually demonstrate how the WRDs will fit into the surrounding landscape in the future.

4.1. Summary of Key Features

Landform design characteristics are detailed for each landform area relevant to DYE. The main landforms are limited to the two WRDs – namely Waste Rock Dump #1 (Eastern Dump) and Waste Rock Dump #2 (Western Dump). Table 4-1 details the key features of each of these landforms and is reflective of the final design concept. A view of the 3D design has been included for each feature.

Table 4-1 Key Features by Landform for DYE

<table>
<tr><th>Waste Rock Dump #1 (Eastern Dump)</th><th>Features</th></tr>
<tr><td>2D detail and 3D design visualisation</td><td> 
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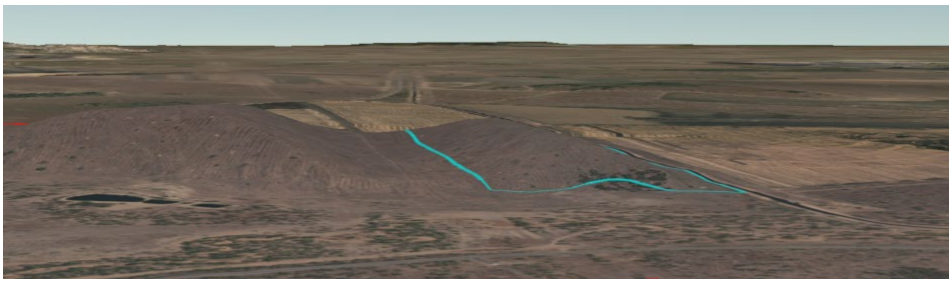
<tr><td>Perspective views</td><td>
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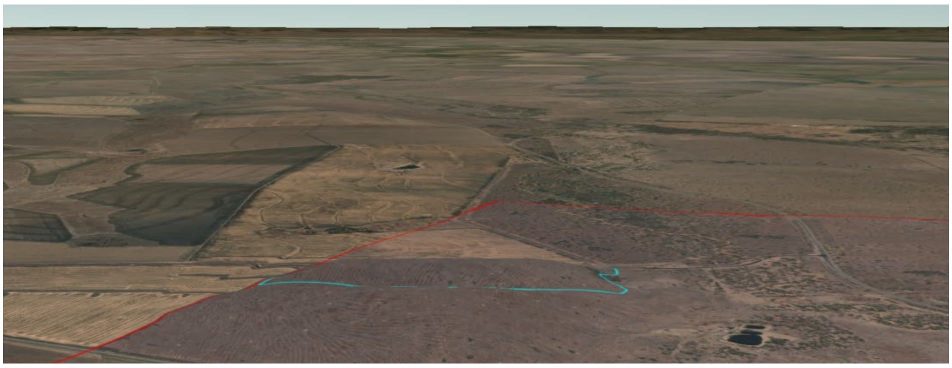
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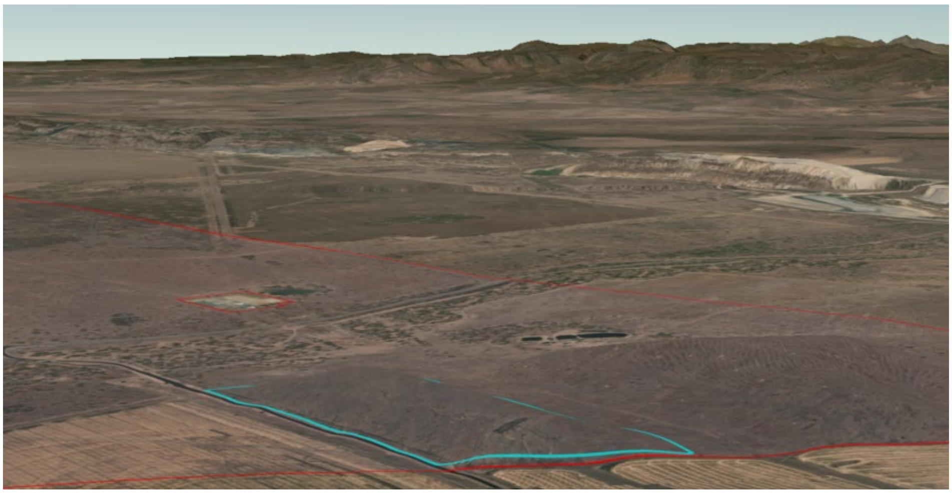
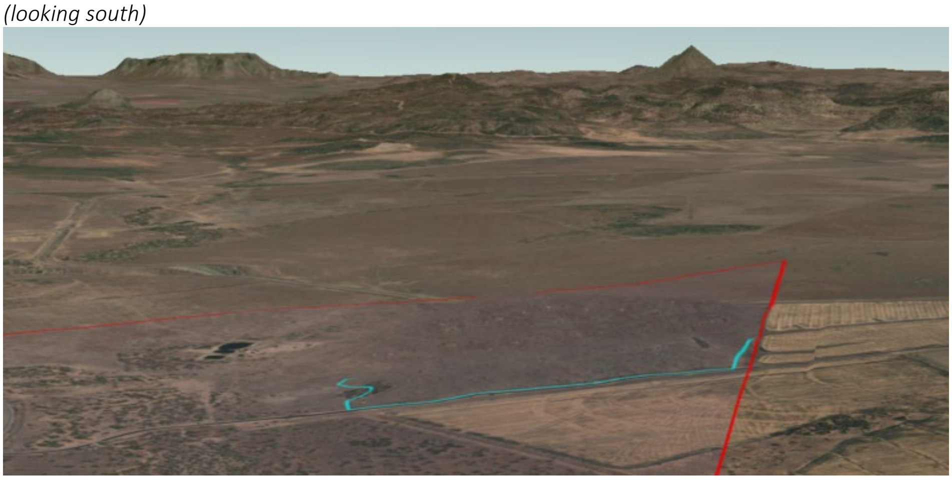
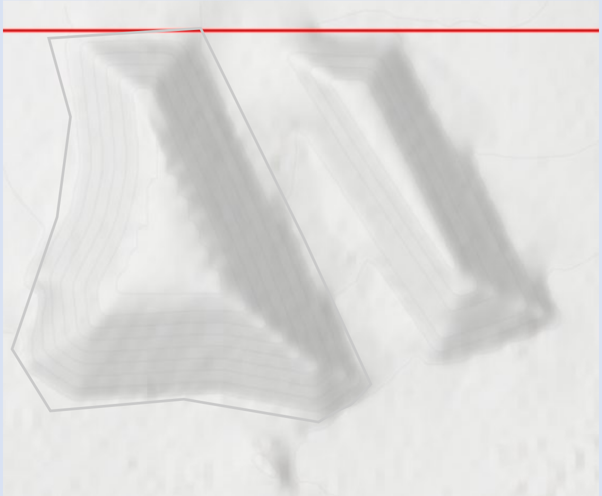
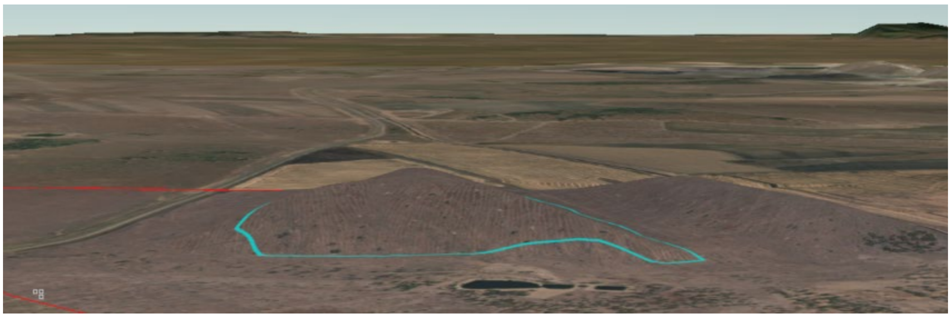
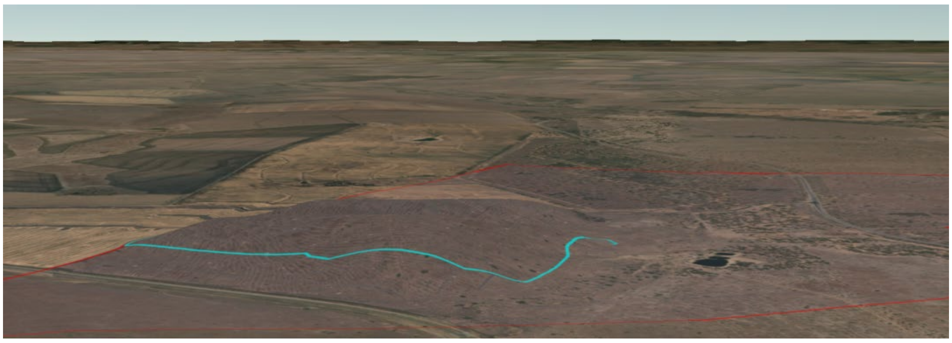
Perspective views	 *(looking south)*  *(looking west)* *(Note that vertical exaggeration of x2 has been applied to highlight WRD areas)*
Landform footprint	26.88 ha
Landform height	27.5m (180m rl – 195m rl at base/ 215m rl at top)
Slope gradient and typical length	10%, maximum length of 205m
Lift height	10m
Surface water philosophy	Water shedding
Surface treatment	Revegetated
Landform PMLU	Grazing
Key design constraints and considerations	• Constrained to north due to ML boundary • Cropping area to east • Rock armouring of toe where floodplain interactions occur • Consider surface water features in order to manage ERSED concerns in runoff during rehabilitation • Visual amenity considerations • Tie into existing landscape as part of rehabilitation

<table>
<tr><th>Waste Rock Dump #2 (Western Dump)</th><th>Features</th></tr>
<tr><td>2D detail and 3D design visualisation</td><td> 
(Note that vertical exaggeration of x2 has been applied to highlight WRD areas)</td></tr>
<tr><td>Perspective views</td><td>
(looking north)

(looking east)</td></tr>
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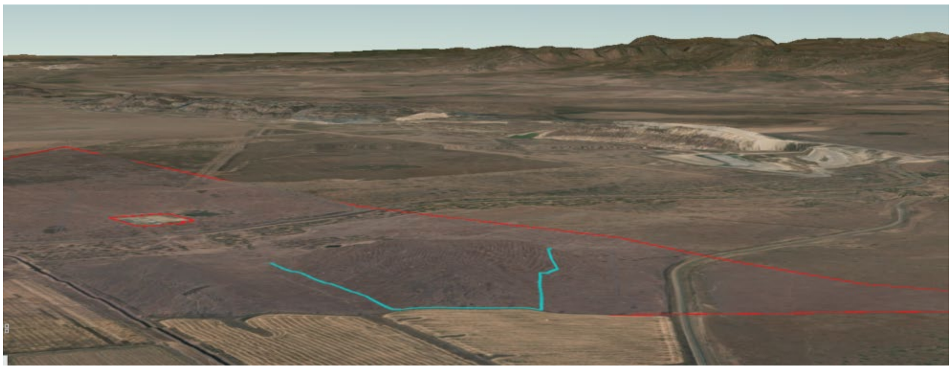
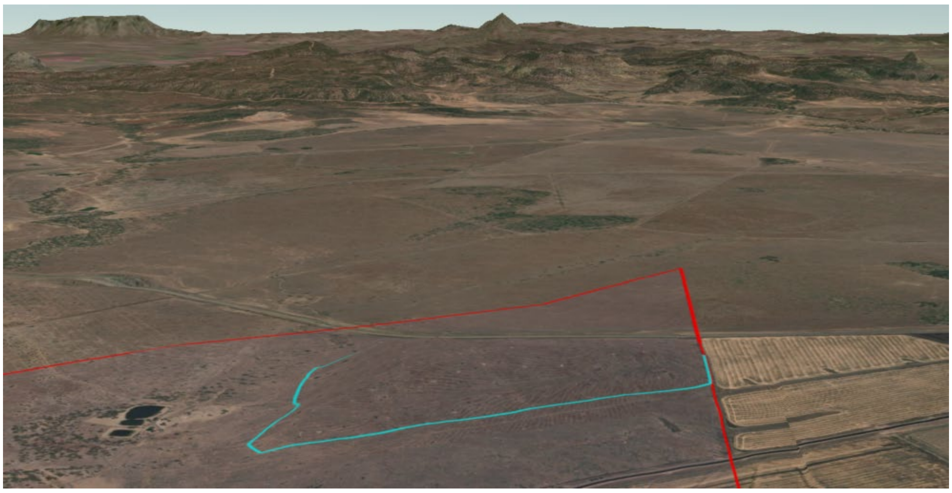
Perspective views	 *(looking south)*  *(looking west)* *(Note that vertical exaggeration of x2 has been applied to highlight WRD areas)*
Landform footprint	42.83 ha
Landform height	35m (190m rl – 200m rl at base/ 230m rl at top)
Slope gradient and typical length	10%, maximum length of 400m
Lift height	10m
Surface water philosophy	Water shedding
Surface treatment	Revegetated
Landform PMLU	Grazing
Key design constraints and considerations	• Constrained to north due to ML boundary • Infrastructure area to west • Rock armouring of toe where floodplain interactions occur • Consider surface water features to manage ERSED concerns in runoff during rehabilitation • Visual amenity considerations • Tie into existing landscape as part of rehabilitation

5. Cover Design Requirements

A cover design is typically required for the surface treatment of a mine landform in circumstances which require control over the exposure of waste rock, low-grade ore or rejects materials due to geochemical concerns. This may be acidic, neutral or alkaline discharge with elevated metal or sulfate concentration. The management of mined and waste material prevents release of contaminants to the receiving environment, legacy concerns, or direct impacts on rehabilitation success.

Hence, the cover system design is a direct reflection of the type(s) of waste generated and reflect a risk-based approach. As extensively described in Section 3.5.4 of the main PRCP Planning Part, at DYE, it is considered that mine wastes will have limited potential to generate acidic, neutral metal or saline drainage under natural oxidation conditions.

This is due to the following factors:

- there is low inherent potential for the materials to generate acidic drainage, and presence of excess acid neutralising capacity (ANC) (with high ANC relative to the maximum potential to generate acid (MPA) (>2)) within waste materials to be encountered;
- the majority (98%) of spoil samples were non-acid forming (NAF) or Uncertain but were considered low risk with limited acid generating capacity, The remaining spoil samples (< 3 %) were classified as PAF;
- approximately 72 % of potential reject samples were considered NAF-Barren, meaning that the geochemical composition of the material cannot generate acid. The remainder of reject materials were considered to have low capacity to generate substantial acidity, classified as potentially acid forming – low capacity (PAF-LC); and
- the total volume of material considered non-benign is projected to be less than 3 tonnes over the life of the DYE mine;
- it is noted that approximately 93 % of samples are considered sodic with a high risk of dispersion (median exchangeable sodium percentage (ESP) value of 17 %), therefore, the mine waste (spoil and reject) materials are not suitable for use as a final cover material on surface disturbance areas without prior treatment or being overlain with a stable topsoil layer.

However, it is noted that some management of mine waste is planned to occur for DYE, primarily focused on mitigating any risk associated with the 2% of spoil samples not classified as NAF, and the 17% of reject samples considered to be PAF. This will include the following key measures:

- further evaluation of the geochemical characteristics of actual reject materials will occur as the DYE site commences;
- reject materials will be combined with NAF materials (spoil) and truck-dumped into the WRDs, where they will be mechanically mixed by dozer back into spoil;
- weathered NAF spoil materials will be used to backfill the drift entrance as well as for the final spoil surface of the WRDs. A minimum thickness of two metres of weathered and known NAF spoil material will be placed on the WRDs as a benign upper cover layer;
- Progressive rehabilitation of the WRDs will occur as soon as practical. A suitable topsoil cover will be placed onto the profiled slopes and areas available for rehabilitation will then be revegetated to provide a safe, stable and sustainable post-mining landform; and

- The WRD emplacements have been designed to minimise erosion potential associated with the dispersive materials.

As a result, the geochemical materials of concern for DYE will be encapsulated so that the WRD areas perform in line with the surrounding WRD characteristics. As such, no engineered cover systems per se will be installed. However, it is noted that a commitment has been made to place a ‘cover’ of weathered and known NAF material as a ‘benign upper cover layer’. Whilst it is again argued that this is an encapsulation technique rather than an engineered cover, the requirements of the PRCP guideline as it relates to Cover Design has been addressed in the subsection below.

5.1. Objectives

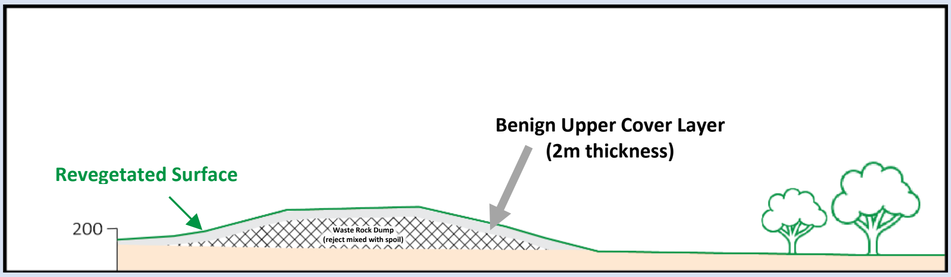
Generally, the objectives in place for the overarching landform design concept apply to the cover system, as outlined in Section 2, and described below specifically for the cover system aspects:

- Achievement of acceptable land use suitability with the cover system enabling rehabilitation to create a stable landform with land use capability and/or suitability similar to prior to disturbance.
- Creation of a stable post-disturbance landform with management and mixing of mine wastes to ensure WRD materials are benign, and rehabilitation achieves a self-sustaining condition.
- Preservation of downstream water quality – with management of potential geochemical contaminants to assure that current/future water quality can be maintained at required levels.

5.2. Details of Cover Design

A range of landform design aspects are of relevance to the cover design for the two WRDs. Table 5-1 details the key design aspects for these landforms and effectively addresses ‘cover design’ requirements of the PRCP Guideline. Cross-sectional diagrams of the WRDs have been provided to illustrate the final cover design concept, as well as show the landform footprints.

Table 5-1 Details of the WRD Cover Design Aspects

<table>
<tr><th>Waste Rock Dumps</th><th>Detail</th></tr>
<tr><td>Cover design diagram</td><td>


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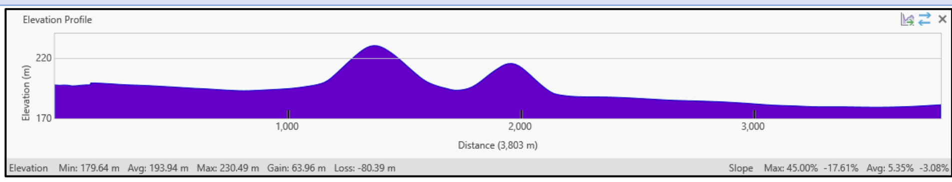
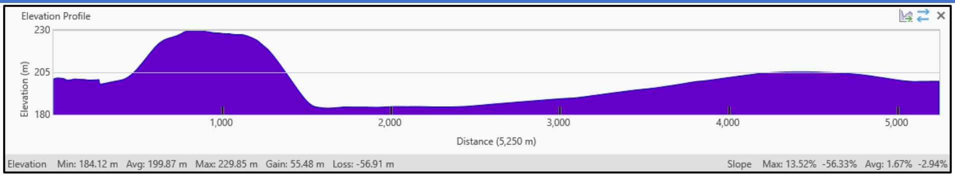
<tr><td>Sectional views</td><td>


Cross-section across WRDs (from West to East)
</td></tr>
</table>

Waste Rock Dumps	Detail
	 *Long-section across WRD2 (from North to South)* *(Note that vertical exaggeration of x2 has been applied to highlight WRD areas)*
Cover design/system	• WRD placed onto natural ground. • Mixed spoil and reject material to be placed over DYE operations. • A benign upper cover layer will be placed. This will consist of a top (horizonal) and side (vertical) layer of Weathered NAF material, no less than 2m thickness, to be placed to form the final WRD landform geometry.
Construction methodology	• Materials are to mechanically mixed as/after they are excavated from the underground mine, prior to being placed on the WRD emplacements. A stockpile of Weathered NAF material will be maintained to supply the final 'benign upper cover layer'. • The benign upper cover layer will be track rolled with machinery to lightly compact. • The construction methodology outlined in Section 7 will be applied.
Quantitative assessment of capping materials	As detailed in Section 3.5.4 of the main PRCP Planning Part, there is an ample volume of NAF materials to form the 'benign upper cover layer'. By volume, 88% of the total available waste material will be NAF, and it is expected that mine planning process will be able to ensure this material is put aside to be used as the 'benign upper cover layer'. More than 13 million tonnes of NAF material will be available over the life of DYE; and is estimated that just more than 2 thousand tonnes of NAF will be required for the 'benign upper cover layer'.
QA/QC processes	The QA/QC process to be employed for construction of the landforms in general will be applied to this aspect of the rehabilitation. This is further detailed in Section 7.1

6. Landform Performance Assessment

Given that the objective of final landform design is to achieve long-term stability, the WRD areas have been designed and assessed to predict their future stability against erosion into the future. Slope angle, length of slope and vegetation cover are important factors in the control of erosion and can be modified by design to manage the risk of erosion of the final landform.

6.1. Benchmarking

An assessment of acceptable long-term erosion rates has been conducted, and although there are no agreed standards or guidelines for acceptable erosion rates, there is an extensive body of literature and scientific practices that can be used for benchmarking. There is also a regulatory expectation that erosion will be minimised, and vegetation cover established. The target applied is for the erosional performance of the landform to ultimately approach an acceptable reference point or benchmark from the surrounding area.

Acceptable baseline erosion rates have been considered for environments analogous to the DYE site, and within Central Queensland in general. Contemporary values for acceptable rates of erosion range from 0.75 t/ha/yr (Waters, 2004) to 8 t/ha/yr (Bowen et al. 1998). Further, significant gully and rill development is a metric of slope stability and long-term performance. Studies by Klingbiel and Montgomery (1961), and Howard and Loch (2019), suggest an erosion rate cap of 10 t/ha/yr, as acceptable, to mitigate the formation of rills and gullies.

Therefore, and an upper limit of 10 t/ha/yr has been adopted as an appropriate benchmark for the performance of rehabilitated landforms.

6.2. Modelling Outcomes

The Revised Universal Soil Loss Equation (RUSLE) was previously utilised to both inform the erosion risk of the pre-mining landscape but also understand the potential for topsoil loss that that could be predicted to occur for different topsoil materials and slope angles applied to rehabilitation and landform arrangements (URS,2015). Calculated estimates across the DYE site for the pre-mining landscape ranged from low (2 t/ha/yr) to moderate (10 t/ha/yr).

The same tool was utilised to inform potential erosion risk for the WRD emplacements. The benefit of applying the RUSLE tool is that the parameters underlying the prediction are derived from site-specific information informed by in-situ soil sampling (URS, 2015a).

This has been applied (as per Table 3-16 in the main PRCP Planning Part, but also reproduced below as Table 6-1) to the proposed WRD landform arrangement, with average slope lengths and angles as per the design principles. The range of potential soil materials has also been considered, as well as potentially different revegetation outcomes.

Table 6-1 Long-term Landform Erosive Stability

WRD1				WRD2		
Soil Type (SMU)	Vegetative Cover (%)	Annual Soil Loss (t/ha/yr)		Soil Type (SMU)	Vegetative Cover (%)	Annual Soil Loss (t/ha/yr)
A2	60% 80%	24 7		A2	60% 80%	21 6
A3	60% 80%	17 5		A3	60% 80%	15 4
U1	60% 80%	8 3		U1	60% 80%	7 2
Average	60% 80%	16 5		Average	60% 80%	14 4

Topsoil material used and the vegetation cover both influence soil loss rates. Most topsoil materials available for use in rehabilitation are soil type U1, and a vegetation cover of 60% and over will achieve acceptable long-term erosion performance.

Based on this design approach, both WRD areas are anticipated to achieve minimum annual erosion rates of between 7 and 8 t/ha/year. This is within the benchmark of 10 t/ha/yr that has been adopted (as detailed in Section 6.1) and is therefore considered acceptable.

7. Landform Rehabilitation Process

A general framework for the completion of rehabilitation activities has been outlined; but may be modified with appropriate justification during the detailed design phase to ensure the most appropriate landform outcome is achieved. The selection of landform arrangement and resulting rehabilitation requirements has been strongly informed by knowledge and experience of regional practices in Central Queensland.

The landform principles adopted are considered extremely conservative given successful rehabilitation practices elsewhere on similar materials, but with larger and steeper landforms. Further, the construction process has been summarised, incorporating the following key steps with detail provided as to the rehabilitation process and construction methodology to be followed for each key step in the process. This is as detailed in Table 7-1 below.

Table 7-1 Landform Rehabilitation Process and Methodology

Process Step	Rehabilitation Process	Construction Methodology
1	Develop the landform with adequate mixing of waste materials and compaction towards a final profile	• Placement of materials will occur as required as part of DYE operations and will be governed by operational procedures. • This will outline and control sources, stockpiling, mixing and placement requirements to ensure mixing and compaction requirements are being met. • Material will be dumped with consideration of the final WRD footprint and design concept, to minimise the need for reshaping. • It is anticipated that this will occur using the truck and shovel fleet, with progressively shaping of areas into suitable landform with dozers. • Construction specific plans will be developed for each WRD and subarea as appropriate, as part of normal site planning and operational processes. • Construction of the WRD landforms will include an allowance for initial drainage control to be designed and constructed as required. • Conformance to design processes will be utilised to ensure that the WRDs are constructed as per the long-term design concept.
2	Placement of a final layer of known NAF spoil materials at a minimum depth of 2m to provide protective cover to the PAF wastes	• After placement of materials as required for DYE operations has been completed, a final layer of benign (NAF) spoil materials will be placed. • This will ensure the encapsulation of all wastes to a minimum depth of 2m, both at the top and on the batters of the WRDs. It is noted that the 2m is to be taken as both a horizonal and vertical buffer zone. • The placement of this material will either be scheduled as part of normal operations or else will utilise previously stockpiled materials confirmed to be NAF. • Material will be dumped with consideration of the final WRD footprint and design concept, to achieve the final landform design shape and geometry. • It is anticipated that this activity will be completed with truck and shovel fleet, potentially with further shaping of areas to be completed with dozers.

Process Step	Rehabilitation Process	Construction Methodology
		• Construction specific plans will be developed for each WRD and subarea as appropriate, as part of normal site planning and operational processes. • Conformance to design processes will be utilised to ensure that the WRDs are constructed as per the long-term design concept.
3	Completion of bulk earthworks to reshape materials to achieve the required slope arrangement. Ensure adequate fall for effective water shedding.	• Further reshaping will occur as required to ensure the WRDs reflect the final long-term landform arrangement. • Ideally, this task will be minimal, assuming that DYE develop the WRDs with an understanding of the long-term landform design requirements (i.e. final WRD footprint and design concept). This will required integration of rehabilitation planning as part of operational mine planning. • It is anticipated that any reshaping required will occur using dozers, with truck and shovel only required for significant haulage requirements. • Conformance to design processes will be utilised to ensure that the WRDs are constructed as per the long-term design concept.
4	Minor earthworks to ensure improved tolerance to design and for fine scale reshaping works.	• Complete any fine scale work required to prepare or treat the landform surface. This may include reshaping for drainage, further detailed work to install drainage features or rock armouring for drainage or flood protection. • All contour and other bench drains will be installed as per long-term design, with longitudinal fall and required dimensions. • Runoff from rehabilitated areas will be contained within operational controls (ie sediment dams) until such time that they can be demonstrated to be suitable for discharge directly into the appropriate natural watercourse.
5	Amelioration of spoil/soil materials if required.	• Detailed soil assessment will inform specific amelioration requirements as well as application rates, timing and methodology. • The methodology for application will be entirely dependent on the material and its requirements. For example, some products will require incorporation and mixing of a powder into the growth media, whilst others may be applied as a liquid immediately prior to/during seeding.
6	Haulage and placement of growth media materials with ripping to scarify the surface.	• All areas will be shallow ripped/scarified along the contour prior to the spreading of topsoil. This will ensure growth media materials are keyed into the underlying landform materials to a maximum depth of 50 cm. • Ripping will aim to create a well-prepared seed bed that is loose and friable, with micro-niches to enable good contact between soil and seeds. • Topsoil will be spread at a minimum depth of 300mm. • Only suitable growth media materials will be used. • Prior to use, a soil assessment will be completed to inform and amelioration requirements (as per next process step).

Process Step	Rehabilitation Process	Construction Methodology
7	Complete revegetation activities to promote the achievement of PMLU outcomes.	• The seeding will be undertaken as soon as possible after the previous preparation steps to limit surface crusting and sealing. • Rapidly growing annual cover crops will be used for quick effective groundcover until native pasture species establish. • Revegetation with suitable seed material will take place in late spring or early summer, following early wet season rainfall. • Species to be seeded will be selected from the PRCP seeding mixture, or as otherwise deemed suitable by an AQP. • Seeding should occur at a rate of between 10-20kg/ha, depending on the exact species in each mix.

7.1. QA/QC Requirements

DYE will employ normal operational QA/QC processes to ensure that rehabilitation outcomes are successfully met, and quality requirements are achieved. This consists of 'conformance to design' processes, rehabilitation inspections during construction and rehabilitation performance reporting.

Variation from design has shown to lead to poor implementation and failure of rehabilitated areas, leading to increased maintenance or re-work and costs and a potential extension of time before standards acceptable for relinquishment can be achieved. Review of rehabilitation works requires a combination of survey control, physical inspection, and verification of actual progressive sign-off of works at specific stages.

7.2. Trials

Given that DYE has not yet been developed, there have been no opportunities yet to complete rehabilitation trials at the site. Given the small footprint and staggered nature of landform rehabilitation activities required, there are also likely to be few opportunities in the future to conduct trials. However, it is noted that the proposed rehabilitation methodology follows tried and established rehabilitation methods already in use in the Bowen Basin, adopts a conservative approach wherever possible and responds to the underlying environment risk factors.

DYE will also adopt a systematic approach whereby management practices are incrementally improved over time, through adaptive feedback processes, learning from the outcomes of past and current practices. Implementation of recommendations will occur from rehabilitation management reviews, monitoring reports and other processes to assess the outcomes of rehabilitation and adapting past rehabilitation in accordance with new learnings. If applied rigorously, this is anticipated to be an effective approach to reducing risk where there is uncertainty about rehabilitation outcomes.

ATC WILLIAMS

REPORT

BENGAL COAL PTY LIMITED

Dysart East Coal Project
Hydraulic Assessment
Probable Maximum Flood

240129_R01_Rev1
MARCH 2025

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1 INTRODUCTION

1.1 Background and Purpose

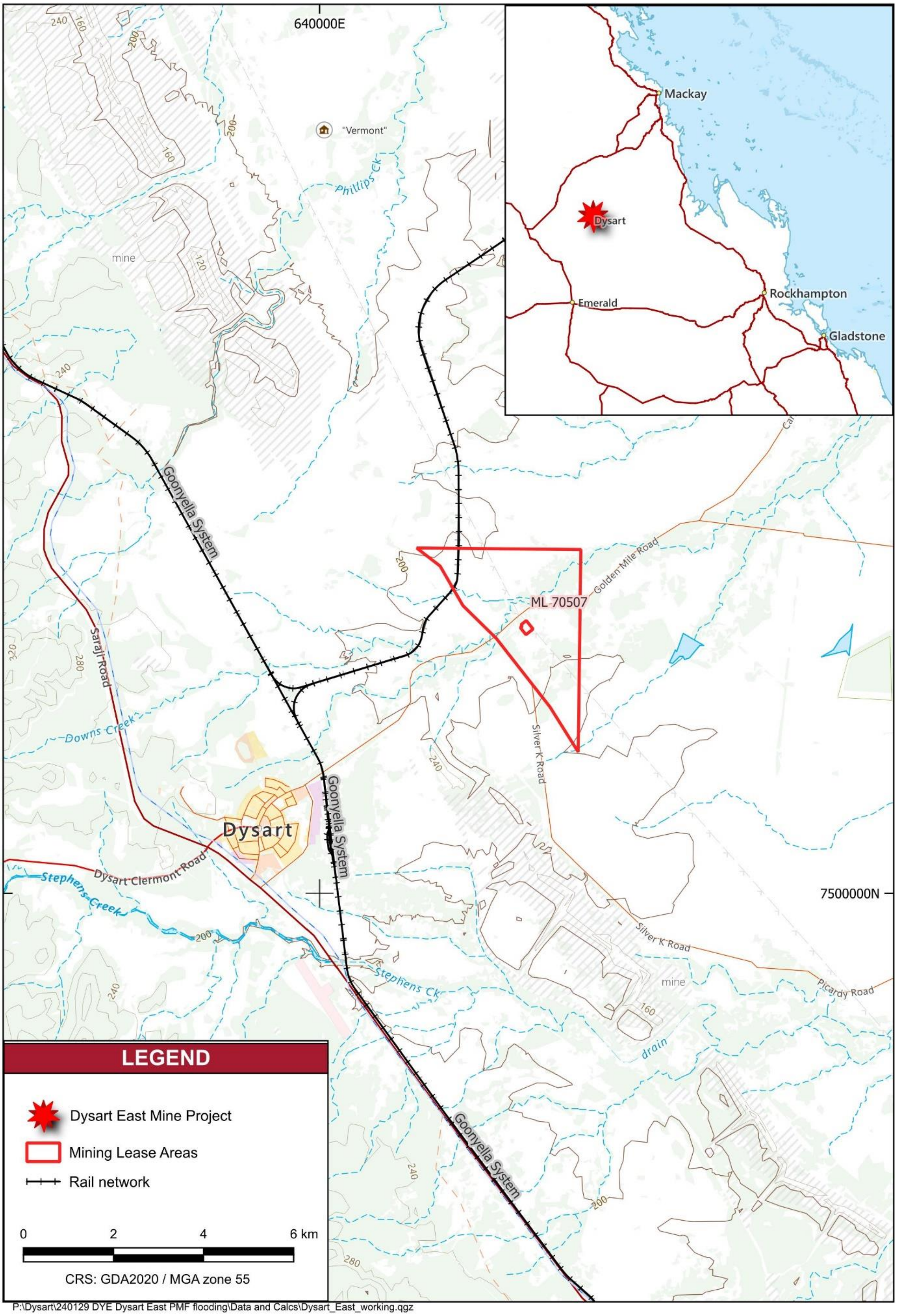
The Dysart East Coal Project (DYE) is wholly owned by Bengal Coal Pty Ltd (BC). The DCEP is located on Mining Lease (ML) 70507 with an approved Exploration Permit for Coal (EPC) 1188. The DYE site is situated within the Isaac Regional Council and located about 7 kilometres (km) northeast of Dysart, as depicted in **DIAGRAM 1**. It is positioned in the upstream reach of Downs Creek, which is part of the Fitzroy River Basin.

The purpose of this report is to develop a flood profile for the DYE site as part of the Progressive Rehabilitation and Closure Plan (PRCP) in accordance with the PRCP guidelines (DES, 2023). The site's flood profile has been developed for the Probable Maximum Flood (PMF) and the impact on mine infrastructure relative to the PMF floodplain extents was assessed.

The PRCP must include an approved schedule detailing post-mining land uses (PMLUs), non-use management areas (NUMAs), and milestones for rehabilitation. Under the PRCP framework, Section 41C of the Environmental Protection Regulation (DES, 2023) mandates land be treated as floodplain if post-activity elevations are at or below the peak water level of a 0.1% Annual Exceedance Probability (AEP) event as determined by floodplain modelling.

This flood assessment was conducted to fulfill a request for information (RFI) provided by the Department of the Environment, Tourism, Science and Innovation (DETSI) as part of the PRCP. The PMF event had not previously been modelled, which DESTI requires as part of the closure approvals process. To support this flood assessment, BC has provided a final landform plan for the DYE that features the proposed PMLUs.

DIAGRAM 1: DYSART EAST MINING LEASE LOCATION



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1.2 Site Layout and Drainage Features

DIAGRAM 2 provides contextual information about the Downs Creek watercourse and its relationship to the surrounding topography, mining activities, and the ML70507.

Downs Creek is a 3rd-order stream that passes through the proposed mining area in a northeast direction. The creek has a typical channel size of 10 metres wide at the top of bank and 3 metres deep. The mining area overlaps part of the Downs Creek catchment, and while site infrastructure is not expected to be significantly affected by flooding (being located outside the 1000 year flood extent), the southern extent of the waste rock dump (WRD) may be within the floodplain.

Multiple road and rail crossings traverse Downs Creek within the study area, including:

- Saraji Road
- Goonyella Rail System (at multiple locations)
- New Saraji Coal haul road
- Vermont Mine access road
- Golden Mile Road

These crossings comprise both culverted and bridge-type structures.

Terrain analysis of the Downs Creek catchment reveals that the upper catchment begins at approximately 400 metres Australian Height Datum (mAHD) and descends relatively steeply to 240 mAHD within the first 4 km (an average bed slope of 4%). Subsequently, the creek flows through progressively flatter terrain.

Downs Creek is bounded by larger creek catchments to the north and south, specifically Phillips Creek to the north and Stephens Creek to the south. Ultimately, Downs Creek joins the Isaac River system approximately 30 km downstream from ML70507.

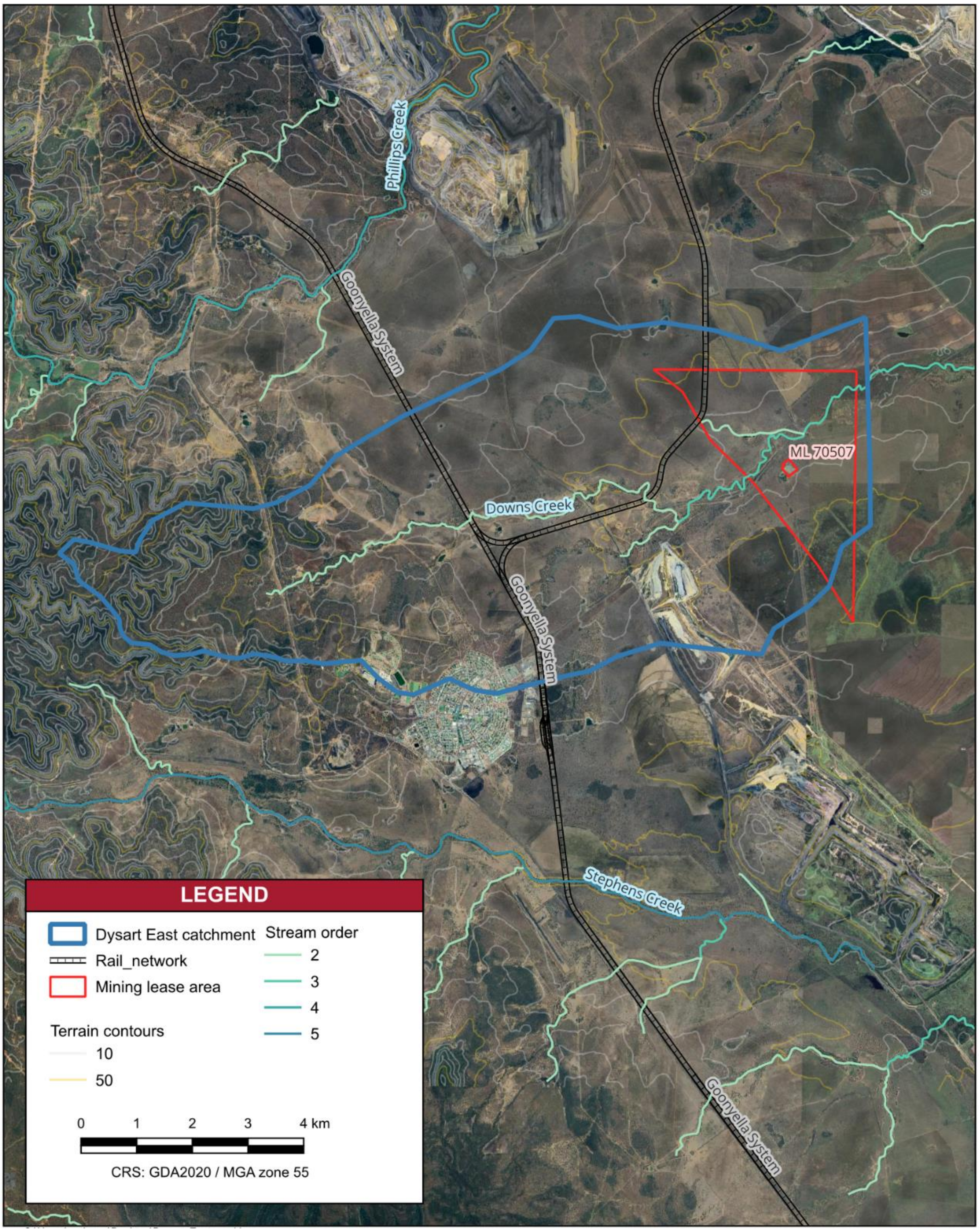
A communication from the Department of Natural Resources and Mines (DNRM, 2012) to the Dysart Mining Group confirms that Downs Creek within ML 70507 (formerly MDL 450) meets the definition of a watercourse under the Water Act 2000 (Qld), whereas an unnamed tributary is classified as a drainage feature that facilitates overland flow.

1.3 Scope of Work

The scope of work includes a detailed flood modelling study of the Downs Creek catchment to assess the PMF flood impacts, which will determine maximum flood levels and water velocities for the DYE post-closure site conditions. The analysis will comply with Section 41C of the Environmental Protection Regulation and follow the ARR 2019 (Australian Rainfall and Runoff) guidelines for flood estimation.

The PMF flood event will be simulated in the 2-dimensional hydraulic modelling package TUFLOW. The outputs include detailed flood maps showing maximum flow depths and flow velocities across the final landform.

DIAGRAM 2: DOWNS CREEK CATCHMENT DRAINING TO ML70507



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1.4 Post-closure landform

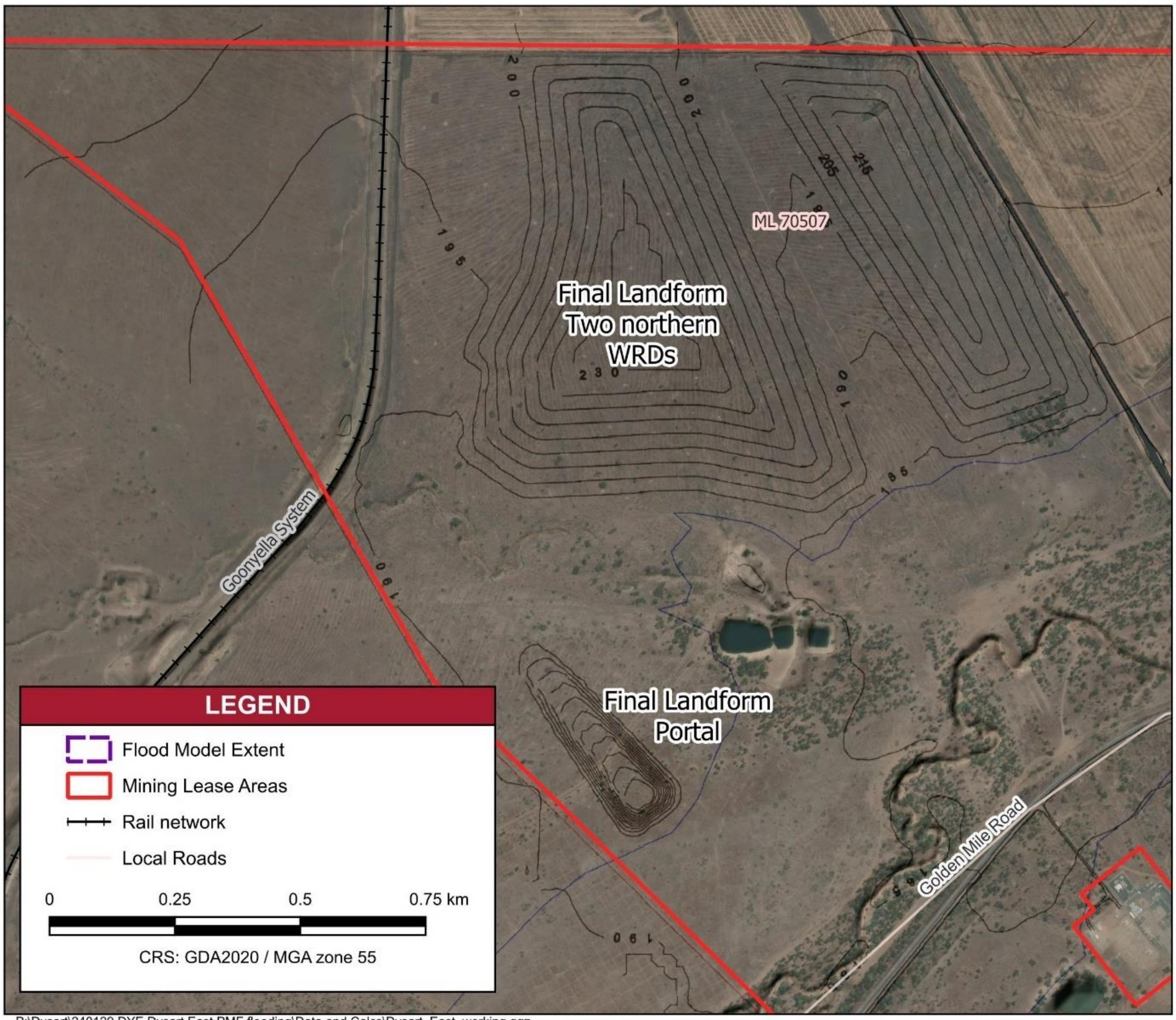
The approved final landform design (version 7a) for the DYE site has been submitted by BC as part of their closure and remediation planning. This design outlines the key features that will remain on the site, which include:

- Two WRDs north of Downs Creek, and
- A backfilled underground portal.

The final landform features are presented in **DIAGRAM 3**.

Mining activities are not planned for the southern portion of ML70507, which lies outside the Downs Creek catchment. Consequently, this area, along with the adjacent local catchment it flows into, has been excluded from the flood assessment.

DIAGRAM 3: FINAL LANDFORM



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1.5 Methodology

The methodology adopted to achieve the scope of works for the PRCP flood study consisted of the following three tasks.

- Hydrologic assessment of the site and upstream catchments including estimation of Probable Maximum Precipitation (PMP) rainfall depths
- Hydraulic modelling of the site and upstream catchments, including:
  - Setting up a digital elevation model Digital Elevation Model (DEM) of the site that conceptually represented the post-closure site conditions;
  - Estimation of surface roughness conditions;
  - Undertaking grid size sensitivity testing to establish the most appropriate grid size for the model;
  - Producing flood maps of depth and velocity for the modelled events and scenarios.
- Preparation of a report to present the results of the modelling for inclusion in the PRCP submission.

1.6 Structure of Report

The structure of the report, to address the above scope of works, is as follows.

Section 2 Details the hydrological estimations undertaken for the site. This section includes the inputs and outcomes of the rainfall estimation process for the PMP design event.

Section 3 Details the development of the TUFLOW hydraulic model utilised to estimate the response of the post-closure surface to the PMP rainfall from **Section 2.0.**

Section 4 Presents and discusses the results of the post-closure conditions to inform the PCRP planning and design.

Section 5 Provides a summary of the hydraulic assessment and conclusions drawn from the results.

2 HYDROLOGIC ASSESSMENT

2.1 General

The DYE site is located within the upstream reaches of Downs Creek. Being in the upper reach of the catchment, indicates that the hydraulic model extents could be set to include both the mine site and the full upstream catchment. This allowed for direct rainfall to be applied to the hydraulic model extents without the need to any external inflows to the model. This eliminated the requirement to develop a one-dimensional hydrologic model for any external inflows to the hydraulic model, while allow for natural routing to occur within the model domain.

2.2 Probable Maximum Precipitation

The PMP for the site was assessed in accordance with Australian Rainfall and Runoff (ARR) **Error! Reference source not found.**. The site is located in the generalised tropical storm coastal zone (**Error! Reference source not found.** and therefore the Generalised Short Duration Method (GSDM) was adopted for event durations between 0.25 and 6 hours. Due to the relatively small catchment size of 67 km^2 to the mine site, assessment of longer duration events using the Generalised Tropical Storm Method Revised (GTSMR) was not required for event durations of 24 hours and longer.

The GSDM requires catchment factors to be applied to the initial rainfall depths to estimate the PMP for the site. The site specific values of the catchment factors utilised in deriving the PMP estimates are summarised in **TABLE 1** for the GDSM.

TABLE 1: GSDM FACTORS FOR PMP ESTIMATE

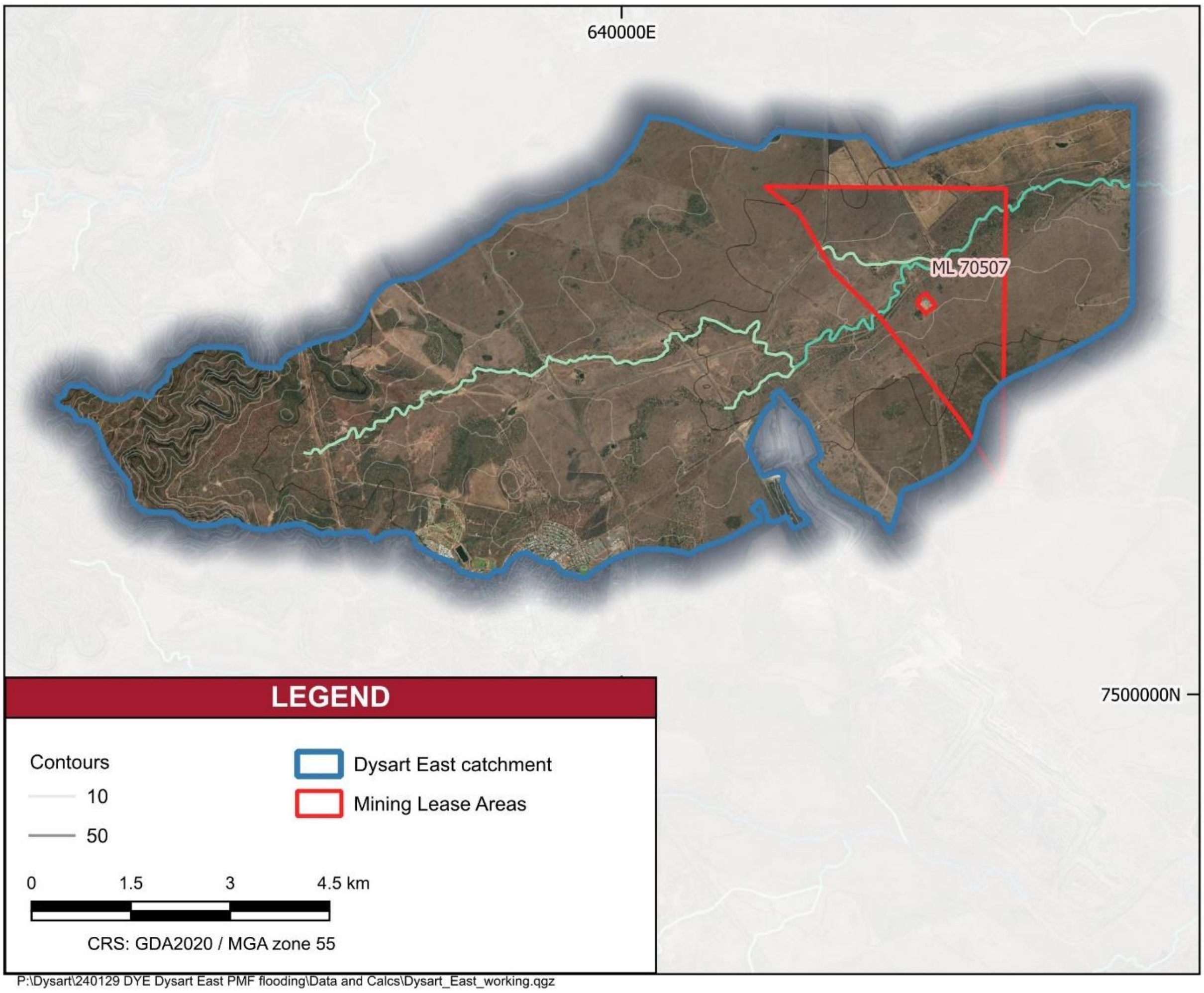
Parameter	Value
Duration Limit	0.25 - 6 hours
Proportion Smooth	0.0
Proportion Rough	1.0
Mean elevation at site (m AHD)	215
Elevation Adjustment Factor (EAF)	1.00
Moisture Adjustment Factor (MAF)	0.872

The GSDM procedure requires classification of the terrain category of the catchment as either smooth, rough or a proportional mixture. This classification is important because terrain characteristics can significantly impact thunderstorm rainfall dynamics over extended periods exceeding one hour. A terrain is considered 'rough' when substantial elevation changes are prevalent. Specifically, areas with vertical changes of 50 metres or more within a 400-meter horizontal distance qualify as rough terrain (**Error! Reference source not found.**. These topographic features can trigger low-level air convergence, potentially enhancing storm development and precipitation. Moreover, the classification extends to regions within 20 km of such rough terrain.

In the case of the Downs Creek catchment, the terrain analysis reveals a significant elevation gradient. The upper catchment starts at approximately 400 mAHD and descends to 240 mAHD within the first 4 km as shown in **DIAGRAM 4**. Areas within the upper catchment meet the requirements of ‘rough’ terrain and, given the relatively short catchment length of 10 km, the entire area is classified as 'rough' terrain.

The next phase involves an elevation adjustment. The procedure requires calculating the catchment's mean elevation using reliable terrain data. For elevations at or below 1500 mAHD, the Elevation Adjustment Factor (EAF) remains constant at 1. In the upper Downs Creek catchment, the mean elevation is 215 mAHD, resulting in an EAF of 1.

DIAGRAM 4: DOWNS CREEK TOPOGRAPHY



The GSDM method also incorporates a Moisture Adjustment Factor (MAF). This factor accounts for variations in moisture availability across different regions. The GSDM procedure includes a comprehensive map of Australia detailing percentage adjustments to refine PMP predictions by considering local moisture conditions. For the upper Downs Creek catchment, the MAF is calculated as 0.872.

The factors in **TABLE 1** were applied to generate the PMP depths for 0.25 to 6 hour durations, as shown in **TABLE 2**. A single temporal pattern for the PMP depths is provided within the GSDM guidelines. A summary of the PMP calculations is provided in **Appendix A**.

The GSDM spatial distribution pattern for the PMP assumes the storm remains nearly stationary and can be rotated in any direction to fit the catchment shape (**Error! Reference source not found.**. The GSDM spatial distribution assumes rainfall occurs in several discreet ellipses which are superimposed over the Downs Creek catchment. These elliptical patterns are arranged so that the smallest possible ellipse completely contains the entire catchment area. More details on the positioning of the spatial distribution are provided in **Section 3.5**.

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TABLE 2: PMP DEPTH ESTIMATE

Duration (hr)	Total Rainfall Depth (mm)	Rainfall Intensity (mm/hr)
0.25	153.7	614.7
0.50	225.9	451.7
0.75	286.6	382.1
1.0	344.7	344.7
1.5	443.2	295.5
2.0	512.2	256.1
2.5	575.4	230.2
3.0	622.7	207.6
4.0	704.4	176.1
5.0	773.7	154.7
6.0	824.4	137.4

3 HYDRAULIC ASSESSMENT

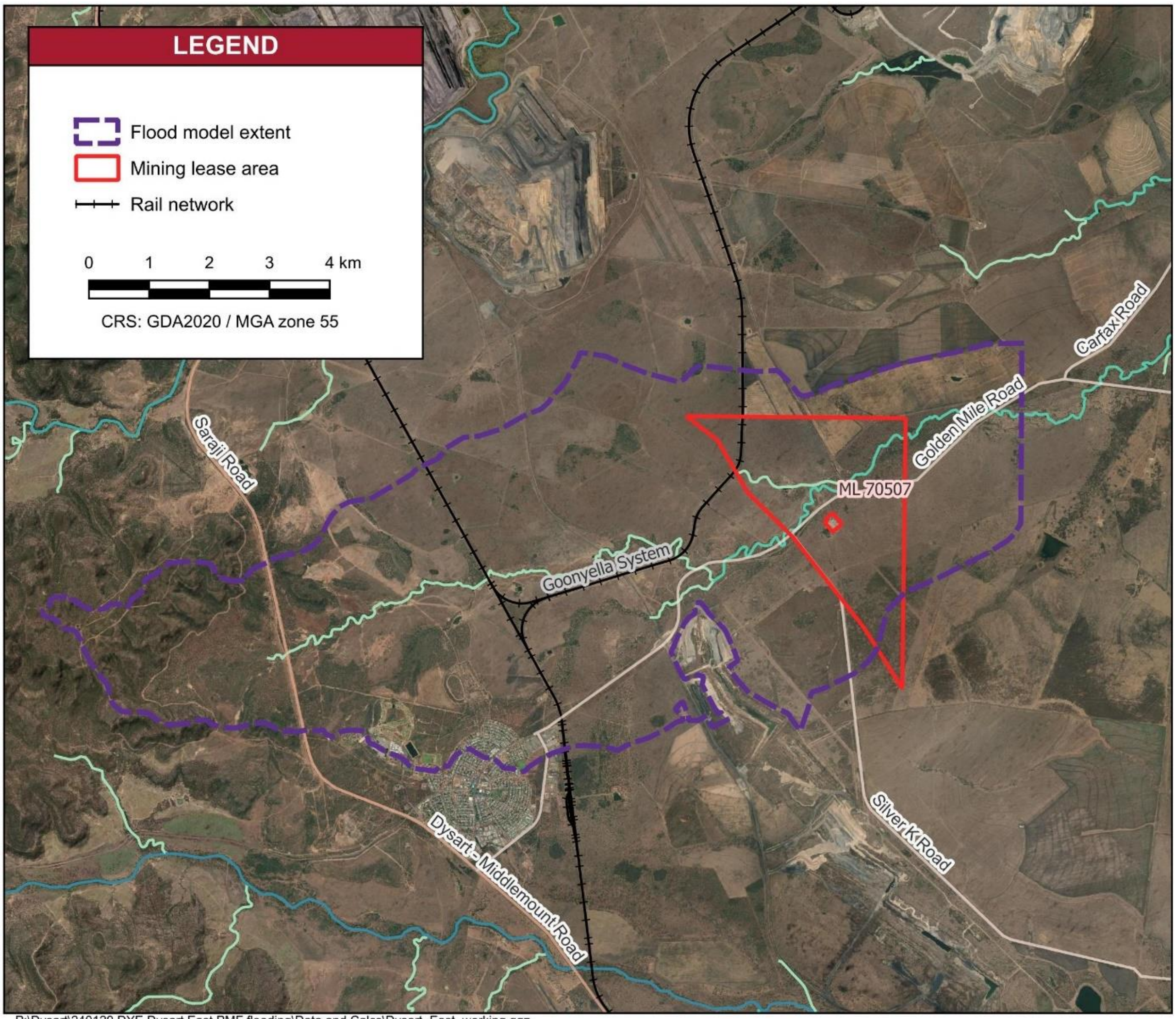
3.1 Model Overview

Hydraulic analysis of the study area was undertaken using the two dimensional (2D) finite difference program TUFLOW, which is an industry accepted software package highly suited to the investigation of flood behaviour in complex flow scenarios. The model can simulate unsteady hydrodynamic flow in two dimensions on a rectilinear grid. The model is based on a robust finite difference solution scheme that can compute both sub-critical and supercritical flow regimes. The selected hydraulic solver for the 2D model was the HPC scheme.

3.1.1 Model Domain

The TUFLOW model was set up to quantify the impacts of the PMP storm event on the post-closure final landform. The model domain is depicted in **DIAGRAM 5.** The model domain includes the entire catchment of Downs Creek upstream of the DYE and extends approximately 2.0 km downstream from the Mining Lease.

DIAGRAM 5: TUFLOW MODEL DOMAIN



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3.2 Digital Elevation Model

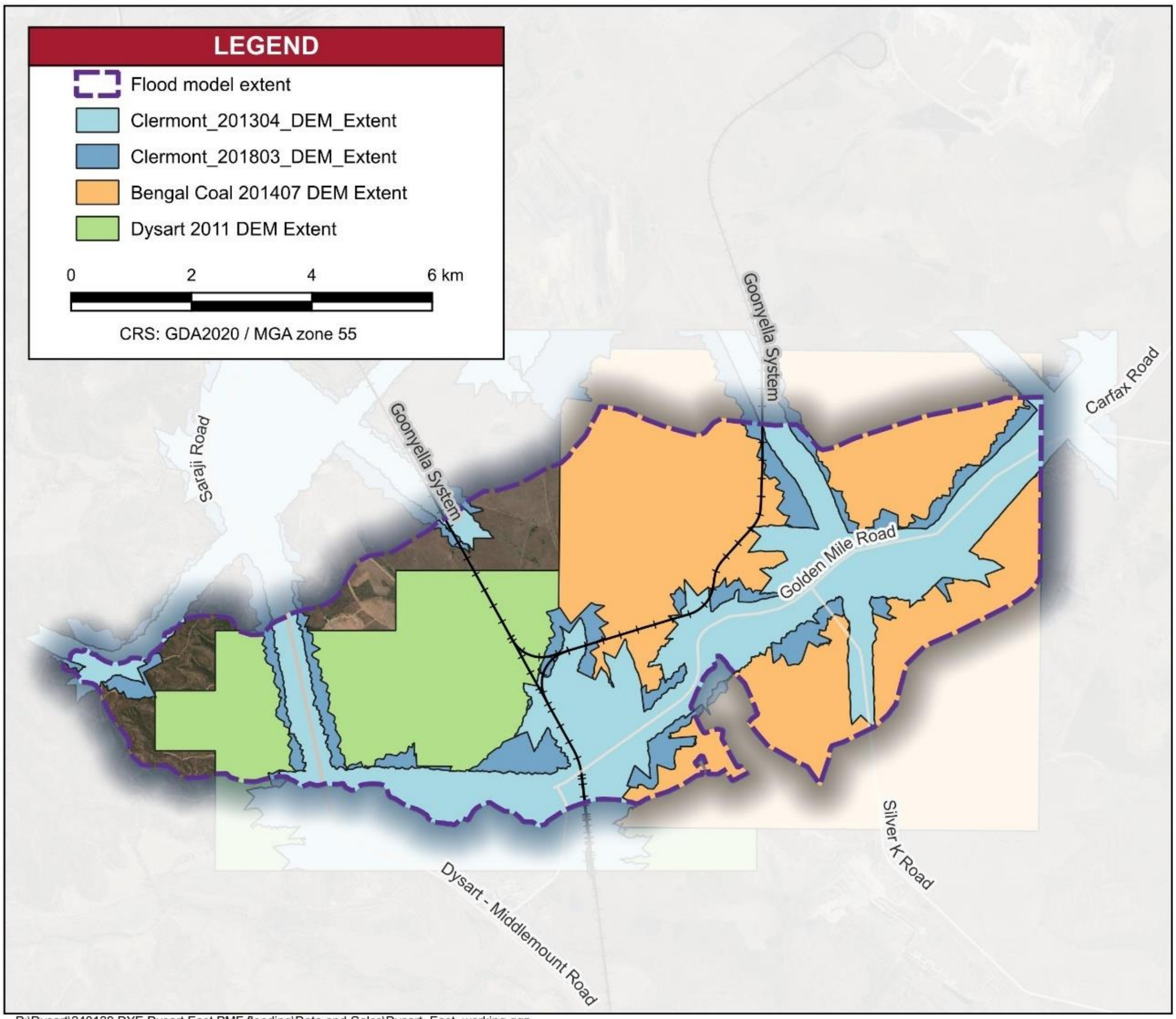
3.2.1 Base Topography

The topographical base for the TUFLOW model was developed from a series of publicly available regional survey datasets and a DYE site specific survey provided by BC. The site survey dataset was resampled into a DEM. The following datasets were input into the topographical model.

- July 2014 Site Survey **Error! Reference source not found.**
- 2011 Dysart LiDAR 1m DEM from the QLD Inland Towns Stage 3 Project
- 2013 Clermont LiDAR 0.5m DEM Fugro ROAMES Power Network Survey
- 2018 Clermont LiDAR 0.5m DEM Fugro ROAMES Power Network Survey
- Copernicus 30m Satellite DSM

The detailed survey **Error! Reference source not found.** covers the area of the mine lease plus approximately an additional 2 km around its perimeter. To ensure appropriate runoff estimation within the hydraulic model domain external to the site survey, the publicly available topographical data was also adopted. The extents of the site survey and publicly available regional survey datasets within the modelling domain are depicted in **DIAGRAM 6**.

DIAGRAM 6: TOPOGRAPHIC DATA SOURCES USED TO DEVELOP THE DEM



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It was necessary to check that hydraulic continuity between the satellite DSM and LiDAR datasets was not impacted by false low points that would unrealistically impact the hydraulic behaviour of surface runoff. Interrogation of the surface elevations at the interface of the detailed survey datasets and the Copernicus DSM was undertaken to ascertain if topographical modifications might be required. It was observed that the Copernicus DSM elevations were approximately 2 to 5 m higher than the detailed survey elevations. As such, no topographical modifications were required.

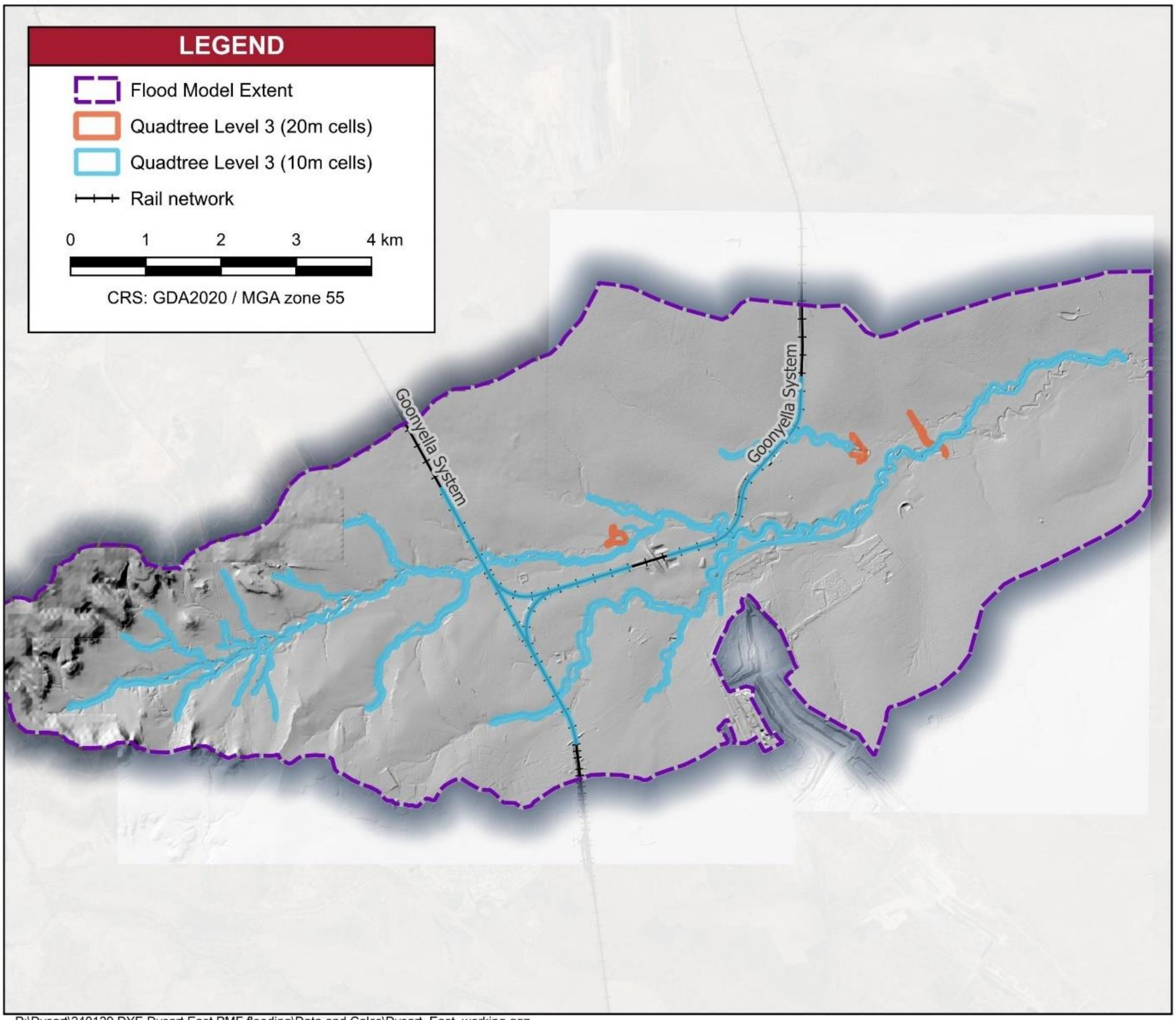
3.3 Grid Size Selection and Time Step

TUFLOW's quadtree mesh system employs an adaptive grid refinement technique. Starting with base cells, the system can progressively split selected cells into four equal smaller units. This subdivision process can be repeated multiple times on the resulting cells, creating increasingly fine resolution where needed.

This flexibility allows for optimal resource allocation across the model: larger cells can be maintained in areas needing less detail, such as expansive floodplains or upper catchment regions, while smaller, more precise cells can be concentrated along river and creek channels where detail is crucial. The strategic increase in cell size in peripheral areas helps optimize computational efficiency, reducing overall model run time.

The refinement process is controlled through a dedicated layer in TUFLOW that specifies both the locations and degree of mesh refinement required. The DYE model was setup with a base cell size of 80 m with mesh refinement levels along creek channels presented in **DIAGRAM 7**.

DIAGRAM 7: QUADTREE REFINEMENT OF CELL RESOLUTION



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3.4 Terrain modifications

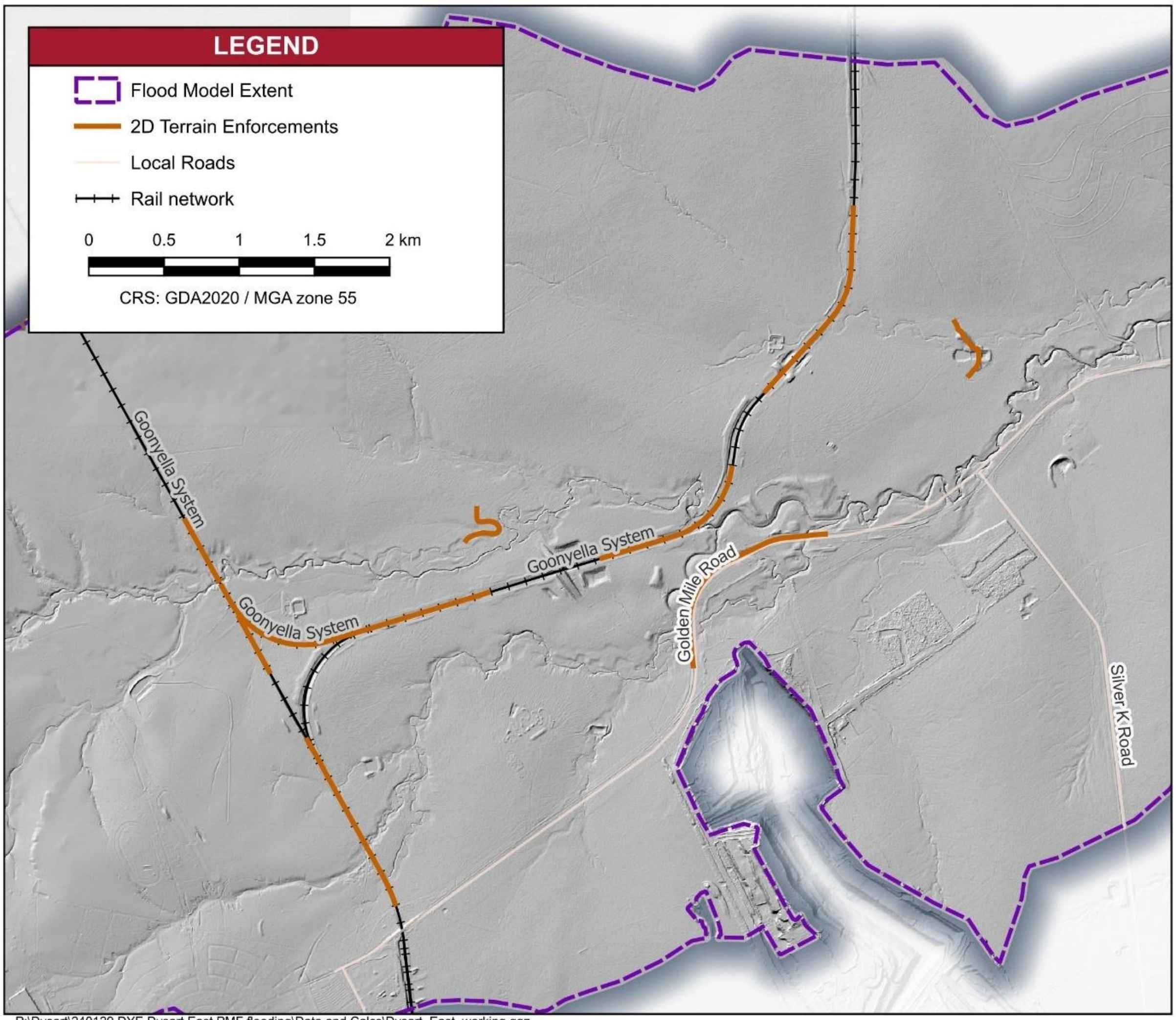
TUFLOW models can be enhanced by strategically placing break-lines to ensure the computational grid properly captures important hydraulic features. This is particularly crucial when modelling linear structures like road embankments, railway corridors, and agricultural dam embankments, where precise representation of crest elevations is essential for accurate flow behaviour. These topographic adjustments are implemented through GIS data layers, which allow for cell elevation modifications using various geometric elements - points, lines, and polygons.

3.4.1 Transport Embankments and Dams

The project required several topographic adjustments and break-lines to be implemented, which are detailed below and illustrated in **DIAGRAM 8**.

- Goonyella Rail System (at multiple locations)
- Golden Mile Road
- Various agricultural dam embankments.

DIAGRAM 8: EMBANKMENT TERRAIN MODIFICATIONS



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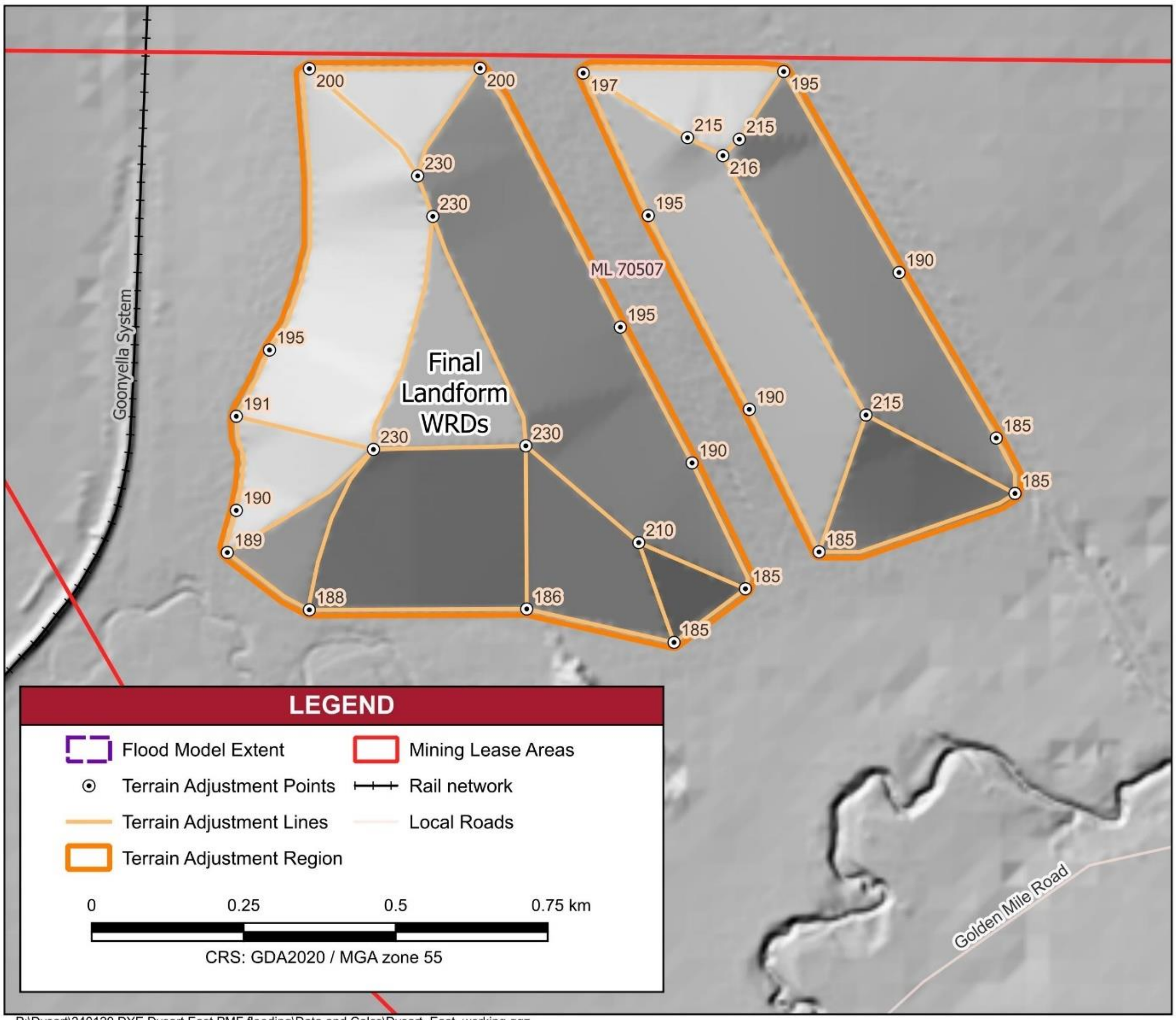
3.4.2 Post-Closure Surface Modifications

The model terrain was updated to reflect represent the approved post-closure modifications. The Final Landform (Plan 7a) shows these modifications, which include:

- two waste rock dumps north of Downs Creek, and
- the underground portal location (ATCW understands this will be backfilled, so it has not been included in the model)

To accurately represent the waste rock dumps shown in **DIAGRAM 3,** several adjustments were made to the TUFLOW model's topography. **DIAGRAM 9** shows the terrain modifications implemented, including multiple break-lines and point elevations to achieve the desired landform.

DIAGRAM 9: FINAL LANDFORM TERRAIN MODIFICATIONS



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3.4.3 Saraji Coal Haul Road

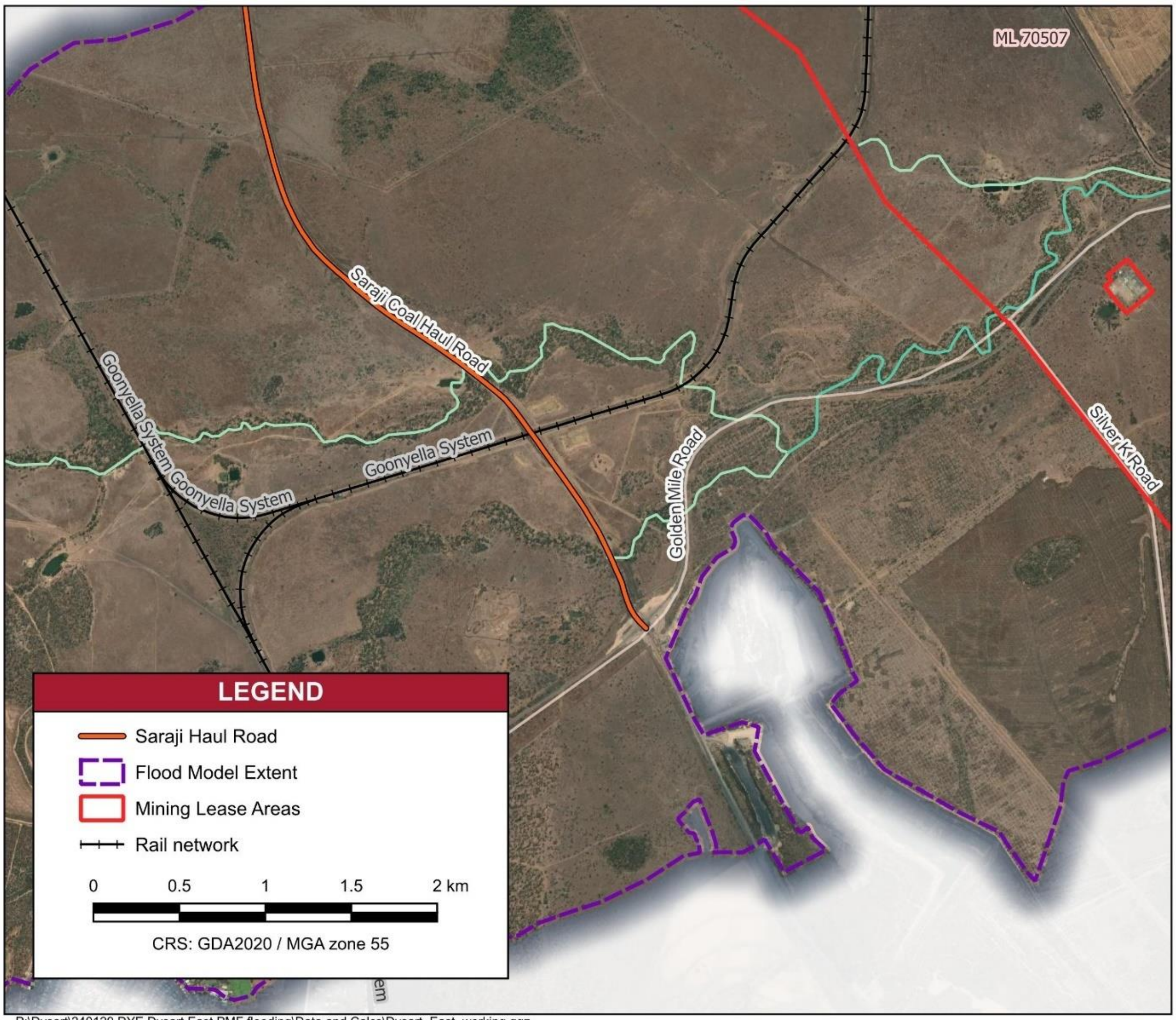
The LiDAR data available for this flood assessment predates several recent developments in the floodplain, including the Saraji Mine Haul Road constructed after the LiDAR capture. To evaluate whether the haul road embankment should be incorporated into the model, BMA provided as-constructed survey data for analysis.

This survey data consists of consolidated contours derived from multiple LiDAR datasets captured in December 2024. A review of the BMA contour data indicates the haul road has been constructed approximately 1.0 to 2.0m above ground level, with additional 1.5m safety berms on either side.

The total height of the haul road (the road base and safety berm) was compared to the Base Case PMF flood depths at Downs Creek Crossing and two other watercourse crossings. This analysis shows that the PMF maximum depths are unlikely to exceed the total road height, however they would meet or exceed the same level as the road base and likely result in overtopping.

As a result, the haul road embankment was excluded from the flood model. This approach is conservative for assessing downstream flood conditions at the DYE as it doesn't account for any flood water storage that might occur behind the haul road.

DIAGRAM 10: SARAJI HAUL ROAD



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3.5 Boundary Conditions

The only input boundary for the model was the direct rainfall over the full extent of the model domain. No other external inflows or point sources were applied. The outflow boundary at the downstream end of the model domain on Downs Creek was set with a bed slope of approximately 0.3%, which was estimated from the topographical survey.

The GSDM spatial distribution pattern for the PMP was rotated and positioned over the Downs Creek catchment. Ellipse E is the smallest possible ellipse that completely contains the entire catchment area to be modelled in TUFLOW. The location of boundary conditions for the DYE model are presented in **DIAGRAM 11**.

The PMP rainfall depths from **TABLE 2** were adjusted for each elliptical zone based on the initial mean rainfall depths outlined in the GSDM guidelines (**Error! Reference source not found.**. The modified rainfall depths are presented in **TABLE 3** which were directly applied to each elliptical zone in the TUFLOW model as rain on grid using the GSDM design temporal distribution **Error! Reference source not found.**.

DIAGRAM 11: TUFLOW BOUNDARY CONDITIONS

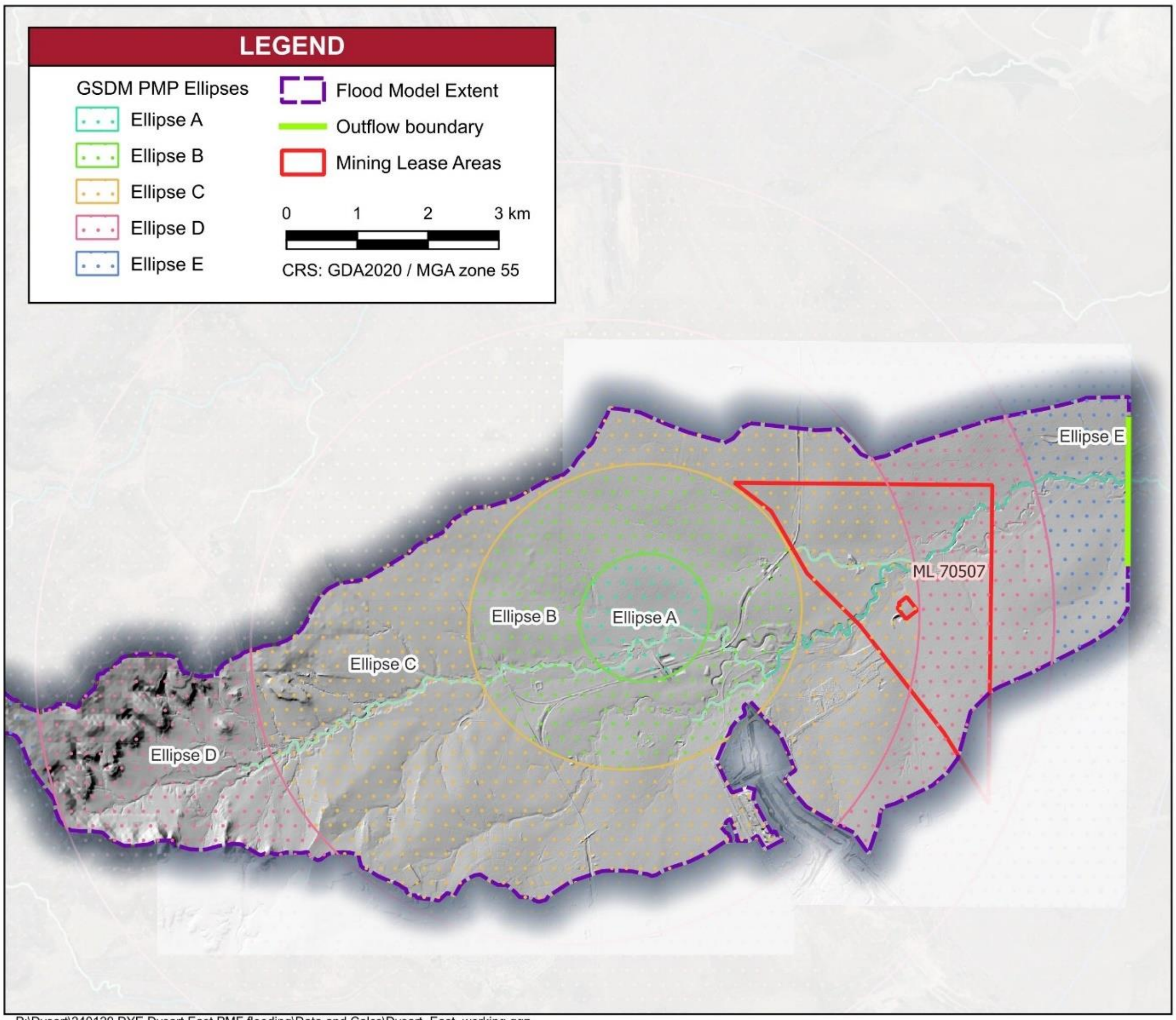

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TABLE 3: MEAN RAINFALL DEPTH (MM) BETWEEN SUCCESSIVE ELLIPSES

Ellipse	0.25 hr	0.50 hr	0.75 hr	1.00 hr	1.50 hr	2.00 hr	2.50 hr	3.00 hr	4.00 hr	5.00 hr	6.00 hr
A	202	294	370	430	554	648	716	785	897	989	1046
B	173	256	326	383	491	574	634	691	791	867	925
C	152	223	283	341	439	507	571	616	695	766	816
D	139	204	260	318	409	469	532	574	647	706	751
E	141	200	248	306	405	461	524	559	628	698	735

3.6 Surface Roughness

Manning's 'n' surface roughness coefficient was used to describe the surface conditions within the model domain. Manning's 'n' roughness coefficients were assigned to the model domain based on land use type and characteristics, as depicted in **DIAGRAM 12**. Selection of the coefficient values for the different surfaces was done by inspection of available aerial imagery and assumption of the proposed surface conditions post-closure. A default surface roughness type adopted for the model is Grazing and Pasture.

Hydraulic roughness reference values **Error! Reference source not found.** were utilised for guidance in selecting Manning's 'n' values to represent natural channels, floodplains and overland flow conditions. Depth varying roughness values are used in direct rainfall models to account for increased bed roughness at shallow depths, gradually transitioning to conventional roughness values as flow depth increases. The depth varying roughness values for the DYE model are presented in **DIAGRAM 13**.

DIAGRAM 12: BASE CASE MANNINGS ROUGHNESS

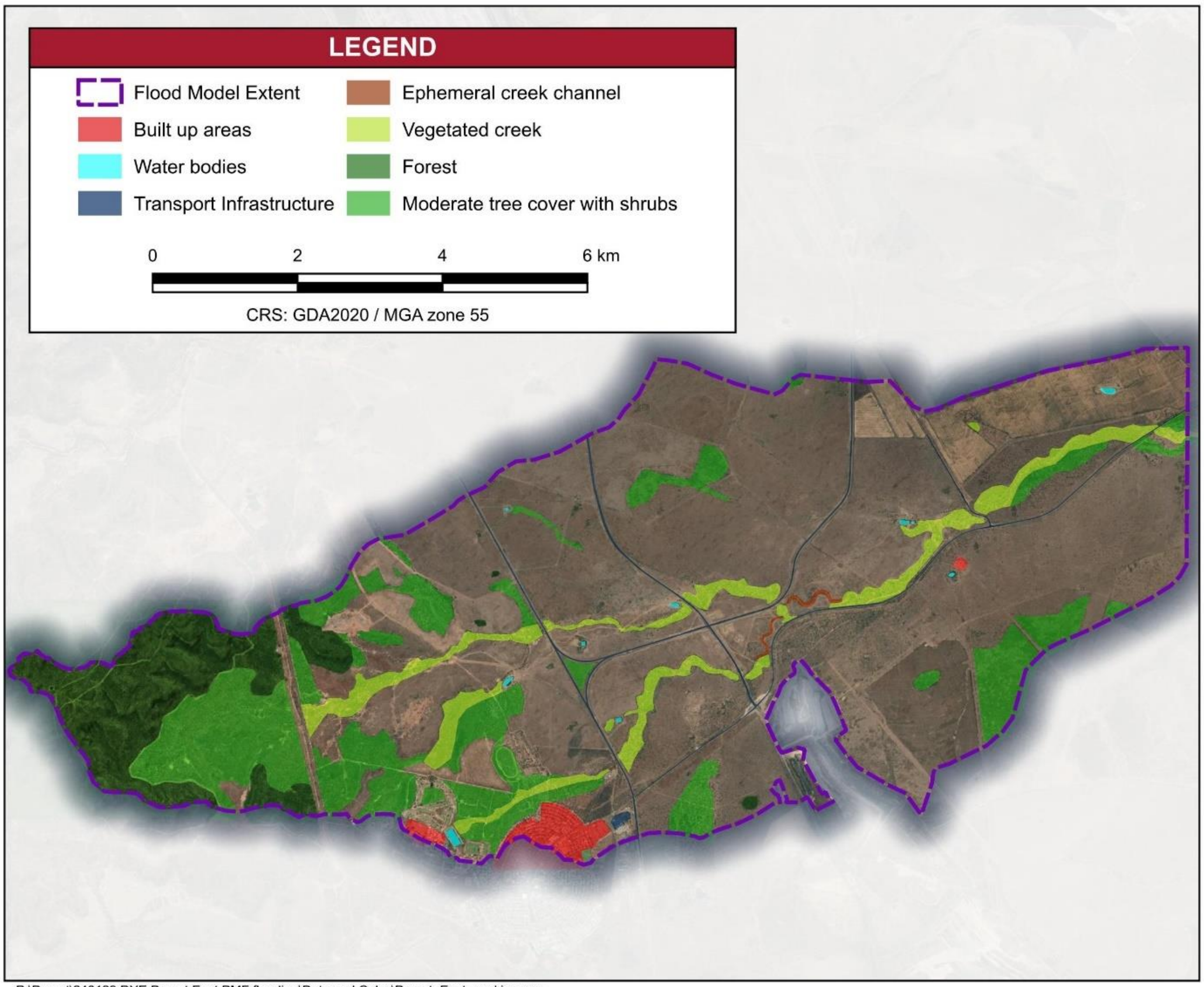

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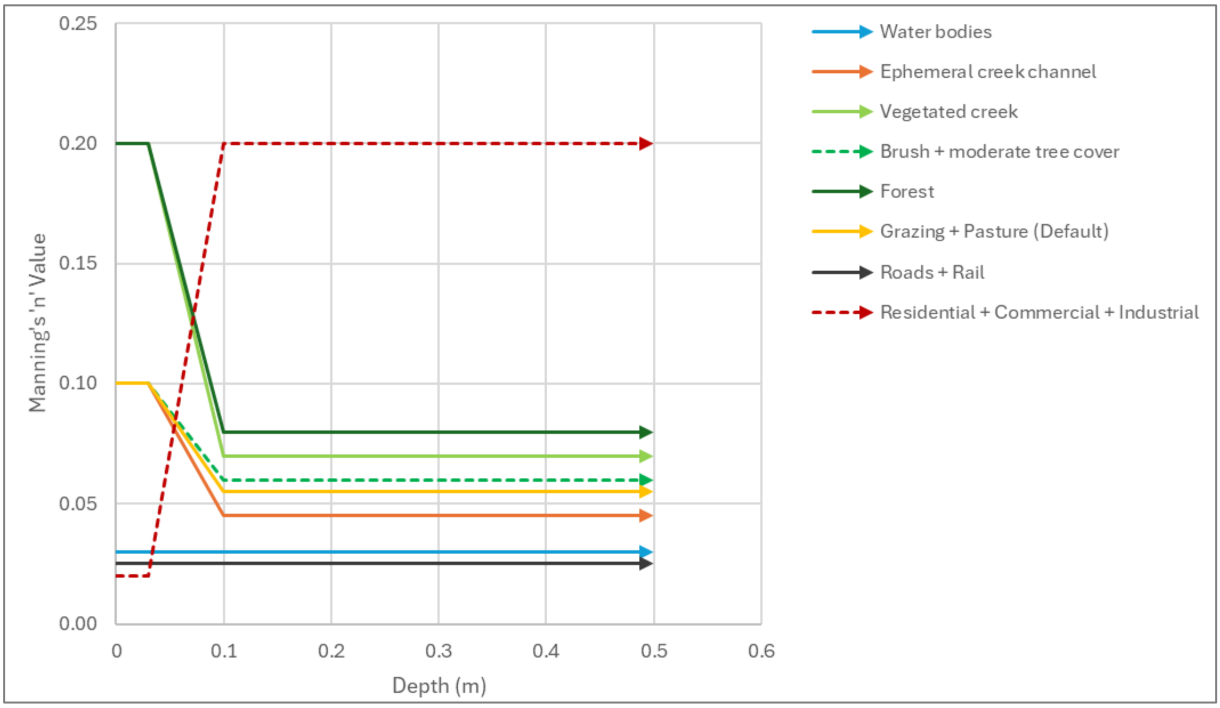
DIAGRAM 13: DEPTH VARYING MANNINGS 'N' ROUGNESS COEFFICIENTS



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3.7 Culverts and Bridges

Multiple road and rail crossings traverse Downs Creek within the study area, including:

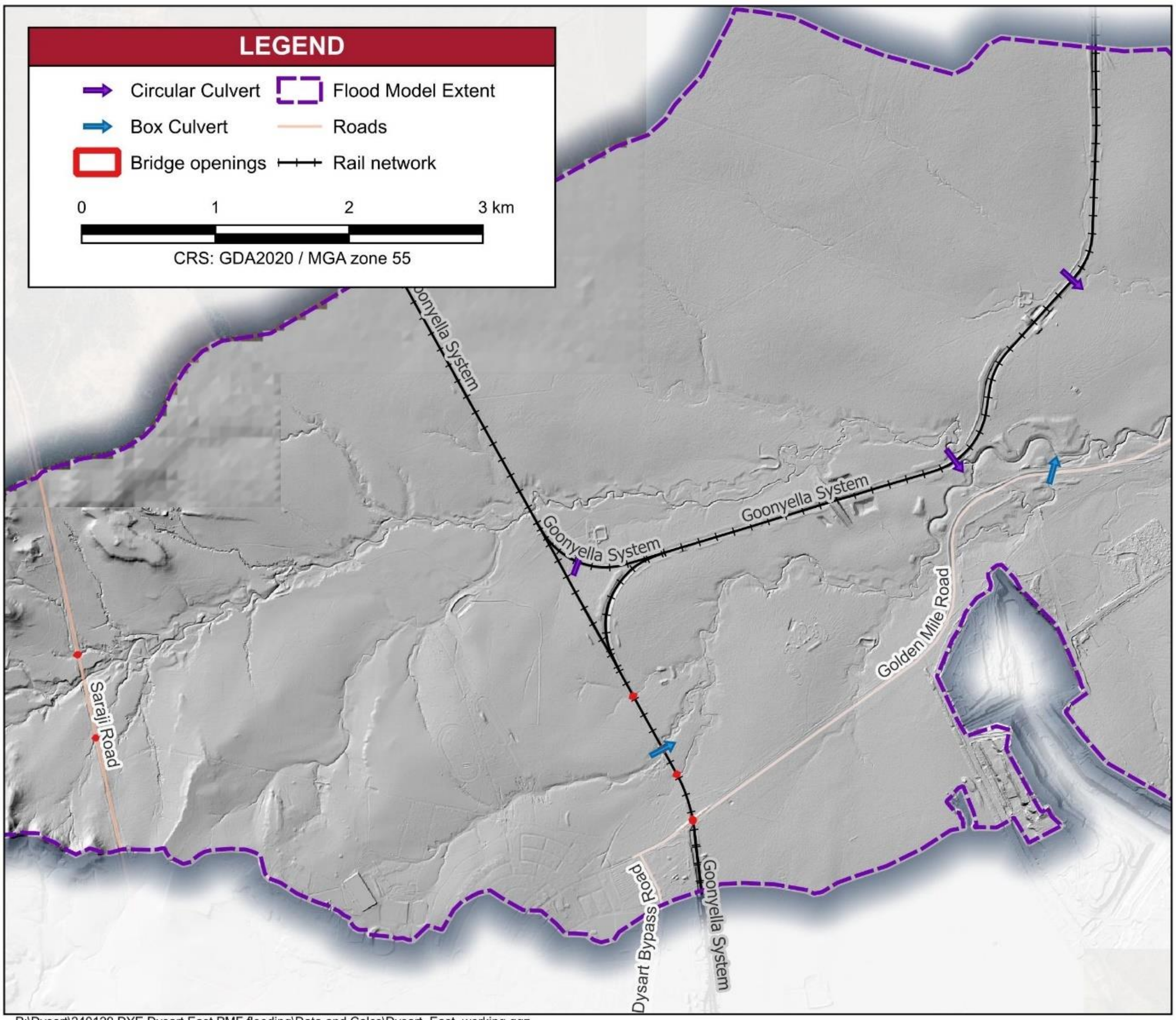
- Saraji Road
- Goonyella Rail System (at multiple locations)
- New Saraji coal haul road
- Vermont Mine access road
- Golden Mile Road

These crossings consist of both culverted and bridge structures. Hydraulic structures included in the DYE flood model are presented in **DIAGRAM 14**.

While PMP flood assessments typically assume all culverts are blocked by debris, this assessment includes major culverts without blockage to provide conservative flood levels for the DYE area of interest.

Detailed structural information (culvert dimensions, number of barrels, pier count, deck height, and thickness) was not available. However, major culverts visible in aerial imagery were incorporated into the TUFLOW model, with their invert levels determined from LiDAR terrain data. For other key culvert openings and bridges along linear infrastructure embankments, gaps were cut into the terrain data using terrain modifiers in TUFLOW to represent these structures.

DIAGRAM 14: CULVERTS AND BRIDGES



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4 RESULTS

4.1 Results at Reporting Locations

The results of flooding on the post-closure conditions of the DYE and Downs Creek are discussed in the following sections. The locations at which results are reported are shown on **DIAGRAM 15** with the results provided in **TABLE 4**.

As can be seen in the table, for the PMF event there is virtually no change after mining. Peak flow rates and flow velocities remaining essentially constant with very minimal change in peak flood levels. The critical storm duration remains unchanged at all locations.

Overall, the mining activities appear to have minimal hydrological impact across all monitoring locations, with changes being either non-existent or very marginal for all measured parameters.

DIAGRAM 15: RESULTS REPORTING LOCATIONS

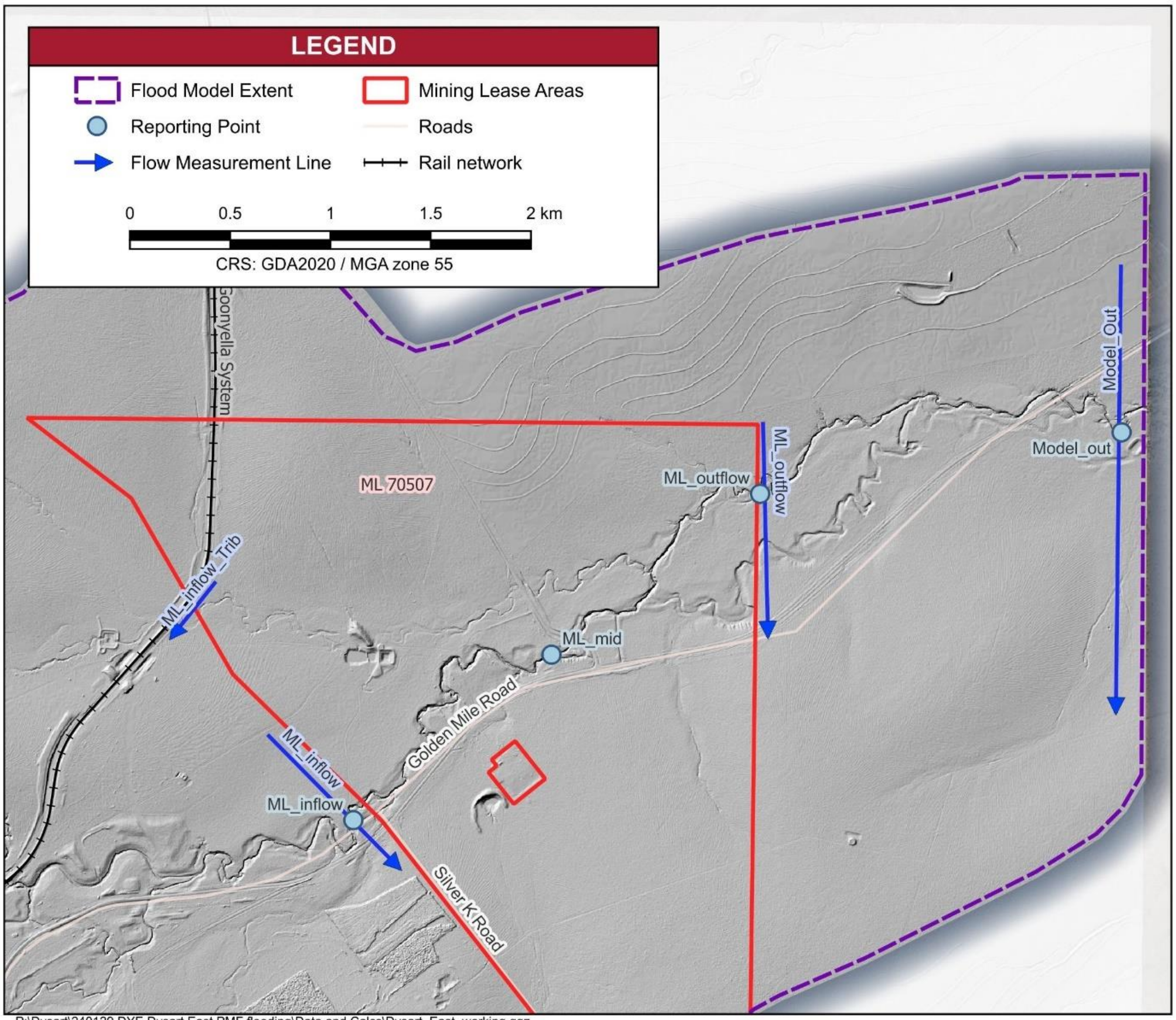

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TABLE 4: HYDRAULIC MODELLING PMF RESULTS

Location	Parameter	Base Case	Post Mine
ML70507 Downs Creek Upstream	Peak Flow Rate (m³/s)	3,177	3,177
	Maximum Water Surface Elevation (m AHD)	189.37	189.38
	Maximum Flow Velocity (m/s)	1.53	1.53
	Critical Storm Duration	2.0 hr	2.0 hr
ML70507 Tributary Upstream	Peak Flow Rate (m³/s)	748	750
	Critical Storm Duration	1.5 hr	1.5 hr
ML70507 Downs Creek Midway	Maximum Water Surface Elevation (m AHD)	185.66	185.67
	Maximum Flow Velocity (m/s)	2.05	2.07
	Critical Storm Duration	2.5 hr	2.5 hr
ML70507 Downs Creek Downstream	Peak Flow Rate (m³/s)	4,000	4,002
	Maximum Water Surface Elevation (m AHD)	182.21	182.21
	Maximum Flow Velocity (m/s)	1.74	1.74
	Critical Storm Duration	2.5 hr	2.5 hr

4.2 Base Case Flood Maps

The PMF flood depth results for the Base Case are presented in **DIAGRAM 16**. The rain-on-grid modelling generates flows in all branches of Downs Creek with peak depths in the main channel reaching 6.0m deep. The primary inflows to the DYE arrive from Downs Creek, flooding the main channel and wider floodplain to a width of approximately 900m, including inundation of Golden Mile Road. The Goonyella Rail embankment is overtopped by 1.2m at the Downs Creek crossing, and by 1.0m at the northern tributary located adjacent to the Final Landform WRDs.

Peak flow velocities are presented in **DIAGRAM 17** and show slow to moderate flow velocity across the entire model domain due to the rain-on-grid approach. Watercourses and tributaries of Downs Creek have typical peak velocities of 1.5 m/s, with peak velocities in Downs Creek reaching 2.5 m/s.

4.3 Post Mine Flood Maps

DIAGRAM 18 and **DIAGRAM 19** display the maximum flood depths and velocities for the Post Mine PMF flood. The post-mine hydraulic characteristics closely resemble the base case results, with notable differences only at the two northern waste rock dumps.

The final landform's southern embankment of each waste rock dump extends into the PMF flood zone, experiencing water depths of 1.0 to 1.5 m. While peak flow velocities near these southern embankments typically remain under 1.0 m/s, they reach up to 2.0 m/s in specific areas.

Additionally, the waste rock dumps redirect small overland runoff channels from the north, causing water to accumulate against their northern embankments before being diverted around the sides to rejoin the main Downs Creek floodplain. This redirection is most evident where flows travel down Lake Vermont Mine Access Road, reaching velocities of 2.5 m/s.

DIAGRAM 16: PMF DEPTHS WITHIN ML70507 - BASE CASE

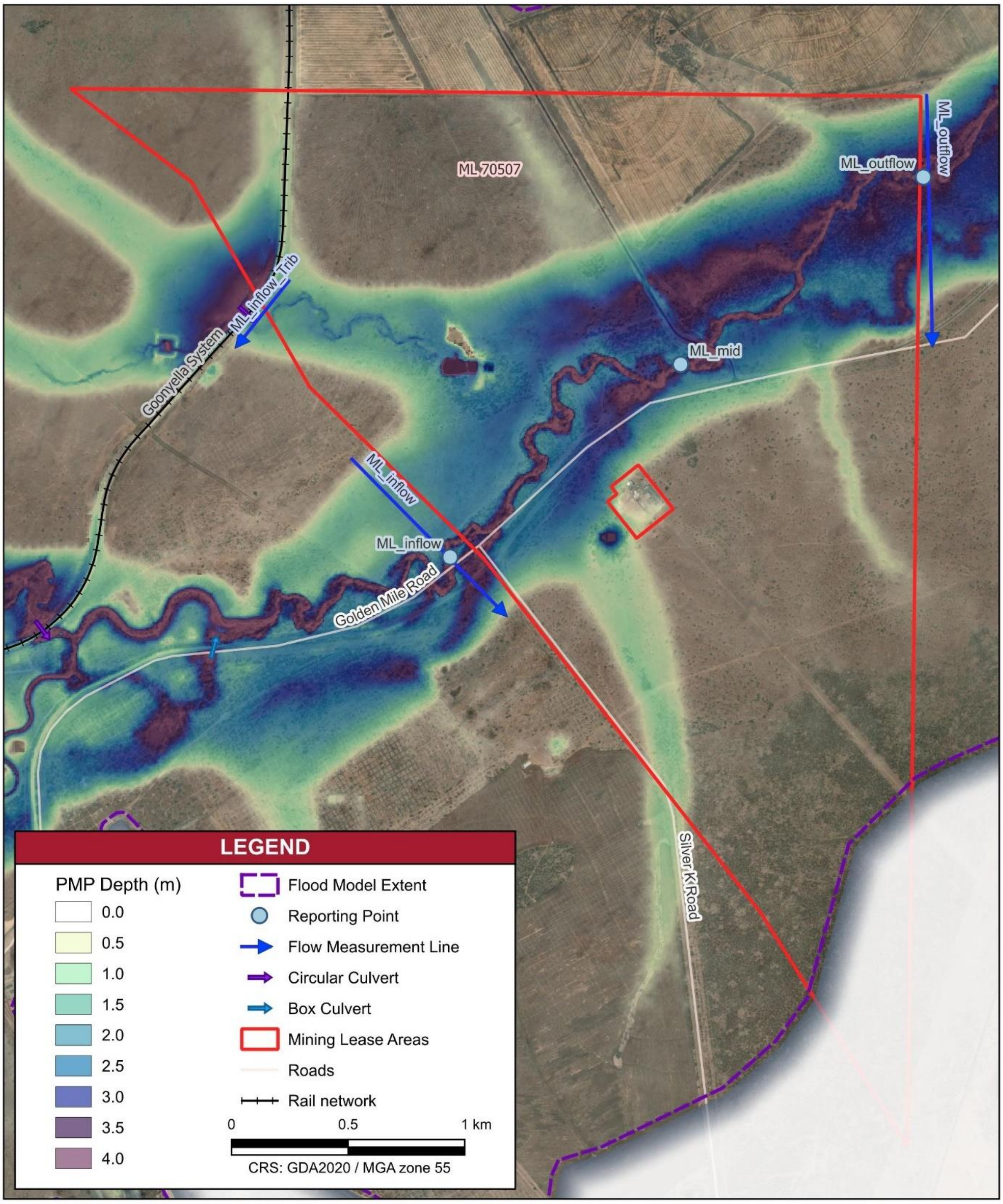

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DIAGRAM 17: PMF VELOCITIES WITHIN ML70507 - BASE CASE

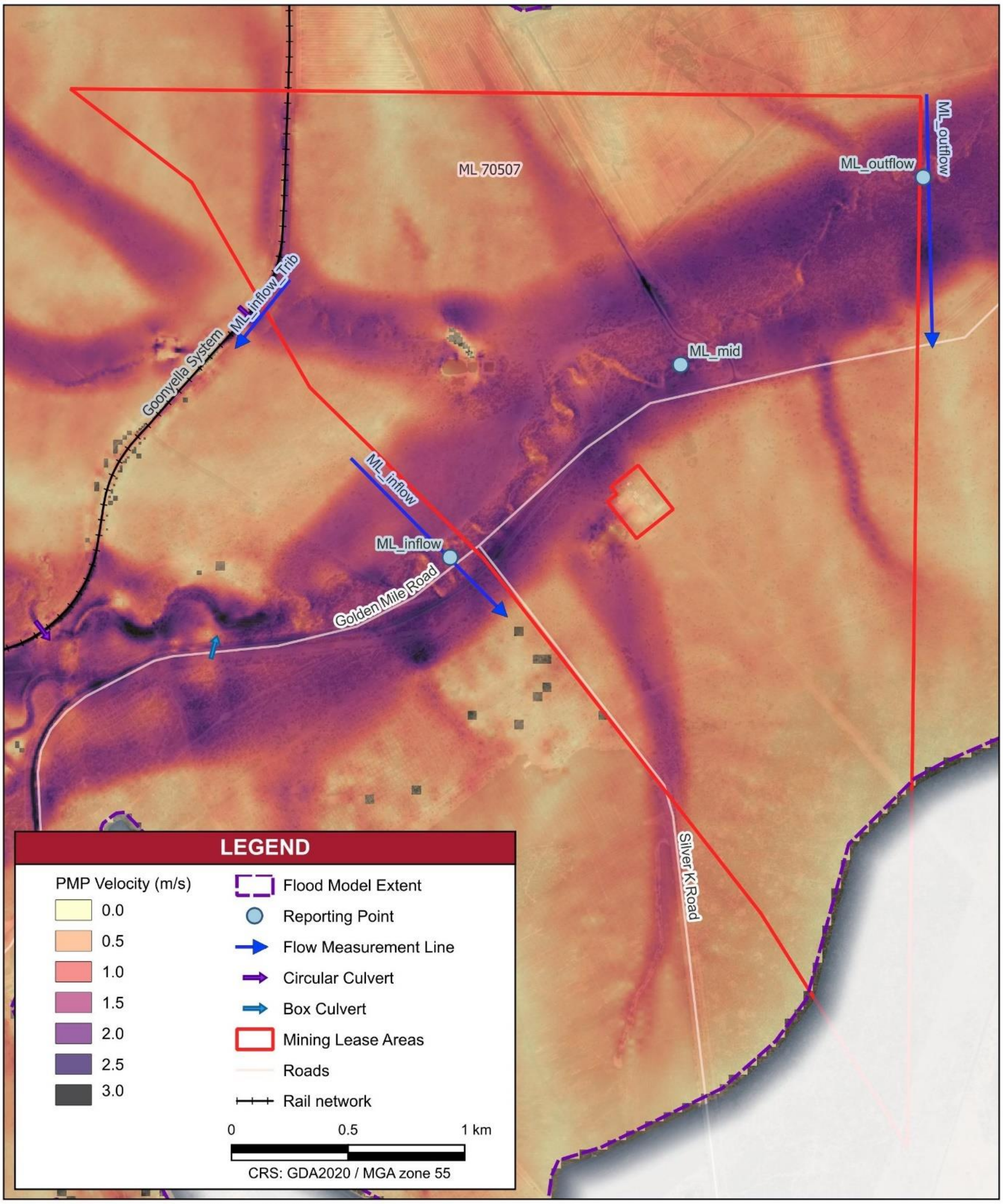

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DIAGRAM 18: PMF DEPTHS WITHIN ML70507 – POST MINE

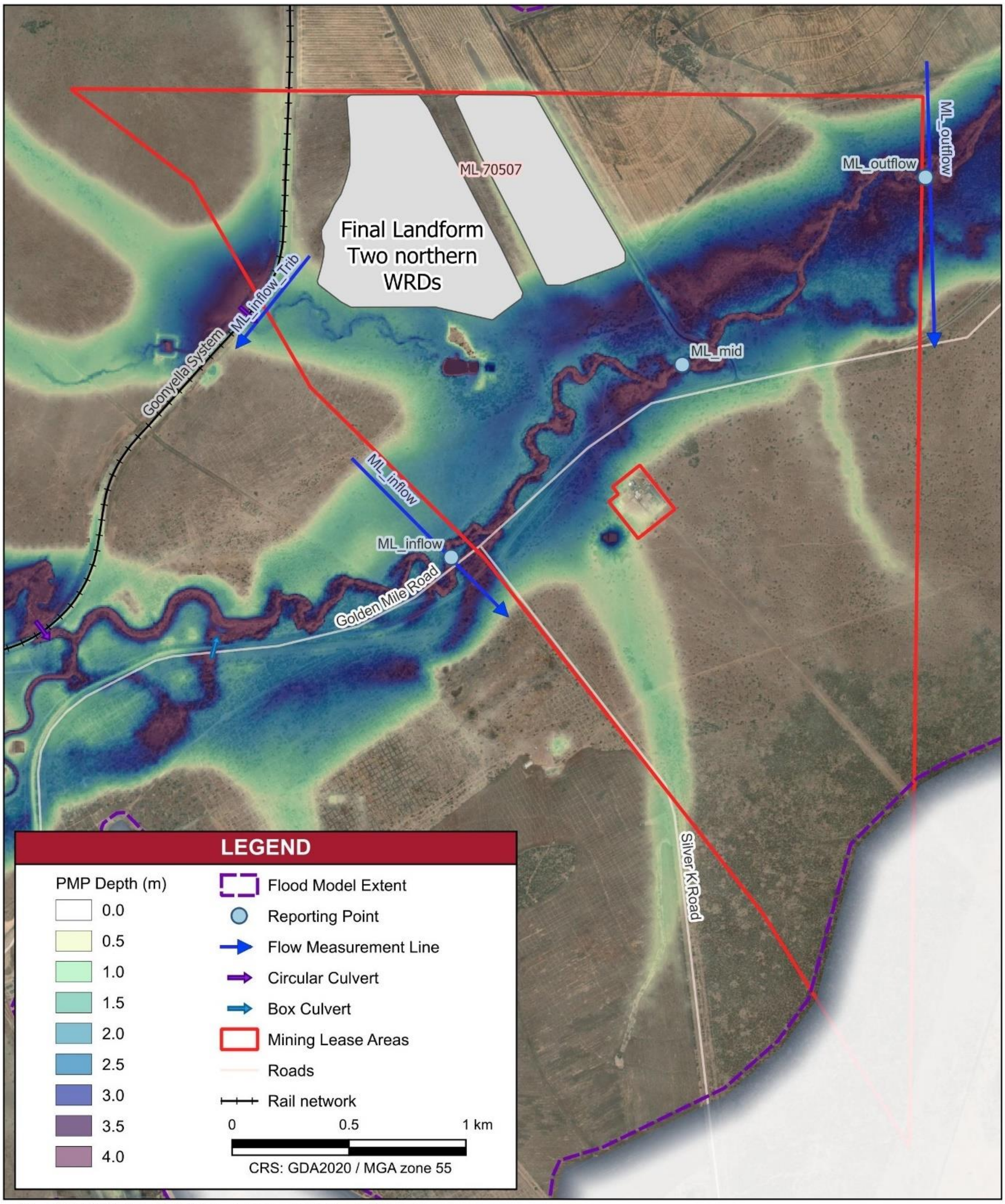

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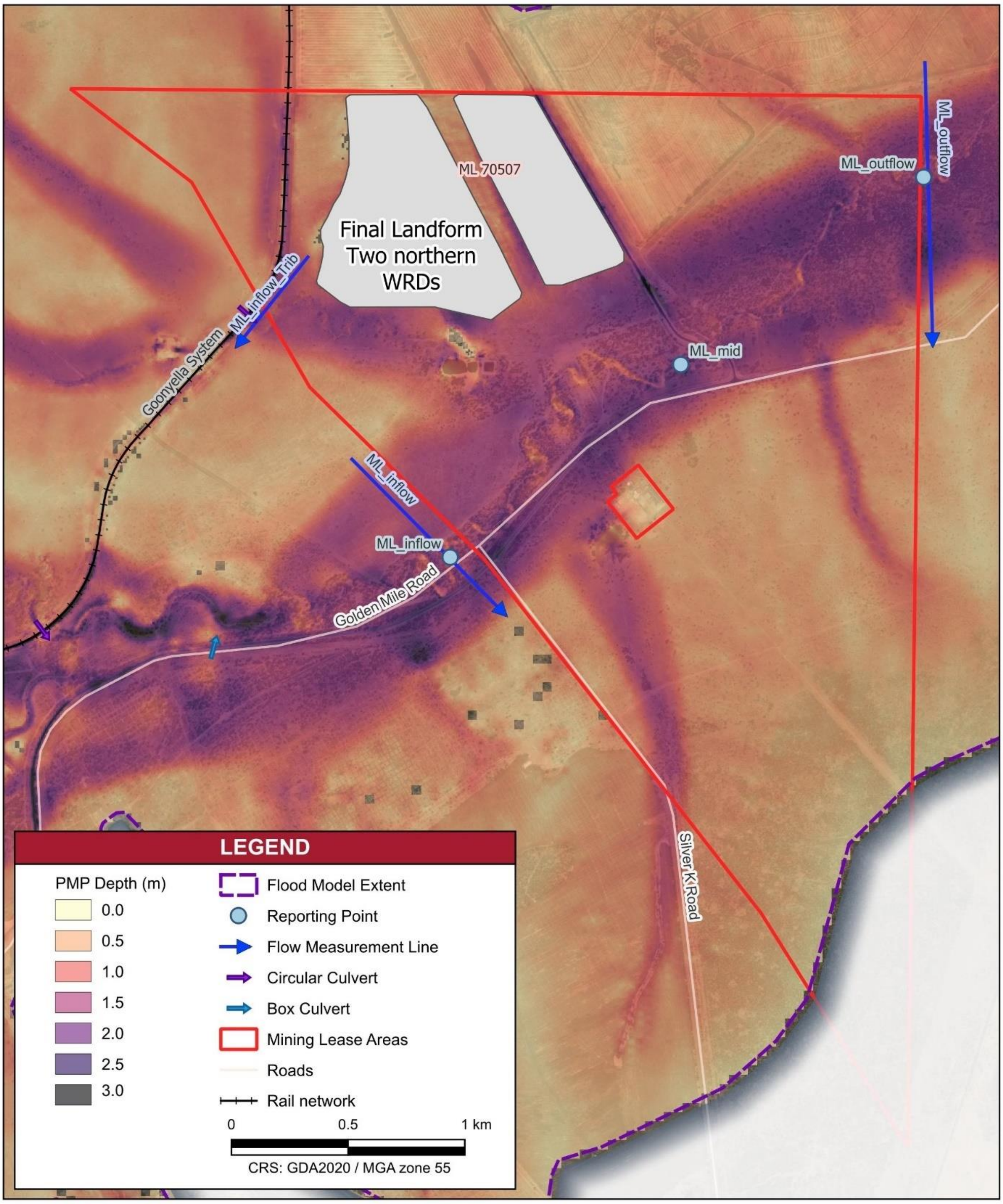
DIAGRAM 19: PMF VELOCITIES WITHIN ML70507 – POST MINE



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4.4 PRCP inputs and discussion

With reference to the PRCP guidelines **Error! Reference source not found.**, the main aims of this flood risk assessment were to assess the flood risk to any remaining mine infrastructure and along Downs Creek. Based on the final landform of the two northern waste rock dumps, hydraulic connectivity is maintained along Downs Creek and the pre mining hydraulic regime is maintained.

Along the southern extent of the waste rock dumps, maximum flood depths during the PMF can reach approximately 1.5 m with flow velocities reaching 2.0 m/s in localised areas. This may contribute to erosion risk, and the final closure design should incorporate erosion protection to reduce this risk as required.

The two waste rock dumps contribute to some localised flood impacts within and outside the DYE mining lease. These changes are presented in **DIAGRAM 20** and **DIAGRAM 21** and include:

- Increase in flood depth of 1.0 m to the north of the waste rock dumps, outside ML70507, where small overland runoff channels pond and get redirected around the sides
- This redirection is most evident where flows travel down Lake Vermont Mine Access Road, with peak depths increasing by 600-800 mm and peak velocities increasing by 1.2 to 1.5 m/s
- General increases in peak flood level in the Downs Creek floodplain of 30-100 mm, with an increase of 20-30 mm along parts of Golden Mile Road
- Peak flood depths downstream of the Goonyella Rail embankment increase by 30-40 mm
- Peak flood depths at the Powerlink Dysart Substation increase by 2 mm.

DIAGRAM 20: PMF PEAK FLOOD LEVEL CHANGE – POST MINE

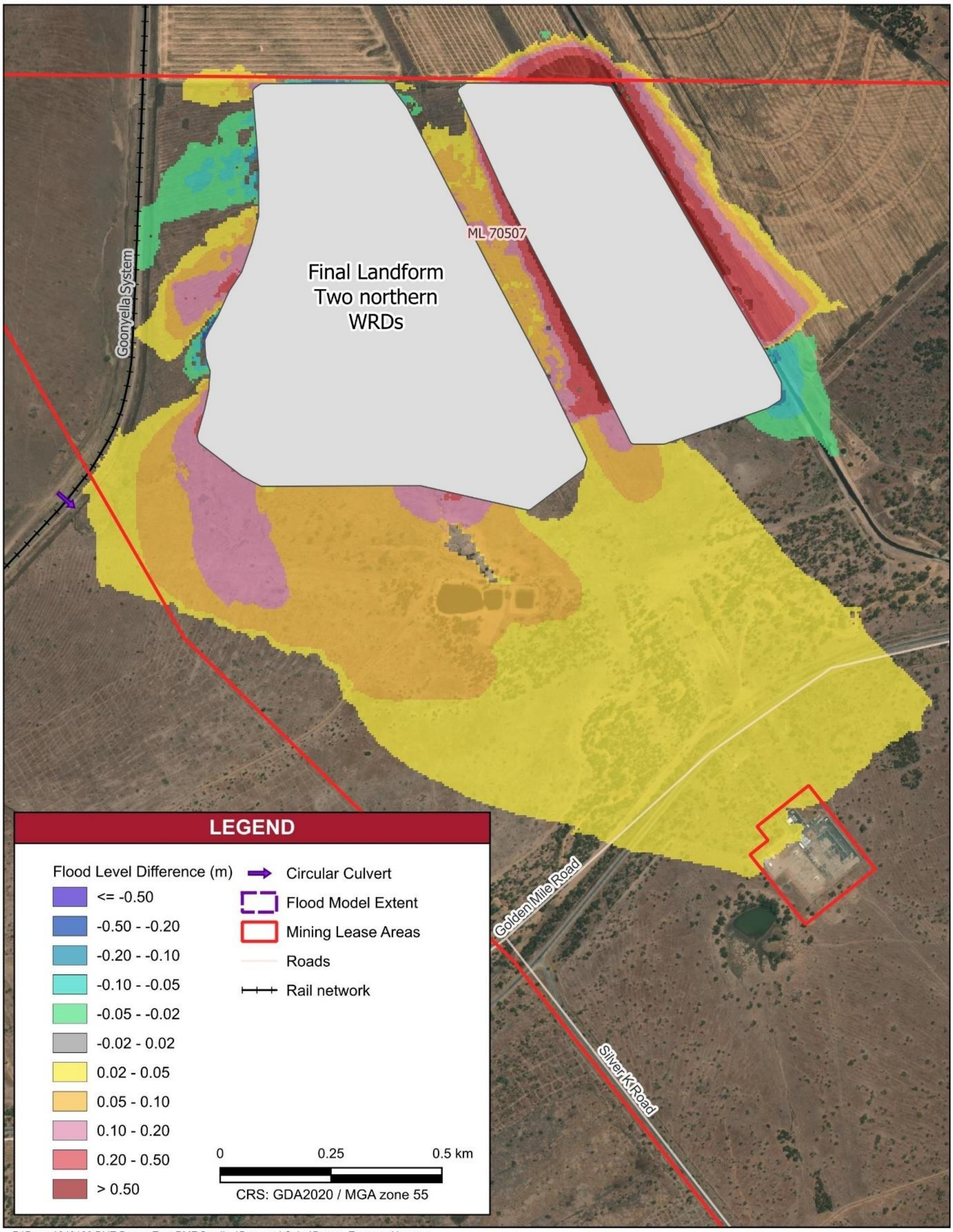

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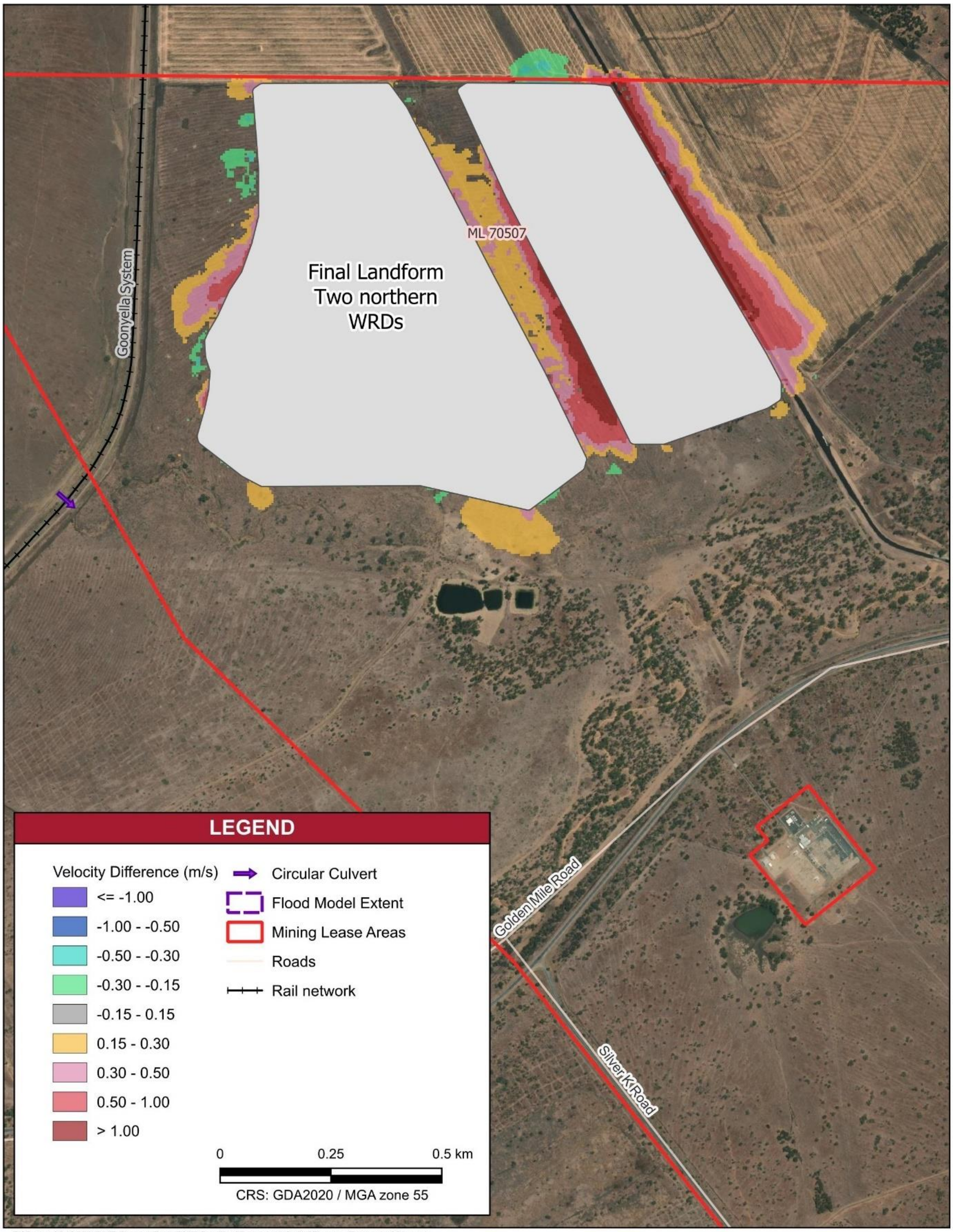
DIAGRAM 21: PMF PEAK VELOCITY CHANGE – POST MINE



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5 SUMMARY AND CONCLUSIONS

5.1 Project Overview and Method

The Dysart East Coal Project (DYE), owned by Bengal Coal Pty Ltd, commissioned ATCW to undertake a flood risk assessment study as part of their Progressive Rehabilitation and Closure Plan (PRCP). This study focused on developing a flood profile for the probable maximum flood (PMF) event to assess flood risks and ensure compliance with environmental regulations.

The DYE is located 7 km northeast of Dysart within Isaac Regional Council. The upper reaches of Downs Creek (a 3rd-order stream) pass through ML70507. Multiple road and rail crossings traverse the creek upstream from the DYE.

The study involved a comprehensive hydrologic assessment using the Generalised Short Duration Method (GSDM) with a 2D hydraulic model developed using TUFLOW software to analyse the post-closure site conditions. The flood model incorporated various infrastructure elements including road and rail crossings.

This assessment meets requirements under Section 41C of the Environmental Protection Regulation and aligns with Australian Rainfall and Runoff (ARR) 2019 guidelines for flood estimation. The study provides flood risk data for the PRCP submission and future site management planning.

5.2 Conclusions & Recommendations

Hydraulic connectivity along Downs Creek will be maintained post-mining, restoring the pre-mining hydraulic regime. The southern extent of the waste rock dump may require specific erosion protection measures due to flood depths and velocities during PMF events. The post-closure design should incorporate appropriate erosion protection measures in high-risk areas.

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APPENDIX A – PROBABLE MAXIMUM PRECIPITATIOMN ESTIMATION

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Generalised Short-Duration Method (GSDM)

LOCATION INFORMATION

Catchment Name	Downs Creek	*Reference:*
Catchment Area	67.0 km²	*Generalised Short Duration Method*
State	Qld	*(BOM, 2003)*

Latitude	Longitude	Duration Limit	Prop Smooth	Prop Rough
-22.55	148.373	6	0	1

ELEVATION ADJUSTMENT FACTOR (EAF)

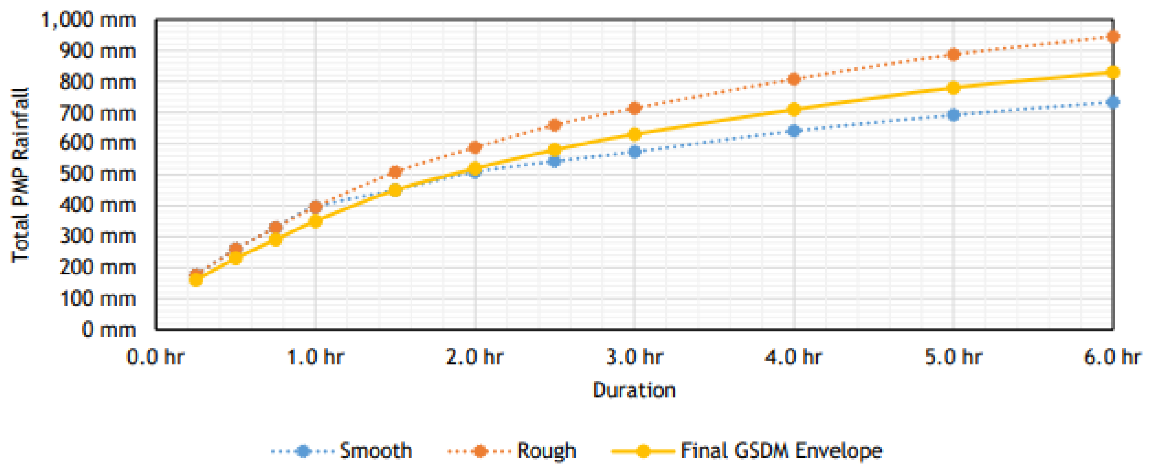
Mean Elevation at Site Location:	215 m	EAF	1

MOISTURE ADJUSTMENT FACTOR (MAF)

MAF	0.872

PMP VALUES (mm)

Duration (hours)	Initial Depth - Smooth (DS)	Initial Depth - Rough (DR)	PMP Estimate = (Ds x S + DR x R) x MAF x EAF	Rounded PMP Estimate (nearest 10 mm)
0.25 hr	176.2 mm	176.2 mm	153.7 mm	160 mm
0.50 hr	259.0 mm	259.0 mm	225.9 mm	230 mm
0.75 hr	328.7 mm	328.7 mm	286.6 mm	290 mm
1.00 hr	395.3 mm	395.3 mm	344.7 mm	350 mm
1.50 hr	450.5 mm	508.3 mm	443.2 mm	450 mm
2.00 hr	508.5 mm	587.4 mm	512.2 mm	520 mm
2.50 hr	543.4 mm	659.9 mm	575.4 mm	580 mm
3.00 hr	573.6 mm	714.1 mm	622.7 mm	630 mm
4.00 hr	640.8 mm	807.8 mm	704.4 mm	710 mm
5.00 hr	692.2 mm	887.3 mm	773.7 mm	780 mm
6.00 hr	734.1 mm	945.4 mm	824.4 mm	830 mm



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Reviewed by		Date	