JELLINBAH – CENTRAL NORTH EXTENSION ASSOCIATED WATER LICENCE

PREPARED FOR

JELLINBAH GROUP PTY LTD

ON BEHALF OF THE JELLINBAH EAST JOINT VENTURE

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ASSOCIATED WATER LICENCE APPLICATION

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AARC	AARC Environmental Solutions Pty Ltd
ANZECC	Australian and New Zealand Environment and Conservation Council
AWL	Associated Water Licence
BOM	Bureau of Meteorology
CHMPs	Cultural Heritage Management Plans
CHRC	Central Highlands Regional Council
CSG	Coal Seam Gas
CNE	Central North Extension
DAWE	Department of Agriculture, Water, and the Environment
DES	Department of Environment and Science
DNRME	Department of Natural Resources, Mines and Energy
DoEE	Department of Environment and Energy
EA	Environmental Authority
EC	Electrical Conductivity
EHP	Department of Environment and Heritage Protection
EIS	Environmental Impact Statement
EP Act	Environmental Protection Act 1994
EPBC Act	Environment Protection and Biodiversity Conservation Act
GDEs	Groundwater Dependent Ecosystems
IESC	Independent Expert Scientific Committee
JBT	JBT Consulting Pty Ltd
mbgl	metres below ground level
MDL	Mineral Development Licence
ML	Mining Lease
Mtpa	Million tonnes per annum
PCI	Pulverised Coal Injection
PD	Preliminary Documentation

REMP	Receiving Environment Monitoring Program
ROM	Run-of-mine
TDS	Total Dissolved Solids
TEC	Threatened Ecological Communities
WQOs	Water Quality Objectives

1.0 INTRODUCTION

Jellinbah Mining Pty Ltd (Jellinbah) operates and manages open-cut coal operations approximately 30 kilometres (km) north-north-east of Blackwater and 180 km west of Rockhampton, within the Central Highlands Regional Council (CHRC) and Isaac Regional Council (IRC) areas.

The existing Jellinbah Coal Mine (the Mine) encompasses 17 approved Mining Leases (MLs): ML 2418, ML 6992, ML 80140, ML 80184, ML 80068, ML 80129, ML 80018, ML 80053, ML 80108, ML 80165, ML 70445, ML 70446, ML 70448, ML 70449, ML 700011, ML 700012, ML 700013 (Figure 1). Jellinbah is planning to commence extractive mining activities in ML 700011 and overburden placement in ML 700012, and ML 700013. These three MLs constitute the Jellinbah Central North Extension (the CNE) (Figure 1). The start of mining at the Central North Extension represents the commencement of associated water take from MLs.

Figure 1 shows the regional location of the Jellinbah Coal Mine and the MLs of the CNE.

Following changes to Queensland's *Environment Protection Act 1994* (EP Act), *Mineral Resources Act* 1989, and the *Water Act* 2000 in December 2016, Jellinbah is required to apply for an Associated Water Licence (AWL) in order to exercise rights to underground water for the CNE MLs.

1.1 PROJECT DESCRIPTION

The Jellinbah Coal Mine encompasses four operating mine areas – Jellinbah Central, Mackenzie North, Jellinbah Plains and Plains South. Mining activities at Plains South are planned to extend into the Central North and Central North Extension areas. Jellinbah South is currently inactive.

The CNE Project extends approved mining activities further to the east and expands the area available for spoil dumping and topsoil placement. The CNE is anticipated to augment the current production of the Mine by an average of 1.0 Mt per annum (Mtpa) run-of-mine (ROM) coal, thereby extending the Mine's overall production life. No increase in mining or production rates is proposed for the Mine, as a result of the CNE. No changes to the currently approved mining methods are proposed as part of the CNE Project.

The life of the Jellinbah Central North operation, including the proposed CNE, is anticipated to be greater than 20 years based on the current economic assessment of the resource. A conceptual layout of the proposed project area and infrastructure is shown in Figure 2. Development of the CNE will involve construction and operation of the following major elements:

- Open-cut mining excavations;
- Access / haul roads;
- Sediment dams for water management;
- Water management drains; and
- Topsoil stockpiling and spoil dumping.

The CNE area represents a small extension of the approved Central North mining area.

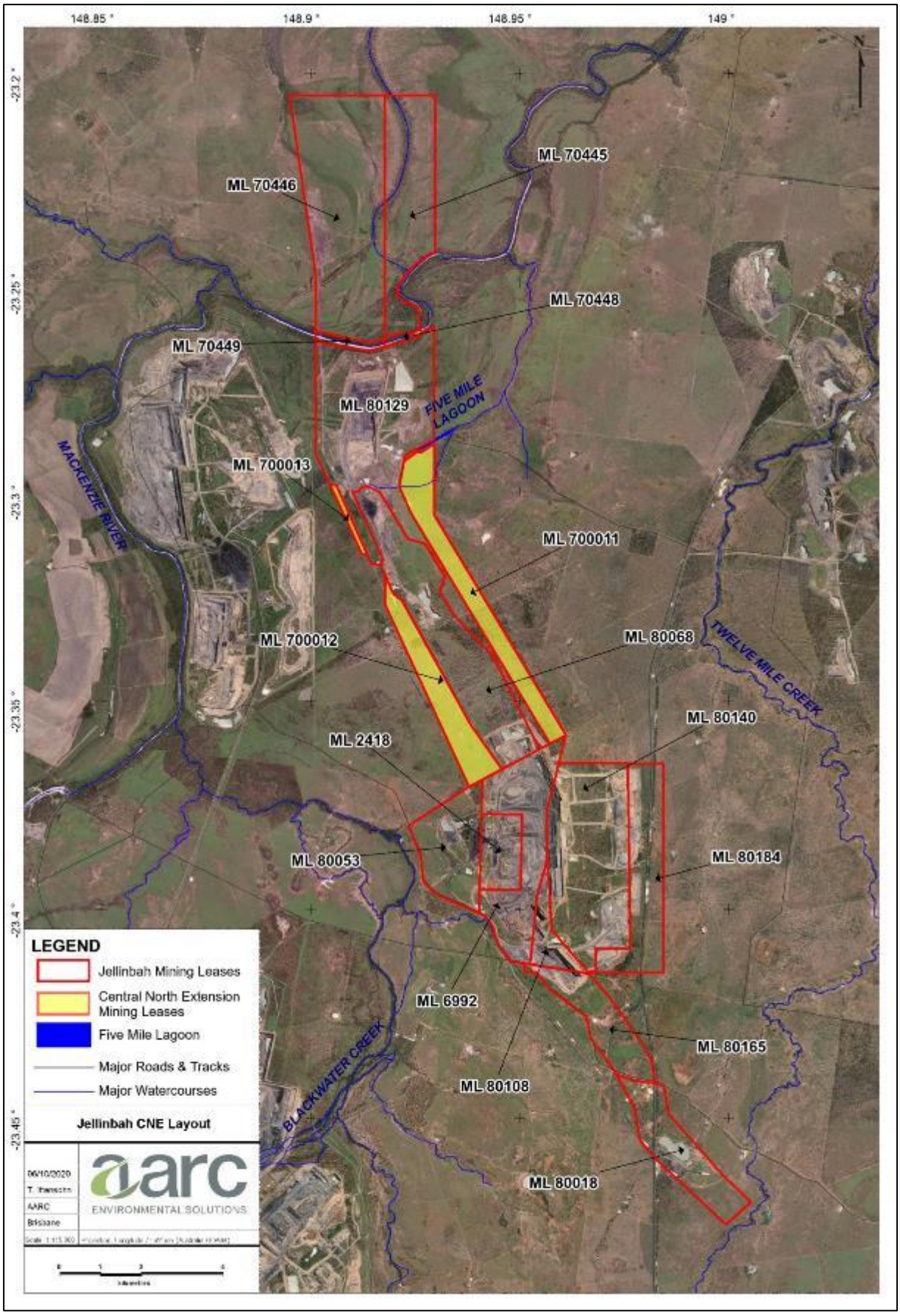

Figure 1 Jellinbah Coal Mine Site Overview

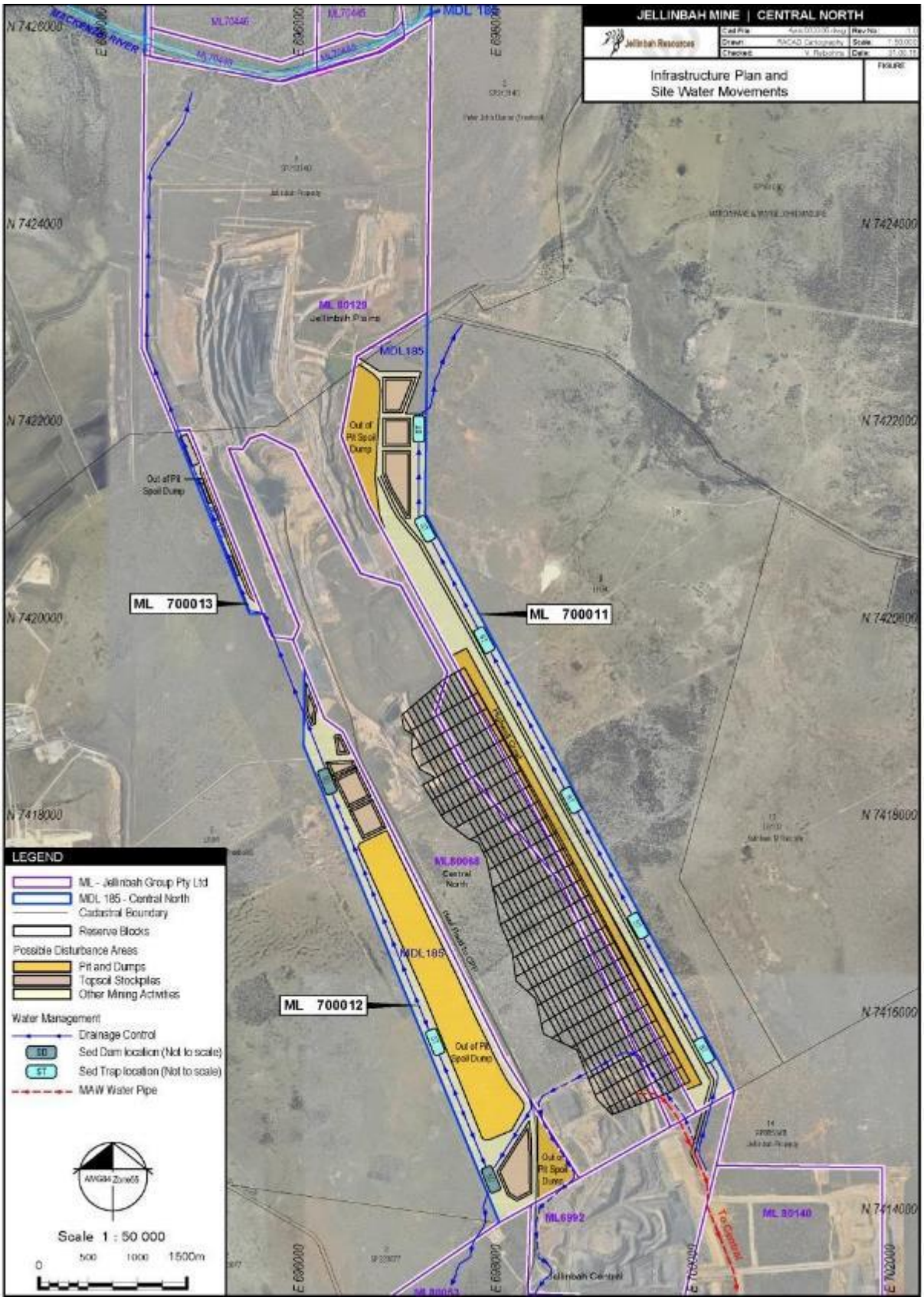

Figure 2 Conceptual Mine Layout (CNE)

1.2 PROJECT APPROVALS

The CNE was submitted for approval as a major amendment to the existing Environmental Authority (EA) for the Jellinbah Coal Mine (EPML00516813) in August 2015. The EA was approved in January 2017, with the MLs granted in July 2017. EPBC Act Assessment was completed and approved (Appendix F) in April 2020. The take of associated water from ML700011 has not yet commenced and is subject to approval of the AWL. Table 1 outlines the project application and approval timeline.

Table 1 Central North Extension Timeline

Date	Project Milestone
9 July 1996	MDL 185 Granted
August 2015	EA Amendment & ML Application made (Appendix B)
January 2017	EA Granted (Appendix A)
July 2017	ML 700011, ML 700012, and ML 700013 Granted (Appendix C)
March 2018	Lodged EPBC Referral
May 2018	DoEE Assessment Decision (Controlled Action)
July 2018	DoEE issued Information Request
October 2018	Lodged response to DoEE Information Request
December 2018	DoEE issued additional Information Request
March 2019	Lodged Preliminary Documentation
June 2019	Received IESC Advice (Appendix D)
November 2019	Lodged revised Preliminary Documentation addressing the IESC Advice
December 2019	Revised Preliminary Documentation accepted by DoEE as addressing all IESC requirements (Appendix E)
January & February 2020	Public Notification Period
April 2020	CNE approved by DAWE (Previously DoEE) (Appendix F)

1.3 LEGISLATIVE REQUIREMENTS

In December 2016, the Queensland Parliament passed legislation amending the *Environment Protection Act* 1994 (EP Act), *Mineral Resources Act* 1989, and the *Water Act* 2000. The amended legislation places additional approval requirements on new or developing mining projects whose operations are in a regulated underground water area and would interact with underground water resources. Broadly, under the new legislation, projects fall into one of three categories:

- resource activities with existing approvals who had commenced operation, and taking or interfering with underground water, prior to December 6, 2016;
- resource activities currently in an approvals process, or with existing approvals, but have not yet commenced operation, and taking or interfering with underground water, prior to December 6, 2016; and
- New resource activities, with approvals processes not commenced as of December 2016.

The CNE falls into the second of these categories, requiring Jellinbah to apply for an AWL for the extension's MLs (700011, 700012, and 700013) prior to undertaking mining operations, which may take or interfere with underground water.

2.0 SUPPORTING INFORMATION

The applicant must provide information to support each of the criteria under section 1250E(c) to (i) of the *Water Act* 2000 including, but not limited to, the minimum requirements outlined in Table 2.

Table 2 Water Act Criteria and Information Requirements

Information required to address criteria under section 1250E (c) to (i) of the *Water Act* 2000.	Relevant Section of Supporting Information Document
c) Any existing water entitlements and authorities to take or interfere with water.	Section 2.1 In accordance with the AWL application form a hydrological report containing detailed underground water modelling for the CNE as well as predicted impacts can be found in Appendix G.
d) Any environmental assessments carried out in relation to the mining tenure, including— i) Any conditions imposed on the mining tenure or on the environmental authority granted in relation to the mining tenure; and ii) Any report prepared by the Coordinator-General under the *State Development and Public Works Organisation Act* 1971, section 34D evaluating the EIS prepared in relation to the mining tenure; and	Section 2.2 Additional information required as part of the AWL application can also be found in the Appendices: • Jellinbah's Environmental Authority (Appendix A); • Jellinbah's EA Amendment Supporting Information Document (Appendix B); • Grant of CNE Mining Leases (Appendix C); • IESC Advice (Appendix D) and Jellinbah's response to the IESC Advice (Appendix E); and • The EPBC Act Approval for the CNE (Appendix F)
e) Any information about the effects of taking, or interfering with, water on natural ecosystems.	Section 2.3
f) Any information about the effects of taking, or interfering with, water on the physical integrity of watercourses, lakes, springs and aquifers.	Section 2.4
g) Strategies for the management of impacts on underground water, including the impacts of dewatering	Section 2.5
h) Strategies and policies for the relevant coastal zone	Section 2.6
i) The public interest	Section 2.7

2.1 EXISTING WATER ENTITLEMENTS

No current water entitlements exist specifically for the CNE tenure.

An AWL was issued under the *Water Act* 2000 for the Mackenzie North Project, which is an extension of the Jellinbah Coal Mine, on the 15th December 2017 (reference no.: 618107). The AWL authorised activities including the taking of associated water from the Mackenzie River alluvium, Rangal Coal measures and adjacent formations with the point of take on or under the area of MLs: 70445, 70446, 70448 and 70449 (refer to Figure 1 for locality), for the purpose of dewatering during the course of, or resulting from, the carrying out of an authorised activity for the ML. The AWL expires on the 30th of June 2040 and is subject to the conditions set out in Annexure A of the AWL.

With the exception of the Mackenzie North and Central North Extension projects, mining activities on all other MLs at the Jellinbah Mine are deemed to have existing rights to underground water under *s334ZP* of the *Mineral Resources Act* 1989, as they were operating prior to the introduction of the new legislative requirements in December 2016, and the excise of the underground water rights had commenced.

Jellinbah Mine uses raw water under license from Sunwater, pumped from Bedford Weir located upstream of the mine on the Mackenzie River. If other water sources on the site are low, they can be supplemented by pumping from the Mackenzie River under this allocation (up to 300 megalitres per year). This water is untreated and used for general purposes (i.e. vehicle washdown).

2.1.1 Existing Water Users

The most current version of the Department of Natural Resources, Mines and Energy (DNRME) Groundwater Database (current to July 2020) was reviewed for the location of registered private groundwater bores. From the review, it was determined that there are no existing registered groundwater bores in the area between the Jellinbah and Curragh/Curragh North mining lease areas (i.e., to the west of the CNE) or in the area between the Jellinbah and Yarrabee mining lease areas (i.e., to the east to the CNE). Therefore, it is concluded that there are no existing registered groundwater bores that could be impacted by the CNE project (JBT 2020).

However, it is possible that not all existing groundwater bores appear in the Groundwater Database; therefore, a bore census was undertaken for properties that are within the predicted area of water level impact for the CNE (Figure 3). The landholders (or in some cases the property leaseholders or managers) were contacted by phone by JBT Consulting Pty Ltd in September and October 2020 and asked if any groundwater bores existed on their property. No private groundwater bores were identified on any of the properties contacted as part of the bore census. It is therefore concluded that no landholder bores will be impacted as part of the CNE and hence there is no requirement for any make-good and/or mitigation measures.

The full results of the bore census can be seen in Appendix G.

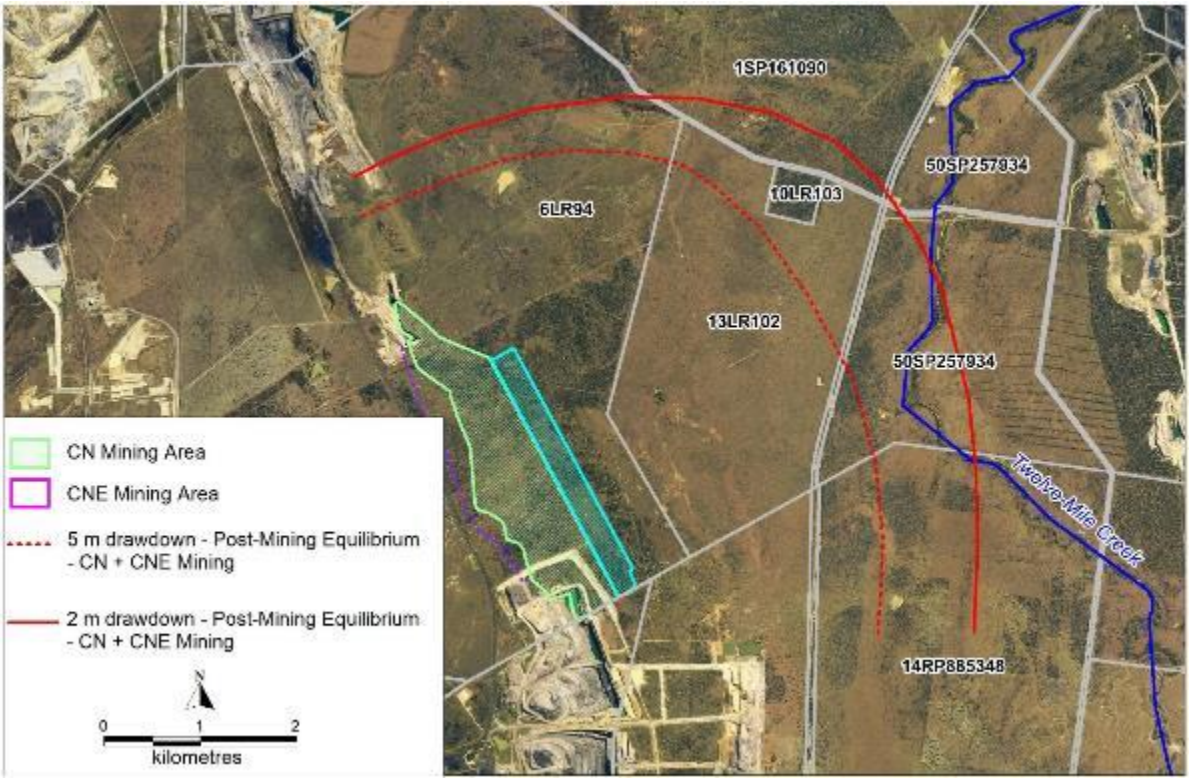

Figure 3 Bore Census Properties and Predicted Drawdown Levels

2.2 PREVIOUS ASSESSMENTS

A groundwater assessment for the CNE was undertaken by JBT Consulting Pty Ltd (JBT 2016) as part of the initial EA amendment application, to add the CNE to the existing Jellinbah Coal Mine EA (EPML00516813). The Groundwater Assessment for the CNE was subsequently updated and included as part of the Federal EPBC Act approval process (JBT 2019).

The potential impacts of the CNE on groundwater have been comprehensively assessed and approved by the (then) Department of Environment and Heritage Protection (EHP) as part of the EA amendment application process, and by the IESC and DAWE as part of the EPBC Act approval process. The assessment has been subject to a public notice and objection process at both the State and Federal level, with no significant groundwater issues or objections being raised.

General groundwater conditions for the entire Mine are included as part of the Jellinbah Coal Mine Environmental Authority (Appendix A). No specific groundwater conditions were imposed as part of the EPBC Act approval conditions. The EPBC Act approval conditions can be seen in Appendix F.

The groundwater assessment for the CNE has since been revised to address the context of the AWL application and can be seen in Appendix G, and is summarised in Section 2.2.1 below. Discussion of the impacts of the CNE is provided in Sections 2.3 and 2.4.

2.2.1 Groundwater Assessment

The objective of the updated groundwater assessment is to assess the impact of the CNE on the groundwater regime and address the specific requirements of the AWL application. To achieve this, the groundwater assessment involved:

- A review of groundwater, geotechnical and environmental reports from the CNE project and surrounding mines to develop an appreciation of the hydrogeological setting of the area;

- A review of exploration data collected for the CNE area;
- A review of data held on the DNRME Groundwater Database for existing water bores;
- Undertaking a census of private landholder bores in the area to confirm locations, usage and water quality;
- Analysing all data and conceptualising the groundwater regime of the CNE surrounding areas;
- Developing a numerical model and undertaking predictive modelling of the scale and extent of mining impacts upon water levels at various stages during mine operations and post-closure;
- Assessing the groundwater impacts and developing feasible mitigation and containment measures and management strategies if potential adverse impacts are identified; and
- Developing an underground water monitoring plan (Appendix H).

The groundwater assessment included a 2-D numerical groundwater seepage model, developed using the program Seep/W, to predict the rate and extent of change to the phreatic surface in response to the ongoing mining of the already approved Central North mine, as well as the proposed extension of the operation into the extension area. Two models were prepared for this study, including a west-east cross-sectional model and a north-south cross-sectional model.

2.2.2 Co-ordinator General's Report

The environmental approval for the CNE was not undertaken as a co-ordinated project through *the State Development and Public Works Organisation Act* 1971, and therefore no report was prepared by the Co-ordinator General.

2.3 IMPACTS ON NATURAL ECOSYSTEMS

2.3.1 Environmental Values

The Flora and Fauna Assessment (AARC 2017) identified two small patches of remnant Brigalow vegetation on the CNE mining leases, with the remaining area being mapped as non-remnant grassland. The remnant vegetation occurring on the CNE mining leases has already been approved to be cleared by both State and Federal Government, with any impacts being offset.

The only natural ecosystems that are likely to be impacted by taking of or interfering with underground water are potential Groundwater-Dependent Ecosystems (GDE's) and stygofauna communities within the vicinity of the CNE. These ecosystems are described below.

2.3.1.1 Groundwater Dependent Ecosystems (GDEs)

Potential GDE's in the vicinity of the CNE as mapped by the Bureau of Meteorology's GDE Atlas (BOM 2019) are discussed below and shown in Figure 4:

Remnant Vegetation on / adjacent to the CNE (low potential terrestrial GDE)

The vegetation within the CNE area is predominantly grassland (non-remnant pasture). However, a small amount of wooded remnant vegetation exists within and just outside the CNE and has been mapped as a low potential terrestrial GDE (Figure 4). The dominant woody species within these communities capable of sending roots to depth are *Eucalyptus spp.* and *Corymbia spp*., however, research on rooting depths has revealed that whilst several species are likely to root deeper than 10 m,

this is limited up to approximately 20 m (Cannadell et al. 1996; O'Grady, Carter & Holland 2010; Hulme 2008).

Twelve Mile Creek to the east of the CNE (moderate potential aquatic and multiple potential terrestrial GDEs)

Tertiary alluvium and residual deposits exist to the east of the CNE, associated with Twelve Mile Creek (Figure 4). The vegetation along Twelve Mile Creek is predominantly non-remnant according to Queensland Government Vegetation mapping, with little or no remnant vegetation present. The remaining remnant vegetation patches are mapped as potential terrestrial GDEs.

Mackenzie River to the north of the CNE (multiple potential aquatic and terrestrial GDEs)

Quaternary alluvium exists to the north of the CNE, associated with the Mackenzie River main channel and flood plains (Figure 4). The Mackenzie River supports substantial amounts of remnant riparian vegetation which are mapped as potential terrestrial GDEs.

Five Mile Lagoon located on the boundary of the Jellinbah Plains / CNE MLs (moderate potential aquatic and high potential terrestrial GDEs)

Five Mile Lagoon is located on the boundary of the Quaternary alluvium and the Tertiary Duaringa Formation (Figure 4). Adjacent to the Lagoon in the top north-eastern corner of ML 700011 is a small patch of vegetation mapped as a high potential terrestrial GDE.

The narrow southward extension of Quaternary alluvium located to the east of Jellinbah Plains (moderate potential aquatic GDE)

The surface geology displayed in Figure 4 shows a small narrow southward extension of the Quaternary alluvium into the Duaringa Formation to the east of Jellinbah Plains. Queensland Government vegetation mapping identifies no remnant vegetation in this area.

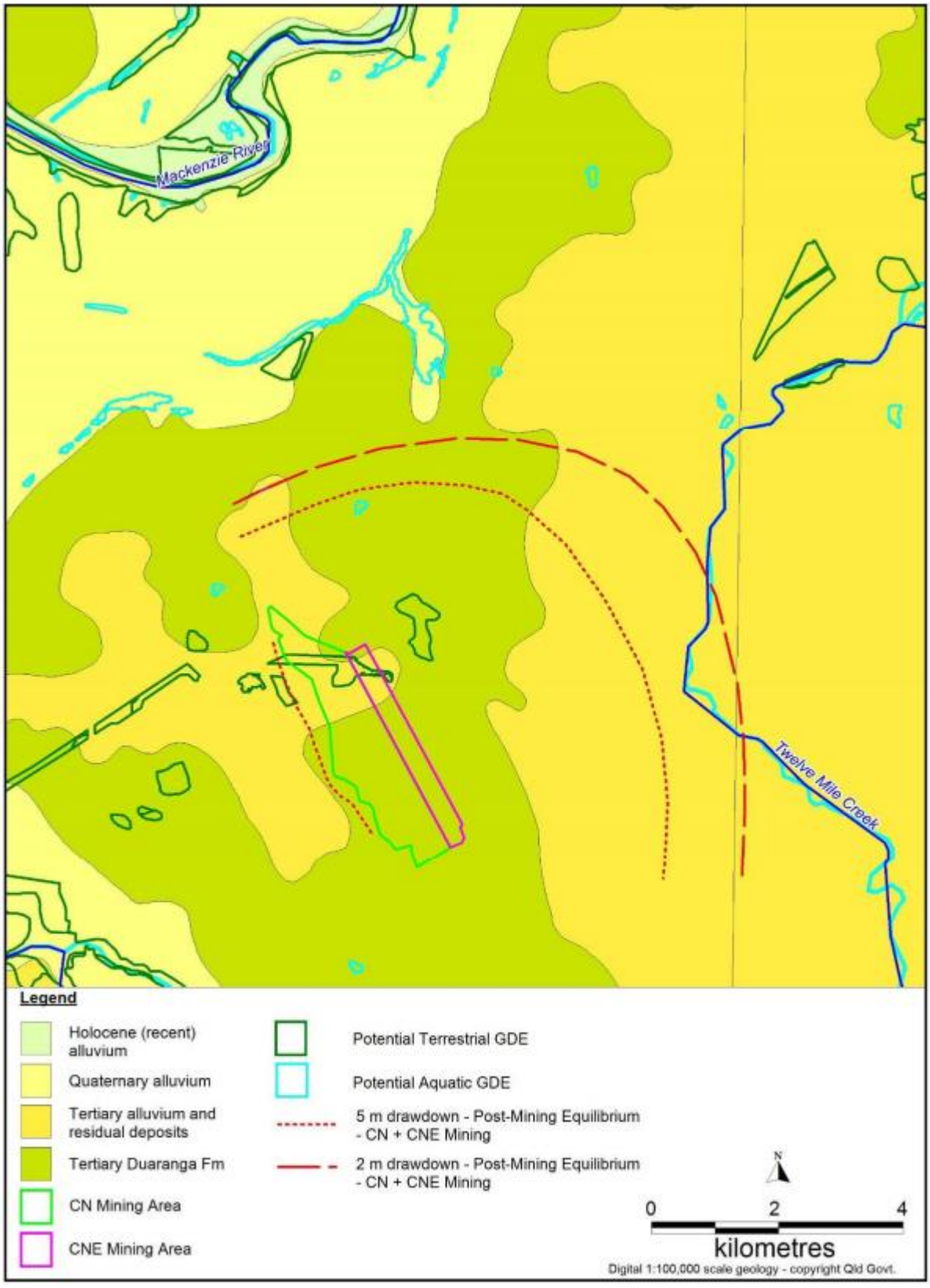

Figure 4 Location of Drawdown Contours with Respect to Surface Geology and Potential GDE's

2.3.1.2 Stygofauna

No stygofauna assessment has been undertaken specifically for the CNE.

A Stygofauna Assessment for the Mackenzie North Project was undertaken by *Eco Logical Australia* in 2013. Sampling at Mackenzie North confirmed that a stygofauna community of at least seven species occurs in the alluvial aquifer of the Mackenzie River, which is north of the CNE area. No stygofauna were collected from the Pollux or the interburden aquifers, despite some of the bores having suitable water chemistry. The likely reason for this is that pore or fracture size in these strata are too small for stygofauna and are not sufficiently interconnected.

Exploration drilling and monitoring data indicates that the Tertiary sediments within the CNE area are dry and are unlikely to support stygofauna communities. Similarly to Mackenzie North, it is expected that the pore or fracture size of the Pollux seam and the interburden aquifers is too small, and they are not sufficiently interconnected to support stygofauna communities. Additionally, the highly saline groundwater within the Pollux Seam and interburden aquifers is also expected to be unconducive for stygofauna.

2.3.2 Potential Impacts

Due to the lack of connectivity between groundwater and riparian or other terrestrial ecosystems in the CNE area, the taking of or interfering with underground water as a result of the CNE operation was not identified as having any significant impacts on natural ecosystems in either the Groundwater (JBT 2020) or Ecology (AARC 2017) assessments undertaken as part of the environmental assessment and approval process for the CNE project.

Potential impacts to GDEs and stygofauna communities as a result of the taking of or interfering with underground water are discussed further below.

2.3.2.1 Groundwater Dependent Ecosystems (GDEs)

Remnant Vegetation on / adjacent to the CNE (low potential terrestrial GDE)

The Groundwater Assessment for the CNE (JBT 2020) has established that groundwater levels within the CNE area are approximately 40 metres below ground level (mbgl) at the shallowest compared to a Tertiary thickness of approximately 15 mbgl. Therefore, it is considered unlikely that any of the *Eucalyptus spp.* and *Corymbia spp*. associated with the remnant wooded vegetation on site are currently accessing groundwater at minimum depths of 40 mbgl, given their rooting depth (<20 m). Therefore, any potential groundwater drawdown is unlikely to impact this remnant vegetation and that this vegetation is not considered to be groundwater-dependent.

Twelve Mile Creek to the east of the CNE (moderate potential aquatic and multiple potential terrestrial GDEs)

Figure 4 also shows the location of potential Twelve Mile Creek aquatic and terrestrial GDEs from the BOM groundwater dependent ecosystem atlas, relative to the 5 m and 2 m drawdown predictions at post-mining equilibrium, for the CNE.

Figure 5 below shows available water level data in the CN and CNE area as well as interpreted water level elevation contours. Figure 6 shows the depth to groundwater data and interpretive contours, which were developed based on Figure 5. The depth to groundwater contours (Figure 6) shows an increase in depth to groundwater from approximately 40 mbgl in the CN/CNE area to approximately 60 mbgl in the area of Twelve Mile Creek. Therefore, it can be interpreted that the groundwater below

Twelve Mile Creek is disconnected from the base of the shallow alluvium and that at 60 mbgl it is beyond the depth that is accessible by vegetation.

Based on the information presented, it is concluded that:

- Any remaining vegetation along Twelve Mile Creek is likely to be dependent on surface water flows and on water that may be periodically stored within the alluvium following recharge events;

- Mining at the Project will have no impact on groundwater levels within the alluvium as mining will only impact on water levels within the Permian sediments and the water level within Permian sediments at the location of Twelve Mile Creek is interpreted to be significantly below ground level and below the base of alluvium.

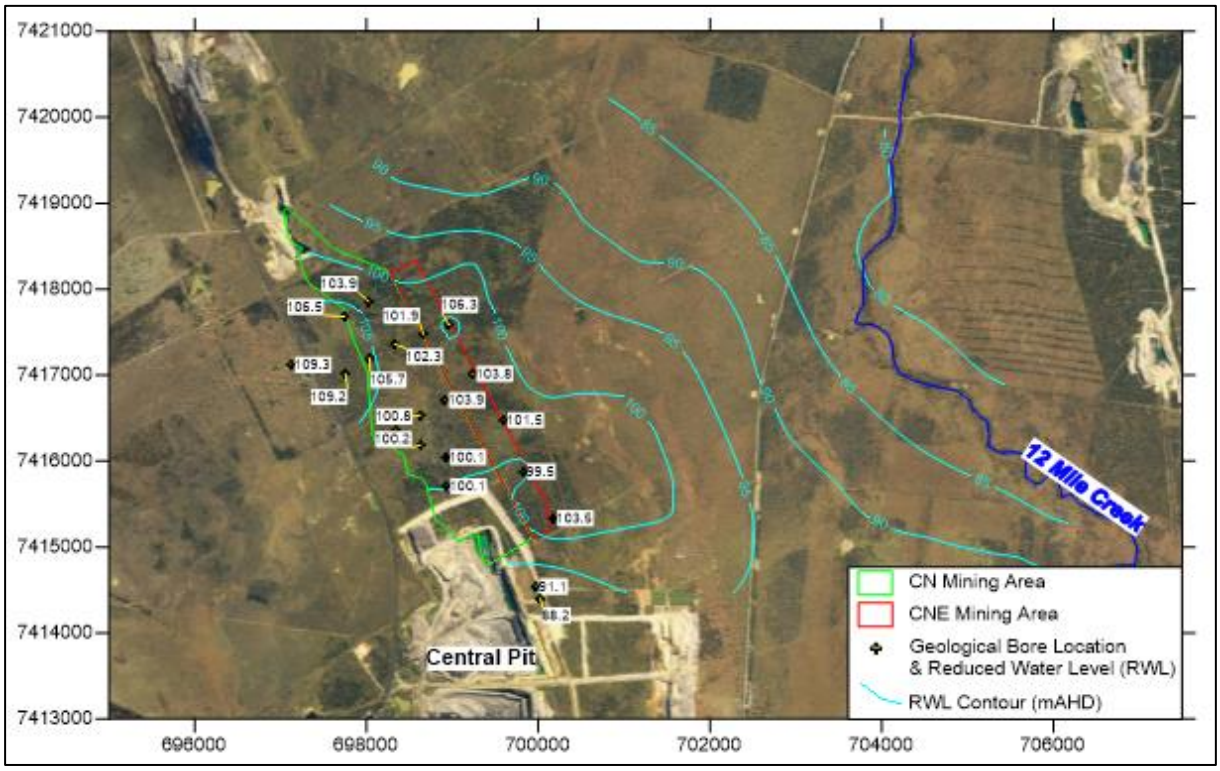

Figure 5 Groundwater Elevation Data and Interpretive Contours

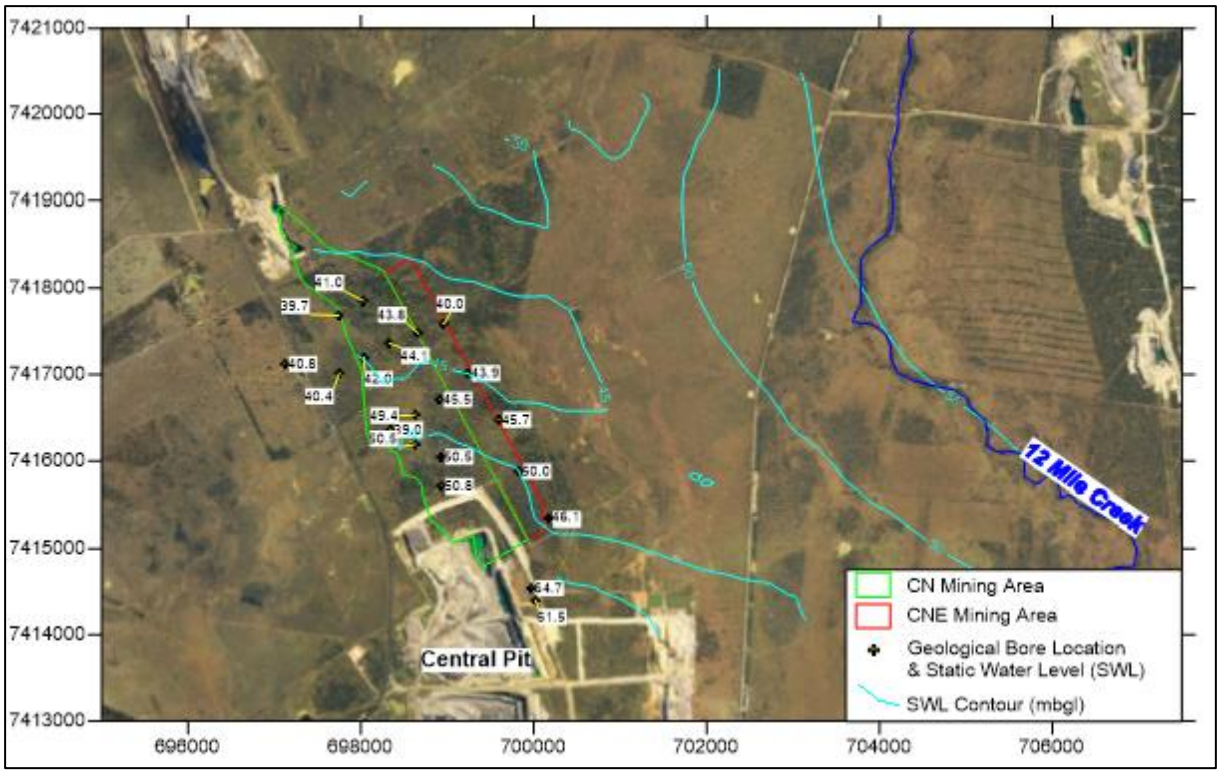

Figure 6 Depth to Groundwater Data and Interpretive Contour

Mackenzie River to the north of the CNE (multiple potential aquatic and terrestrial GDEs)

It is noted that the 2 m drawdown contour from CNE operations at post-mining equilibrium is more than 4.5 km from the Mackenzie River and does not extend to the area of mapped Mackenzie River alluvium (Figure 4); therefore, any GDEs that are associated with the Mackenzie River to the north of the Project are not considered to be at risk from any potential groundwater related impacts corresponding to the CNE.

Five Mile Lagoon located on the boundary of the Jellinbah Plains / CNE MLs (moderate potential aquatic and high potential terrestrial GDEs)

Five Mile Lagoon lies outside of the modelled post mining equilibrium 5 m & 2 m draw down contours (Figure 4), and it is unlikely that the CNE will impact any potential GDEs associated with Five Mile Lagoon. The field study assessed the area of vegetation next to the Lagoon, with this area being mapped as non-remnant regrowth vegetation in the *Terrestrial Flora and Fauna Assessment* (AARC 2017). This patch also lies outside of the 5 m & 2 m drawn down contours (Figure 4), and it is considered highly unlikely that the CNE will impact potential GDEs associated with this non-remnant vegetation.

The narrow southward extension of Quaternary alluvium located to the east of Jellinbah Plains (moderate potential aquatic GDE)

This area also falls outside the predicted 5 m & 2 m drawdown contours (Figure 4). There is no mapped remnant vegetation and no known GDE in this area and the risk of impact from the CNE is considered to be insignificant or nil.

In summary, it is not expected that any GDEs within the vicinity of the CNE will be impacted as a result of taking or interfering with underground water.

2.3.2.2 Stygofauna

No impacts to stygofauna communities are anticipated as the Tertiary sediments within the CNE area are dry, and groundwater within the Pollux Seam and interburden aquifers is considered to be highly saline and unconducive for stygofauna communities. Likewise, the pore or fracture size of the Pollux seam and the interburden aquifers is considered too small, and not sufficiently interconnected to support stygofauna communities.

2.4 IMPACTS ON WATERCOURSES, LAKES, SPRINGS AND AQUIFERS

2.4.1 Watercourses, Lakes and Springs

Surface waters of the area are of environmental value to the surrounding grazing industry, existing mining operations, the local community, and native flora and fauna. Blackwater Creek runs parallel to the western boundaries of the Jellinbah Central area. Twelve-Mile Creek runs parallel to the Jellinbah Coal Mine to the east and flows through the neighbouring Yarrabee Coal Mine. The Mackenzie River transects the Jellinbah Coal Mine between the Mackenzie North and Plains operational areas. The CNE area naturally drains north to the Mackenzie River, either directly or via a small tributary.

The CNE falls within the Mackenzie main channel and southern tributaries in respect to the Mackenzie River Sub-basin Environmental Values and Water Quality Objectives (EHP 2011).

The Mackenzie River is a major tributary of the Fitzroy River, which flows to the Coral Sea at Rockhampton. The total catchment area of the Mackenzie River to the Bingegang Weir (35 km downstream of the Jellinbah Coal Mine) is approximately 50,960 km^2 and incorporates the Comet and Nogoa River Catchments. Beside the towns of Clermont, Emerald, Springsure and Blackwater, the catchment is sparsely populated. Land use within the catchment is typically rural, with substantial areas cleared for grazing.

Watercourses within the area are ephemeral, with the exception of the Mackenzie River, which carries controlled releases from Fairbairn Dam, on the Nogoa River, upstream of the CNE area. Releases are made from the dam to deliver supplies to downstream riparian water users and to maintain supplies from Bedford and Bingegang Weirs to various towns, mines, and irrigators. Water captured in Bingegang Weir, downstream of the CNE, is used to supply the towns of Middlemount and Dysart.

Semi-permanent pools exist in Blackwater Creek and the Mackenzie River, as well as Three and Five Mile Lagoons. All water bodies regularly dry up without further flows in the surficial creek system.

No springs are mapped within the vicinity of the CNE Project or the Jelinbah Coal Mine.

2.4.2 Potential Impacts

Creeks to the west and east of the CNE area (Blackwater Creek and Twelve Mile Creek, respectively) are ephemeral, and available groundwater level data indicates that the regional water table is generally at or below the base of Tertiary. Therefore, it is judged that there is a low risk that the CNE will impact on baseflow contribution (i.e., groundwater contribution) to surface water resources, with a correspondingly low risk of impact to any potential GDEs (as discussed in 2.3.2.1).

The nearby Three and Five Mile lagoons are fed by flooding and local runoff, and are situated beyond the modelled 2 m drawdown contour (Figure 4). The minor groundwater drawdown as a result of the CNE is unlikely to impact on these surface water features.

Quaternary alluvium exists to the north of the CNE, associated with the Mackenzie River main channel and flood plains. Surface water and potential GDEs associated with the Mackenzie River floodplain to

the north of the CNE are not considered to be at risk from any potential groundwater-related impacts corresponding to the CNE as the modelled 2 m drawdown contour is located well to the south (see Figure 4).

No impacts to springs are anticipated as a result of the CNE Project, as no springs are mapped within the vicinity of the Mine.

2.4.3 Aquifers

The CNE area falls within the central part of the Bowen Basin, which is prominently known for its Permian aged coal reserves. The Mine, including the CNE lies within the Highlands Groundwater Management Area, which is a regulated groundwater area managed through the Fitzroy Basin Water Plan.

The CNE is developed in areas where the Rangal Coal Measures sub-crop beneath the Tertiary cover (i.e., mining is undertaken in areas where the coal measures are shallowest). The dip of the coal seams is to the east or southeast so that the CNE extends mining down-dip from the Central North mining area. The mining area is situated within the Jellinbah Thrust Belt, which lies between the Jellinbah Fault to the west and the Yarrabee Fault to the east; the faults act to compartmentalise the various groundwater units in the area of the Mine.

Two main groundwater-bearing units have been identified in the Jellinbah mining area, including:

1. Quaternary Alluvium, which is associated with prior channels and flood deposits of the Mackenzie River (to the north). In part due to the presence of water supply structures, the Mackenzie River tends to be a perennial stream adjacent to the Mine. Quaternary alluvium is encountered in the northern section of the Jellinbah Plains operation, but there are no Quaternary alluvial deposits within the CNE area. Quaternary alluvium is also associated with Blackwater Creek (to the west of the Mine).

   It is noted that Twelve Mile Creek (to the east of the CNE area) is mapped as occurring within Tertiary alluvium and residual deposits and has no mapped Quaternary alluvium at 1:100,000 scale. Twelve Mile Creek is a minor drainage feature and contains no or little remnant riparian vegetation

2. Permian Coal Measures, which comprise interbedded siltstone, sandstone, shale (interburden), and coal. The Permian interburden is hydrogeologically “tight” and hence very low yielding, with most of the groundwater storage and movement occurring within the coal seams. Faults at site are generally identified as dry. It has been observed from face mapping within the Jellinbah Central Pit that faults and joints can act as conduits for water flow; however, this is interpreted to be related to the relaxation of the strata and associated structures adjacent to the pit, with the source of the water being predominantly surface water infiltration in the zone adjacent to the pit crest.

Findings from the Groundwater Assessment (JBT 2020) and previous exploration drilling have indicated that within the CNE area that the Tertiary sediments are dry and that the recorded groundwater level is within the Permian sediments (i.e. the coal measures). Groundwater quality data collected to date from existing Jellinbah bores at Mackenzie North and Jellinbah Plains, shows that groundwater within the Permian Coal Measures tends to be saline (EC > 7,000 µS/cm). The quality of groundwater within the CNE is therefore also likely to be saline and be of limited value for environmental or stock watering purposes.

2.4.4 Impacts on Aquifers

At the Jellinbah Mine, the rate of groundwater inflow from the Permian coal measures tends to be relatively low in respect to evaporation. Evaporation generally removes all seepage, and the pit walls have the appearance of being dry at pit depths of 100-120 m. For mining at the adjacent Central Pit, it is observed that the pit is dry (in terms of groundwater inflow) at current mining depths of approximately 100 m below ground level.

The Seep/W model for the CNE operation predicts a rate of groundwater seepage of 0.002 L/s/m on the seepage face of the pit, which is slightly in excess of the rate of evaporation (0.0019 L/s/m), but is generally consistent with observations on site that seepage is in excess of evaporation at a depth of approximately 150 m below ground level.

The Groundwater Assessment (JBT 2020) modelling results are shown in Figure 4 and Figure 7 below. Figure 4 and Figure 7 both show that drawdown is most extensive to the northeast and extends beneath Twelve Mile Creek in some areas. However, the groundwater below Twelve Mile Creek is disconnected from the base of the shallow alluvium. The modelling predicts that the 2 m drawdown contour from CNE operations at post-mining equilibrium is more than 4.5 km from the Mackenzie River and does not extend to within the area of mapped Mackenzie River alluvium (see Figure 4).

Water quality within aquifers is expected to be unaffected as the void will act as a groundwater sink. Groundwater modelling (JBT 2020) predicts that a permanent cone of depression will develop that will direct groundwater flow towards the void, therefore the risk of the CNE impacting on aquifer water quality (via outflow to the groundwater system) is assessed to be low.

Additionally, end of mine closure studies for the Mine predict that post-mining, voids will continue to remain groundwater sinks. The proposed extension to the Central North final void due to the CNE will cause a minor increase in void equilibrium water level (~0.14 m) and negligible change in water quality (i.e., salinity). Therefore, the risk of the CNE impacting water quality via the groundwater system is judged to be very low.

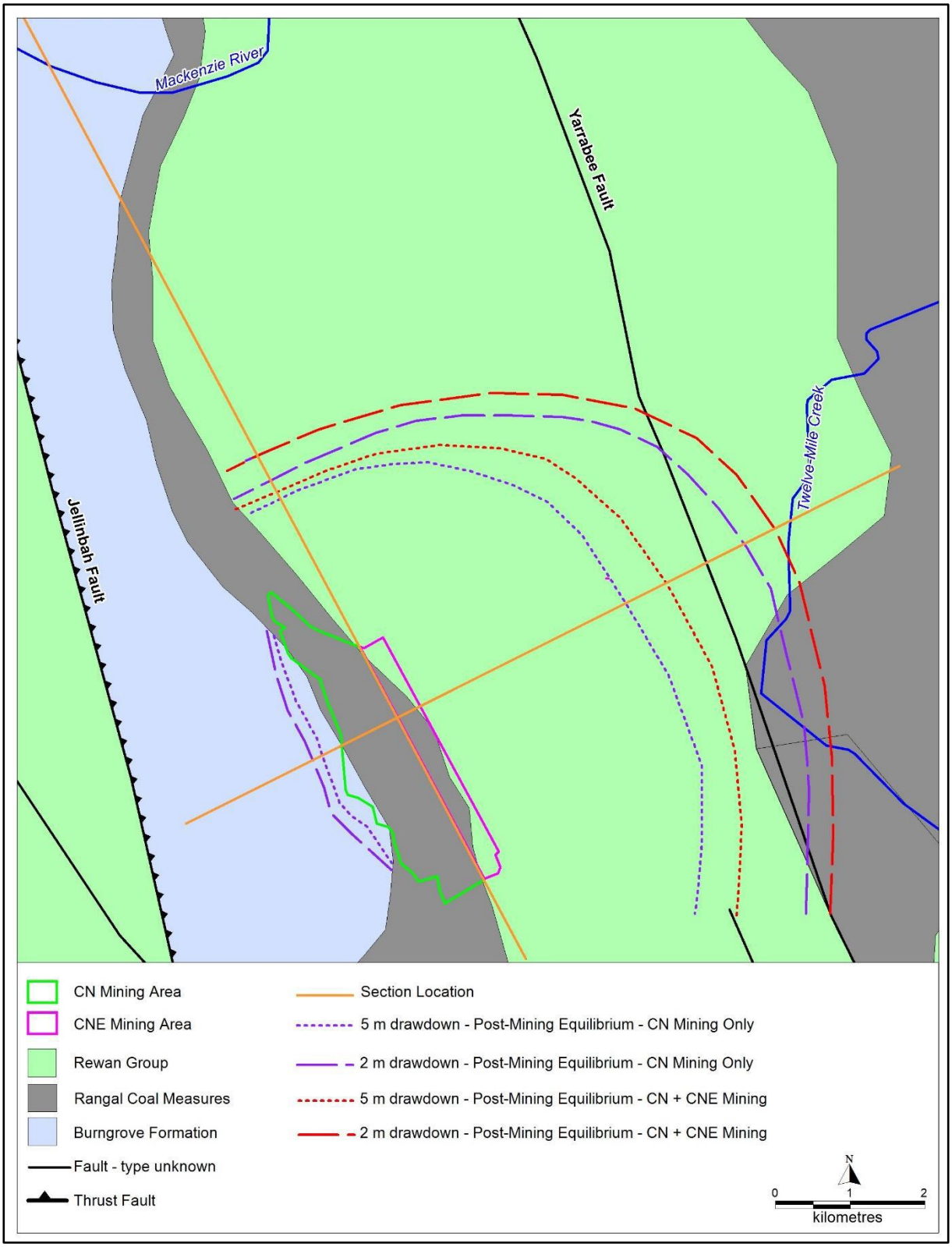

Figure 7 Groundwater Level Drawdown for CN and CNE Mining Cases – Post-Mining Equilibrium (source: JBT 2020)

2.5 MANAGEMENT STRATEGIES

As outlined in Section 2.4.4, contamination of the groundwater system with mine-affected water is not expected, due to the net inflow of water into the open pit. Within the existing areas of the Mine, pit developments have encountered minimal groundwater resources (expect for the alluvial groundwater ingress at the Plains Pit), which is consistent with the current understanding of groundwater aquifers. Therefore, management strategies will focus on the detection of impacts on groundwater levels surrounding the CNE.

The objective for water management at Jellinbah, including the CNE, is to prevent degradation of water quality in the receiving environment and the local groundwater aquifers.

The aim of the mine water management system is to:

- Maintain the quality of water leaving the leases in accordance with the EA conditions to protect downstream use;
- Minimise interruption to mining operations, including flooding of the pit;
- Ensure water is available for coal processing and dust suppression;
- Preferentially use water that cannot be discharged for mining and processing; and
- Comply with statutory requirements under the *Environmental Protection Act* 1994 and the *Water Act* 2000.

Through the ongoing implementation of the water management plan, Jellinbah aims to ensure that water quality, water access, and the physical, chemical and biological characteristics of the receiving environment and groundwater aquifers are not degraded by operations at Jellinbah Coal Mine, including the CNE.

2.5.1 Make-Good Agreements and/or Mitigation Measures

As discussed in Section 2.1.1, no registered or private groundwater bores exist within the predicted area of groundwater level impact, as such there is no requirement for make-good agreements and/or mitigation measures for any groundwater bores.

2.5.2 Groundwater Monitoring

To monitor the potential impacts to the groundwater resources identified within the CNE area, a groundwater monitoring program will be adopted for the CNE, building on the monitoring requirements of the Jellinbah Coal Mine EA. The proposed groundwater monitoring program for the CNE is outlined in Appendix H. The following commitments will be undertaken for the Mine and the CNE:

- Ensure there continues to be no connectivity between the Mackenzie River and the mining operations by conducting groundwater monitoring at the locations and frequency defined in Table C10 of the EA (Appendix A);
- Three additional groundwater monitoring bores have been installed within ML 700011 and ML 6992 in accordance with recommendations from DNRME (Figure 8). The bores will provide information on the presence/absence of water and the rate of water level decline as a result of mining activity occurring at Central North and the CNE. Any bores located within the mining

footprint will be decommissioned as the mine progresses (Appendix I). These bores will be monitored as part of the underground water monitoring program (Appendix H); and

- All mine-affected water storages will be monitored for level and quality to identify potential contaminant sources within the operation.

Annual associated water volume reporting for the Jellinbah Coal Mine will continue to be undertaken in accordance with the *Mineral Resources Act* 1989.

Figure 8 CNE Groundwater Monitoring Bores

2.5.3 Receiving Environment Monitoring Program (REMP)

Along with the above-mentioned groundwater monitoring program, a REMP is currently implemented at Jellinbah and includes annual monitoring of surface water, stream sediments, and macroinvertebrates, at both upstream (reference) and downstream (impact) sites. The REMP aims to quantify the potential impacts of the Mine on the receiving environment. To achieve this, REMP monitoring is conducted on an annual basis providing a comprehensive understanding of business-as-usual impacts. In addition, monitoring of the receiving environment is conducted during controlled and uncontrolled releases to determine the potential impacts associated with release events.

The REMP includes aquatic macroinvertebrate monitoring to quantify the response of aquatic environments to potential disturbance from both surface and groundwater impacts.

2.6 STRATEGIES AND POLICIES FOR THE RELEVANT COASTAL ZONE

Groundwater drawdown, as a result of the CNE project, will have no impact on coastal zones.

2.7 PUBLIC INTEREST

2.7.1 Project Benefits

The proposed CNE has a direct economic impact on the State of QLD through the development of the mine to make the best use of the existing resource. The consequences of not proceeding with the CNE are associated with a significant coal resource remaining undeveloped and economic proceeds through taxation and royalties not being realised for the State of Queensland.

There is a significant opportunity cost to both State and Commonwealth revenues without the development of the CNE. The availability of existing process facilities and product transport infrastructure at the Mine is limited to the economic life of the operating Mine. Should the CNE development not go ahead, or be deferred to a later date, the use of existing coal processing and transport infrastructure is not guaranteed. The feasibility of a deferred development of the CNE, without transport and processing facilities, is highly uncertain.

The Blackwater area has a rich history in mining spanning forty years, the extension of the Mine's life through the addition of the resources in the CNE area will contribute to continued direct and contract employment of operating workers and support personnel, with flow-on employment through the provision of associated goods and services at the local and regional levels, as well as the State and National levels.

The remote location of the Mine site, away from houses and residential concentrations, means that there will be little impact to the visual amenity or other community issues. Community consultation with affected landholders will continue to be carried out as required throughout the life of the Mine.

2.7.2 Public Consultation

Public consultation specific to the CNE project has been undertaken with the relevant stakeholders, including the underlying landholders, the CHRC, and relevant QLD and Commonwealth Government departments. Affected persons were notified of the application during the Certificate of Public Notice process. All property owners of land underlying the CNE have been consulted and have entered into compensation agreements where applicable.

Jellinbah has conducted extensive consultation with the registered Native Title groups and will continue to do so as part of a proactive community consultation program and ongoing development of Cultural Heritage Management Plans (CHMPs) for the existing Mine. Consultation has been planned between

the registered Native Title groups and Jellinbah for the purpose of developing a CHMP for the Central North MLs.

Following public consultation, one submission was received from the CHRC for consideration prior to the QLD Government's EA Amendment approval. The submission raised concerns regarding communication infrastructure, road transport, and associated impacts to Five Mile Lagoon, fire and flood potential, noise mitigation, waste management, pest management, water management, rehabilitation, accommodation, community liaison and benefits, and local opportunities. No significant issues or objections relating to groundwater were raised.

Issues raised during the consultation process have been addressed via a presentation to CHRC and have been accounted for in the EA Amendment application supporting document and the PD during the EPBC Referral process. Consultation with the community will continue throughout the life of the CNE project.

3.0 CONCLUSION

In December 2016, the Queensland Parliament passed legislation amending the *Environment Protection Act* 1994, *Mineral Resources Act* 1989, and the *Water Act* 2000. The amended legislation places additional approval requirements on new or developing resource activities whose operations are in a regulated underground water area and would interact with underground water resources. As Jellinbah's CNE meets these requirements, they are required to apply for an AWL prior to the take of associated water.

The CNE project received approval from the Queensland Government in 2017 (EA EPML00516813) and the Federal Government in April 2020. The approval processes included public notice periods and assessment of impacts to water by the IESC.

The Groundwater Assessment (JBT 2016 and JBT 2019) was undertaken for the CNE for the approvals phase and updated to address the requirements of the AWL (JBT 2020). The groundwater assessment concluded that:

- The Tertiary sediments at the CNE area are dry and that the regional groundwater system is developed within the Permian coal measures and is assessed to be disconnected from the surface water systems and alluvium.
- There is no possibility of outflow from the final void via the base of Tertiary and that there is a very low risk of the CNE impacting the water quality of the surrounding groundwater system.
- It is not expected that the CNE project will have any impacts on any GDEs or stygofauna.
- No registered or private landholder bores were identified in the bore census conducted for the CNE project; thus no impacts are predicted on existing groundwater users.

A specific underground water monitoring program has been developed for the CNE (Appendix H). Annual reporting of associated water take will occur, consistent with the Jellinbah Mine as a whole.

4.0 REFERENCES

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Appendix A Jellinbah Coal Mine – EA EPML00516813

Appendix B Jellinbah Coal Mine EA Amendment Supporting Information

Appendix C Grant of ML 700011, ML 700012, and ML 700013

Appendix D IESC Advice – Central North Extension

Appendix E Response to IESC Advice

Appendix F EPBC Approval Notice

Appendix G Groundwater Report for Associated Water License (AWL) Application – Jellinbah Central North Extension (CNE) Area (JBT 2020)

Appendix H Underground Water Monitoring Program – Jellinbah Central North Extension (CNE) Project

Appendix I Additional Groundwater Monitoring Sites – Central North Extension