

China Stone Coal project

Coordinator-General's evaluation report on the environmental impact statement

November 2018

The Department of State Development, Manufacturing, Infrastructure and Planning

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Contents

Synopsis.....	vi
1. Introduction.....	1
2. About the project	2
2.1 The proponent	2
2.2 Project location	2
2.3 Project description	6
2.4 Off-lease infrastructure requirements.....	11
2.5 Project stages.....	12
2.6 Project need	13
3. Environmental impact statement assessment process	13
3.1 Coordinated project declaration	14
3.2 Commonwealth assessment.....	14
3.3 Terms of reference	15
3.4 Review of the EIS	15
3.5 Referral to the Independent Expert Scientific Committee.....	18
3.6 Additional information to the EIS.....	18
3.7 Review of the AEIS.....	19
4. Project approvals.....	20
4.2 Australian Government approvals.....	21
4.3 State government approvals	22
4.4 Local government approvals.....	24
5. Evaluation of environmental impacts.....	25
5.1 Land use and rehabilitation.....	25
5.2 Matters of state environmental significance	37
5.3 Air quality.....	49
5.4 Greenhouse gas and climate change	57
5.5 Waste	66
5.6 Noise and vibration	77
5.7 Traffic and transport.....	82
5.8 Hazard and risk	89
5.9 Cultural heritage	94
5.10 Social impacts	100
5.11 Economic impacts	117
5.12 Power supply	122
6. Matters of National Environmental Significance	140
6.1 Project description	140
6.2 Project location	141
6.3 A water resource, in relation to coal seam gas development and large coal mining development	141
6.4 Listed threatened species and communities	213
6.5 Listed migratory species	254

6.6	Ecologically sustainable development	257
6.7	Coordinator-General's overall conclusion	258
7.	Conclusion	261
Appendix 1.	Imposed conditions	263
Appendix 2.	Coordinator-General's stated conditions	295
Appendix 3.	Recommended conditions for the Commonwealth Minister for the Environment	335
Appendix 4.	General recommendations	345
Appendix 5.	Proponent commitments	352
Appendix 6.	Recovery plans, conservation advices, threat abatement plans	369
Appendix 7.	China Stone Coal project Groundwater Model Targeted Peer Review	387
	Acronyms and abbreviations	409
	Glossary	414

Figures

Figure 2.1	Project site in relation to the Galilee Basin State Development Area	3
Figure 2.2	Project in relation to local government area boundaries	4
Figure 2.3	Resource tenements of project and adjoining tenements	5
Figure 2.4	Hydrogeological cross-sections of project area from groundwater section 7	7
Figure 2.5	Project layout	8
Figure 2.6	Project development schedule	12
Figure 5.1	Land use and noise and air sensitive receptors	26
Figure 5.2	Conceptual decommissioning plan	29
Figure 5.3	Visual setting	35
Figure 5.4	Southern and northern seasonal wetlands	41
Figure 5.5	Highwall layout	48
Figure 5.6	Conceptual tailings storage facility and power station waste storage facility final landform drainage design	74
Figure 5.7	Regional road network	83
Figure 5.8	Native title claim area - Wangan and Jagalingou People	95
Figure 6.1	Subsidence schematic	143
Figure 6.2	Monitoring bore locations	146
Figure 6.3	Groundwater users	148
Figure 6.4	Conceptual groundwater regime	149
Figure 6.5	Surface geology	153
Figure 6.6	Geological units sub-cropping under Tertiary/Quaternary sediments	154
Figure 6.7	Hydrogeological cross-sections	155
Figure 6.8	Depressurisation extents	161
Figure 6.9	Water take – during mining	166
Figure 6.10	Open-cut mine layout – final landform	171
Figure 6.11	Regional catchment setting	188
Figure 6.12	Local catchment setting	190

Figure 6.13	Conceptual site drainage – final landform.....	197
Figure 6.14	Baseline monitoring sites.....	203
Figure 6.15	Place subsidence ponding and remedial drainage.....	205
Figure 6.16	Maximum predicted extent of potential cumulative depressurisation.....	210
Figure 6.17	Flora survey sites	222
Figure 6.18	Threatened, special least concern and migratory fauna species records identifies the locations where the species were recorded.	226
Figure 6.19	Black-throated finch habitat based on revised habitat modelling)	229
Figure 6.20	Bioregion setting.....	251

Tables

Table 3.1	Summary of public and agency submissions on the draft EIS.....	15
Table 4.1	Core approvals required for the project	20
Table 4.2	Possible subsequent approvals required for the project.....	21
Table 5.1	Regional Ecosystems	42
Table 5.2	Sensitive receptors.....	51
Table 5.3	Estimated scope 1 GHG emissions for the project over the mine life.....	61
Table 5.4	Estimated maximum non-mining waste quantities for construction and operations (per annum)	68
Table 5.5	Sensitive receptors.....	77
Table 6.1	Galilee Basin projects' approved maximum disturbance areas and offset areas	249
Table 6.2	Listed migratory species.....	255

Synopsis

This report evaluates the potential impacts of the China Stone Coal project (the project). It has been prepared pursuant to section 34D of the *State Development and Public Works Organisation Act 1971* (Qld) (SDPWO Act).

The proponent, MacMines Austasia Pty Ltd (MacMines), proposes to construct and operate an open-cut and underground thermal coal mine in the Galilee Basin, 300 kilometres (km) west of Mackay and 190 km west of Moranbah.

At peak production, the project would produce up to 38 million tonnes per annum (Mtpa) of coal for export to the Asian market, principally China. The mine life will be around 50 years.

The project would include the development of mine infrastructure areas, a coal handling and preparation plant (CHPP), a tailings storage facility (TSF), a rail loop and train-loading facilities, a coal-fired power station and power station waste storage facility, a private airstrip and an accommodation village.

The project's environmental impact statement (EIS) states the project would require significant capital expenditure of around \$6.7 billion. Key project benefits identified in the EIS are:

- for the 5-year construction and early works phase, the project would generate up to 3,892 direct full time equivalent (FTE) jobs at peak. The operations phase would require up to 3,391 direct FTE jobs at peak
- an estimated \$951 million per annum added to the Gross State Product (GSP) during the construction phase
- contribution of up to \$1.5 billion per year to the GSP of Queensland for the first 25 years of operations
- an annual average of \$188.26 million in royalties for the first 25 years of operations paid to the State.

As part of my assessment of the EIS, I have set conditions in this evaluation report to avoid, manage and mitigate impacts on the environment and local communities.

The following provides an overview of key matters from my evaluation.

Land use and rehabilitation

The EIS states that the project would occur on a site of approximately 20,000 hectares (ha) and would result in the progressive clearing of around 11,000 ha of vegetation. The EIS proposed that around 45 per cent of the cleared land would be rehabilitated post-mining to be suitable for grazing, which is the current primary land use in the area. However, the EIS proposed that the remainder would have been permanently lost post-mining. This is not an acceptable outcome.

I consider there to be significant environmental, economic and social benefits to be realised by returning the land to a useful state after mining, including for grazing and as

habitat for the endangered black-throated finch (BTF) and other significant fauna species. Therefore, I have set conditions in this report requiring:

- progressive rehabilitation, during the life of the mine, of all land used for the project must be undertaken. Further, this land is to be rehabilitated in such a way that, after mining, it should be of use for grazing and as habitat for significant species (e.g. BTF)
- backfilling the open-cut mine pits, which would otherwise have sterilised 3,400 ha, to at least a level above the pre-mining groundwater level to prevent ongoing groundwater impacts and enable the land to be used post-mining.

Power station

The EIS assessed the potential impacts of the proposed 1,050 megawatt (MW) power station and the power station waste storage facility on matters of state environmental significance (MSES) and matters of national environmental significance (MNES), groundwater and surface water. I am satisfied that these issues were appropriately considered in the EIS.

With regards to power supply options, the EIS considered the option of connecting to the existing electricity grid, but disregarded others.

I accept that the project proposes a power station but, after considering its predicted greenhouse gas emissions (GHG) in the EIS, I found that further assessment of power supply alternatives including renewables is required.

I have imposed conditions to ensure this additional information is provided to the Department of Environment and Science (DES) to enable assessment of the need for a new coal-fired power station and its impacts on air quality.

If after consideration of other alternatives, the proposed power station remains the preferred option, its final operating specifications are required for developing conditions for an environmental authority (EA) for environmentally relevant activity (ERA) 14 – Electricity generation.

In the event DES authorises ERA 14, I have imposed a condition requiring the proponent to prepare and submit for my approval a power station GHG emissions reduction and management (PSGHG) plan.

Should the power station be ultimately authorised by DES, my conditions will ensure that its impacts are adequately identified and avoided, mitigated or offset.

Groundwater

I consider the EIS groundwater assessment provides an adequate prediction of the potential impacts from mining including drawdown of water and depressurisation in landholder bores.

Based on a peer review of the groundwater model presented in the EIS, I consider further refinements to this model are required to improve the prediction of groundwater impacts. I have imposed a condition requiring a groundwater model revision and updated impact assessment report to be provided prior to the public notification of the

EA application. This will enable DES and the Department of Natural Resources, Mines and Energy (DNRME) to assess the information.

No impact on groundwater resources would be authorised until an EA is issued complete with groundwater conditions; the Commonwealth's EPBC Act assessment is completed; an Associated Water Licence has been issued by DNRME; and requirements of my imposed conditions for groundwater have been satisfied.

Key conditions included in this report to address groundwater impacts include:

- backfilling the open-cut mine pits to prevent ongoing groundwater impacts
- a groundwater monitoring and management program (GMMP) to ensure groundwater resources are identified, monitored, managed and mitigated
- the GMMP is to include groundwater quality monitoring and management approaches to protect water values
- a report on the GMMP is to be submitted to the administering authority for the *Water Act 2000* and the administering authority for the *Environmental Protection Act 1994* (EP Act) for approval before the project's EA is notified for public comment
- appropriate groundwater offsets that would return water to regional aquifers to minimise potential impacts
- for groundwater bore users that may be affected by the project, the proponent must enter into legally binding arrangements to make good any impacts before mining commences
- the proponent is to monitor, measure and report on the groundwater impacts of this project combined with other Galilee Basin mines. The proponent is to work closely with DNRME and provide funding and data for its Galilee Basin regional groundwater and surface water monitoring and assessment program
- the GMMP is to be reviewed at regular intervals during mining, and the administering authority may request a report on the GMMP for review and approval at any time
- if the administering authority makes recommendations when approving the GMMP report, the recommendations must be implemented
- where monitoring identifies any impacts have occurred that were not predicted by the groundwater model or approved by the administering authority for the *Water Act 2000* and the administering authority for the EP Act, the GMMP must outline the investigation measures and actions to be undertaken to prevent the impact from continuing.

Surface water

Conditions set in this report to avoid, minimise, manage and mitigate impacts on surface water include:

- the proponent must provide DES with baseline water quality and flow monitoring data for the North Creek receiving environment prior to public notification of the EA application. This will allow DES to determine appropriate compliance and flow

monitoring locations, release limits and contaminant trigger levels required for the development of any draft EA conditions

- any on-site water drainage is to maintain the pre-existing surface water flow characteristics of the area
- to prevent the downslope movement of contaminated water, I have stated a condition requiring the installation of a surface water and seepage collection system at the Tailings Storage Facility
- post-mining, surface water is not to be captured in land depressions caused by underground mining (subsidence), to ensure this resource is not lost to downstream users.

Cultural heritage

The EIS includes a commitment to prepare a Cultural Heritage Management Plan (CHMP) in consultation with native title claimants, the Wangan and Jagalingou People, which is in accordance with the requirements of the *Aboriginal Cultural Heritage Act 2003* (ACH Act). The proponent must also negotiate with the Wangan and Jagalingou People to prepare an Indigenous land use agreement (ILUA) in accordance with the *Native Title Act 1993* (Cwth) (NT Act). These agreements must be in place before the project starts construction.

Matters of national environmental significance

The project would potentially impact on MNES protected under the EPBC Act. The controlling provisions for the project are:

- a water resource, in relation to coal seam gas development and large coal mining development (section 24D and 24E)
- listed threatened species and communities (sections 18 and 18A)
- listed migratory species (sections 20 and 20A).

For each of the three controlling provisions I have set conditions in this report for consideration by the Commonwealth Minister, including:

Impacted species

- progressive rehabilitation, during the life of the mine, of all land used for the project must be undertaken. Further, this land is to be rehabilitated in such a way that, after mining, it should be of use including for grazing and as habitat for significant species (e.g. BTF) – this will result in an increase of 6,011 ha of land being returned to use after mine closure
- backfilling the open-cut mine pits, which would otherwise have sterilised 3,400 ha, to at least a level above the pre-mining groundwater level to prevent ongoing groundwater impacts and enable the land to be used for environmental and other uses
- prohibiting impacts on the Doongmabulla Springs Complex, Lake Buchanan and the adjacent Moray Downs biodiversity offsets area, including from groundwater drawdown, with these areas vital for significant species including the BTF

- pre-clearance surveys must be undertaken to identify all potentially impacted species and their habitat. The results of the surveys must inform a biodiversity offset strategy (BOS) which is to be submitted to the Commonwealth Department of the Environment and Energy (DEE) and DES for approval
- the project must provide biodiversity offsets for significant residual impacts to MNES and MSES, with the offsets proposal to be approved by DEE and DES
- the offset areas are to be secured and protected before any clearing of habitat for BTF or other protected species can occur.

In August 2015, I submitted a joint request for advice with the Commonwealth Department of the Environment on water matters for the project to the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC).

The IESC advice has informed my evaluation of the project and set conditions and recommendations, and my conditions respond adequately to matters raised in the Committee's advice.

Coordinator-General's conclusion

This report has evaluated the EIS documentation, submissions on the draft EIS and agency responses to the additional information on the EIS (AEIS), the IESC advice, the independent peer review of groundwater modelling and other material relevant to the project. I have considered all submissions made on the draft EIS and agency comments on the AEIS in my evaluation of the project.

I conclude that there are significant local, regional and state benefits to be derived from the China Stone Coal project, and that environmental impacts can be acceptably managed, minimised or offset, through the implementation of the measures and proponent commitments outlined in the EIS.

The conditions I have specified in this report have been formulated to further manage impacts associated with the project. Further information that I have required the proponent to provide will inform consideration of the project's EA and the associated water licence applications, and both these processes include the ability for people to have their say about the project.

I approve the project, subject to the conditions and recommendations set out in the appendices of this report. In addition, I require the proponent's commitments to be fully implemented.

This report will lapse 4 years after the day this report is publicly notified.

A copy of this report will be provided to the proponent and relevant government Ministers and agencies, and will also be made publicly available on the Department of State Development, Manufacturing, Infrastructure and Planning website at www.dsdmip.qld.gov.au/chinastone.



Barry Broe
Coordinator-General

22 November 2018

1. Introduction

This report has been prepared pursuant to section 34D of the *State Development and Public Works Organisation Act 1971* (Qld) (SDPWO Act) and provides an evaluation of the environmental impact statement (EIS) for the China Stone Coal project (the project).

This report does not record all the matters that were identified and subsequently addressed during the assessment. Rather, it concentrates on the substantive issues identified during the EIS process and the measures and conditions required to address the impacts. The report:

- summarises the key issues associated with the potential impacts of the project on the physical, social and economic environments at the local, regional, state and national levels
- presents an evaluation of the project, based on information contained in the draft EIS, additional information on the EIS (AEIS) and an addendum to the AEIS (collectively, the EIS documentation), submissions made on the draft EIS as well as information and advice from advisory agencies and other relevant authorities
- states and imposes conditions and makes recommendations under which the project may proceed
- documents the proponent's commitments.

2. About the project

2.1 The proponent

MacMines Austasia Pty Ltd (MacMines) is the proponent for the project.

MacMines was established and registered as a company in Queensland in 1999 and has focused on geological exploration. MacMines is a related entity of the China-based Shanxi Meijin Energy Group (Meijin). Both companies are wholly owned by the Yao family. Meijin is primarily engaged in manufacturing commercial metallurgical coke and owns, operates and manages a fully integrated coal to steel product chain in China.

2.2 Project location

The EIS confirms the project is proposed to be located on a 20,000 hectare (ha) site ('the project area') in the central Galilee Basin, within mining lease application (MLA) areas held by the proponent (MLA 70514, MLA 70515, MLA 70516, MLA 70517 and MLA 70518) (Figure 2.1, Figure 2.2 and Figure 2.3).

The project area is approximately 300 kilometres (km) west of Mackay and 190 km west of the regional centre of Moranbah, within the Isaac Regional Council (IRC) area. Access to the site is via 130 km of unsealed road from the Gregory Development Road. The nearest townships by road are Charters Towers (285 km to the north) and Clermont (260 km to the south-east).

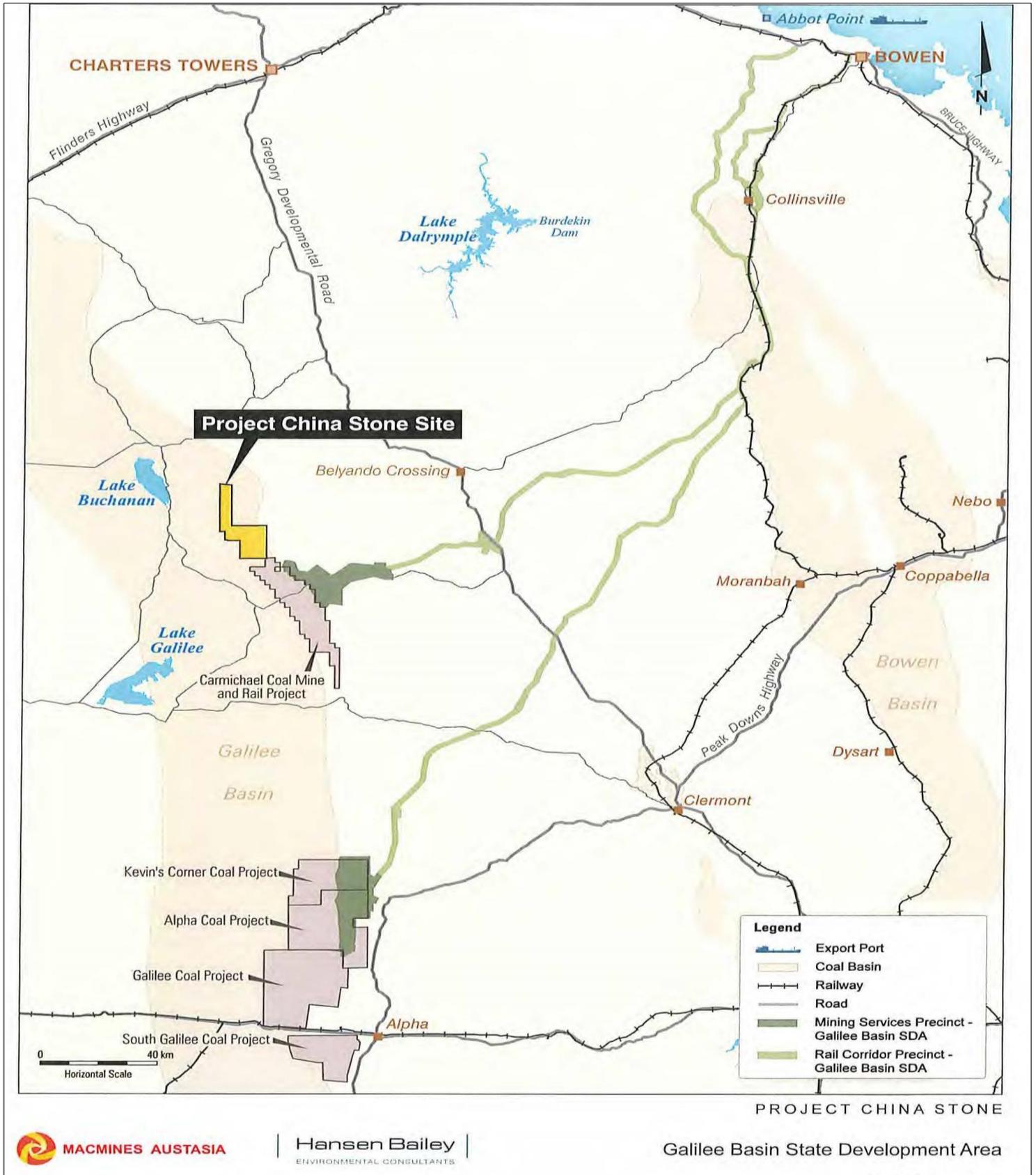


Figure 2.1 Project site in relation to the Galilee Basin State Development Area

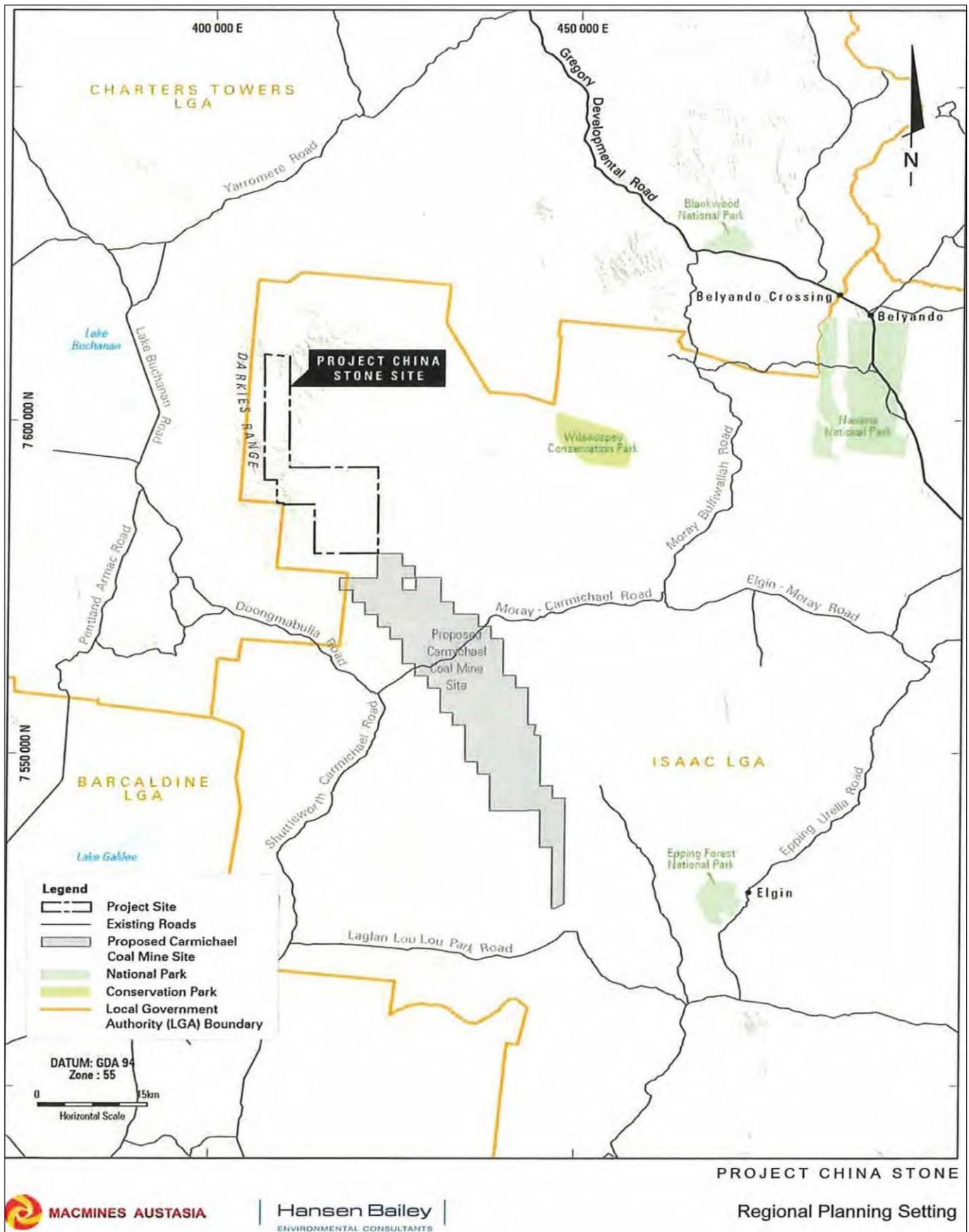


Figure 2.2 Project in relation to local government area boundaries

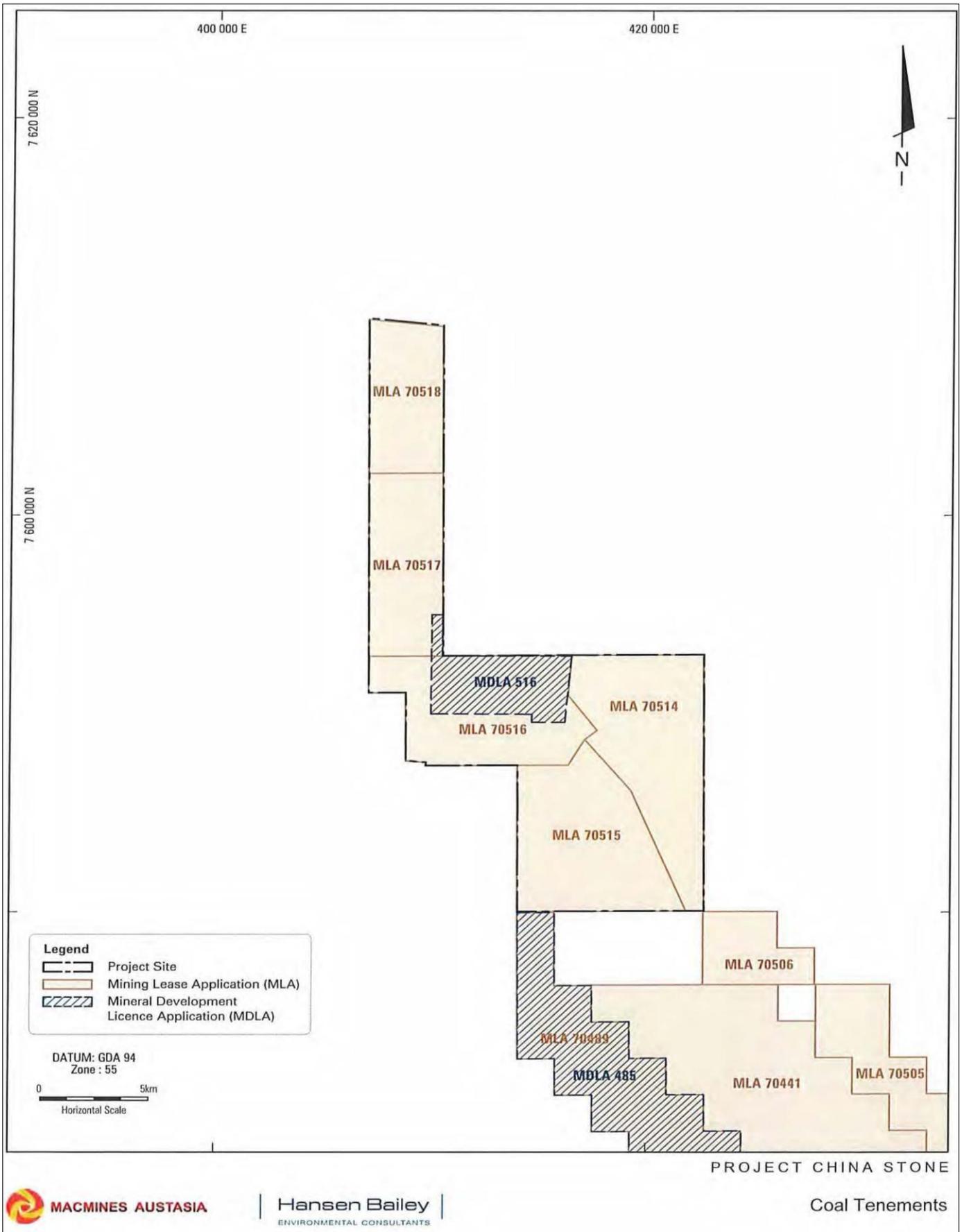


Figure 2.3 Resource tenements of project and adjoining tenements

2.3 Project description

The EIS states the project involves the construction and operation of a greenfield, thermal coal mine and associated infrastructure on the mining lease.

Mining would target the A, B, C and D coal seams of the Galilee Basin (Figure 2.4) producing, at peak, 38 million tonnes per annum (Mtpa) of product coal over the early years of the 50-year mine life. Coal would be washed and processed on-site and transported via rail for export at the Abbot Point Coal Terminal.

The proposed project involves nine key elements:

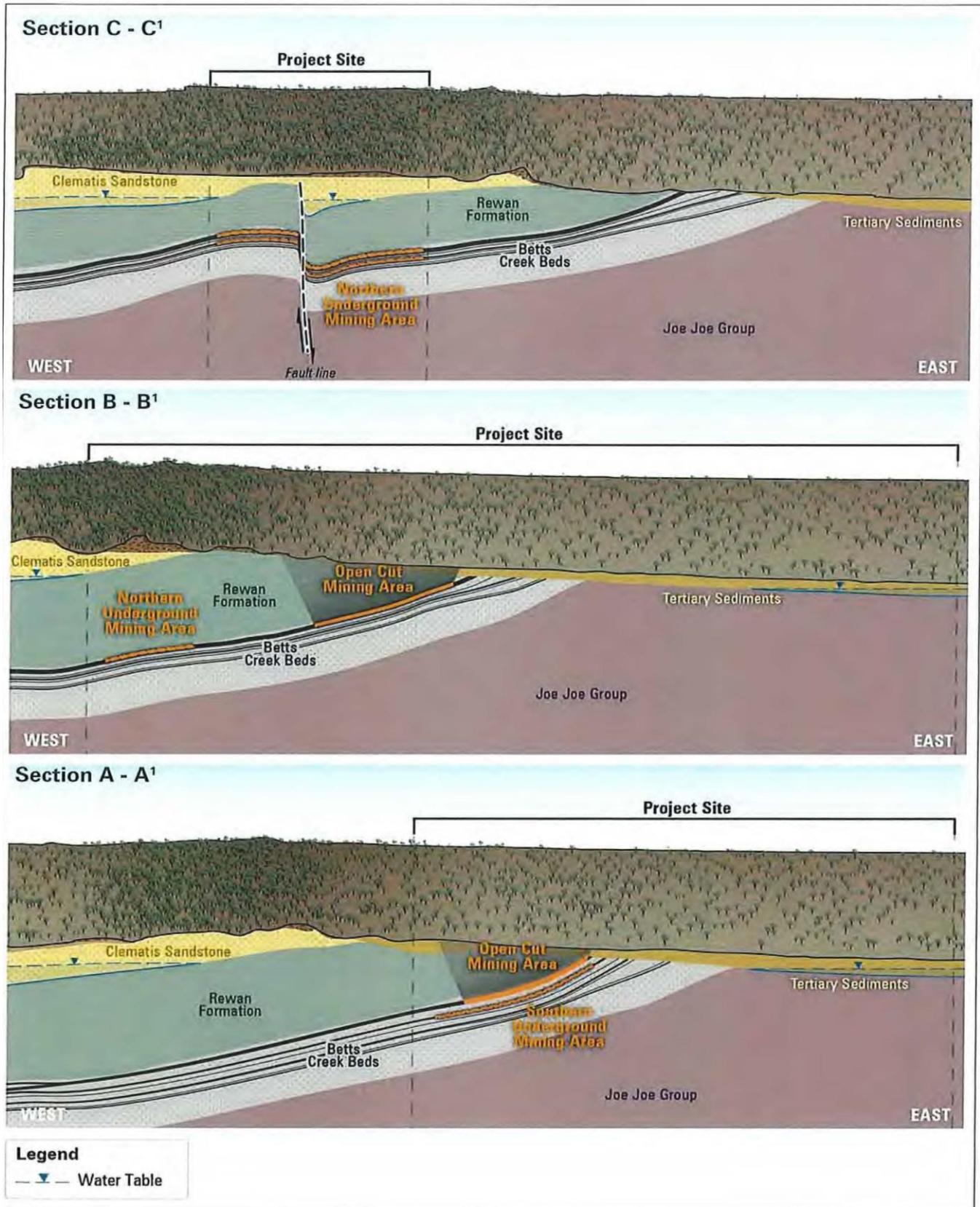
1. one open-cut mine
2. three underground mines
3. mine infrastructure areas and workshops
4. coal handling and preparation plant (CHPP), stockpile areas and coal conveyors
5. tailings storage facility (TSF) and dams
6. rail loop and train-loading facilities
7. power station and associated power station waste storage facility (PSWSF)
8. airstrip
9. accommodation village.

Each of the project elements is described in the sections below. The mine site layout concept plan developed for the EIS is shown on Figure 2.5. Final mine layout and infrastructure design plans may be further refined prior to the grant of the mining lease and approval of the plan of operations.

2.3.1 Open-cut mine

The EIS states that the open-cut mine would have a 30-year mine life with a peak run of mine (ROM) production of approximately 32 Mtpa. Mining in the open-cut pit would target the A, B and C coal seams, with production expected to commence in Year 3 of the project. Mining would progress from east to west.

The fully developed open-cut pit would be approximately 275 to 410 metres (m) wide, and 330 to 400 m deep with a total length of approximately 8,700 m. For a period of operations, the open-cut mine would be divided into a north and south pit by a temporary land bridge that would connect the mine infrastructure area with the underground mining areas (Figure 2.5).



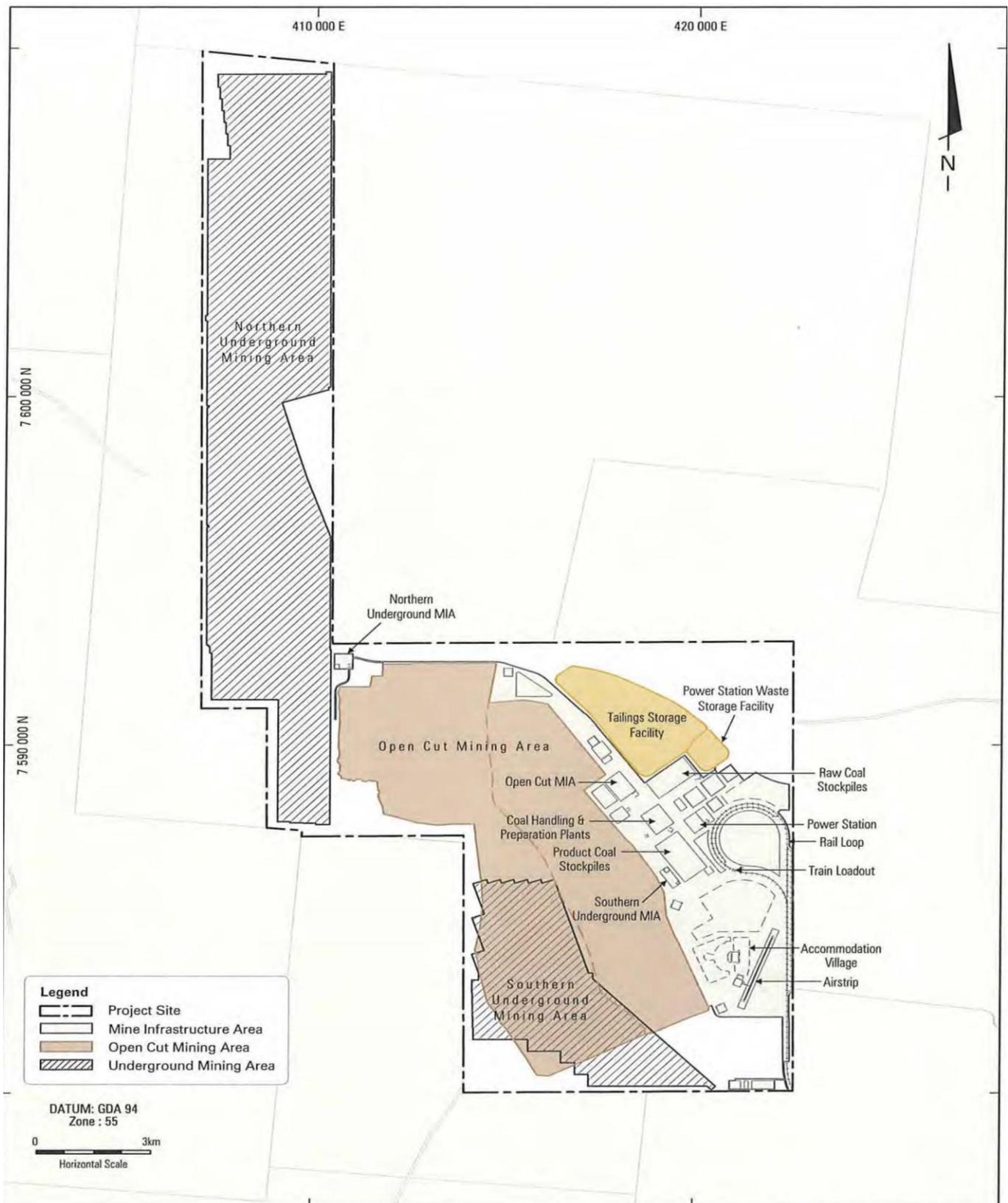
PROJECT CHINA STONE



Hansen Bailey
ENVIRONMENTAL CONSULTANTS

Hydrogeological Cross Sections of Project Site

Figure 2.4 Hydrogeological cross-sections of project area from groundwater section



PROJECT CHINA STONE



Hansen Bailey
ENVIRONMENTAL CONSULTANTS

Project Layout

Figure 2.5

Project layout

2.3.2 Underground mines

The proponent proposes three longwall mine panels to be operated in two underground mining areas known as the northern underground mine and southern underground mine (Figure 2.5).

Longwalls would be approximately 300 m wide and 4.5 m high. The chain pillars that provide loading support to the underground mine structure are proposed to be 35 m wide. The length of the longwalls and depth of the targeted seams vary as described below.

Northern underground mine

The northern underground mine would have two longwall panels targeting the A and D coal seams. Production would commence in Project Year 3, following completion of underground mine access drifts, and continue for 47 years. Peak ROM production would be approximately 15 Mtpa.

The A coal seam longwall panels would vary in length from approximately 1 to 4.8 km. The depth of the A coal seam to be mined ranges from approximately 140 to 420 m.

The D coal seam longwall panel would be located below the A coal seam longwall and would vary in length from approximately 0.8 to 3 km. The depth of the D coal seam to be mined ranges from approximately 200 to 490 m.

Southern underground mine

The southern underground mine would have one longwall panel targeting the C coal seam. Production would commence in Year 3 of the project and continue for approximately 13 years. Peak ROM production would be approximately 8 Mtpa.

The C coal seam longwall panels would vary in length from approximately 0.5 to 4.2 km. The depth of the C coal seam to be mined ranges from approximately <100 to 450 m.

2.3.3 Mine industrial areas

Mine industrial areas (MIA) would be located adjacent to the mining areas. The MIA servicing the open-cut mine pit would be located to the east of the out-of-pit overburden emplacement areas (Figure 2.5). The northern underground MIA would be located to the north-east of the open-cut mine pit, and the southern underground MIA would be located near the coal stockpiles east of the open-cut mine pit.

2.3.4 Coal handling and preparation plants

The CHPP would be located east of the open-pit mining area, adjacent to the rail loop (Figure 2.5). The CHPP would crush, screen, size and wash the coal. A series of conveyors would transport the coal from the CHPP loading station to the raw coal stockpiles and onto the CHPP. Conveyors would transport the product coal from the CHPP to the train-loading facility to be transported to port.

2.3.5 Tailings storage facility

The TSF would be located north-east of the open-cut mine pit MIA (Figure 2.5). The TSF would have a 600 ha footprint with a capacity of approximately 100 million cubic metres (m³), and a maximum embankment height of 34 m.

The TSF would be a conventional tailings dam with sufficient capacity for life-of-mine tailings storage. It would be designed to prevent overtopping. Tailings would be transported to the TSF from the CHPP via a slurry pipeline.

2.3.6 Rail loop and train-loading facilities

The train-loading facilities and on-site rail loop would be located east of the CHPP and north of the airstrip (Figure 2.5). The on-site rail loop would link to an off-site rail spur to connect the mine to the proposed North Galilee Basin Rail project in the Galilee Basin State Development Area, travelling from the Galilee Basin to the Abbot Point Coal Terminal. The EIS confirms that alignment of the rail loop is dependent on the alignment of the North Galilee Basin Rail line, which is proposed by another project proponent.

2.3.7 Power station

The EIS states that a coal-fired power station, comprised of three 350 MW supercritical generating units, is proposed to be constructed on-site. The proponent proposes to fuel the power station by reject coal from the CHPP supplemented with raw coal from the B-coal seam.

The EIS assessed the alternative of connecting to the existing electricity grid, however concluded that constructing and operating a power station would be the less expensive option.

The power station is intended to only provide power for mining activities and associated facilities such as the workforce accommodation village and supporting infrastructure within the project area. It would be located in the MIA, adjacent to the CHPP (Figure 2.5) and have an associated waste storage facility.

The EIS further states that two 350 MW generating units are required to supply the potential maximum peak mine power demand, including the operation of the open-pit mine at peak production, three longwalls in underground mines, the CHPP and other associated infrastructure. The third 350 MW generating unit is proposed as a redundancy unit, should one of the other units be shut down, to ensure a reliable power supply for the mine due to its remote location.

2.3.8 Airstrip

A private airstrip would be located in the south-eastern part of the project area (Figure 2.5). It would be used to transport workers and materials. Construction is scheduled to be completed prior to the end of Project Year 1.

The EIS states approximately 40 aircraft trips per week carrying approximately 200 persons per trip are expected to be required during operations. The airstrip would be designed to cater for a range of aircraft.

2.3.9 Accommodation village

A workers' accommodation village would be located between the open-pit mining area and the airstrip (Figure 2.5). The first stage of the accommodation village would be completed during Project Year 1, comprising of approximately 560 rooms for construction workers. The village would progressively expand up to approximately 3050 rooms for operations workers.

The village would include retail and recreational facilities, administration facilities, kitchens and mess halls, health and first aid facilities, and water and sewage treatment facilities.

2.4 Off-lease infrastructure requirements

The declared coordinated project does not include the off-lease infrastructure required for the project to proceed, therefore this report does not include assessment of the off-lease infrastructure. The off-lease infrastructure would be assessed in a separate environmental assessment and approvals processes. This infrastructure could include:

- the mine site access road connection from the site to the Moray-Carmichael Road
- a rail spur connection from the mining lease to the Galilee Basin State Development Area rail corridor
- a pipeline connection to a 12,500 megalitres (ML) per annum raw water supply
- Abbot Point Coal Terminal port facility access and port capacity would be negotiated with the relevant port infrastructure service provider.

Each of the off-lease elements is described in the sections below.

2.4.1 Mine site access from Moray-Carmichael Road

The EIS confirms a new intersection and access road to the mine site would need to be constructed from Moray-Carmichael Road. The location of the intersection and alignment of the new access road would depend on the Moray-Carmichael Road realignment proposed by Adani Mining Pty Ltd and Carmichael Rail Network Pty Ltd (Adani), the joint proponents of the Carmichael Coal Mine and Rail Project (CCM&RP), which is adjacent to the project area.

The intersection and access road would be subject to a separate approvals process. The proponent would progress the process once the Moray-Carmichael Road realignment is finalised.

2.4.2 Rail spur and connection to port

A rail line connecting the Galilee Basin to the Abbot Point Coal Terminal is being developed by another company.

The proponent would be responsible for constructing the off-site rail spur connecting the project to the rail line. The rail spur would be subject to a separate approvals process and would be progressed once the alignment of the Galilee Basin to Abbot Point rail line is finalised.

2.4.3 External water supply

The project would require an external water supply of up to 12,500 ML annually. The EIS states that the proponent’s preferred water supply is an allocation from a piped water supply from the Cape River or the Belyando-Suttor River systems.

The proponent requires an external water supply to be developed by others and intends to enter into negotiations with the relevant authority when a water supply option becomes available.

2.4.4 Coal export terminal

The proponent proposes to obtain access to export capacity at the Abbot Point Coal Terminal via a port access agreement with the relevant authority.

2.5 Project stages

The project would have an approximate 50-year mine life. The EIS includes an indicative schedule (Figure 2.6), advising that this is subject to change based on detailed planning and mining conditions.

The schedule shows construction of the mine site infrastructure, including accommodation village and airstrip would commence in Project Year 1 and be completed in Project Year 5. Coal production in the open-cut mine and underground mines is expected to commence in Project Year 3. Open-cut mining is expected to be completed by Project Year 32 and underground mining is expected to be completed by Project Year 49.

The final stage of the project would be the final rehabilitation and decommissioning stage commencing around Project Year 50 and continuing for 4 years.

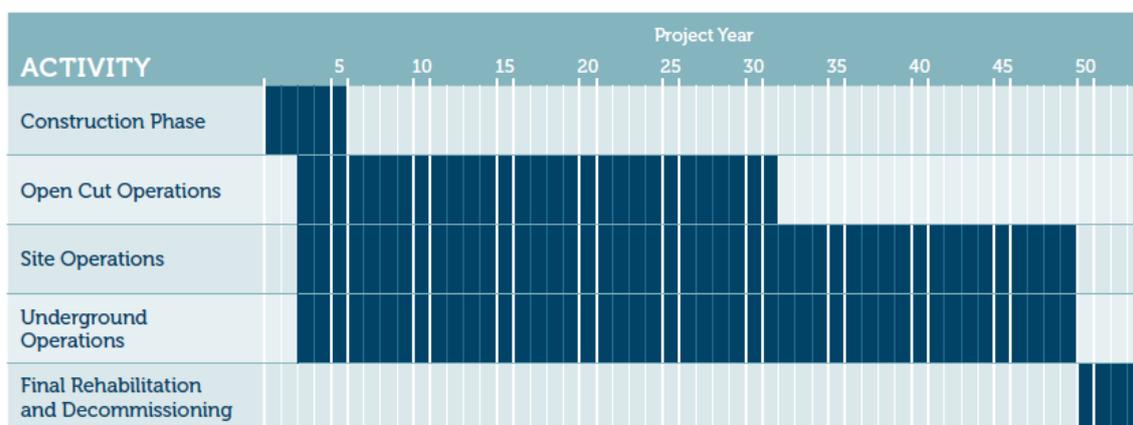


Figure 2.6 Project development schedule

2.6 Project need

The project proposes to mine and remove over 900 million tonnes of thermal coal resources to meet a forecast need to supply thermal coal to the Asian market, principally China.

The coal would be used to generate electricity. Figures provided in 2015 by the proponent indicate that electricity generated from thermal coal accounted for about 40 per cent of global electricity needs. The proponent forecast that the demand for thermal coal to burn in overseas power stations would remain strong in the long term, particularly in Asia.

The EIS states that the project would result in economic benefits for the local area and Queensland, including 3,892 peak full time equivalent (FTE) jobs during the five-year construction phase, 3,391 FTE jobs during phase 1 of operations, 1,377 FTE jobs during operations phase 2 and 275 FTE jobs during operations phase 3. The project would also contribute an additional \$951.9 million per annum to the gross state product during the construction phase and \$1,513 million per annum during operational phase 1 (Project Years 6-31) and \$182.9 million during operations phase 2 (Project Years 32-49).

3. Environmental impact statement assessment process

In undertaking this evaluation, I have considered information including:

- the initial advice statement (IAS)
- the EIS and technical reports
- issues raised in submissions on the draft EIS
- the AEIS and technical reports
- advice from the proponent
- the addendum to the AEIS
- advisory agency advice throughout EIS process from:
 - Department of Environment and Science (DES) (including the former Department of the Environment and Heritage Protection (DEHP))
 - Department of Natural Resources, Mines and Energy (DNRME) (the former Department of Natural Resources and Mines (DNRM) and the Department of Energy and Water Supply (DEWS))
 - Department of Transport and Main Roads (DTMR)
 - Department of Agriculture and Fisheries (DAF)
 - Commonwealth Department of the Environment and Energy (DEE) (formerly Department of the Environment)
 - Queensland Health
 - Department of Aboriginal and Torres Strait Islander Partnerships (DATSIP)

- advice from the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC)
- the independent targeted peer review of the proponent's groundwater modelling.

The steps taken in the project's EIS process are documented on the project's webpage at www.dsdmip.qld.gov.au/chinastone

3.1 Coordinated project declaration

On 31 October 2012, I declared this project to be a 'coordinated project' under section 26(1)(a) of the SDPWO Act. This declaration initiated the statutory environmental impact evaluation procedure of Part 4 of the SDPWO Act, which required the proponent to prepare an EIS for the project.

3.2 Commonwealth assessment

On 30 October 2014, a delegate of the Commonwealth Minister for the Environment determined the project to be a 'controlled action' under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act) (EPBC ref. 2014/7353). The relevant controlling provisions under the EPBC Act are:

- sections 18 and 18A, listed threatened species and communities
- sections 20 and 20A, listed migratory species
- sections 24D and 24E, a water resource, in relation to coal seam gas development and large coal mining development.

On 12 November 2014, the delegate determined that the project should be assessed by an accredited assessment under Part 4 of the SDPWO Act. The project was not assessed under the bilateral agreement, however matters of national environmental significance (MNES) have been assessed in my report.

Under Part 4 of the SDPWO Act and section 36 of the State Development and Public Works Organisation Regulation 2010 (SDPWO Regulation), the Coordinator-General must ensure the assessment report evaluates all relevant impacts that the action has, would have, or is likely to have. The Coordinator-General's assessment must provide sufficient information about the action and its relevant impacts to allow the Commonwealth Minister for the Environment to make an informed decision whether or not to approve the action under the EPBC Act.

Section 6—MNES of this report lists each controlling provision under the EPBC Act and explains the extent to which the relevant Queensland Government's EIS process addresses the actual or likely impacts of the project on the matters covered by each controlling provision.

After a copy of my evaluation report is provided to the Australian Government, a decision on the controlled action under section 133 of the EPBC Act will be made by the Commonwealth Minister for the Environment or the delegate. The Minister will use the information in section 6—MNES to decide whether the project should proceed, and

if so, whether any additional conditions, beyond those I have recommended in this report, will be applied to manage the impacts on MNES.

3.3 Terms of reference

The draft terms of reference (TOR) for the EIS for the proposed project were released for public and advisory agency comment from 3 November 2012 to 3 December 2012. Comments were received from 20 submitters, comprising 13 advisory agencies, 1 private individual, 5 private organisations and 1 from the proponent.

The final TOR were prepared, having regard to comments received, and issued to the proponent on 9 January 2013.

The TOR were amended on 4 December 2014 to include MNES, following the determination that the project was a controlled action under the EPBC Act and that it would be assessed by an accredited assessment process under the SDPWO Act.

3.4 Review of the EIS

The draft EIS, prepared by the proponent, was released for public and agency submissions from 25 July 2015 to 7 September 2015.

Sixty-five submissions were received, comprising 28 private individuals, 19 advisory agencies, 15 non-government organisations and 3 businesses. Copies of the submissions were forwarded to the proponent and DEE. Key issues raised by private submitters and advisory agencies are listed in Table 3.1. In my evaluation of the project I have considered each of the submissions and how the information provided by the proponent addressed issues raised.

Table 3.1 Summary of public and agency submissions on the draft EIS

Agency	Issue
Queensland Government	
• DATSIP	• incorrect, incomplete and/or poor explanation of methodology for field investigations and surveys
• DAF	• subsidence impacts
• Department of Communities, Disability Services and Seniors, and Department of Child Safety, Youth and Women (formerly Department of Communities, Child Safety and Disability Services)	• impacts to wetlands
• Department of Education and Training	• impacts to the Great Artesian Basin
• DES	• workforce management and arrangement
• Department of Housing and Public Works (Housing Services)	• traffic and transport impacts to local and regional roads
• Department of Housing and Public Works (Strategic Asset Management)	• hazard management
• DNRM and DEWS	• TSF and power station waste storage facility designs
	• downstream surface water impacts
	• groundwater impacts
	• raw water supply options
	• sewage management
	• impacts to stock routes
	• surface water drainage

Agency	Issue
<ul style="list-style-type: none"> • DSDMIP (formerly Department of State Development) • Department of Tourism, Major Events, Small Business and the Commonwealth Games • Department of Innovation, Tourism Industry Development and the Commonwealth Games (formerly Department of Transport and Main Roads) • Public Safety Business Agency (QPS and Queensland Fire and Emergency Services) • Queensland Health • Queensland Treasury • SunWater Limited (government-owned corporation) 	<ul style="list-style-type: none"> • surface water quality • sulphur emissions • impacts to matters of state environmental significance (MSES) and MNES, including the Australian painted snipe, yakka skink and black-throated finch (BTF) • stakeholder engagement and consultation • depressurisation of registered groundwater bores • biodiversity and groundwater offsets • workforce training • Aboriginal and Torres Strait Islander employment • road impact assessment • on-site telecommunications infrastructure • impacts to agriculture • native title • rehabilitation • impacts to groundwater dependent ecosystems • health services • land tenure • air quality monitoring.
<p>Commonwealth Government</p> <ul style="list-style-type: none"> • DEE (formerly Department of the Environment) 	<ul style="list-style-type: none"> • BTF habitat mapping • squatter pigeon habitat mapping • offsets • surface and groundwater impacts.
<p>Local government</p> <ul style="list-style-type: none"> • IRC • Mackay Regional Council 	<ul style="list-style-type: none"> • employment and business opportunities • road impacts • housing • health and safety • off-lease infrastructure • power station capacity • raw water supply • aircraft noise • coal price • development approvals.

Agency	Issue
<p>Non-government organisations</p> <ul style="list-style-type: none"> • Australian Marine Conservation Society • BirdLife Australia • BirdLife Southern Queensland • Coast and Country – Land Services • Coast and Country – Rural Services • Correct Planning and Consultation for Mayfield group (CPCFM) • Environmental Justice Australia • Greenpeace Australia Pacific • Lock the Gate Alliance • Mackay Conservation Group • North Queensland Conservation Council • Protect the Bush Alliance • Queensland Conservation Council • The Black-throated Finch Recovery Team • Wangan & Jagalingou Traditional Owners Family Representative Council (Native Title Claimant) 	<ul style="list-style-type: none"> • impacts to the Great Barrier Reef from shipping • impacts to MSES and MNES, including the Australian painted snipe, yakka skink and BTF • groundwater impacts • Great Artesian Basin impacts • impacts to springs • climate change • greenhouse gas emissions • economic analysis • socio-economic baseline • workforce management and arrangements • road traffic • air traffic • cultural heritage • consultation • rehabilitation • impacts to agriculture • impacts combined with other Galilee Basin mines • methodology • environmental monitoring • offsets • downstream surface water impacts • impacts to sensitive receptors.
<p>Businesses</p>	<ul style="list-style-type: none"> • subsidence impacts • BTF habitat assessment • dust impacts • road, rail and air transport impacts • consultation • methodology • offsets • project water demand combined with other water user demands.
<p>Private individuals</p>	<ul style="list-style-type: none"> • dust and pollution impacts on cattle grazing, beef production and environmental values • impacts to cattle handling and husbanding via helicopter • downstream surface water impacts • water and soil contamination • groundwater and surface water impacts • impacts on water resources, including the Great Artesian Basin. • inadequate assessment of impacts to landholder homesteads • impacts to threatened species • biodiversity offsets.

3.5 Referral to the Independent Expert Scientific Committee

Queensland is a signatory to the Council of Australian Governments (COAG) National Partnership Agreement (NPA) on Coal Seam Gas and Large Coal Mining Development. The NPA requires coal seam gas or large coal mining development proposals undergoing environmental impact assessment and that are likely to have a significant impact on water resources to be referred to the IESC.

In accordance with section 131AB of the EPBC Act, on 24 August 2015, I submitted to the IESC a joint request for advice with DEE on water matters for the project. The IESC provided its advice on 9 October 2015 and a copy is available at www.dsdmip.qld.gov.au/chinastone.

The IESC advice has informed my evaluation of the project and is discussed in section 6 of this report.

3.6 Additional information to the EIS

Following release of the EIS and my review of submissions, on 6 November 2015, I required that the proponent submit additional information regarding:

- a revised groundwater impact assessment
- additional field data collection
- a revised draft subsidence management plan
- quantitative information about the surface water environment
- results of additional surveys for terrestrial and aquatic ecology
- revised habitat assessment and impacts to MNES and MSES
- updated biodiversity offset strategy
- re-designs of the TSF and PSWSF
- revised air quality impact assessment
- community consultation and engagement strategy
- revised visual impact assessment
- revised transport impact assessment
- air traffic impact assessment
- rehabilitation management plan
- mine closure plan
- impact assessment of water resources and habitat clearing combined with other mines in the Galilee Basin
- details of Aboriginal and Torres Strait Islander peoples' use of the area and project impacts.

3.7 Review of the AEIS

On 22 August 2017, the proponent submitted the AEIS responding to the submissions on the draft EIS and the IESC advice. I approved its release for agency information and consideration which occurred between 20 October 2017 and 10 November 2017. On 8 February 2018, at my direction, the proponent submitted an addendum to the AEIS in response to agency comments on the AEIS.

This report has evaluated the EIS documentation, submissions on the draft EIS and agency response to the AEIS, the IESC advice, the independent peer review of groundwater modelling and other material relevant to the project. I have considered all submissions made on the draft EIS and agency comments on the AEIS in my evaluation of the project.

4. Project approvals

Following the release of this evaluation report, the proponent will need to obtain statutory approvals from Commonwealth, state and local government jurisdictions before the project can proceed. Table 4.1 provides a list of core approvals required for the project to proceed.

The EIS confirms that further information may be required by the relevant authority for the granting of these approvals prior to the construction and operational phase of the project.

Table 4.1 Core approvals required for the project

Project component/activity	Permit/ approval	Legislation	Authority
Whole of project	Controlled action (EPBC 2014/7353)	<i>Environment Protection and Biodiversity Conservation Act 1999</i>	DEE (Cwlth)
Mining and associated activities on the mining lease	Environmental Authority (EA) for mining lease and environmentally relevant activities (ERAs) including: ERA 8 – Chemical storage ERA 14 – Electricity generation ERA – 31 – Mineral processing ERA 56- Regulated waste storage ERA 60 – Waste disposal ERA 61 – Waste incineration and thermal treatment ERA 63 – Sewage treatment ERA 64 – Water treatment	<i>Environmental Protection Act 1994</i>	DES
Mining tenure and associated activities on the mining lease	Mining leases for MLA 70514, MLA 70515, MLA 70516, MLA 70517, MLA 70518	<i>Mineral Resources Act 1989</i>	DNRME

Subsequent approvals required for the project including for off-site infrastructure are subject to separate applications and assessment processes. The EIS states that further information would be required to support lodgement of applications for these subsequent approvals with the relevant assessment managers.

Table 4.2 Possible subsequent approvals required for the project

Relevant approval	Legislation	Administering authority
Vegetation clearing	<i>Vegetation Management Act 1999</i>	DNRME
Biodiversity offsets	Queensland: <ul style="list-style-type: none"> • <i>Environmental Offsets Act 2014</i> • Environmental Offsets Regulation 2014 Commonwealth: <ul style="list-style-type: none"> • <i>Environment Protection and Biodiversity Conservation Act 1999</i> 	DES DEE Commonwealth Minister for the Environment
Plan of operations including financial assurance	<i>Environmental Protection Act 1994</i>	DES
Aerodrome certification	<i>Civil Aviation Act 1988</i>	Civil Aviation Safety Authority
Agreement with authorities for alteration of a stock route	<i>Land Protection (Pest and Stock Route Management) Act 2002</i>	DNRME and IRC
Approval to take native wildlife	<i>Nature Conservation Act 1992</i>	DES
Permits: <ul style="list-style-type: none"> • rehabilitation permit (spotter catcher endorsement) • damage mitigation permit (removal and relocation) • protected plant clearing permit • species management program (tampering with animal breeding place) 	<i>Nature Conservation Act 1992</i>	DES
Approval to close a road temporarily	<i>Transport Operations (Road Use Management) Act 1995</i>	DTMR
Associated Water Licence	<i>Water Act 2000</i>	DNRME
Cultural Heritage Management Plan (CHMP)	<i>Aboriginal Cultural Heritage Act 2003</i>	DATSIP

4.2 Australian Government approvals

Environment Protection and Biodiversity Conservation Act 1999

The project was declared a controlled action on 30 October 2014 under the EPBC Act. The EIS process has been assessed by an accredited assessment process as discussed in section 3.2 of this report. The Commonwealth Minister for the Environment will use the information in section 6—MNES of this report to make an informed decision under section 133 of the EPBC Act whether or not to approve the controlled action, and if approved, apply conditions to the approval necessary to manage the impacts on MNES.

Aerodrome certification

The Civil Aviation Safety Authority (CASA) prescribes the standards for civil aviation safety in the Civil Aviation Safety Regulations 1998. The private airstrip on the mine site would require an aerodrome certification issued by CASA.

Native Title Act 1993

In accordance with Division 3 of the *Native Title Act 1993* (Cwlth), the proponent will need to reach an agreement with the Native Title claimants, the Wangan and Jagalingou People, about how land and waters in the mine area would be used and managed. The agreement is known as an Indigenous land use agreement (ILUA). The CHMP can form part of the ILUA.

If no agreement can be reached and the proponent has complied with the Act, the proponent can choose the right to negotiate process, which leaves the final decision to resolve native title interests with the Native Title Tribunal.

Native title interests must be resolved before the Queensland Minister for Natural Resources, Mines and Energy can issue a mining lease for the project under the *Minster Resources Act 1989* (MR Act).

4.3 State government approvals

The relevant state-based planning and approvals framework is primarily established by the:

- MR Act, which regulates mining tenures
- *Environmental Protection Act* (1994) (EP Act), which regulates mining activities and related ERAs on and off the mine site
- *Planning Act 2016* (Planning Act), (replaced the *Sustainable Planning Act 2009* on 3 July 2017) which regulates development off the mining lease.

Mining lease

Mining and associated mining activities undertaken as part of the project would be carried out on MLA 70514, MLA 70515, MLA 70516, MLA 70517 and MLA 70518 which were lodged on 3 February 2014 with DNRME.

A mining lease must be granted pursuant to the MR Act before mining activities commence. An EA for mining activities must be issued, and native title interests over the mine area must be resolved before the mining lease can be granted.

The mining lease would state whether activities and infrastructure proposed on the mine site are to be considered 'associated mining activities' pursuant to the MR Act. If activities or infrastructure are not stated as such on the mining lease, separate approvals for the activities and infrastructure would need to be sought from the relevant assessment managers.

Environmental authority

Under the EP Act, an EA is required to carry out a mining activity as defined under section 110 of that Act, which would include the construction and operation of the rail loop located on the mine site. The project would involve the following types of mining activities:

- mining under the MR Act
- processing mined materials
- activities directly associated with, or facilitating or supporting the mining and processing activities
- rehabilitation and/or remediation of the mine and associated infrastructure
- actions taken to prevent environmental harm.

I have included stated conditions in Appendix 2 of this report for the draft EA. In accordance with section 47C of the SDPWO Act, the stated conditions must be included in the draft EA that is to be publicly notified and in the final EA issued for the mine. I note people will have an opportunity to have their say on the proponent's EA application and the draft EA which is to be developed by the administering authority for the EP Act (DES). DES will consider any objections received in deciding on the final EA.

As the project's mine design has yet to be finalised, a full set of stated conditions for the draft EA has not been included in Appendix 2. Before the EA application is publicly notified, the proponent must provide more information to DES related to groundwater, surface water, the power station (or alternate power supply) and sewage treatment as specified in my imposed conditions, in Appendix 1, related to these matters. DES will be required to develop further conditions related to these matters for inclusion in the draft EA in consultation with the proponent before it is publicly notified. Additional conditions developed by DES for inclusion in the final EA or a future amendment to the EA must be consistent with my stated conditions in Appendix 2.

Environmentally relevant activities

Under the EP Act, an EA issued by DES is required to carry out an ERA. The provisions of the EA (for mining activities) can provide authority for any non-mining ERAs (e.g. waste disposal, sewage treatment, electricity generation) that occur on the mining lease, as long as these ERAs support the mining activity.

Table 4.1 provides a list of ERAs from Schedule 2 of the Environmental Protection Regulation 2008 that would need to be authorised under the EA for the project.

Associated water licence

The proponent would be required to hold an 'associated water licence' (AWL) under the *Water Act 2000* (Water Act) before the project can take associated water. Associated water is groundwater taken during the course of, or which results from the carrying out of an authorised activity for the mining lease. Examples include mine dewatering to achieve safe working conditions and the take of water related to groundwater evaporation from an open-cut mine pit.

Applications for AWLs need to be publicly notified so the public can have their say on the application. An AWL can be conditioned by the administering authority for the Water Act (DNRME) to manage predicted groundwater impacts from the take of associated water and include groundwater conditions from other approvals obtained for the project prior to the issuance of an AWL, including conditions in my report.

Cultural heritage management plan

Part 7 of the *Aboriginal Cultural Heritage Act 2003* requires a CHMP to be developed and approved when an EIS is required for a project.

The proponent is required to develop a CHMP in agreement with the Native Title claimants, the Wangan and Jagalingou People, stating how land use activities can be managed to avoid or minimise harm to the Traditional Owners' cultural heritage.

The CHMP will need to be approved by DATSIP before the project can commence.

4.4 Local government approvals

The development of a mining activity for which an EA applies is exempt from assessment against a local government planning scheme under the Planning Act and therefore, there are no applicable local government development approvals for activities on the mining lease.

The project is located in the IRC local government area. The proponent is required to negotiate with IRC and DNRME to alter the stock route that intersects the project area. The proponent is also required to consult IRC about the location of the new mine access road, including the design of the road intersection with Moray-Carmichael Road, once the road alignment has been determined.

5. Evaluation of environmental impacts

This section discusses the major environmental effects identified in the EIS. Matters addressed in the EIS to my satisfaction have not been included in this report. For these matters, I am satisfied that the proponent's mitigation measures and commitments are appropriate.

For the remaining matters, I have included a detailed evaluation and stated or imposed conditions or made recommendations to manage potential adverse impacts.

5.1 Land use and rehabilitation

The EIS states that the project area comprises approximately 20,000 ha of vegetated land with a densely vegetated ridgeline known as Darkies Range, running north to south through the western portion of the site. The primary land use within and adjacent to the project area is cattle grazing and resource exploration (see Figure 5.1).

The project area is located on three parcels of crown land, leased by three separate lessees for grazing. There are two other parcels of land that directly adjoin the project area, leased for grazing activities. The project area is covered by mining exploration tenements. There are also underlying petroleum gas exploration tenements that are held by other proponents. A stock route (U398BELY01) traverses the southern part of the project area.

Soil tests and land suitability assessments undertaken for the EIS found the soil in the project area suitable for beef cattle grazing with large areas having marginal potential for improved pastures. The site is not mapped as an area of regional interest under the *Regional Planning Interests Act 2014* (RPI Act). Therefore, a regional interests development approval is not required at this time. However, should the area be mapped at a later date but before the project has all of its other approvals, the project may be subject to further assessment under the RPI Act.

The EIS identified three rural residences within 15 km of the project area with the closest homestead being located approximately 7.2 km to the west. The nearest settlement is Belyando Crossing which is located approximately 140 km to the east of the project area.

The proposed CCM&RP adjoins the project area to the south-east. Five other coal mines are proposed for the Galilee Basin south of the CCM&RP.

Lake Buchanan is located approximately 20 km to the north-west of the project area and is used by the local community for recreational activities. Wilandspey Conservation Park is located approximately 25 km to the east of the project area and aims to conserve the natural ecosystems, flora and fauna populations.

Several sensitive environmental areas were identified on the project area including MSES and MNES. These are discussed in more detail in section 5.2—MSES and section 6—MNES of this report.



Figure 5.1 Land use and noise and air sensitive receptors

Submissions received

The key issues raised in submissions on the draft EIS regarding potential land and rehabilitation impacts of the project included the following:

- impacts to agricultural land use and productivity
- impacts to the stock route network (SRN)
- impacts to sensitive visual receptors
- the adequacy of the proposed revegetation methods for subsidence crack rehabilitation
- concerns regarding rehabilitation and the final landform.

I have considered the issues raised in submissions in my evaluation of the EIS, and how the information provided by the proponent addresses these issues.

5.1.1 Impacts and mitigation

Land use and rehabilitation

Impacts

The EIS states that approximately 70 per cent of the 20,000 ha project area would be subject to mine disturbance, including the mine infrastructure areas, which would be rehabilitated as part of mine closure and restored to its pre-mining land suitability for grazing purposes. However, the EIS states that approximately 6,011 ha of existing grazing land (or 30 per cent of the project area), comprising the proposed overburden emplacement areas and final void (the EIS refers to the residual open-cut mine pits left in perpetuity post-mine closure as a final void), would not be suitable for grazing following mine closure and rehabilitation, resulting in the permanent loss of that land for grazing purposes.

The EIS states that the remaining open-cut mine pits would not be backfilled in the post-mining phase commencing year 47, as the financial cost of moving the overburden back into the open-cut mine pits could render the project economically unviable. The EIS proposes that the overburden emplacement areas and open-cut mine pits would be left in a geotechnically stable form. The EIS states that the overburden emplacement areas would not be suitable for grazing due to their height and slopes (180 m above existing ground level with external slopes of 6 horizontal:1 vertical) and their agricultural land class would render them unsuitable for agricultural land uses. Similarly, the EIS states that the remaining open-cut mine pits would not be suitable for grazing due to their steep slopes and the groundwater-fed lakes that would form within the open-cut mine pits.

The EIS states that, post-rehabilitation, the mine pits would comprise an area of approximately 3,400 ha within which two groundwater-fed lakes would form, reaching a level approximately 50 m below the spill point of the final mine pits (see Figure 5.2). The pits are anticipated to have a maximum depth of approximately 300 m and the lakes that would form in the pits would have a total surface area of approximately 264 ha.

The EIS states that these lakes are likely to be groundwater ‘sinks’, meaning groundwater would flow toward the pits and not flow through the pits back into the surrounding groundwater system. However, ongoing evaporation would result in a loss of groundwater from the lakes. At the end of mining, groundwater would seep into the pits at a rate of approximately 5 ML/day (1,825 ML/year). Ongoing loss of groundwater is predicted to reach an equilibrium of 0.5 ML/day (183 ML/year) once the lakes are full and subject to ongoing evaporation. Groundwater impacts by the project are discussed further in the section 6—MNES of this report.

Several submissions raised concerns about the project’s predicted impacts on existing agricultural land use activities requesting that equivalent land be secured to ensure no net loss of land for agricultural production

Proposed management and mitigation measures

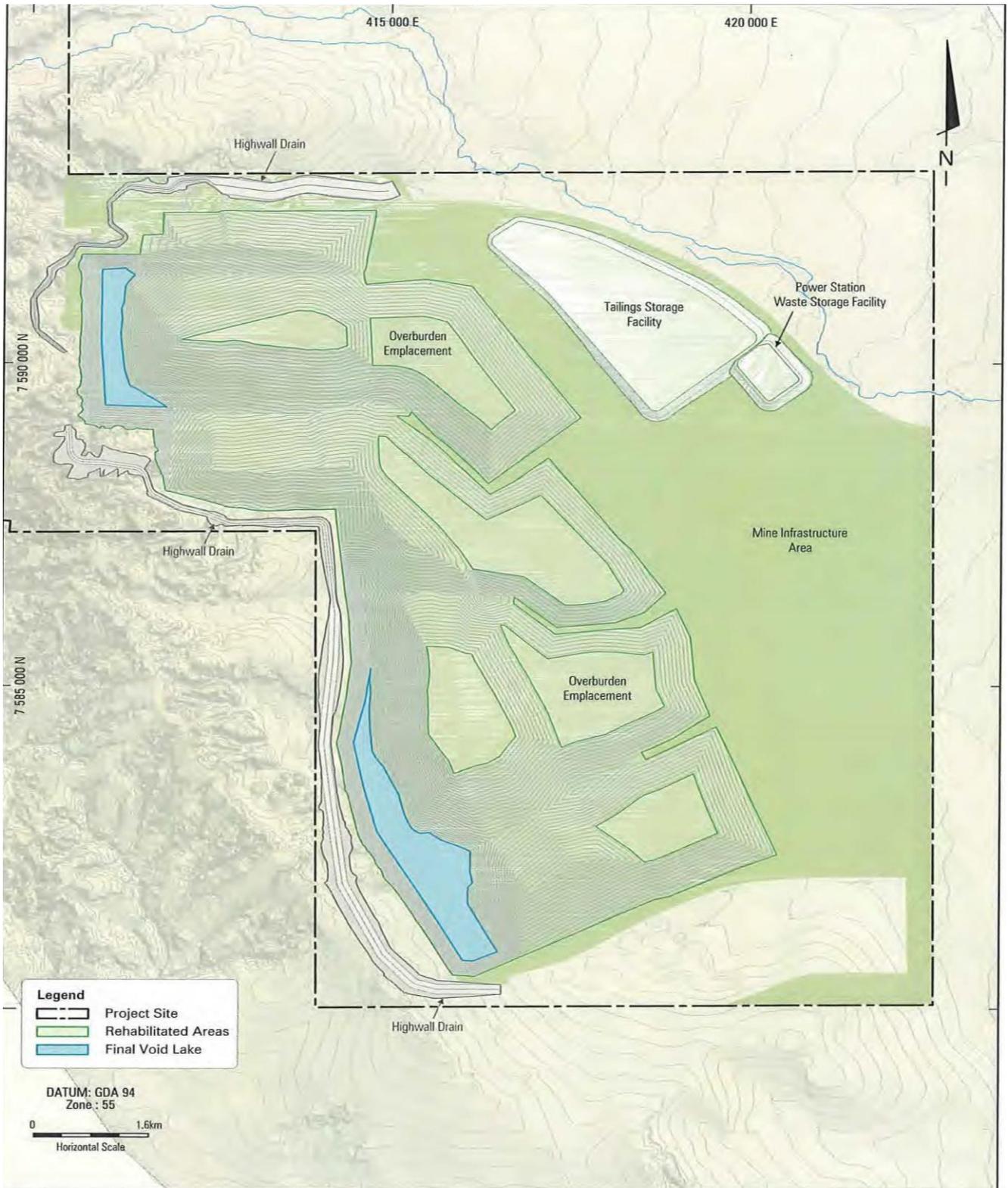
The EIS acknowledged the need to secure all appropriate land tenure and necessary approvals and consents from those holding a lawful interest in state-owned or state-controlled lands, in accordance with requirements of the *Land Act 1994*, prior to project commencement.

The EIS states that the proponent has commenced discussions with all affected landholders to obtain access to the land for the project, and negotiate land access agreements prior to project commencement. Land access agreements would include appropriate compensation for affected landholders and would address the impacts of the granting of the mining leases over affected properties, including the loss of agricultural use of land.

The EIS includes a commitment to rehabilitate mine infrastructure areas as part of mine closure and restore these areas to their pre-mining land use suitability for grazing purposes. The EIS states that management measures would be put in place to ensure that the suitability of land for grazing is unchanged, except for the 6,011 ha of overburden emplacement areas and the remaining open-cut mine pits, which would not be suitable for grazing or any other land use.

I do not accept that the overburden emplacement areas cannot be rehabilitated to facilitate a post-mining land use such as grazing. Accordingly, I have stated a condition within the EA (Appendix 2) requiring the proponent to prepare a rehabilitation management plan (RMP) for approval by the administering authority for the EP Act. The RMP must ensure all land disturbed by mining activities, including the overburden emplacement areas, is rehabilitated to a stable condition able to sustain a post-mining land use, to be agreed with the administering authority for the EP Act.

Further, while I recognise there is a financial cost to the proponent of backfilling the open-cut mine pits with the removed overburden, there would be environmental, economic and social benefits by returning all of the disturbed land within the project area to its pre-mining land use, for example, cattle grazing or similar. Another key benefit of backfilling the pits to a level at least above the pre-mining groundwater level, is limiting the ongoing loss of groundwater due to the evaporation of the groundwater that would flow in to the pits in perpetuity, as discussed further in section 6.3.2—Groundwater of this report.



PROJECT CHINA STONE



Conceptual Decommissioning Plan

Figure 5.2 Conceptual decommissioning plan

Partial backfilling, recontouring and rehabilitating of the final pits would also reduce the impacts associated with the loss of grazing land within the region, as the total disturbance area for the CCM&RP open-cut mine pits to the south of the project, is 8,331 ha. While my conditions of my approval for the CCM&RP require the remaining open-cut mine pits post-mining operations to be partially backfilled to cover the coal seams, the suitability of the CCM&RP pits for grazing post-mining is yet to be determined.

Partial backfilling the remaining pits with the overburden would align with the community expectations related to mine rehabilitation. Ensuring mined land is rehabilitated progressively, so that land disturbed by mining activities is rehabilitated to a stable landform that is able to sustain an approved post-mining land use, reduces the financial risk to the state from resource project failure. I also find that improved rehabilitation and open-cut mine pit remediation improves the social and environmental acceptance of these activities to operate, and so I have conditioned this project accordingly. As the mine design is at a conceptual stage, I consider that there is an opportunity for time and cost savings to be investigated to enable backfilling and revegetation of the remaining mine pits proposed in the EIS. For example, the overburden emplacement areas which are located 5 km from the mine pits could be located closer to reduce the distance to truck the material back to the mine pits. Best practice mining recognises that rehabilitation, including backfilling, should be undertaken progressively. Therefore, more efficient mine planning would ensure that coal extraction and progressive backfilling and rehabilitation could occur together.

To ensure all the disturbed land can be returned to productive purposes, I have stated a condition (Appendix 2) that requires any open-cut mine pits (voids) located on a flood-plain to be completely backfilled to ground level to avoid potential flooding of the pits. There are parts of the project area that are subject to localised flooding (refer to section 6.3.3—Surface water of this report, for further discussion on flooding).

I have also stated a condition (Appendix 2) requiring the backfilling of the pits to above the pre-mining groundwater level, at a minimum in order to prevent the ongoing loss of groundwater in the post-mining phase. Indentations in the landform may remain on-site because backfilling to the pre-mining groundwater level, which is approximately 50 m below current ground level, still permits some areas of reduced land surface height. However, these areas could be re-contoured with slopes suitable for revegetation in a manner that permits the land within the remaining mine pits to be returned to its pre-mining land use suitability.

Further, I have imposed a condition (Appendix 1) requiring the proponent to prepare an open-cut mine pit management plan to ensure any pits that remain on the site are rehabilitated to a stable condition suitable for a post-mining land use with an economic, social and environmental benefit. The open-cut mine pit/s management plan must include an assessment of completely backfilling the open-cut mine pit. The management plan is to be approved by DES prior to the public notification of the draft EA for the project and would inform the preparation of the RMP which manages rehabilitation for mining activities for the entire site. The RMP, required by my stated

condition (Appendix 2), requires all disturbed land to be rehabilitated so that it can sustain an agreed post-mining land use.

The EIS includes a commitment to rehabilitate the mine site in accordance with a mine closure plan (MCP). The MCP would be prepared to provide guidance on mine closure activities and would include rehabilitation goals, closure and rehabilitation activities, performance criteria and monitoring and reporting. To ensure this outcome, I have stated a condition (Appendix 2) requiring the preparation of a closure management plan prior to the commencement of mining on the site for a nominal period of at least 30 years following the cessation of mining.

Coordinator-General's conclusion – Land use and rehabilitation

The EIS has identified the potential land use impacts associated with the project. I am satisfied with the proponent's proposed mitigation measure of negotiating land access agreements with directly impacted stakeholders (including landholders) regarding access to land and compensation for the loss of the use of agricultural land.

I am not satisfied with the EIS proposal that the overburden emplacement areas and open-cut mine pits post-mine closure not be rehabilitated and returned to their pre-mine land suitability. Accordingly, I have stated conditions (Appendix 2) requiring backfilling of the pits to above the pre-mining groundwater level, at a minimum, as well as a requirement for all land disturbed by mining activity, including the overburden emplacement areas, to be rehabilitated to a stable condition able to sustain an agreed post-mining land use.

I have also imposed a condition (Appendix 1) requiring the proponent to prepare an open-cut mine pit management plan to assess complete backfilling of the pits and stated a condition requiring a RMP to rehabilitate all disturbed land to a stable condition suitable for a post-mining land use. Further, I have stated a condition requiring the proponent to prepare a closure management plan prior to the commencement of coal mining on the site (Appendix 2).

Stock route

Impacts

A stock route (number U398BELY01) traverses the southern part of the project area from south-west to north-east (see Figure 5.1). The stock route is within the proposed open-cut mining area and would require realignment to ensure the stock route can continue to be used by landholders. Submissions received on the draft EIS raised concerns regarding the potential loss of the stock route which is currently used by landholders as an alternative to transporting stock by rail or road.

Proposed management and mitigation measures

The EIS includes a commitment to liaise with DNRME, IRC, and affected landholders regarding the management and possible realignment of the stock route prior to the commencement of construction¹.

I note that the proponent is required under the *Stock Route Management Act 2002* and the *Land Act 1994* to negotiate alternative routes which provide functional connectivity and stock route facilities equal to or better than the existing facilities, prior to commencement of mining activities. I also recognise that the proponent of the CCM&RP, directly adjoining the project to the south, has also committed to discussions with DNRME, IRC and landholders regarding the re-alignment of stock routes impacted by the mine project as part of developing a stock route agreement addressing the final treatment for each stock route impacted.

Coordinator-General's conclusion – Stock route

I am satisfied that the potential impacts of the project on the stock route can be appropriately managed with the implementation of the proponent's commitment and requirements of the *Stock Route Management Act 2002* and the *Land Act 1994* to negotiate an alternative stock route with DNRME, the IRC and affected landowners.

Sensitive visual receptors

The existing visual setting is dominated by grazing land and remnant woodland vegetation. A well-vegetated ridgeline known as Darkies Range is a dominant feature in the landscape and runs in a north to south direction through the western portion of the project area. Visual receptors near the project area are limited to isolated rural residences and unsealed local government roads.

Impacts

The potential visual effect of the project will be primarily related to the elevated portion of the overburden emplacement areas (180 m above existing ground level) and the tall power station stack (210 m above the existing ground level).

A visual impact assessment was undertaken for the three closest residences located within 15 km of the project area comprising Moonoomoo Homestead (the closest residence located approximately 7.2 km west of the project area), Carmichael Homestead (located 11.8 km to the south-west) and Dooyne Outstation (located 9.9 km to the east) (see Figure 5.3).

The EIS states that due to distances between the project and sensitive receptors, combined with screening from vegetation and topography, the overall visual effect of the project would be low.

¹Construction means physical construction, including significant and continuous site preparation work such as major clearing or excavation for foundations or the placement, assembly or installation of facilities or equipment at any site related to the project.

Local roads comprising Elgin-Moray Road and Moray-Carmichael Road are both unsealed local government roads that provide primary access from the Gregory Developmental Road to the project area. The EIS states that the visual impact of the overburden emplacement areas and power station on road users would be low due to the intervening vegetation and topography coupled with distant views along the Elgin-Moray Road and Moray-Carmichael Road.

The EIS states that night lighting at the mine infrastructure area would not be visible from the receptors or local government roads due to the long-range viewing distances and the screening by vegetation, topography and the overburden emplacement areas.

Submissions on the EIS raised concerns that the visual assessment did not consider impacts from the project on all residences located within 50 km of the project area. The AEIS states that the visual assessment conducted on the three closest receptors to the project area was assessed as low, and the visual effects and impacts on areas beyond these residences would be generally less.

Impacts from air emissions and noise on sensitive receptors are discussed further in sections 5.4—Air quality and 5.6—Noise and vibration, respectively

Proposed management and mitigation measures

The EIS includes a commitment to mitigate visual and lighting impacts of the project by:

- progressively rehabilitating and revegetating the overburden emplacement areas to minimise the visual effect
- using neutral tones in the cladding of infrastructure to blend with the surrounding environment
- designing external lighting to minimise off-site impacts.

Furthermore, my stated conditions (Appendix 2) to backfill the open-cut mine pits will require moving the overburden back into the pits, thereby removing the visual impact of the overburden emplacement areas in the post-mining phase.

Coordinator-General's conclusion – Sensitive visual receptors

My evaluation of the EIS found that the project impacts on visual amenity would be low given the remote project location, distance to sensitive receptors, vegetation and topography. I am satisfied that the proposed mitigation measures for visual and lighting impacts, including my stated conditions for backfilling the pits (Appendix 2), would further reduce impacts to landholders and local road users.

Surface subsidence

Impacts

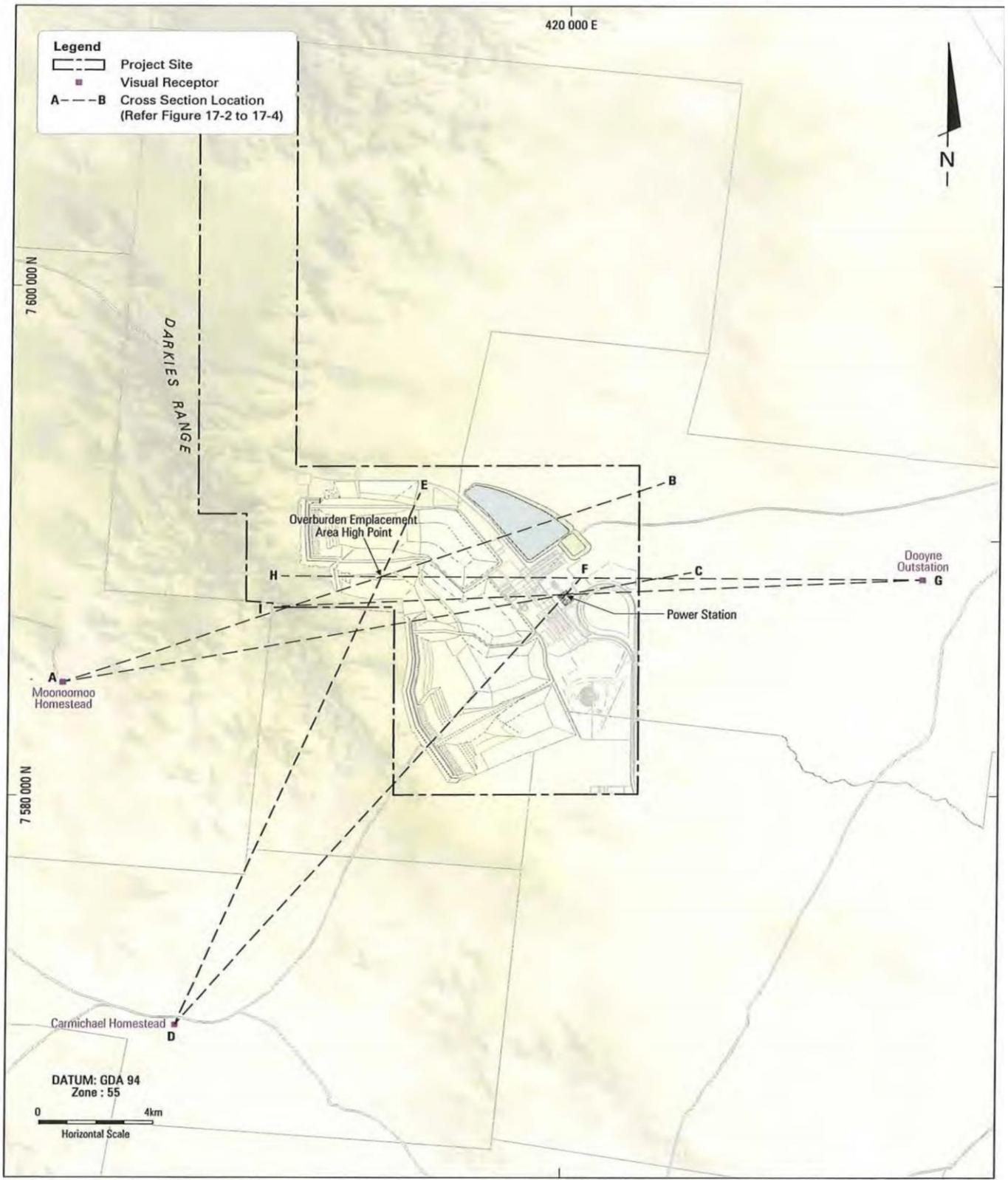
Underground longwall mining would result in the controlled collapse of the layers of sedimentary rock and soil (strata) overlying the underground space (goaf or voids) where the coal has been extracted. Subsidence cracking would spread upwards in the strata above the goaf until the tensile strength of the strata above is sufficient to support the overburden. Surface subsidence comprises the formation of surface tension cracks, surface buckling effects, ponding of water in shallow surface

depressions and potential erosion in minor surface drainage lines. Submissions raised concerns regarding the adequacy of the proposed revegetation methods for crack rehabilitation.

The effects of subsidence on ecology and water resources is discussed in section 5.2—MSES and section 6—MNES of this report

Proposed management and mitigation measures

The EIS states that mitigation measures for tension cracking and buckling would include monitoring areas potentially subject to tension cracking and repairing any cracks that may develop. A monitoring and maintenance program would also be established for areas that have been disturbed to ensure cracks are successfully rehabilitated and any disturbed vegetation is re-established.



PROJECT CHINA STONE



Visual Setting

Figure 5.3 Visual setting

The EIS includes a commitment to prepare a subsidence management plan (SMP) related to the mitigation and management of subsidence impacts. Given the potential impacts of subsidence on post-mining land use suitability, ecology and water resources, I have stated a condition (Appendix 2) within the draft EA requiring a SMP to be developed and submitted to DES for approval prior to the commencement of mining activities. The SMP must detail measures that provide for the proper and effective management of the actual and potential environmental impacts resulting from the mining activity including proposed options for mitigating any impacts associated with subsidence.

Coordinator-General's conclusion – Surface subsidence

I am satisfied that the potential impacts of the project on surface subsidence can be managed through implementation of a SMP. I have stated a condition for the draft EA (Appendix 2) for a SMP to be developed and submitted to DES for approval prior to commencement of mining activities.

Land contamination

Impacts

A contaminated land site history compiled for the EIS identified that there are no known historical or existing contaminated sites within the project area.

Chemical, oil and waste handling and storage have the potential to contaminate soil during construction and operation of the mine.

Proposed management and mitigation measures

The EIS includes commitments to prevent and manage soil contamination, including:

- storage and handling of waste hydrocarbons and chemicals in accordance with standard operating procedures to minimise potential for spillage and leakage
- provision of oil spill clean-up kits at strategic locations
- managing on-site landfill to reduce the risk of contamination of surface and/or groundwater.

I have stated a condition (Appendix 2) within the draft EA for the proponent to prepare a site investigation report for any areas used for notifiable activities to ensure that the land is suitable for a post-mining land use such as grazing, or similar.

Coordinator-General's conclusion – Land contamination

I am satisfied with the EIS commitments to prevent and manage land contamination during construction and operation of the mine. To ensure this outcome, I have stated a condition for the proponent to prepare a site investigation report for any areas used for notifiable activities to ensure that the land is suitable for a post-mining land use.

5.1.2 Coordinator-General's conclusion- Land use and rehabilitation

The EIS has identified the potential land use and tenure impacts associated with the project and I have accepted the proposed mitigation measure in the EIS to negotiate land access agreements with affected landholders.

I am not satisfied with the proposal in the EIS that the overburden emplacement areas and the remaining open-cut mine pits after mine operations cease not be returned to their pre-mining land use suitability. Accordingly, I have stated a condition requiring the backfilling of the pits to above the pre-mining groundwater level at a minimum and imposed a condition requiring the proponent to prepare an open-cut mine pit management plan to assess options for rehabilitating the open-cut pit to a stable condition suitable for a post-mining land use. I have also stated a condition within the EA requiring the proponent to prepare a RMP to ensure all land disturbed by mining activities, including the overburden emplacement areas, is rehabilitated to a stable condition able to sustain an agreed post-mining land use.

I am satisfied that the potential impacts of the project on the stock route can be managed and that the proponent will negotiate an alternative stock route, prior to commencement of mining activities.

I am satisfied that the project's visual amenity impact on sensitive receptors would be low, based on the remote location of the mine, intervening vegetation and implementation of mitigation measures, including my conditions to backfill the open-cut mine pit.

Finally, I have stated conditions within the draft EA for the proponent to mitigate any project impacts associated with subsidence, minimise potential soil contamination and rehabilitate the land in accordance with specific requirements.

I am satisfied that, subject to the commitments in the EIS and the requirements of my stated and imposed conditions, land disturbance impacts would be appropriately managed and rehabilitated throughout the project life and post-mining.

5.2 Matters of state environmental significance

This section discusses the major environmental effects of the project on matters of state environmental significance (MSES). For these matters, I have evaluated impacts and proposed mitigation measures and have stated or imposed conditions or made recommendations to manage adverse impacts in addition to the proponent's mitigation measures and commitments.

Submissions lodged in respect of species which are both MSES and MNES are addressed in this section and section 6—MNES of this report.

The MSES found within the project area are:

- regulated vegetation – Regional Ecosystems (REs) and essential habitat for fauna and flora

- protected habitat (protected plants and animals)
- a wetland of high ecological significance.

State government approvals for the project are outlined in section 4—Project approvals of this report. The approvals required in respect of fauna and flora include an EA under the EP Act, fauna and flora surveys and permits under the NC Act and the removal of vegetation under the VM Act. MSES offsets assessments and determinations are made under the *Environmental Offsets Act 2014*, and in respect of MNES under the EPBC Act.

Where offsets are required for a species that is designated as both MSES and MNES, one offset is required.

Submissions received

Key issues raised in the submissions on the draft EIS regarding MSES and MNES included the following:

- direct impacts on the existing habitat currently used by the endangered BTF within the south-western section of the project area and in the adjoining Moray Downs offset area provided as part of the EPBC Act decision for the CCM&RP. The habitat is considered critical to the survival of this species. Habitat includes areas necessary for activities such as foraging, breeding and roosting
- the EIS assessments of both MSES and MNES species and their habitat are not adequate to determine the species' populations and habitats and any determination of offsets required. Habitat assessments and an estimate of offsets should be included in the EIS
- species survey programs were inadequate, did not provide for spatial and temporal environmental conditions within the semi-arid region, and do not reflect the range of species and quality of habitat within the project area. The condition and quality of habitat may be significantly diminished if an action results in a net loss or degradation of water sources for species
- species of cultural significance were not identified in the EIS
- the Biodiversity Offset Strategy was not included in the publicly notified draft EIS. All proposed offset areas must contain areas in which MNES and MSES values are known and records prove the values exist in the areas. Proposed offset areas in which values are not known and which will be confirmed at a future time are not acceptable
- the 'vulnerable' species *Corymbia clandestina* is present on the site and has not been described and assessed in the EIS
- the impacts of this project combined with other Galilee Basin mine projects have not been taken into account. Potential impacts should include habitat fragmentation which contributes to loss of connectivity of habitat for species
- the project is not consistent with the principles of ecological sustainability and the precautionary principle, and will cause irreversible environmental damage to habitat for species such as the BTF, squatter pigeon, Australian painted snipe, koala and short-beaked echidna and irreversible damage to ecosystems

- the proposed works may cause loss of fish habitat in waterways
- the amount of sampling for stygofauna was inadequate
- the surface and subsurface ecological assessments to identify groundwater dependent ecosystems and fish habitat were inadequate.

I have considered each submission and the responses provided by the proponent in my evaluation of the project and my assessment is provided in the relevant sections below.

5.2.1 Surveys

The EIS notes that desktop surveys and field surveys were undertaken to identify MSES and MNES for the 20,000 ha project area. Section 6—MNES provides details of the survey methodology and timing. In summary, the EIS noted that the surveys were undertaken over two years and in different seasons, including after the area had received substantial rain.

The EIS adopted the following definitions for the purpose of mapping analyses and suitability of habitat for species:

- high-value habitat contains resources of high value that are essential for the species and include core breeding habitats around permanent waters, roosting areas for bats and REs containing primary food plants that are essential for a species' existence
- low-value habitat contains biological resources that may be used on occasion for foraging or dispersal, but not essential for the species' existence.

The EIS recognised that, due to the large size of the project area (20,000 ha) there is potential for undetected species to be present.

The EIS includes the commitment to undertake pre-clearing flora and fauna surveys prior to the commencement of mining activities or prior to the finalisation of the mine design plan.

In 2016 an AEIS was prepared to supplement the EIS with information required by agencies in respect of the probable areas to be disturbed by the project ('significant residual impact) which will impact upon BTF, the squatter pigeon and the yakka skink and biodiversity offset areas. The impact of the project on these matters is addressed in section 6—MNES.

In 2017 the AEIS was provided to agencies for review and comment.

Survey results and impacts

The EIS indicated that the largest direct impact on flora and fauna would be the progressive clearing of 11,000 ha of vegetation for the open-cut mine, mine infrastructure, remedial drains and highwall infrastructure drainage channel.

The direct impact on MSES would be the removal of woodland habitat, rock outcrops habitat, the southern seasonal wetland, the southern farm dam and ephemeral drainage lines which support a wide range of fauna species, including birds, mammals

and reptiles identified in state and Commonwealth databases. Figure 5.4 identifies the location of the southern seasonal wetland and the southern farm dam.

The following threatened fauna were identified in the project area during field surveys:

- (1) BTF (*Poephila cincta cincta*), endangered
- (2) Australian painted snipe (*Rostratula australis*), endangered
- (3) Squatter pigeon (*Geophaps scripta scripta*), vulnerable
- (4) Yakka skink (*Egernia rugosa*), vulnerable
- (5) Koala (*Phascolarctos cinereus*), a special least concern species
- (6) Short-beaked echidna (*Tachyglossus aculeatus*), a special least concern species.

Species 1 to 5 are MNES and the impact of the project on these species is addressed in section 6—MNES of this report.

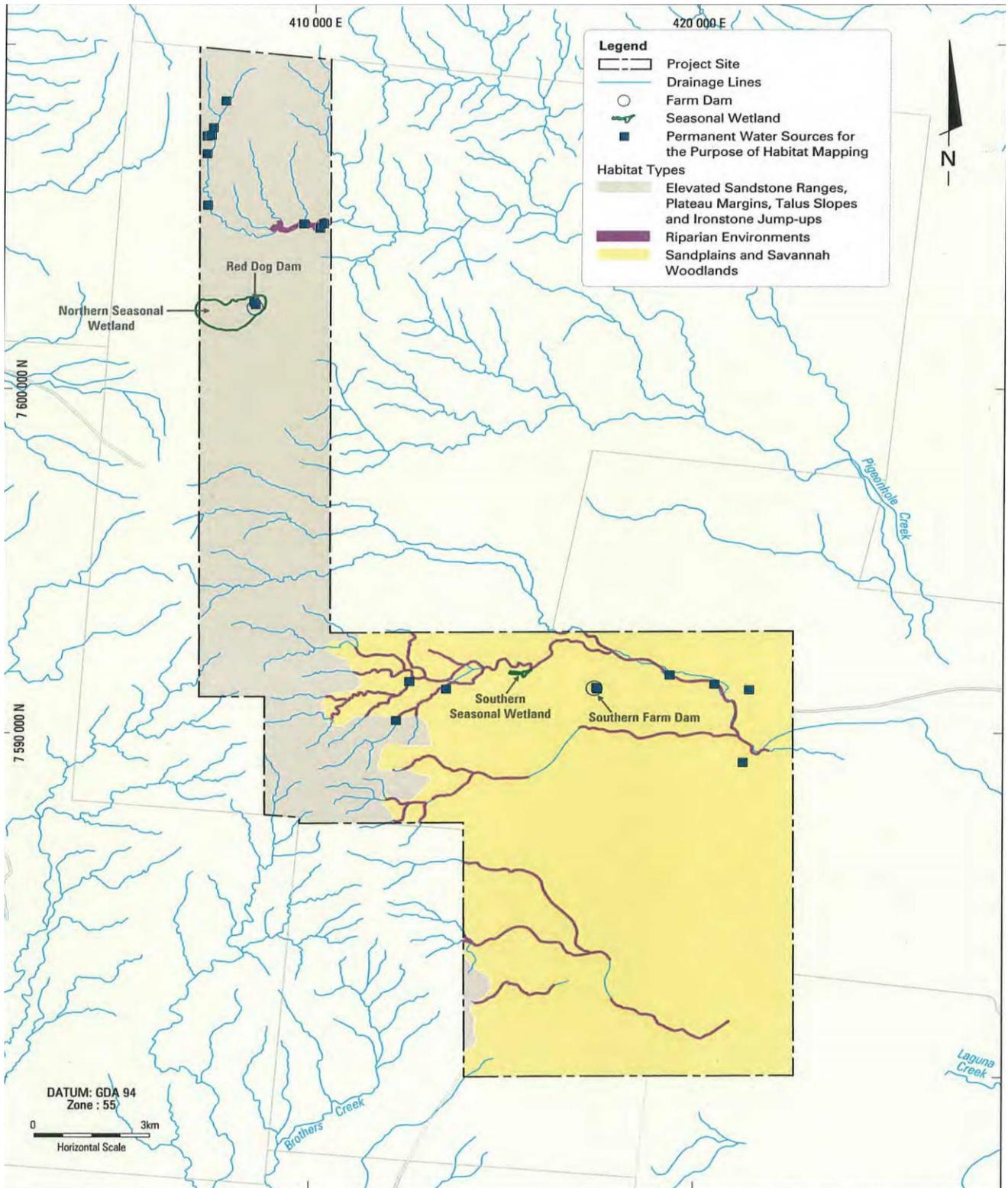
The field surveys revealed 32 regional ecosystems, the majority of which are classified as 'least concern' under the VM Act. No communities listed as endangered were recorded and only one community, of 26 ha in area, is listed as 'of concern'.

The vegetation surveys and groundwater dependent ecosystem surveys did not identify any areas of vegetation or ecosystems dependent on groundwater. The EIS indicated there is no shallow groundwater within the study area, that the groundwater table is at least 25 metres below ground level and is disconnected from surface water features.

The desktop and field surveys indicated no aquatic species listed under the EPBC Act or NC Act and that there were limited numbers of stygofauna within subsurface waters. However, only one round of stygofauna sampling was conducted, collecting groundwater samples from 15 monitoring bores within the project area. DNRME provided advice that one round of stygofauna sampling is inadequate and not in accordance with best practice guidelines (which require sampling in two rounds of sampling from different seasons) and that there is a potential for shallow groundwater to be present on the project area which is conducive to stygofauna, as further discussed in section 6—MNES of this report.

No creek diversions and creek crossings are proposed. The EIS also indicated that the open-cut mining area and mine infrastructure areas have been designed to avoid Tomahawk Creek, identified as a major waterway on DAF's *Queensland waterways for water barrier works* maps.

The desktop and field surveys identified the northern seasonal wetland as a referable wetland of high ecological significance mapped by DES and is a prescribed MSES under the Environmental Offsets Regulation 2014. A direct impact on the northern seasonal wetland is the impact of potential subsidence caused by underground mining. Figure 5.4 identifies the location of the northern seasonal wetland. The southern seasonal wetland is not a referable wetland mapped by DES



Hansen Bailey
ENVIRONMENTAL CONSULTANTS

Habitat Types

Figure 5.4 Southern and northern seasonal wetlands

5.2.2 Regulated vegetation

Regulated vegetation is prescribed as a MSES under the Environmental Offsets Regulation 2014. Regulated vegetation includes regional ecosystems, essential habitat and protected habitat (protected plants and animals).

The *Queensland Environmental Offsets Policy Significant Residual Impact Guideline* provides that an offset may be required for regulated vegetation where the impact of the project cannot be managed by management and mitigation measures.

Regional ecosystems

A regional ecosystem is defined under the VM Act and is regulated by the *Queensland Offsets Policy Significant Residual Impact Guideline 2014* to protect vegetation. Three types of ecosystems are defined in the VM Act – endangered, of concern and least concern.

The REs identified in the EIS within the open-cut mining area, mine infrastructure areas and the highwall drainage infrastructure channel and remedial drains are outlined in Table 5.1. The locations and VM Act class protection status of the REs are as shown. RE 10.10.3 *Eucalyptus drepanophylla* open-woodland on sandstone ranges is prescribed as an ‘of concern’ RE. All of the other REs listed are prescribed in the guideline as being within the defined distance from the defining banks of a relevant watercourse on a ‘vegetation management watercourse and drainage feature map’ which is defined under the VM Act.

The location of the impact of the project on these REs is also outlined in Table 5.1 and shown in my stated conditions for the draft EA in Figures I1 and I2 (Appendix 2).

Table 5.1 Regional Ecosystems

RE type	VM Act class	Definition	Location of impact	Maximum extent of impact
10.10.3	Of concern	<i>Eucalyptus drepanophylla</i> open-woodland on sandstone ranges	Appendix 2, Figure I1.	26.0 ha
10.3.6	Least concern	<i>Eucalyptus brownii</i> open woodland on alluvial plains	Appendix 2, Figure I2.	63.2 ha
10.3.14	Least concern	<i>Eucalyptus camaldulensis</i> and/or <i>E. coolabah</i> open woodland along channels and on floodplains	Appendix 2, Figure I2.	14.1 ha
10.3.16	Least concern	Ephemeral lakes with sparse herbland or sparse tussock grassland	Appendix 2, Figure I2.	27.2 ha
10.3.28	Least concern	<i>Eucalyptus melanophloia</i> open woodland on sandy alluvial fans	Appendix 2, Figure I2.	63.4 ha
10.5.1	Least concern	<i>Eucalyptus similis</i> open woodland on sand plains	Appendix 2, Figure I2.	16.8 ha
10.5.4	Least concern	<i>Eucalyptus crebra</i> or <i>E. drepanophylla</i> open woodland on sand plains	Appendix 2, Figure I2.	2.4 ha

RE type	VM Act class	Definition	Location of impact	Maximum extent of impact
10.5.5	Least concern	<i>Eucalyptus melanophloia</i> open woodland on sand plains	Appendix 2, Figure I2.	65.0 ha
10.5.10	Least concern	<i>Corymbia leichhardtii</i> open woodland on sand plains	Appendix 2, Figure I2.	14.5 ha
10.7.2	Least concern	<i>Eucalyptus persistens</i> low open woodland with soft spinifex on ferricrete above scarps	Appendix 2, Figure I2.	4.9 ha
10.7.3	Least concern	<i>Acacia catenulate</i> on low woodland on scarps	Appendix 2, Figure I2.	41.4 ha
10.7.4	Least concern	<i>Eucalyptus persistens</i> low open woodland on pediments below scarps	Appendix 2, Figure I2.	0.3 ha
10.7.5	Least concern	<i>Eucalyptus thozetiana</i> open woodland on scarps and on pediments below scarps	Appendix 2, Figure I2.	0.01 ha
10.7.12	Least concern	<i>Eucalyptus drepanophylla</i> open woodland on ferricrete	Appendix 2, Figure I2.	17.2 ha
10.10.1	Least concern	<i>Acacia shirleyi</i> woodland on sandstone ranges	Appendix 2, Figure I2.	8.1 ha
10.10.3	Least concern	<i>Eucalyptus drepanophylla</i> open woodland on sandstone ridges	Appendix 2, Figure I2.	2.0 ha
10.10.4	Least concern	<i>Corymbia leichhardtii</i> open woodland on sandstone ranges	Appendix 2, Figure I2.	18.5 ha
TOTAL				383.01 ha

Essential habitat for threatened flora and fauna

The DES habitat mapping databases identifies essential habitat as 'vegetation in which a species that is endangered, vulnerable, rare or near threatened has been known to occur'. The NC Act provides for 'critical habitat' and defines it as essential for the conservation of protected wildlife or community of native wildlife and can include land not presently occupied by the wildlife.

The Guideline provides that MSES 'protected wildlife habitat' includes an area of essential habitat on the essential habitat map for an animal or plant that is endangered or vulnerable wildlife, and an area of habitat used for foraging, roosting, nesting or breeding.

The EIS indicated that the project would directly cause the loss of 10,916 ha of essential habitat for the short-beaked echidna.

Impacts and mitigation

The proponent identified in the EIS the need to undertake further detailed field surveys prior to the commencement of mining activities and to minimise disturbance to native vegetation.

The EIS also recognised that matters of cultural heritage, including species, would be identified in consultation with the Traditional Owners as part of the preparation of the CHMP.

The EIS predicted significant residual impacts on REs (26 ha 'of concern' and 357.01 ha 'least concern totalling 383.01 ha across the project area), would be caused by removal or subsidence. The proponent made a commitment to provide for offsets for these residual impacts and to undertake pre-clearance surveys prior to commencement of mining activities to identify any MSES.

The EIS indicated that the fish habitat and other aquatic habitat above and below the surface area of the site and drainage lines to be removed within the open-cut mining and mine infrastructure areas is considered to be low-value habitat due to the ephemeral nature of the drainage lines.

The field surveys did not identify any waterways as defined in the *Fisheries Act 1994*.

No MSES were found at the southern seasonal wetland area. Tomahawk Creek is classified under DAF's fish habitat waterways mapping as having fish habitat and is not intended to be removed. The EIS found that there would be no significant residual impact on the southern seasonal wetland area or waterways areas.

The proponent also made commitments to rehabilitate and revegetate mined areas after the completion of the relevant stage of the mine project and to prepare a range of environmental management plans relating to vegetation, topsoil, subsidence, bushfires, erosion and sediment control, species management, and biodiversity management. The EIS indicated these commitments would contribute to re-establishing habitat which may be suitable for the short-beaked echidna. The list of commitments and environmental management plans identified in the EIS is provided in Appendix 5.

I accept the findings in the EIS, however, I agree with the submitters that further survey work is required to establish with certainty the location and extent of aquatic habitat, fish habitat, waterways, groundwater dependent ecosystems and the identification of any MSES not found in the EIS field surveys, together with the impact of the project on these MSES.

Coordinator-General's conclusions

To address the need for further survey work to be undertaken to identify groundwater dependent ecosystems, waterways and aquatic habitat, I have imposed a condition (Appendix 1) which requires the proponent to undertake pre-clearance surveys prior to the clearing of vegetation, to identify whether environmental values exist and are MSES under Queensland and/or MNES under Commonwealth legislative frameworks.

For state matters, my conditions set that the proponent is required to submit the results of the surveys to the relevant administering authority (currently DES) for assessment. Should environmental values such as additional MSES, groundwater dependent ecosystems, waterways or aquatic habitat be identified during these surveys, further measures including offsets may be required.

To address the impact of the project on fish habitat identified in waterways, I have imposed a condition (Appendix 1) which requires the proponent to submit any waterway barrier works plan to DAF for approval.

To complement these conditions and make clear that any environmental values identified in pre-clearance surveys must be authorised, I have also recommended a stated condition for the draft EA (Appendix 2) that only the EIS regional ecosystem significant residual impacts identified in Schedule I of the EA are authorised. Significant residual impacts above those identified in Schedule I are not authorised.

5.2.3 Wetlands and watercourses

Wetlands and watercourses are prescribed under the Environmental Offsets Regulation 2014 as an MSES. There are three types of MSES related to wetlands and watercourses: a wetland in a wetland protection area, a wetland of high ecological significance shown on the DES map of referable wetlands, and a wetland or watercourse in high ecological value waters. The *Queensland Environmental Offsets Policy Significant Residual Impact Guideline (2014)* (the Guideline) provides that an offset may be required for these wetlands and watercourses where the impact of the project cannot be managed by management and mitigation measures.

The EIS identified the northern seasonal wetland ('the wetland') as a MSES wetland of high ecological significance. It is located in the northern part of the project area, is a natural depression which collects surface water during the wet season and is wildlife habitat for the Australian painted snipe (a MNES).

The EIS found that the site does not include any watercourses as defined under the Water Act 2000 and the Guideline.

Impacts and mitigation

Subsidence modelling undertaken for the EIS indicated that there are no watercourses within the project area and that drainage lines are close to the top of the catchment area and are unlikely to cause subsidence cracking.

The EIS found the northern seasonal wetland would be subject to subsidence and potential impacts include surface cracking and changes in drainage patterns. The ponding area of the wetland before mining is 127 ha and after mining would increase to 199 ha as a result of subsidence, and that the catchment area would change from 2,711 ha pre-underground mining to 2,399 ha post-underground mining, resulting in a 12 per cent reduction in the catchment area.

The EIS indicated the reduction in catchment area would cause the wetland to dry out more rapidly and more frequently leading to a predicted significant residual impact of 15.03 ha for wildlife habitat.

To manage these impacts, the EIS included the commitment to undertake detailed field surveys and further subsidence modelling work prior to the design of the mine, and to design and implement drainage works and a bund to reduce the potential impacts of the project on the wetland. The proponent also committed to prepare a subsidence

management plan which would address these and other matters necessary to mitigate the impacts of the project on subsidence and cracking caused by underground mining.

I support these commitments, included at Appendix 5 of this report, and require them to be undertaken.

Coordinator-General's conclusions

To address the need for further survey work to be undertaken to identify MSES, I have imposed a condition (Appendix 1) which requires the proponent to undertake pre-clearance surveys prior to the clearing of vegetation, to identify whether environmental values exist and are protected under Queensland and Commonwealth legislative frameworks, and to submit the survey results to DES for consideration.

To complement this condition and make clear that the impacts of the project on the northern seasonal wetland must be assessed, I have also recommended a stated condition for the draft EA (Appendix 2) which requires the preparation of a subsidence management plan which would identify measures to manage any environmental impacts on the northern seasonal wetland, watercourses, and floodplains.

The EIS also indicated that a significant residual impact 15.03 ha of protected wildlife habitat for the Australian painted snipe would occur as a result of the decrease in catchment area for the northern seasonal wetland. To address this significant residual impact, I have included a stated condition for the draft EA (Appendix 2) which requires an offset for 15.03 ha for the Australian painted snipe wildlife habitat.

Habitat offset areas for threatened and endangered species including the Australian painted snipe, must be protected before any clearing of habitat could occur.

5.2.4 Protected wildlife – fauna

The EIS assessment indicates that the project would impact on the habitat of one MSES species.

Short-beaked echidna

The short-beaked echidna (*Tachyglossus aculeatus*) is listed as 'special least concern' under the NC Act. The species is a monotreme and, along with the platypus, is the only Australian mammal to lay eggs. The echidna sleeps in a burrow during the day and feeds in the cooler part of the mornings and evenings. The species inhabit rocky areas, hollow logs, under vegetation or piles of debris, and under tree roots.

Results of surveys

The species was recorded opportunistically during the field surveys in one location.

The EIS habitat modelling identified 16,226 ha of high-value habitat for this species is present within the project area.

Impacts and mitigation

The EIS states that 10,916 ha of the 16,226 ha high-value habitat would be cleared for open-cut mining and the construction of infrastructure. The EIS noted that despite the

reduction of habitat, the short-beaked echidna would be able to move to adjoining vegetation.

The EIS includes commitments (Appendix 5) to rehabilitate and revegetate areas after the completion of the relevant stage of the mine project, and to prepare a range of environmental management plans relating to vegetation, topsoil, subsidence, bushfires, erosion and sediment control, species management, and biodiversity management. These commitments would contribute to re-establishing habitat which may be suitable for the short-beaked echidna.

Coordinator-General's conclusions

To address the need for further survey work to be undertaken to identify MSES, I have imposed a condition (Appendix 1) which requires the proponent to undertake pre-clearance surveys prior to the clearing of vegetation, to identify whether environmental values exist and are protected under Queensland and Commonwealth legislative frameworks. The findings of these surveys regarding MSES would be submitted to DES for assessment and may require offsets and an amendment to the EA.

To complement this condition, I have also stated a condition in the draft EA (Appendix 2) that a maximum significant residual impact of 10,916 ha of short-beaked echidna habitat is authorised. A significant residual impact area above that area is not authorised.

In addition, in line with DNRME's recommendation to ensure sampling for stygofauna is adequate, I have imposed a condition (Appendix 1) which requires the proponent to undertake survey work and sampling and to report on the survey results.

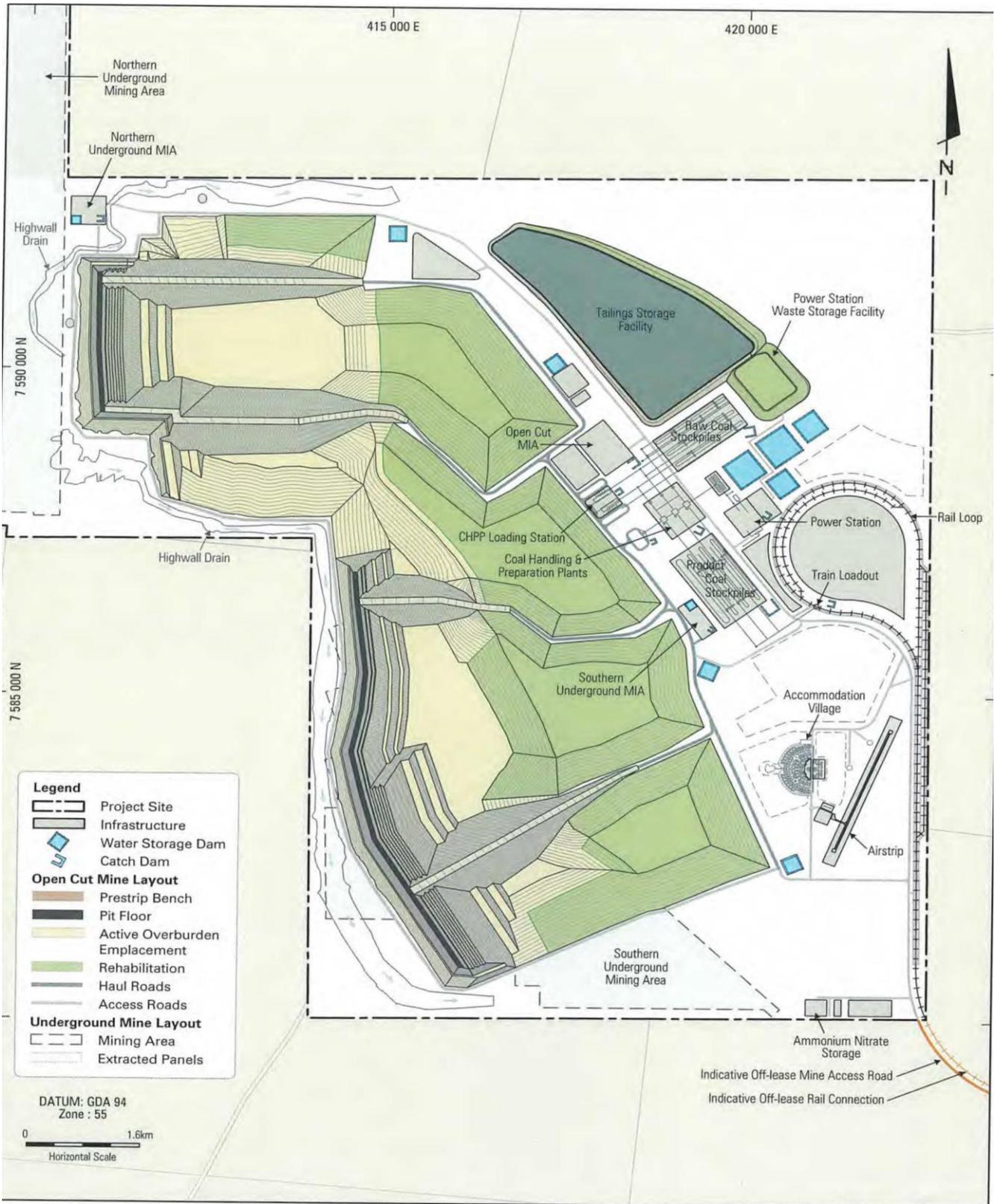
Habitat offset areas for threatened and endangered species including the short-beaked echidna, must be protected before any clearing of habitat.

Highwall drainage

A highwall drainage infrastructure channel (see Figure 5.5) is proposed in the EIS to provide flood protection for the operating pits and remain in place as a flood mitigation measure after mine closure. The channel is located 25 m from the western mining lease boundary and adjoins the Moray Downs offset area which is part of a Commonwealth and state approved Biodiversity Offset Strategy for the CCM&RP. The channel base is proposed to range from 34 m to 250 m in width, be 4 m deep and around 12 km in length.

Impacts and mitigation measures

The EIS did not address the impact of the drainage channel on the movement of ground-dwelling fauna protected as part of the proposed Biodiversity Offset Strategy. In addition, the EIS did not provide for measures to allow the movement of fauna from the adjoining Moray Downs offset area across the highwall drainage area for foraging, access to water or roosting sites.



PROJECT CHINA STONE

Open Cut Mine Layout - Year 30



Figure 5.5 Highwall layout

I consider that to protect listed fauna, the highwall drainage channel is to allow for fauna movement and connectivity along the 12 km length of the channel to ensure the fauna have access to food, water sources and roosting sites beyond the channel. The proponent is to incorporate into the mine closure plan a design that does not require the need for the channel to remain in place post-mine closure for flood mitigation, but instead allow for overland flow of surface water to cross the recontoured and revegetated mine site.

Coordinator-General's conclusions

To address the movement of fauna species to other areas within the project area or to land adjoining the project area, I have imposed a condition (Appendix 1) that requires the provision of fauna crossings and fauna habitat connectivity along the highwall drainage channel during operations. Post-mine closure this fauna crossing condition will continue to apply should the channel be required for flood mitigation into previously mined pits until the post-mining landform is re-contoured to allow overland flow across the site from west to east.

Black-throated finch (southern) – Bioregional management plan

The impact of the project on BTF is addressed in section 6—MNES.

The DES has commenced the preparation of a Black-throated finch (southern subspecies) Bioregional Management Plan for the Galilee Basin and Desert Uplands Bioregion (the 'Plan') to address the impacts of mining projects with that bioregion. I included the requirement for the preparation of the Plan in the Coordinator-General's evaluation report (CGER) for the CCM&RP.

To assist in the management of the impact of this project on the BTF and to further the research monitoring programs being undertaken by DES for this Plan, I have imposed a condition (Appendix 1) requiring the proponent to contribute to the research work being undertaken by DES, to provide the results of monitoring programs to DES and to contribute to the delivery and operation of the Plan, including pro-rata funding.

To ensure this project is included within the Plan, I have also included a recommendation (Appendix 4) that DES prepare a Black-throated Finch Bioregional Management Plan for the Galilee Basin and Desert Uplands Bioregion to address the impacts of the project within the context of a bioregion.

5.3 Air quality

This section of the report evaluates the proponent's assessment of air quality impacts associated with the construction and operation of the open-cut and underground mines, and operation of the power station.

The EIS states that air quality impacts associated with off-lease infrastructure areas, including mine site access road, port development, rail connection to the port and raw water supply, will be assessed in separate assessment and approvals processes, and therefore I have not included assessment of these matters in this report.

Submissions received

Submissions on the draft EIS raised issues including:

- the particulate matter (PM) assessment ($PM_{2.5}$ and PM_{10}) has not considered the appropriate criteria
- the need for long-term dust monitoring on-site and an analysis of the dust impacts on existing and proposed land uses, including the proposed CCM&RP airstrip
- dust emissions from project-generated traffic on unsealed roads on and off-lease
- dust impacts associated with temperature inversions and spontaneous combustion
- the predicted exceedance of PM_{10} at Dooyne Outstation and Carmichael Homestead
- odour emissions resulting from sewage treatment
- the limited scope of the air assessment combined with other current and proposed projects in the Galilee Basin
- dust impacts on the health of workers on the mining lease.

I have considered issues raised in submissions in my evaluation of the EIS, and how the information provided by the proponent addresses these issues.

5.3.1 Existing air quality

The EIS states that air quality monitoring data in proximity to the project is not available due to the project's rural and remote location. Accordingly, the proponent has obtained particulate matter (PM_{10} and $PM_{2.5}$), total suspended particulates (TSP) and dust deposition data from air quality assessments undertaken at other coal mines within the region for consideration in the EIS assessment.

Existing levels of nitrogen dioxide (NO_2), sulfur dioxide (SO_2) and carbon monoxide (CO) were characterised using data from DES monitoring stations at Toowoomba and Townsville. Due to the rural nature of the project area, the EIS considers that using data from the two urban monitoring locations to characterise the project area's background concentrations is a conservative approach.

Sensitive Receptors

The existing land uses in the region are predominantly cattle grazing and coal exploration. The region is sparsely populated, with a few isolated homesteads, but no towns or cities are located nearby.

The sensitive receptors considered in the EIS are presented in Table 5.2, in order of distance from the project area, and their locations are shown on Figure 5.1. The receptors are largely individual homesteads, with the exception of the proposed CCM&RP accommodation village and the Dooyne Outstation. The closest homestead (Moonoomoo Homestead) is located approximately 7 km west of the project area. The Dooyne Outstation is not permanently occupied and is only used intermittently.

Table 5.2 Sensitive receptors

Sensitive receptor name	Distance from project area
Moonoomoo Homestead	7.2 km west
Dooyne Outstation	9.9 km east
Carmichael Homestead	11.8 km south-west
Bowie Homestead	17.4 km west
Old Hyde Park Homestead	20.2 km north-east
Doongmabulla Homestead	20.6 km south
Hyde Park Homestead	22.8 km north-east
Ulcanbah Homestead	24.7 km south-west
Scott Homestead	27.6 km west
Proposed CCM&RP accommodation village	27.7 km south-east
Ronlow Park Homestead	28.9 km west
Yarrowmere Homestead	29.7 km north-west
Kyong Homestead	31.5 km south-west
Moray Downs Homestead	40.0 km south-east
Bulliwallah Homestead	42.8 km north-east
Plain Creek Homestead	51.0 km north-east

The project includes an on-site accommodation village. The village does not meet the definition of sensitive receptor, in accordance with the DES model mining conditions (MMC), as it is located on the mining lease; however the health of workers residing in the village is regulated under the *Coal Mining Safety and Health Act 1999* (CMSH Act) and Coal Mining Safety and Health Regulation 2001 (CMSH Regulation).

The EIS includes a commitment (Appendix 5) to design the project accommodation village with consideration for the safety of workers, including installation of air-conditioning. I consider the health and wellbeing of the workers within the accommodation village would be appropriately protected during detailed design of the village and regulated by the CMSH Act and the CMSH Regulation.

5.3.2 Impacts and mitigation

The air quality assessment described in the EIS is based on a modelling study that incorporates predicted air pollutant emission rates from mining activities, local meteorology, including temperature inversions, terrain, land use, and the geographical location of sensitive receivers.

Project-related construction and operational impacts on air quality may occur due to project activities such as vegetation clearing, blasting, removing overburden, wind erosion of earth exposed by project activities, power generation by diesel generators and the power station, coal mining, coal handling and coal transportation on the mining lease.

Particulates and dust

Impacts and mitigation

The EIS modelling found that for all sensitive receptors, the dust impacts resulting from the mine and power station, including background concentrations, are predicted to be within the objective levels specified in the *Environmental Protection (Air) Policy 2008* (EPP (Air)), specifically:

- 24-hour average ground concentrations of PM₁₀ are not expected to exceed 74 per cent of the EPP (Air) objective of 50 µg/m³ at all sensitive receptors
- maximum 24-hour average and annual average ground concentrations of PM_{2.5} are expected to be below the adopted assessment criteria of 25 µg/m³ and 8 µg/m³ respectively at all sensitive receptors
- annual average ground-level concentrations of TSP are not expected to exceed 32 per cent of the adopted 90 µg/m³ criteria at all sensitive receptors
- annual average dust deposition rates are not expected to exceed 82 per cent of the adopted 120 mg/m²/day criteria at all sensitive receptors.

The *National Environment Protection (Ambient Air Quality) Measure 2015* (NEPM AAQ) provides updated assessment criteria for PM₁₀ and PM_{2.5} emissions. I note the project's PM_{2.5} emissions are not predicted to exceed the NEPM AAQ criteria; however, the EIS modelling methodology does not allow for a comparison with the annual PM₁₀ in the NEPM AAQ.

I have used the NEPM AAQ PM_{2.5} and annual PM₁₀ criteria in development of the draft EA conditions I have stated in Appendix 2 of this report. The draft EA conditions ensure that all reasonable and feasible avoidance and mitigation measures are employed so that the dust and particulate matter emissions generated by the mining activities do not cause exceedances of the specified levels at any sensitive or commercial place.

The EIS states that due to the distance of the project to the closest sensitive receptors, an air quality monitoring program is not proposed. However, I require collection of air quality data in accordance with the *Australian Standards Methods for Pollutant Monitoring* and have stated a condition for the draft EA (Appendix 2) to implement this requirement.

I have also stated a condition for the draft EA (Appendix 2) requiring the proponent to develop an air quality management plan (AQMP) to be submitted to the administering authority for approval at least three months prior to commencement of mining activities. The AQMP must identify major sources of dust resulting from mining activities and provide for the effective management and mitigation of actual and potential air quality impacts, including:

- progressive rehabilitation on the open-cut mine overburden emplacement areas to reduce wind erosion and dust
- compliance with the relevant requirement of the Aurizon Coal Dust Management Plan at the train loading facility, including the use of coal wagon veneering systems.

Project traffic dust impacts

The EIS included an assessment of the impacts from traffic on haul roads within the project area creating airborne dust and includes a commitment to minimise this impact by placing water on the haul roads. I have also included the requirement to place water on haul roads as part of my stated condition for the draft EA (Appendix 2) to prepare an AQMP.

Spontaneous combustion air and dust impacts

A submitter on the draft EIS queried the risk of dust and air quality impacts associated with potential spontaneous coal combustion events. Spontaneous combustion management is discussed in section 5.8—Hazards and risks of this report. I have stated a condition for the draft EA (Appendix 2) requiring the proponent to develop and implement a coal spontaneous combustion management plan to be submitted to the administering authority for approval three months prior to commencement of mining activities to reduce the risk of spontaneous combustion events and manage impacts in the event of a spontaneous combustion event.

The EIS includes a commitment to implementing a complaint handling procedure, including investigation of any complaints in relation to air quality impacts (Appendix 5). I support this commitment and require it to be implemented.

Power station combustion emissions

Impacts and mitigation

The EIS states that combustion emissions from the power station, including NO₂, SO₂ and CO, and other air toxicants would be well below the relevant criteria at all sensitive receptors. However, the EIS also states that the final specifications of the power station have not been confirmed. As a result, Appendix 2 does not contain draft EA conditions for the power station ERA 14 – Electricity generation.

Therefore, I have imposed a condition (Appendix 1) requiring the proponent to provide additional information on the power station emissions profile to the administering authority for the EP Act to assess the power station air quality impacts. Information about the best practice performance of the power generating units must also be provided for consideration in the air quality assessment. The construction of the power station cannot proceed until the information has been provided and assessed, and conditions for ERA 14 have been included in an EA for the project. Potential greenhouse gas emissions from the power station are discussed in section 5.12—Power supply of this report.

Odour

The EIS concludes that the only project activity likely to result in odour emissions is air from ventilation of underground mine shafts, and this odour is unlikely to impact sensitive receptors. However, a submission on the EIS raised concerns that odour emissions from sewage treatment works and associated infrastructure have not been considered in the assessment. Adequate information was not provided in the EIS regarding proposed sewage treatment. Therefore, I have imposed a condition

(Appendix 1) requiring the proponent to provide additional information to the administering authority for the EA for assessment of the sewage management system, including odour emission control.

Coal workers' pneumoconiosis – exposure to respirable coal dust

Coal workers' pneumoconiosis (CWP) (or black lung), is an occupational lung disease caused by prolonged exposure to respirable coal dust. The CSMH Act and CSMH Regulation require mining companies to implement a management system to ensure the safety and health of persons who may be affected by the coal mining operations.

Under section 89 of the CSMH Regulation, a coal mine's safety and health management system must ensure each coal mine worker's exposure to respirable dust at the mine is kept to an acceptable level. The average concentration of dust in the atmosphere/air which the mine worker breathes must not exceed 2.5 mg/m³ air for coal and 0.1 mg/m³ air for silica over an 8-hour period.

The Regulation would require the proponent to undertake monitoring of respirable dust in the atmosphere of the work environment and submit monitoring reports to the Mines Inspectorate at DNRME every three months. A summary of the respirable dust monitoring data is made publicly available through an online publication². Should average concentration of respirable dust exceed the specified levels, section 89A of the Regulation nominates additional dust monitoring and reporting procedures that the proponent would be required to undertake.

The EIS includes a commitment to comply with the CSMH Act and Regulation and prepare and implement a safety health management system (SHMS) to address all phases of the project in compliance with the *Work Health and Safety Act 2011* (WH&S Act) and *Work Health and Safety Regulation 2011* (WH&S Regulation). I support this commitment and require it to be implemented. I expect the proponent to comply with the existing, and any future, legislation, regulations, guidelines and standards to ensure each coal mine worker's exposure to respirable dust at the project, is kept to an acceptable level. In addition to the CSMH Act and Regulation, existing standards include:

- *Australian Standard 2985 Workplace atmospheres - method for sampling and gravimetric determination of respirable dust*
- *Recognised Standard 14: Monitoring respirable dust in coal mines (26 October 2018)*
- *Recognised Standard 15: Underground respirable dust control (21 April 2017).*

Future legislation, regulations, guidelines or standards may emerge from the CWP Select Committee's (the Committee) inquiry into occupational respirable dust issues. The Committee was established by Queensland Parliament on 15 September 2016 to

² <https://www.business.qld.gov.au/industries/mining-energy-water/resources/safety-health/mining/hazards/dust/monitoring-data>

conduct an inquiry and report on the 're-emergence' of CWP amongst mine workers in Queensland.

The terms of reference for the Committee included consideration of the respirable dust exposure for coal rail workers, coal-fired power station workers and other workers and the efficacy and efficiency of adopting methodologies and processes for respirable dust measurement and mitigation, including monitoring regimes.

The Committee tabled a number of reports in Queensland Parliament relating to the re-emergence of CWP in Queensland. The Committee released *Report No. 4, Inquiry into occupational respirable dust issues*, on 29 September 2017 and the Queensland Government responded to the Report's recommendations on 9 March 2018. I have considered the report's findings and the government response to two of the recommendations which are relevant to the project.

Dust hazards in coal-fired power stations

The Committee recommended the development of a code of practice on the management of respirable dust hazards in coal-fired power stations, to be informed by international best practice. The Queensland Government supported the recommendation noting that the development of guidance material for managing coal dust and fly ash exposure is an important step to provide certainty and clarity regarding work health and safety obligations in relation to the management of respirable dust hazards within the coal-fired power generation industry.

A working group has been established and is responsible for the development of the code to be recommended to the Minister for Industrial Relations for approval under the *Work Health and Safety Act 2011* (Qld) (WHS Act).

I have imposed a condition (Appendix 1) which requires the proponent to provide detailed information about how respirable dust hazards on human health related to the coal fired-power station will be minimised, managed and monitored using best practice design, operation and maintenance of operation and plant. If the guidance material or code of practice developed by the working group is available when the proponent is preparing the information, the material and code should be referenced. The information is required to be submitted to the administering authority for the EA for assessment prior to notification of the EA application.

Respirable dust measurement and mitigation, including monitoring regimes

The Queensland Government response proposes to focus on respirable dust measurement and mitigation, including monitoring regimes and:

- ensuring duty holders comply with requirements to ensure workers are not exposed above relevant workplace exposure standards and that exposure is kept as low as reasonably practicable
- ensuring businesses keep concentrations of airborne pollutants below environmental air quality standards
- encouraging improvements in technology, plant and product development focused on reducing the emission of airborne pollutants.

I have recognised this government response by stating conditions (Appendix 2) for the draft EA regarding air quality thresholds for the project, requiring the proponent to keep pollutants levels below these thresholds and requiring an AQMP.

Air quality impacts with other Galilee Basin projects

Submissions on the EIS raised concerns regarding the methodology used to predict the air quality impact of the project and the CCM&RP. The EIS states that pollutants were selected for the assessment on the basis that they would have the most potential for significant impact. I am satisfied with this approach to selecting pollutants for the assessment.

Submitters on the EIS raised concerns regarding the lack of proposed long-term dust monitoring of the combined impacts of the project and the CCM&RP. I am not satisfied with the proponent's proposal not to undertake air quality monitoring. Therefore, to adequately understand the potential long-term impacts of the project and how these relate to the impacts from the CCM&RP, I have stated conditions requiring meteorological monitoring to be undertaken for the life of the project and monitoring results made available to the administering authority for the EA upon request (Appendix 2). I have also stated a condition in Appendix 2, requiring the proponent to develop an AQMP, which must detail the monitoring of air quality data.

Submitters also had concerns with the draft EIS predicted exceedances of PM₁₀ as a result of combined impacts between the project and CCM&RP. PM₁₀ is predicted to exceed the 50 µg/m³ 24-hour average EPP (Air) objective at Dooyne Outstation, 9.9 km from the project area, and at the proposed CCM&RP accommodation village. The EIS states that, as air quality impacts were predicted during worst-case operational years for both the project and CCM&RP, predicted exceedances are considered conservative. The EIS includes a commitment to consult with the Dooyne Outstation property owner and Adani, in relation to the monitoring and management of any adverse PM₁₀ impacts on these receptors. I require this commitment to be undertaken and have included it in Appendix 5.

The EIS predicts that combined NO₂ emissions from the project power station and the Moray Downs Power Station will be below the maximum 1-hour average EPP (Air) objective of 250 µg/m³ at sensitive receivers. I have imposed a condition (Appendix 1) to require an updated emissions assessment, which considers both the Moray Downs Power Station and the project, which is to be provided to the administering authority for the EP Act prior to notification of the EA application.

5.3.3 Coordinator-General's conclusion – air quality

For my evaluation of the air quality impacts of the project, I have considered the EIS, each submission on the draft EIS, and how the AEIS has responded to submitter issues.

I have stated draft EA conditions for the mine site (Appendix 2,) which specify that dust and particulate matter limit criteria are not to be exceeded at sensitive receptor locations, as well as long-term monitoring and reporting requirements through

meteorological monitoring, an AQMP, an odour monitoring program and spontaneous combustion management plan.

I am satisfied that by implementing the proponent's commitments listed in the EIS and the draft EA conditions stated in Appendix 2, as well as complying with relevant legislative requirements, the project's potential air quality and odour impacts on sensitive receptors, excluding those resulting from the power station, can be appropriately managed within acceptable limits.

In respect of CWP, I require the EIS commitments to be implemented in relation to complying with the CSMH Act and Regulation and preparing and implementing a SMHS. I expect the proponent to comply with the existing, and any future, legislation, regulations, guidelines and standards, including the materials that have emerged from the CWP Committee inquiry into occupational respirable dust issues, to ensure each coal mine worker's exposure to respirable dust at the project, is kept to an acceptable level.

In relation to the power station, I have imposed a condition (Appendix 1) requiring the proponent to provide additional information on the power station emissions profile to the administering authority for the EP Act to assess the power station air quality impacts. Furthermore, I have imposed a condition (Appendix 1) which requires the proponent to provide detailed information about how respirable dust hazards related to the coal fired-power station will be minimised, managed and monitored using best practice design, operation and maintenance of operation and plant. The construction of the power station cannot proceed until the information has been provided and assessed by the administering authority for the EA, and conditions for ERA 14 have been included in an EA for the project.

5.4 Greenhouse gas and climate change

This section of the report evaluates the EIS assessment of greenhouse gas (GHG) emission impacts associated with the proposed construction and operation of the open-cut and underground mines, and the coal-fired power station. This section of the report also considers the potential impacts of climate change on the project.

Submissions received

Submissions on the draft EIS raised a number of concerns including:

- impact of GHGs on human health and existing land use (for example grazing stock)
- impacts to terrestrial and aquatic habitat caused by GHG emissions
- GHG emissions profile of the power station
- limited consideration of GHG impacts from diesel emissions
- lack of consideration of scope 3 emissions
- impacts of GHG emissions on climate change.

I have considered issues raised in submissions in my evaluation of the EIS, and how the information provided by the proponent addresses these issues.

GHG policy and legislative context

Australia has an international obligation under the Paris Agreement to reduce GHG emissions by 26 to 28 per cent below 2005 levels by 2030. The Paris Agreement is an agreement within the United Nations Framework Convention on Climate Change (UNFCCC) dealing with GHG emissions mitigation, adaptation and finance. The agreement was negotiated by representatives of 196 parties at the 21st Conference of the Parties of the UNFCCC in Paris. It was adopted by consensus on 12 December 2015. As of November 2018, 197 UNFCCC members have signed the agreement, 176 of which, including Australia on 6 November 2016, have ratified it. According to the Climate Action Tracker³, to meet the government's Paris Agreement targets, emissions must decrease by an average annual rate of 1.3 to 1.5 per cent until 2030.

In line with the Paris Agreement, DEE has introduced a range of actions to lower emissions from the electricity sector, including the *National Energy Productivity Plan* (NEPP), which provides a framework to deliver a 40 per cent improvement in Australia's energy productivity between 2015 and 2030.

Additionally, in July 2017, the Queensland Government released the *Queensland Climate Transition Strategy 'Pathways to a clean growth economy'*⁴, which commits to setting an interim emissions reduction target of at least 30 per cent below 2005 levels by 2030, and a target for zero net emissions by 2050. The strategy also commits to powering Queensland with 50 per cent renewable energy by 2030.

The *National Greenhouse and Energy Reporting Act 2007* (Cwlth) (NGER Act), requires project proponents to report on GHG emissions in accordance with the corporate group thresholds, where emissions exceed a carbon dioxide equivalent (CO₂-e) of 50,000 tonnes (t) per annum and energy production or consumption exceeds 200 terajoules (TJ) per year. The NGER Act prescribes an accounting methodology and includes the following scope definitions for emissions attributable to a project:

- scope 1 (direct) emissions—release of GHG emissions as a direct result of activities undertaken at a facility
- scope 2 (energy direct) emissions—release of GHG emissions from the generation of purchased electricity, steam, heating or cooling consumed by a facility, but that do not form part of the facility
- scope 3 (indirect) emissions—all indirect emissions that are not included in scope 1 or 2. They are a consequence of the activities of the facility but occur at sources or facilities not owned or controlled by the entity.

³ <http://climateactiontracker.org/countries/australia.html>

⁴ <http://www.ehp.qld.gov.au/assets/documents/climate/qld-climate-transition-strategy.pdf>

Assessment methodology

This report only evaluates the potential impacts of scope 1 GHG emissions for the life of the project. The EIS states that no grid-sourced electricity will be purchased during the life of the project for use on-site so there will be no scope 2 emissions. In the event that a project scope change should occur before construction or during the life of the project which requires the purchase of electricity, rather than electricity generation from an on-site power station, the proponent would be required to undertake an assessment of scope 2 GHG emissions at that time and undertake relevant reporting.

In accordance with the NGER Act accounting methodology framework and the TOR for the project, the EIS did not include scope 3 emissions in the assessment and they are not evaluated in this report. Consideration of scope 3 emissions is not a requirement of either Australian Government or state government legislation or policy.

The EIS estimated the GHG emissions from the proposed power station, diesel combustion and land clearing in accordance with the National Greenhouse and Energy Reporting (Measurement) Determination 2008 (NGER Determination), the National Greenhouse Accounts Factors (July 2013) and the Greenhouse Gas Protocol. The GHGs considered for the assessment are carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O) and sulphur hexafluoride (SF₆).

The EIS factored in the progressive rehabilitation and regrowth of cleared areas to offset the GHG emissions from land clearing, which is consistent with the approach in the NGER Determination. The EIS states that approximately 12 years following rehabilitation, the carbon storage associated with rehabilitated areas will be restored to levels equivalent to vegetation in place prior to clearing, which leads to a position of neutral net GHG emissions for land clearing. The proponent's commitments to, and my conditions requiring progressive rehabilitation, are outlined in section 5.1—Land use and rehabilitation of this report.

Power demands of the mine and capacity of the power station

The EIS identified that the proposed power station would consist of two 350 MW operating units to supply the potential maximum power demand of the mine with an additional third 350 MW unit for redundancy. The total operating capacity of the power station would therefore be 1,050 MW.

Given the majority (86.7 per cent) of the GHG emissions generated by the project would come from the power station, I requested further information regarding the size of the power station, the need for redundancy and the forecast power demands, which was provided in the AEIS. The breakdown of forecast power demands confirmed the potential peak power demand for the project is approximately 388 MW. I accept that peak power demand has been appropriately determined.

The total operating capacity of the power station (1,050 MW) was justified in the EIS on the basis that the smallest super critical generating units available from the proponent's preferred supplier are 350 MW. Therefore, two units are required to meet peak demand of 388 MW. The third unit would provide redundancy in the event of failure of one of the primary units. The proponent did not investigate other sources or types of power

generators. Further discussion relating to the power station design and capacity is located within the section 5.12—Power supply of this report.

The EIS assessment methodology is based on the power station output powering only the mining activities on the mining lease. The EIS stated the power station would have spare capacity for potential future supply to off-lease users, however the proponent confirmed in the AEIS that electricity supply to off-lease users is not currently proposed.

Any off-lease supply of power would be subject to separate approvals under the *Electricity Act 1994* and Electricity Regulation 2006, or relevant legislation at the time of seeking approval to supply power off-lease. My evaluation of the project's GHG impacts is only for the approvals sought in the EIS for the project's mining activities on the proposed mining lease.

5.4.1 Impacts and mitigation

Impacts

The sources of scope 1 GHG emissions generated by the project during the operations phase include:

- burning of 159,868,000 t of coal in the on-site coal-fired power station for electricity generation – the fuel source for the power station would be the fine rejects from the CHPP, supplemented with raw coal from the mine
- fugitive methane emissions resulting from extraction of 1,332,184,000 t of ROM coal from the open-cut and underground mining operations
- 4,427,705,000 litres of diesel used at the open-cut and underground mining operations for site equipment, vehicles and back-up diesel generators
- carbon storage loss associated with 11,000 ha of land clearing for the project

Predicted GHG emissions over the mine life are provided in Table 5.3. The majority of GHG emissions associated with the project are related to the combustion of coal in the power station accounting for 86.7 per cent of the project's GHG emissions.

The EIS states that GHG emissions vary over the life of the project, so scope 1 emissions were estimated for each year of operations of the project. The average annual GHG emission is estimated to be 4,707,000 tCO₂-e, with the highest emissions expected in Project Year 10 at 6,989,000 tCO₂-e and the lowest in Project Year 49 at 77,000 tCO₂-e. The EIS estimates that operational scope 1 GHG emissions for the life of the project total 230,666,000 tCO₂-e.

Table 5.3 Estimated scope 1 GHG emissions for the project over the mine life

Activity	Total (tCO ₂ -e)	Percentage by source category
Diesel open-cut	11,952,000	5.2
Diesel underground	735,000	0.3
Fugitive emissions	17,238,000	7.5
Power station	200,036,000	86.7
Land clearing/rehabilitation	705,000	0.3
Total	230,666,000	100.0

Source: CSCP draft EIS July 2015 Appendix L Table 34

The project's estimated annual GHG emissions of 4,707,000 tCO₂-e can be compared with the 2014 GHG inventory estimates for Australia (523,309,820 tCO₂-e) and Queensland (145,098,780 tCO₂-e). Based on these figures, the project's total annual GHG emissions would contribute approximately 3.2 per cent to Queensland's total annual emissions, and 0.9 per cent to Australia's annual GHG emissions.

The project's estimated annual GHG emissions of 4,707,000 tCO₂-e can also be compared with the predicted annual emissions of the proposed CCM&RP at 1,440,198 tCO₂-e⁵ (including scope 1 and 2 emissions). The CCM&RP would not have an on-site power station; however, it would use power from the Moray Power Project (MPP). The power CCM&RP use from the MPP would be considered as scope 2 emissions. The MPP involves the construction and operation of a thermal and diesel power station with a generating capacity of 150 MW. The MPP would be located immediately to the east of the CCM&RP and is proposed to provide power to the CCM&RP and other mines in the Galilee Basin.

The project is expected to have an average emission intensity of 0.98 tCO₂-e per megawatt hour (MWh) of electricity produced. The emissions intensity of existing coal-fired power stations ranges from around 0.80 to 1.38 tCO₂-e/MWh, reflecting differences in plant age, design, and the type of coal used.

Submitters on the draft EIS raised concerns regarding potential impacts of GHGs on human health and existing land uses, terrestrial and aquatic habitat by GHG emissions, and the impacts of GHG emissions on climate change. While the EIS estimated the types and quantity of GHG emissions from the proposed project, the EIS did not assess what the potential impacts of GHG emissions would be on matters such as climate change, human health or terrestrial and aquatic habitat values. I am not satisfied with the EIS impact assessment related to GHG emissions and I have discussed this further in the following mitigation measures section.

⁵ Carmichael Coal Mine and Rail Project SEIS Report for Greenhouse Gas Emissions, 21 October 2013 prepared by GHD.

Mitigation measures

The EIS includes the following commitments to report on GHG emissions and mitigate, reduce, control or manage GHG emissions through energy efficiency:

- reporting yearly on GHG emissions, and energy production and consumption in accordance with the NGER Act
- regular assessment, review and evaluation of greenhouse gas reduction opportunities
- procurement policies that require the selection of energy efficient equipment and vehicles
- monitoring and maintenance of equipment in accordance with manufacturer recommendations
- optimisation of diesel consumption through logistics analysis and planning
- progressive clearing and rehabilitation of land areas to manage and limit the combined loss of carbon storage associated with land clearing.

I support these commitments, included in Appendix 5 of this report, and require that they be implemented.

In addition, I note the Emissions Reduction Fund safeguard mechanism, which commenced on 1 July 2016, applies to facilities that must report under the National Greenhouse and Energy Reporting Scheme and emit more than 100,000 tCO₂-e scope 1 emissions per year⁶. Under the safeguard mechanism, the proponent would be required to keep project emissions at or below a baseline set by the Clean Energy Regulator (CER). For the project, this baseline would be determined using forecasts of emissions.

Power station

I acknowledge the importance of Australia's commitment to its obligation under the Paris Agreement and the Queensland Government's GHG reduction target of at least 30 per cent below 2005 levels by 2030. Given the significant GHG emission contribution of the power station, I consider that the EIS has not demonstrated the need for a coal-fired power station on the mining lease, compared to alternative power supply options or a combination of coal-fired generation with other generation technologies such as solar, diesel and waste coal mine gas, that could produce less GHG emissions. As renewables have a shorter lead time and there is potential for battery storage, I consider that it is credible for the proponent to look at these options. Furthermore, as the forecast peak power demands of the power station are 388 MW

⁶ <http://www.cleanenergyregulator.gov.au/ERF/About-the-Emissions-Reduction-Fund/the-safeguard-mechanism>
<http://www.environment.gov.au/system/files/resources/8fb34942-eb71-420a-b87a-3221c40b2d21/files/factsheet-safeguard-mechanism.pdf>
<http://www.cleanenergyregulator.gov.au/NGER/The-safeguard-mechanism/Coverage>

and the proposed power station can generate up to 1,050 MW, I consider the EIS has not adequately justified the size or type of power station generating units compared to other units that may produce less power and less GHG emissions. I have discussed the power station in more detail in the section 5.12—Power supply of this report.

Therefore, I have imposed a condition (Appendix 1) requiring the proponent to prepare a comprehensive power supply options assessment report, including cost and viability of alternative power supply options. The report must consider renewable energy technologies such as wind, solar and hybrid technologies or alternative fuel sources, for all or part of the mining activities on the lease. If renewable energy options can be adopted, there may not be a need for the coal-fired power station, or for three generating units if a combination of renewable energy and a smaller power station is viable.

The proponent must submit the power supply options assessment to the administering authority for the EP Act prior to public notification of an EA application that includes ERA 14 – Electricity generation, so that the authority can consider the information as part of its assessment of the EA application. I note the public would also have an opportunity to comment on the information. The administering authority can then prepare conditions for the draft EA relating to the emissions from the proposed power option.

The EIS identified the GHG emissions without assessing the potential for GHG emissions to have an impact on human health and existing land uses, and terrestrial and aquatic habitat. Given the potential GHG emission impacts on these matters, I have imposed a condition (Appendix 1) requiring an updated emissions profile and impact assessment for the proposed power station component of the project, which reflects the actual performance of the generator units proposed to be used for the project. The information required in the emissions profile includes:

- a detailed inventory of air emissions during construction and operation of the proposed power station (including source, type and levels of emissions)
- ground level predictions for any site identified as an environmental value or sensitive receptor in the EPP (Air)
- best practice mitigation measures and proactive and predictive operational and maintenance strategies to prevent or mitigate emissions impacts
- an evaluation of potential air quality impacts from emissions, with reference to its risk to human health, to nearby terrestrial and aquatic habitat for protected species and health risk to livestock.

The proponent must submit the updated emissions profile and impact assessment to the administering authority for the EP Act prior to public notification of an EA application that includes ERA 14 – Electricity generation, so that the authority can consider the information as part of its assessment of the EA application and the public will have an opportunity to comment on the information.

The power supply options assessment and updated emissions profile and impact assessment must demonstrate that a coal-fired power station would deliver the best environmental, economic and human health outcome, and provide adequate

information for the administering authority for the EP Act to grant ERA 14 for a coal-fired power station. Should the ERA be granted, I require the proponent to develop a power station GHG emissions reduction and management plan (PSGHG Plan) for my approval that details how the proponent will minimise, monitor and report on the GHG emissions of the power station. The report must be updated annually and made publicly available upon request. I have imposed a condition (Appendix 1) to achieve this outcome. The PSGHG Plan must:

- demonstrate that best practice, maximising energy efficiency, opportunities for future energy recovery, and minimising GHG emissions have been given priority in the design, operation and maintenance of the power station including but not limited to:
 - coal-fired base load generation plant designed to achieve best practice thermal efficiency
 - use of economisers and feed water heaters to reduce fuel consumption
- provide evidence of how the greenhouse gas intensity (i.e. quantity of CO₂-e produced per MWh of electricity produced) is equivalent to or better than benchmarked best practice for the electricity industry at the date of each report
- demonstrate how continuous improvement in greenhouse gas intensity could be achieved
- outline how the power station has been designed and constructed to be carbon capture and storage (CCS) ready, implement CCS technology and store gas demonstrate that new and emerging technologies have been considered such as ultra-supercritical coal-fired technologies, or Integrated Gasification Combined Cycle technologies⁷
- detail how emissions from the power station would be monitored and reported.

Further discussion relating to the power station is included in section 5.12—Power supply of this report.

Other mining activities

I have stated a condition for an air quality management plan (AQMP) (Appendix 2) in the draft EA which is to include a GHG management program, including reporting, to manage and mitigate the GHG emissions from all mining activities on the mining lease (other than the power station), including clearing, diesel combustion and fugitive emissions, (Appendix 2). The AQMP must be submitted to the administering authority for approval at least three months prior to commencement of mining activities.

I am satisfied that the implantation of a GHG management program regulated by an EA will appropriately manage GHG emissions from other mining activities.

⁷ <http://www.climatechwiki.org/technology/igcc>

Impacts of GHG emissions combined with other Galilee Basin projects

The EIS included an air quality impact assessment of the project combined with the impacts of the proposed CCM&RP and the MPP, which is discussed in section 5.4—Air quality of this report. However, this assessment did not include a GHG emission impact assessment in the EIS.

As the proponent has not provided information on just the power station emissions or a GHG emissions impact assessment combined with emissions from other projects, I have imposed a condition (Appendix 1) to require a GHG cumulative impact assessment for approval, which is to be provided to the administering authority for the EA prior to notification of the EA application, so the authority can consider the information as part of its assessment of the EA application. The public will also have an opportunity to comment on the information. This impact assessment must consider the potential GHG emission impacts on climate change and the resulting impacts on human health, livestock and terrestrial and aquatic habitat for protected species and communities.

Climate change impacts on the project

The EIS included an assessment of how predicted climate change conditions may affect the project, including increased temperatures and evaporation, reduced rainfall leading to associated changes to water availability, and rain and flooding associated with an increasing number of extreme events including cyclones.

The EIS includes management and mitigation measures to ensure the project is designed to adapt to climate change, including:

- robust design of site drainage infrastructure and the water management system to account for variability of water supply and allow for extreme flooding and rainfall events
- designing and constructing mine infrastructure to engineering specifications to ensure safety during extreme events
- following waste management procedures to reduce risk of disease from vectors.

I am satisfied that the EIS has considered the risks to the project from climate change and that the proposed management and mitigation measures will adequately protect the project from the impacts of climate change.

5.4.2 Coordinator-General's conclusion – Greenhouse gas and climate change

I am satisfied that the assessment of GHG emissions in the EIS adequately identified the sources and quantities of the scope 1 GHG emissions in accordance with the methodology of the NGER Act and NGER Determination. As predicted emissions will exceed the threshold CO₂-e of 50,000 t per annum in every year of the project, the proponent must report on GHG emissions. The proponent is aware of the legislative requirements of the NGER Act to report on CO₂-e, keep project emissions at or below a baseline set by the CER and has committed to implement measures to reduce GHG

emissions over the life of the project. I require these commitments to be implemented and have included them at Appendix 5.

I consider that the EIS has not sufficiently demonstrated the need for a new coal-fired power station and that the extent of GHG emissions predicted to be produced by the project could be minimised by the use of alternate power sources or the installation of smaller, potentially more efficient generating units. Additional information is required to allow conditions to be developed for the draft EA related to ERA 14 – Electricity generation and I have imposed conditions which would ensure that this information is provided by the proponent. I have imposed conditions requiring the proponent to undertake a comprehensive power supply options assessment and an updated emissions profile and impact assessment (Appendix 1).

To minimise and manage the GHG emissions for both the construction and operational phases of the project, I have imposed a condition requiring the proponent to develop and implement a PSGHG plan (Appendix 1), if the administering authority for the EP Act authorises ERA 14. The PSGHG must include measures to continuously improve and report on the GHG emissions from the power station.

I also require a GHG impact assessment, that must consider the potential GHG emission impacts of this project and other Galilee Basin projects for which GHG emission data is available, on climate change and the resulting impacts on human health, livestock and terrestrial and aquatic habitat for protected species and communities.

I am satisfied that the EIS has considered the risks to the project from climate change and that the proposed design of the mine and management and mitigation measures will adequately protect the project from the impacts of climate change.

5.5 Waste

This section of the report evaluates potential impacts and proposed mitigation measures associated with the management of both non-mining waste and mining waste generated by the project.

Submissions received

Submissions on the draft EIS raised a number of issues including:

- non-mining waste:
 - limited adoption of high-value strategies in the waste resource and management hierarchy
 - the sewage management system has not been adequately described.
- mining waste associated with the TSF and PSWSF:
 - insufficient assessment of impacts, including impact of waste, fly ash waste, radioactivity and lead-210, on groundwater, surface water, biodiversity, human health and existing land uses

- the conceptual design of the TSF and PSWSF (including drainage, spillway design and final slopes)
- insufficient commitments to avoid or minimise adverse impacts
- rehabilitation and decommissioning of the TSF and PSWSF, including stability of final landform design, identification of waste physical characteristics and final open-cut pit water quality.

I have considered each of the submissions and how the proponent has responded to submitter issues as part of my evaluation of waste impacts.

I have also considered advice received from the IESC regarding management of mine wastes to prevent contamination of surface water and groundwater.

5.5.1 Impacts and mitigation

Non-mining (general) waste

The EIS identified potential impacts and mitigation measures associated with the type, quantity and nature of waste that may be generated by the project during both construction and operation. The EIS also identified the relevant legislative and regulatory framework for waste management, which includes the *Waste Reduction and Recycling Act 2011* (Qld) (WRR Act), the Waste Reduction and Recycling Regulation 2011, the Environmental Protection (Waste Management) Regulation 2000 (EP (Waste Management) Regulation), the EP Act and the Environmental Protection Regulation 2008.

Impacts

General waste encompasses the remainder of unwanted materials (non-mining) produced by the mine. During construction and operation, the project would generate a range of general waste types from:

- vegetation clearing and earthworks
- construction of infrastructure
- use and maintenance of vehicles, plant and equipment
- general administration
- package wastewater treatment plants
- operation of the workforce
- sewage treatment.

Table 5.4 shows the estimated maximum quantities of non-mining waste generated from the above activities per annum.

Without appropriate waste management strategies, including avoidance, reduction, re-use, recycling, recovery, treatment and disposal strategies, potential impacts could include contamination of land, surface water and groundwater, odour impacts and human health impacts.

Table 5.4 Estimated maximum non-mining waste quantities for construction and operations (per annum)

Waste Category	General composition	Quantities – construction	Quantities – operations
Non-Regulated			
General waste	Food scraps; wood and non-reusable pallets; non-Class 1, 2, 5 plastics	260 t	1,200 t
Recyclable waste	Aluminium steel cans; class 1, 2, 5 plastics; paper; cardboard; carbon brushes for motors; rubber	150 t	1,500 t
Refurbishable items	Ventilation tubes; hoses; manifolds and couplings; pipe work and associated components and fittings; cabling fixings and hangers; (some) drill steels and roof bolts; plastic dome plates; butterfly plates; wing nuts; plastic and steel rib plates; steel mesh; conveyor rollers	60 t	450 t
Green waste	Grass; cleared timber	11,000 ha	< 10 t
Scrap metal	Steel; copper; brass; cast iron; stainless steel; electrical cable; wire; aluminium; any item considered to be metal (ferrous or non-ferrous) including machine parts)	1,000 t	< 10 t
Personal protective equipment and small items	Gloves; hardhats; safety glasses; gumboots; water coolers	< 1 t	< 1 t
Air filters	Engine air filters	< 1 t	< 1 t
Wooden pallets	Reusable pallets	< 1 t	< 1 t
Regulated			
Waste oils, grease and sludge	-	3,000 kL	2,500 kL
Empty chemical drums	20 L drums, 205 L drums	10 t	50 t
Paints	General paint	< 5 kL	< 5 kL
Tyres	-	550	1,200
Oily water	-	1,500 kL	3,000 kL
Sewage effluent	On-site disposed effluent	320,000 kL	320,000 kL
Septic tank waste	Off-site disposed tank wastes	2,800 kL	4,600 kL
Waste grease cartridges	-	300 kL	500 kL
Miscellaneous hydrocarbon wastes	Oily rags; absorbent and other oil spill clean-up products	< 20 t	< 20 t
Miscellaneous chemicals	Engine coolant; solvents; sealants etc	< 20 kL	< 50 kL

Waste Category	General composition	Quantities – construction	Quantities – operations
Dry or gel cell batteries	Cap lamp batteries	< 1 t	< 1 t
Spent vehicle batteries (lead acid batteries)	Vehicle batteries	< 15 t	< 15 t

The proponent proposes to construct package sewage treatment plants with a capacity of 140 kilolitres per day, within each of the MIAs and the accommodation village. The EIS states that effluent from the sewage treatment process would be pumped to settlement ponds from which the treated effluent would be sprayed to pasture in accordance with relevant regulatory requirements.

Mitigation measures

The EIS confirms that all non-mining wastes would be managed in accordance with the waste and resource management hierarchy set out in the WRR Act: avoid, reduce, re-use, recycle, recover, treat and dispose.

The EIS includes a commitment to developing and implementing a waste management system for the project, which will be based on all relevant regulatory requirements and values, and principles described in the EIS. The waste management system would provide for the identification of waste types, commit to the use of licensed waste transport contractors, and outline the process for tracking of relevant regulated wastes. The waste management system will be subject to a continual improvement process with the aim of identifying new opportunities for waste minimisation and addressing any new waste streams generated.

Additionally, the EIS includes commitments to adopt the following measures to minimise impact of non-mining waste on existing land uses, human health and ecological processes:

- landfill to be designed and managed to dispose of general (non-regulated and non-hazardous) wastes in accordance with the Queensland Government *Guideline – Landfill siting, design, operation and rehabilitation, EM2319, Version 2*
- wastes to be collected, handled and stored to protect mine site staff, community health and prevent nuisance
- maintaining an inventory of all waste types and quantities produced on the site and their applicable disposal method in accordance with the WRR Act and EP (Waste Management) Regulation
- submitting annual National Pollution Inventory reports in accordance with the *National Pollutant Inventory Guide* and associated manuals (e.g. *Emission Estimation Technique Manual for Mining*), as required
- providing DES with details of areas with notifiable activities in accordance with legislative requirements
- reducing the risk of land contamination from project activities through consideration of the design, construction and operation of project facilities and post-mining

rehabilitation activities. This includes the appropriate containment and handling of hazardous or contaminated substances and training of key staff in spills prevention and clean-up.

I support the commitments in the EIS, included in Appendix 5 of this report, and require them to be undertaken.

Submissions on the draft EIS raised concerns that there were no avoidance or reduction waste management strategies put forward in the draft EIS, while a high number of waste disposal strategies were put forward. Submitters considered that this limitation in proposed waste management strategies would impact on existing land uses, human health, and ecological processes. The AEIS states that the waste management strategies put forward are in accordance with the relevant regulatory requirements.

I agree the waste management strategies proposed in the EIS generally accord with the waste management hierarchy and principles of the EPP (Waste). However, I have stated conditions for the draft EA (Appendix 2) to include waste avoidance measures, which go a step further than EPP (Waste) to reduce potential impacts of non-mining waste on environmental values. The draft EA conditions prohibit the burning of waste, including vegetation waste, on the mining site. I expect the proponent to beneficially re-use waste on-site, such as mulching of vegetation waste for use in on-site garden beds and progressive rehabilitation in accordance with the waste management and resource hierarchy.

Where waste cannot be re-used on-site, waste should be transported to an off-site recycling facility or licensed landfill. Where waste is unable to be transported to an off-site facility, I have stated a draft EA condition (Appendix 2,) requiring the proponent to design and install a leachate collection system to collect the leachate generated in the on-site landfill unit and convey this to an appropriate storage facility. The condition also outlines the appropriate management of leachate and stormwater run-off.

With the implementation of the EIS commitments, compliance with the relevant non-mining waste legislative framework and my stated conditions, I am satisfied the potential impacts of non-mining waste from the project can be appropriately mitigated and managed.

Sewage treatment

The EIS states that the use of treated effluent in areas of human contact would be avoided. Sludge from the treatment process would be collected by a licensed waste contractor and transported to a sewage treatment plant for treatment and disposal.

Submissions on the draft EIS raised concerns that the sewage management system has not been adequately described. Due to these concerns and the lack of background information on the proposed sewage management system, Appendix 2 does not contain sewage conditions for the draft EA. I have imposed a condition (Appendix 1) requiring the proponent to provide sewage management system information to the administering authority for the EA, prior to it publicly notifying its draft EA application, to

allow a full assessment and development of sewage conditions for inclusion in the draft EA.

Mining waste

Impacts and mitigation measures

Mining waste refers to the overburden and interburden, which are the waste rock materials that are required to be mined in order to access coal resources, as well as coarse and fine rejects (tailings) from the CHPP, and power station waste material.

The EIS estimates that over the life of the project, 96 Mm³ of tailings waste will be generated by processing coal at the CHPP and will be disposed of in the TSF. An estimated 16.4 Mm³ of dry power station waste materials (fly ash, bottom ash and clinker) would be generated in the first 10 years of the project and stored in the PSWSF. After Project Year 10, power station waste would be stored within the open-cut mine overburden emplacement areas (Figure 5.2).

Geochemical assessment

The EIS describes the geochemical assessment undertaken for the project mine and power station waste materials, completed in accordance with technical guidelines for geochemical assessment of mining waste. Samples of tailings and power station waste material were subjected to static and kinetic geochemical tests to evaluate their geochemical properties and to assess the level of risk from acid generation, the presence and leaching of soluble metals and salts, and/or other salinity and erosion issues. The geochemical assessment concluded that the tailings and power station waste material are likely to be non-acid forming and of a benign nature.

The EIS states that run-off and seepage from the TSF and PSWSF would be collected and stored in the TSF central decant water pond. Due to the benign nature of the tailings and power station waste materials, the EIS indicates that no additional special management measures are required for handling and storage of waste within the TSF and PSWSF. The EIS concludes that as the tailings and power station wastes are benign they are unlikely to present any contamination risks to land, groundwater or on-site or downstream surface water quality. Further discussion about the conceptual design of these facilities is provided in the following section.

The EIS states that quarterly monitoring of surface run-off and seepage from the TSF and PSWSF will be undertaken to ensure key water quality parameters for surface water and groundwater remain within relevant criteria for pH, electrical conductivity, TSS and a range of dissolved trace metals/metalloids and major ions.

In order to validate the sampling and geochemical assessment undertaken for the EIS and ensure ongoing monitoring of the potential impacts on mining waste, I have stated a condition for the draft EA requiring the proponent to develop a mineral waste management plan (MWMP) prior to commencement of mining activities. The MWMP must be subject to a third-party audit and provided to the administering authority for the EP Act once undertaken. The MWMP requirements are detailed in Appendix 2 and include a program of progressive sampling to predict the quality of run-off and

seepage, classifying waste rock zones, placement and use on the basis of sampling results and monitoring and management measures.

I have also stated a condition for the draft EA requiring a mining waste and rejects management plan (MWRMP) (Appendix 2) which is applicable to disposal and rehabilitation activities. The MWRMP would ensure disposal and rehabilitation is carried out in a way that minimises the potential impacts of waste rock, spoil and rejects disposal, including salinity, acidity and alkalinity in run-off and seepage, on surface water or groundwater quality. The MWRMP must include a disposal plan demonstrating how potentially acid-forming waste rock, spoil and rejects will be selectively placed or encapsulated back in the open-cut pits or overburden emplacement areas to minimise generation of acid mine drainage.

I am satisfied the MWMP and MWRMP would ensure potential impacts of mining waste can be appropriately identified, mitigated and managed.

Radioactive contaminants and heavy metal wastes from the power station

Submissions on the draft EIS raised concerns regarding the potential environmental, human and land use impacts from the power station fly ash waste, which may contain radioactive contaminants, lead and other heavy metals. I requested further information on this matter, and the AEIS stated that screening of coal ash, undertaken as part of the draft EIS, established that there are low levels of radioactive elements present in the coal because the elements were below the laboratory limit of recording. The AEIS considered that, as the screening levels are low, it is not necessary to undertake a detailed radionuclide assessment for the coal ash samples. However, given the potential risks associated with radioactive contaminants and heavy metals I consider that further assessment is required.

I have imposed conditions (Appendix 1) requiring the proponent to provide additional information on the power station to the administering authority for the EP Act to assess the power station and PSWSF impacts. The construction of the power station and PSWSF cannot proceed until the information has been provided and assessed, and conditions for ERA 14 – Electricity generation have been included in an EA for the project.

Should the administering authority for the EP Act authorise the power station after an assessment of all information provided, I have imposed a condition (Appendix 1) requiring the proponent to undertake a detailed radionuclide assessment of coal ash waste prior to commencement of construction of the power station. I also require the proponent to undertake continued monitoring for radioactivity of TSF and PSWSF run-off and seepage. As the power station waste is proposed to be stored in the overburden after Project Year 10, my condition also ensures waste would be fully contained should the radioactivity be considered too high by independent expert testing.

Conceptual design of TSF and PSWSF

The EIS included conceptual designs for the TSF and PSWSF, which were informed by a geotechnical assessment of the storage facility foundation areas and landform stability analysis.

Tailings are proposed to be stored in a conventional wet TSF with a storage capacity of approximately 96 Mm³ and a final embankment height of approximately 34 m. The tailings would be pumped from the CHPP to the TSF via a surface pipeline. Details of the length and diameter of the pipeline are not provided in the EIS. The proponent will determine these details at the detailed design stage.

Dry waste generated by the power station would be transported from the power station by haul truck for storage in the PSWSF. The PSWSF would have a total storage capacity of approximately 16.4 Mm³, sufficient to store power station waste for the first 10 years of operations and cover an area of around 80 ha. The PSWSF final landform once mining ceases would be integrated with the TSF final landform. It would have a final combined surface area of greater than 680 ha. The location of the TSF and PSWSF is shown on Figure 2.5.

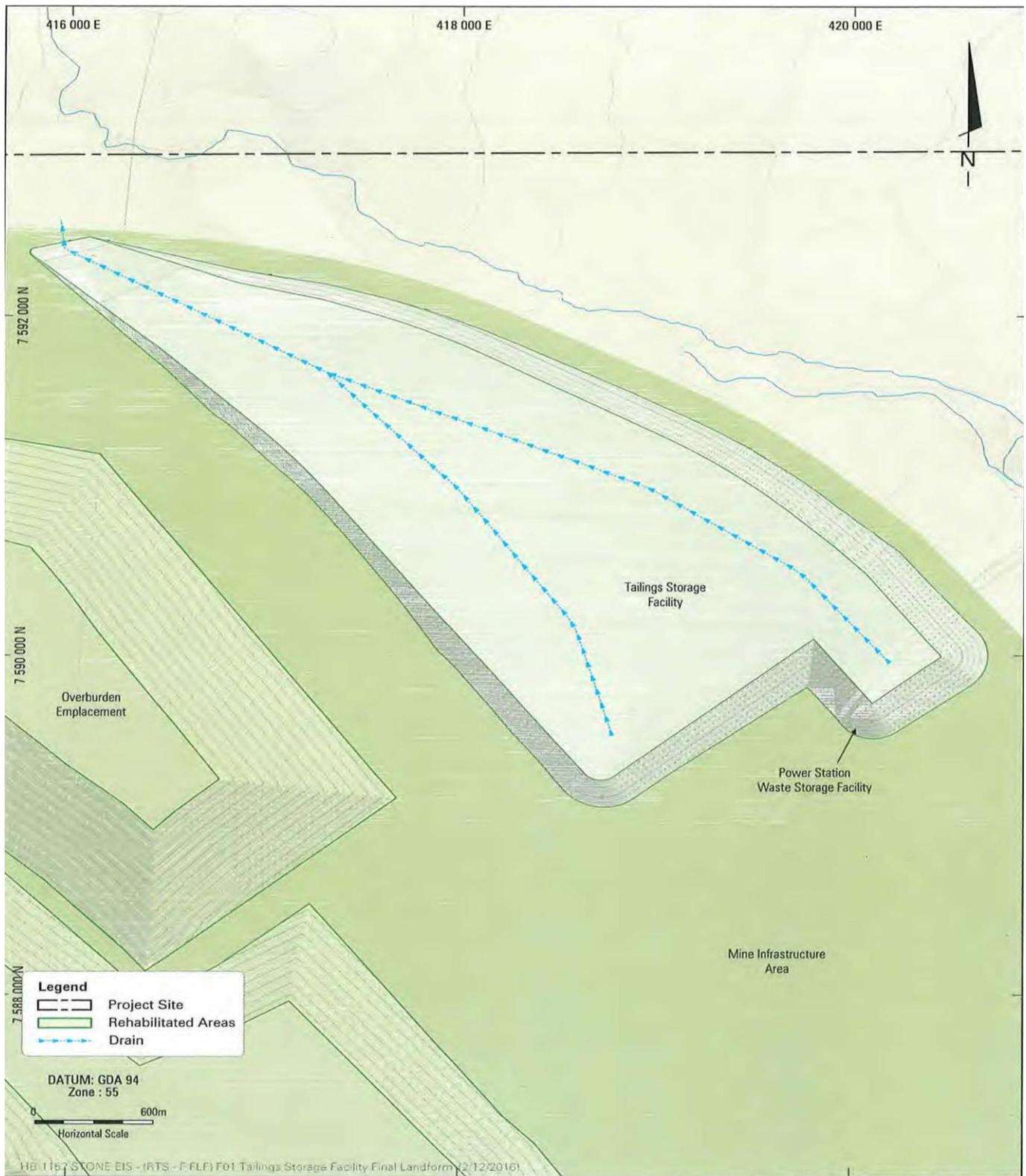
In terms of the liquid waste stream from the power station, the EIS states that the power station would be air cooled, will only use about 3 GL/yr of input water and would be designed to be a zero-discharge liquid waste plant. There would be approximately 30 tonnes per week of dry waste associated with filtering and demineralising the input water to remove total suspended solids (TSS) and this dry waste would be stored in the PSWSF or overburden emplacement areas after Project Year 10.

Submissions on the draft EIS raised concerns regarding the conceptual design of the TSF and PSWSF, including proposed drainage and spillway design, and potential final slope instability, which could result in erosion and impacts to downstream surface water quality. In response to submissions, the AEIS included revised conceptual designs of the TSF and PSWSF, which are shown on Figure 5.6. The EIS states that a detailed TSF design plan, including tailings management, testing and monitoring procedures, would be developed prior to lodgement of the Plan of Operations to the administering authority for the EP Act, or commencement of TSF construction.

The EIS states that run-off and seepage from the TSF and PSWSF would be stored in the TSF central decant water pond. A low water level would be maintained in the decant pond by pumping collected water to the return water dam for storage and re-use in the CHPP.

The EIS also includes commitments to the following measures to minimise risk of impacts resulting from the TSF and PSWSF, such as seepage and landform stability (see Appendix 5):

- the TSF and PSWSF would be constructed to be geotechnically stable landforms
- suitable preparation measures would be taken to provide a low permeability foundation for the TSF and PSWSF



PROJECT CHINA STONE



Conceptual Tailings Storage Facility and Power Station Waste Storage Facility Final Landform Drainage Design

Figure 5.6 Conceptual tailings storage facility and power station waste storage facility final landform drainage design

- the conceptual design of the final surface of the TSF and PSWSF combined plateau would include an internal drain with capacity to convey run-off from the probable maximum precipitation to natural ground at the northern end of the TSF
- monitoring programs would be implemented for the TSF and PSWSF to monitor key environmental and design performance indicators. The results of the monitoring will be used to assess the performance of the TSF and PSWSF and to undertake regular reviews of the design and operating plans
- monitoring of the consolidation of the deposited tailings would be undertaken and included in the TSF design plan
- progressive rehabilitation of the TSF and PSWSF would be undertaken in available areas
- for decommissioning, the PSWSF landform would be integrated with the TSF final landform so that the plateau area of the PSWSF is at the same level and contiguous with the TSF plateau.

The EIS concludes that with the mitigation measures and monitoring programs in place, impacts to groundwater or downstream surface water quality from run-off or seepage from the TSF and PSWSF are unlikely. While I support the proponent's commitments and require them to be undertaken, I consider additional measures are necessary to ensure significant environmental impacts from the TSF and PSWSF do not occur.

Therefore, for the TSF I have stated a condition (Appendix 2) requiring tailings disposal management procedures, including:

- constructing the TSF to be geotechnically stable with a low permeability foundation
- installation of a surface water and seepage collection system along the downstream toe of the TSF embankment to intercept surface expression of seepage or leachate
- surface run-off and seepage from the TSF monitoring to confirm run-off and leachate quality.

The EIS assessment concludes that the proposed TSF would be considered a 'significant' consequence category structure and would be considered a 'regulated structure' under the EP Act. A further detailed consequence category assessment, including a full dam break analysis, would be conducted at the detailed design stage to confirm the consequence category and regulated status under the EP Act. I have stated conditions for the draft EA (Appendix 2) regarding the design, construction and operation of regulated structures to minimise the risk of failure of containment, including during flood events.

As mentioned earlier, further information is required about the power station and PSWSF and therefore I have not stated conditions for the draft EA. Rather, I have imposed conditions in Appendix 1 requiring additional information to be provided to the administering authority for the EA. Should the administering authority for the EA authorise the power station and include conditions for ERA 14 – Electricity generation in an EA for the project, conditions will be added by DES to ensure power station waste disposal management procedures will minimise risk of environmental impacts.

I have also imposed conditions in Appendix 1 requiring groundwater and surface water quality monitoring that would ensure any impacts such as contaminated run-off or seepage from the TSF, PSWSF and other mining activities are promptly identified, and action taken to contain the contamination.

To ensure the methods for decommissioning and final rehabilitation of the TSF and PSWSF include the prevention and management of acid mine drainage, slope stability and erosion minimisation I have stated rehabilitation conditions for the draft EA (Appendix 2). The final landform and slopes for the TSF and PSWSF are discussed further in section 5.1—Land use and rehabilitation.

5.5.2 Coordinator-General's conclusion - waste

Non-mining waste

I am satisfied that potential impacts of non-mining waste would be appropriately avoided, mitigated and managed during construction, operation, decommissioning and rehabilitation, through the implementation of the EIS commitments and mitigation measures, and compliance with the conditions I have stated for the draft EA for non-mining waste.

I have imposed a condition requiring the proponent to provide additional information on the sewage management system to DES to allow the sewage management system to be fully assessed prior to notification of the draft EA application.

Mining Waste

I accept the proponent's geochemical assessment which concluded that tailings and power station wastes are likely to be non-acid forming and benign. I have stated conditions for the draft EA to ensure mineral waste does not cause impacts to the environment, including the requirement for the development of a MWMP to be submitted to DES subsequent to a third-party audit. Draft EA stated conditions included in this report also require progressive rehabilitation to ensure that spoil and reject dumps do not impact on environmental values and a MWRMP to manage waste, spoil and rejects in the rehabilitation phase.

In response to EIS submitter concerns and advice from the IESC, I have imposed a condition requiring the proponent to undertake additional monitoring of radioactivity of TSF and PSWSF run-off and seepage.

Additionally, I have stated draft EA conditions relating to regulated structures and contaminated land, and imposed conditions for surface water and groundwater, which will ensure any potential impacts arising from mining waste such as soil, groundwater and surface water contamination, are monitored and managed appropriately.

Based on compliance with the draft EA conditions and the implementation of the MWMP, MWRMP and mitigation measures in the proponent's commitments, I am satisfied that the project would effectively manage mining waste over the life of the project.

I am satisfied the proposed revised conceptual design plan for the TSF and PSWSF storage facilities, proposed mitigation measures, and stated draft EA conditions, would satisfactorily reduce the risk associated with these facilities, and mitigate and manage potential impacts.

5.6 Noise and vibration

This section of the report evaluates the EIS assessment of noise and vibration impacts from the mine and associated infrastructure area.

The EIS confirms that noise and vibration impacts associated with off-lease infrastructure areas, including mine site access road, port development, rail connection to the port and raw water supply, would be assessed in a separate assessment and approvals process, and therefore I have not included assessment of these matters in this report.

Submissions received

Submissions on the draft EIS raised issues including:

- the limited number of noise monitoring locations
- concerns not all sensitive receptors were considered in the noise assessment
- lack of appropriate consideration given to the existing land use on the project area during establishment of the baseline noise levels and prediction of potential impacts
- noise impacts on the health of workers in the accommodation village due to the village's proximity to the airstrip, open-cut mine and mining infrastructure
- noise impacts associated with project aircraft noise on sensitive receptors in the flight path of the on-site airstrip

I have considered issues raised in submissions in my evaluation of the EIS and how the information provided by the proponent addresses these issues.

Sensitive receptors

The EIS states that the region in which the project is located is sparsely populated, with a few isolated homesteads, but no towns or cities nearby. Sensitive receptors adopted for the project were selected by the proponent in line with the *Environmental Protection (Noise) Policy 2008* (EPP (Noise)) guidelines and based on factors including sensitivity and potential exposure to noise, and distance from project noise sources. The sensitive receptors considered in the EIS are presented in Table 5.5 and shown on Figure 5.1.

Table 5.5 Sensitive receptors

Receptor name	Distance from project area	Occupancy type
Moonoomoo Homestead	7.2 km west	Permanent
Dooyne Outstation	9.9 km east	Intermittent
Carmichael Homestead	11.8 km south-west	Permanent

The project's on-site accommodation village does not meet the definition of sensitive receptor in accordance with the DES 2013 *Model Mining Conditions* (MMC) as it is located within the mining lease. Health and wellbeing of workers accommodated at the village would be regulated by *Coal Mining Safety and Health Act 1999* and Coal Mining Safety and Health Regulation 2001 is considered in section 5.4—Greenhouse gas and climate change of this report and is discussed in the EIS.

5.6.1 Existing noise levels

The EIS states that the existing ambient noise levels at identified sensitive receptors are considered low and are typical of a rural environment encompassing natural sounds from grazing stock, farm animals, birds and insects. The key existing land uses in the region are cattle grazing and coal exploration. No industrial noise and minimal traffic noise was audible at sensitive receptors during monitoring undertaken in May-June 2013.

The existing acoustic environment was characterised using data from environmental noise monitoring undertaken at two monitoring locations near Moonoomoo and Carmichael homesteads.

Submissions on the EIS raised concerns that in obtaining data from only two monitoring locations, the EIS inadequately assessed the existing noise environment and failed to take into consideration the current land use on the project area. The EIS states that as measured ambient noise levels were lower than the MMC's minimum recommended background of 30 LA_{90, 15 min}, the criteria adopted for the EIS impact assessment are the most stringent required by the MMC. I consider the EIS appropriately identified sensitive receptors and the existing land use of the area during establishment of the baseline noise environment.

5.6.2 Impacts and mitigation

Impacts

Potential noise and vibration impacts arising from construction and operational activities at the mine, infrastructure area and airport were analysed for the EIS using modelling in combination with desktop analysis.

Noise and vibration would be generated during construction and operation by earthworks, blasting, machinery and equipment use, vehicle movements, power generation and aircraft movement.

Construction noise

Noise modelling undertaken for the EIS indicates that construction noise is not anticipated to cause significant impacts at sensitive receptors, as all levels are predicted to be below the MMC night-time noise criteria of 30 LA_{eq, 15min} during day, evening and night.

Noise from construction vehicle movements along the Elgin-Moray Road and Moray-Carmichael Road are predicted to be 52 dB(A) L_{10, 18hr}, which is below the

63 dB(A) $L_{10, 18hr}$ maximum limit set by the *Environmental Protection (Noise) Policy 1997* (EPP (Noise) 1997). The EIS states that criteria are sourced from this repealed policy in the absence of equivalent guidance in EPP (Noise) 2008. I am satisfied with the use of the EPP (Noise) 1997 to compare maximum limits with predicted vehicle movement noise, and that vehicle movement noise is unlikely to cause adverse impacts to sensitive receptors.

Operational noise

The EIS calculates operational noise levels based on continuous operation of each noise source at maximum noise level, to represent the worst-case scenario. Noise sources considered include open-cut and underground mining, coal processing, train loading and operation of the power station.

Noise levels generated during operation are predicted to meet MMC criteria at all sensitive receptors, including maximum noise levels at night for comparison with the DES *Planning for Noise Control Guideline* sleep disturbance criteria.

The EIS states that noise from operational vehicle movements along the Elgin-Moray Road and Moray-Carmichael Road are predicted to be 50 dB(A) $L_{10, 18hr}$, and therefore compliant with the EPP (Noise) 1997 criteria adopted for the EIS.

Operational low frequency noise from the coal handling and processing plant is predicted to be within the 60 dBL criterion at all sensitive receptors during worst-case prevailing weather conditions at night.

Vibration impacts during construction and operations

Airblast overpressure and ground vibration levels during construction and operations were predicted for the EIS assuming a Maximum Instantaneous Charge (MIC) of up to 2,000 kg. At the highest predicted MIC, modelling indicates that the closest sensitive receiver would receive ground vibration levels of 0.22 mm/s, which is well below the 5 mm/s MMC criteria. Overpressure is not predicted to exceed 87 dBL, which is compliant with the 115 dBL MMC criteria. I am satisfied that vibration from the project would not cause impacts to nearby sensitive receptors.

Aircraft noise

The project is predicted to generate approximately 40 flights per week, or 5.8 flights per day over a 7-day workweek, once fully operational. The EIS adopts *AS 2021:2000 Acoustics - Aircraft noise intrusion - Building siting and construction* to establish criteria for predicting aircraft noise impacts on receptors near the project area. The EIS predicts that a large jet aircraft travelling from the project airstrip directly over the closest receptor (R2) would result in a maximum noise level of 69 LA_{max} . This is below the AS 2021:2000 maximum noise level criterion of 80 LA_{max} for residences receiving fewer than 20 aircraft flights per day. The standard, updated in 2015 (AS2021:2015), states that each night-time flight is equivalent to four flight operations.

I understand the criteria adopted by the proponent are applicable to small aerodromes with a small number of civil, non-jet aircraft movements. The EIS predicts a requirement for aircraft of 150 to 200 person capacity, which indicates larger jet-aircraft

may be required. The EIS includes a commitment to designing, constructing and operating the airstrip using the Civil Aviation Safety Authority (CASA) regulations and guidelines, and coordinating air traffic control with the airports at the workforce source locations, and the CCM&RP airstrip. I support this commitment and require it to be undertaken.

Combined impacts with other Galilee Basin projects

The EIS uses noise and vibration data from the CCM&RP Supplementary EIS (2013) as a baseline to calculate the combined impact resulting from construction and operation of the CCM&RP and the project. Worst-case noise levels are predicted to be below the adopted MMC criteria of 35 LA_{eq, 15 min} at all receptors. No adverse noise impacts caused by the combination of noise levels from the proposed project and CCM&RP are predicted to occur at any of the sensitive receptors. The EIS states that worst-case combined noise levels are below the criterion at all sensitive receptors.

Mitigation and monitoring measures

Noise and vibration

The noise impact assessment undertaken for the EIS predicts that noise levels during construction and operation are expected to be below the relevant criteria under all prevailing meteorological conditions. As such, no specific noise control strategies are proposed in the EIS. No blast mitigation measures are proposed in the EIS due to the low predicted ground vibration and overpressure levels.

I have stated conditions for the draft EA (Appendix 2) to ensure that noise and vibration levels comply with the MMC levels when measured at sensitive receptors. Blasting would not be permitted at all between 6 pm and 7 am. Noise monitoring and reporting requirements are also outlined in my stated conditions and require the proponent to monitor noise and blast levels, identify location, date and time of monitoring, atmospheric conditions and any effects due to extraneous factors.

The EIS includes a commitment to implementing a complaint handling procedure for the project, where any complaints received in relation to noise and blast impacts would be investigated, including noise and blast impact monitoring, if necessary. A complaints handling procedure is outlined in the stated conditions for the draft EA (Appendix 2).

To ensure the local community is consulted during construction and operations about the potential noise and vibration impacts of the project, I have imposed a condition in Appendix 1. The condition requires the proponent to prepare a community and stakeholder engagement plan and submit it to the Coordinator-General for approval six months prior to commencement of mining activities. The plan must include consultation with the local community, including potentially affected nearby landholders.

Aircraft noise

CASA's Office of Airspace Regulation would regulate flight paths for the proposed airstrip. The proponent or its contractor would be required to submit an airspace change proposal form, which includes requirements for the proponent to carry out an environmental assessment, mainly in relation to noise impacts.

The project's contractor responsible for jet aircraft (up to 200 seat capacity) flying to and from a private airstrip would also be required to design flight procedures to ensure safe arrivals and departures, and to connect with the existing air traffic management network, managed by Airservices Australia. Those procedures would be designed by Airservices Australia, or a CASA-accredited consultant, and would be required to be approved by CASA's Office of Airspace Regulation.

The EIS includes a commitment to manage aircraft noise by avoiding flight paths over the closest sensitive receptors and scheduling aircraft movements during the day, and evening where possible, to avoid or minimise noise impacts on receptors, including the CCM&RP accommodation village. I support this commitment and require it to be undertaken.

Further, the EIS includes a commitment to design the project accommodation village with consideration for the safety and amenity of workers, including acoustic insulation. The EIS predicts that external noise levels at the accommodation village would be below accepted occupational health and safety levels for hazardous exposure and residential amenity criteria. I support this commitment and require it to be undertaken, particularly implementation of necessary measures to ensure external noise levels at the accommodation village remain within the accepted criteria.

5.6.3 Coordinator-General's conclusion – noise and vibration

I am satisfied the EIS has adequately assessed potential noise and vibration impacts of the mine and infrastructure area during construction and operations. Noise and vibration levels are predicted to be lower than the adopted guidelines for the sensitive receptors in the vicinity of the project during both construction and operational stages. Through implementation and compliance of stipulated noise and vibration levels in my stated conditions (Appendix 2), and monitoring and reporting requirements, I am satisfied that any potential noise and vibration impacts to sensitive receptors can be appropriately managed.

I require that the health and wellbeing of the workers be considered during detailed design of the accommodation village to provide appropriate levels of protection from noise and vibration impacts that may be averse to their health. I expect the proponent to consider *AS 2021:2015 Acoustics-Aircraft noise intrusion-Building siting and construction*, during detailed design of the accommodation village to ensure minimisation of aircraft noise impacts on workers. I also recognise that the health and wellbeing of workers is regulated by *The Coal Mining Safety and Health Act 1999* and *Coal Mining Safety and Health Regulation 2001*.

I accept the proponent's commitment to scheduling flights and flight paths to ensure minimum disturbance on receptors. The proponent would be required to liaise with CASA and Airservices Australia to coordinate approval for airspace changes, including consideration for potential noise and environmental impacts associated with the proposed air traffic.

The EIS includes a commitment to implementing a complaint handling procedure for the project and I have also stated conditions for the draft EA (Appendix 2) to require

implementation of a complaints management procedure, including recording and investigation of complaints and abatement measures.

To ensure the local community is consulted during construction and operations about the potential noise and vibration impacts of the project, I have imposed a condition requiring the proponent to prepare a community and stakeholder engagement plan and submit it to the Coordinator-General for approval. I am satisfied that with the implementation of the proponent's commitments and my stated and imposed conditions, the potentially affected local community would be consulted and engaged regarding the project and have the opportunity to submit complaints if necessary regarding excessive noise and vibration, which would require investigation and abatement measures by the proponent.

5.7 Traffic and transport

The EIS states that access to the project area is via the Flinders Highway, Gregory Developmental Road, Elgin-Moray Road and Moray-Carmichael Road. The Peak Downs Highway may also be used to a lesser extent. A road impact assessment (RIA) undertaken for the project identified the following baseline daily traffic volumes:

- Flinders Highway – 2,932 vehicles per day (vpd)
- Gregory Developmental Road – 1,197 vpd
- Peak Downs Highway – 650 vpd
- Moray-Carmichael Road – 20 vpd

The EIS states that a new mine access road would connect the project area to the Moray-Carmichael Road. The location of the access road is yet to be finalised and would be subject to separate future approvals.

Coal from the project is proposed to be transported by rail to the Abbot Point Coal Terminal, located at the Port of Abbot Point, using proposed rail infrastructure to be built by others in the multi-user common rail corridor in the Galilee Basin State Development Area (SDA) (Figure 2.1)

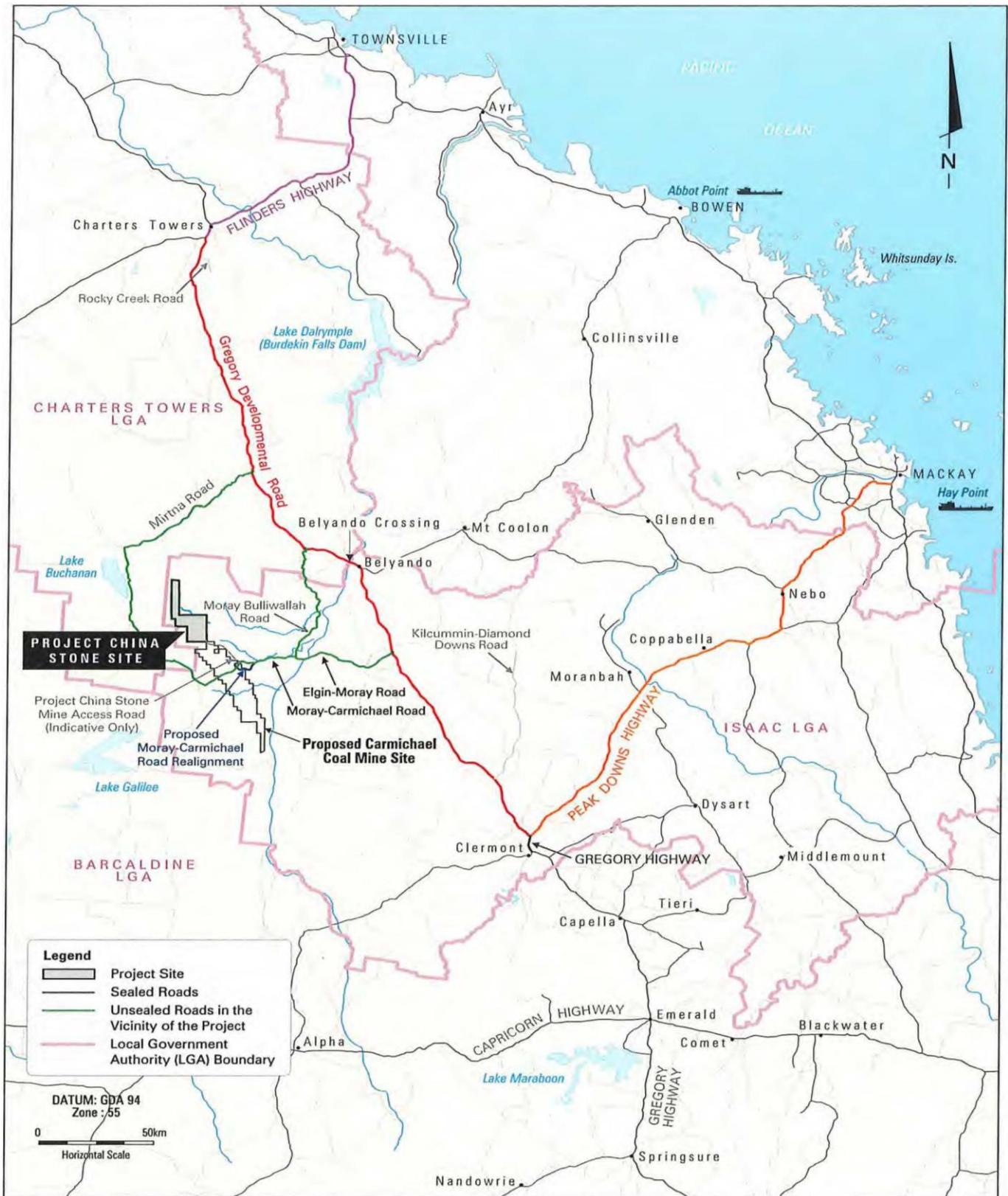
A private airstrip is proposed to be used for the transport of mine workers and materials. The airstrip would be constructed in the south-eastern part of the project area as shown on Figure 2.5.

Figure 5.7 identifies the road network including an indicative alignment of the proposed mine access road.

Methodology

The EIS contains a RIA, dated 6 July 2015, prepared in accordance with DTMR's *Guidelines for the Assessment of Road Impacts of Development*. The analysis accounted for the combined impact of projects which may ultimately eventuate by the 2028 design horizon, including specific allowance for the CCM&RP.

The pavement loadings associated with the project have the potential to influence the extent and timing of future rehabilitation works and maintenance activities. The EIS



PROJECT CHINA STONE

Regional Road Network



Figure 5.7 Regional road network

states that prior to the project commencing, the pavement impact assessment would be updated to take into account the traffic information from the pre-construction road impact assessment for the CCM&RP and any refinements to project traffic estimates arising from more detailed construction planning. The updated pavement impact assessment would also enable the accurate calculation of appropriate contributions for pavement rehabilitation and maintenance.

On 3 July 2017, DTMR introduced a new guideline *Guide to Traffic Impact Assessments* which now requires the preparation of a traffic impact assessment (TIA), instead of a RIA.

DTMR has advised further impact analysis and mitigation strategies are required for DTMR to determine that the proponent's mitigation measures have sufficiently addressed impacts to the state-controlled road network and potential increases to road safety risks. Therefore, I require the proponent to consult with DTMR to reach agreement on the technical information required before further analysis of the project's road impacts is undertaken. Once further design and construction details of the project become available, I require the proponent to prepare and finalise a TIA and prepare a subsequent road-use management plan (RUMP) (Appendix 4).

Submissions received

The key issues regarding traffic and transport impacts raised in submissions on the draft EIS included the following:

- the transportation of machinery and building construction materials to the project area would necessitate a significant increase in heavy vehicle movements which would adversely impact existing road infrastructure and present safety issues
- increased traffic on the Elgin-Moray Road would make the road unreliable, hazardous and dangerous
- the road impact assessment should provide assessment of road impacts with and without the CCM&RP as there is uncertainty regarding the timing of the delivery of the CCM&RP
- the proposed location of new road infrastructure linking the Moray-Carmichael Road to the proposed project mining lease would travel through the Moray Downs pastoral lease and a proposed biodiversity offset area
- the draft EIS did not discuss how the new rail infrastructure, required to transport coal from the project to the Abbot Point Coal Terminal, would interface with the existing Newlands rail system operated by Aurizon Network
- air traffic using the project's proposed air strip would adversely impact helicopter mustering currently undertaken on adjoining properties.

I have considered each submission and the information provided by the proponent in response to submitter issues in my evaluation of the potential impacts of the project.

5.7.1 Impacts and mitigation

Roads

Construction phase traffic

The EIS reports that vehicle movements generated during the construction phase of the project would be predominantly associated with the delivery of construction equipment and materials, waste removal and workforce transportation (prior to completion of the project airstrip).

The majority of material movements to the project area would come from Townsville and Moranbah, located to the north and east of the project area respectively, via the Flinders Highway, Gregory Developmental Road, Peak Downs Highway, Moray-Elgin Road and Moray-Carmichael Road. The proponent will be required to obtain all relevant permits from the Queensland Police Service (QPS) for over-dimensional vehicles delivering large indivisible equipment and materials to the project area during the construction phase.

The EIS states that the peak workforce during the construction phase would be 3,892 staff in Project Year 4. Until the airstrip is constructed at the end of Project Year 1, the majority of the Project Year 1 workforce totalling 1,304, would commute to the site on a bus-in bus-out basis on a fortnightly roster.

The daily traffic demands likely to be generated by the project during the construction phase are as follows:

- Flinders Highway – 73 vpd
- Gregory Developmental Road (North) – 73 vpd
- Gregory Developmental Road (South) – 8 vpd
- Peak Downs Highway – 5 vpd.

Operations phase traffic

Vehicle movements generated during the operations phase are anticipated to be associated with the delivery of equipment and consumables and the removal of wastes. Most of the materials would travel to the project area from Townsville via the Flinders Highway, Gregory Developmental Road, Moray-Elgin Road and Moray-Carmichael Road.

During the operations phase there would be a peak workforce of approximately 3,391 staff in Project Year 8. The workforce strategy envisages that during the operations most of the workforce would commute to the site on a fly-in, fly-out basis using the mine's airstrip.

The EIS states that the daily traffic demands likely to be generated by the project during the operations phase are as follows:

- Flinders Highway – 100 vpd
- Gregory Developmental Road (North) – 100 vpd
- Gregory Developmental Road (South) – 6 vpd

- Peak Downs Highway – 2 vpd.

Impacts and proposed mitigation measures

The project RIA considered the performance of the road network in line with standard industry practice, i.e. for the peak year of the project's construction phase, first year of the project's operations phase and for the ten-year design horizon following commencement of the project's operations phase. The project RIA identified the following potential impacts from project traffic on road intersections:

- the Flinders Highway/Gregory Developmental Road intersection would continue to meet industry standard performance thresholds despite project traffic demands
- the Gregory Developmental Road/Elgin-Moray Road intersection will operate acceptably, however from a safety perspective, improved turn treatments would be required to safely accommodate future traffic volume. It is noted that an upgrade of the intersection to include protected turn lane treatments is required as part of the CCM&RP which is anticipated to precede the project
- right and left turn treatments would be required at the new mine access road/Moray-Carmichael Road intersection to ensure an appropriate level of safety and operational performance – the EIS includes a commitment to provide these treatments following resolution of the access road alignment.

The RIA also identified potentially significant impacts on pavement rehabilitation on sections of the Flinders Highway and Gregory Developmental Road during the project construction and operations phases. Potentially significant increases in pavement maintenance impacts were also identified on the Townsville Port Road, Flinders Highway, Gregory Development Road and the Peak Downs Highway primarily during the construction phase.

Submissions on the EIS raised concerns that increased traffic movements to the Elgin-Moray Road would make the road unreliable, hazardous and dangerous. The EIS states that these road safety concerns would be adequately addressed once the Elgin-Moray Road is sealed and the intersection of Elgin-Moray Road and the Gregory Developmental Road is upgraded as part of the CCM&RP.

Submissions on the EIS also raised concerns about the potential adverse impacts on existing road networks caused by the increase in heavy vehicle movements to the project area. Submissions also stated that the RIA should have provided an assessment of road impacts with and without the CCM&RP due to uncertainty regarding the timing of the CCM&RP. The EIS states that the CCM&RP would most likely precede the project but recognises that should the project commence before the CCM&RP, the RIA would need to be updated to take into account the absence of CCM&RP traffic in the baseline.

As noted previously, DTMR has advised that the RIA is insufficient, and that further design and construction details of the project would be required to allow a subsequent TIA and RUMP to be prepared. Accordingly, I have recommended (Appendix 4) that a TIA be prepared in accordance with DTMR's new guideline *Guide to Traffic Impact Assessments* and be provided to DTMR for approval no later than 6 months prior to the

commencement of significant project related construction traffic. The TIA is required to analyse and address impacts on the safety, efficiency and infrastructure of state-controlled and local roads. I require the TIA to include recalculated road pavement impacts based on confirmed estimates of CCM&RP traffic and to quantify any monetary contribution requirements for DTMR pavement upgrade activities.

I have also recommended (Appendix 4) that a RUMP be developed after the TIA, with a view to optimising and minimising road-based trips required for the project, to be provided to DTMR for approval no later than 3 months prior to the commencement of significant project related construction traffic.

Another submitter raised concerns that the proposed mine access road linking the Moray-Carmichael Road to the project area would adversely impact the Moray Downs pastoral lease and biodiversity offset area which was approved as part of the Biodiversity Offset Strategy for the adjoining CCM&RP. While I have not evaluated this off-lease infrastructure, which would be subject to separate land access negotiations as well as separate environmental assessment and approval processes, I have recommended a condition of approval under the EPBC Act to the Commonwealth Minister for the Environment (Appendix 3) that the project must not impact on the Moray Downs offset area. Accordingly, the proponent must arrange mine access so as not to impact on the Moray Downs offset area.

The EIS also includes a commitment to consult IRC about the location of the new mine access road, including the design of the road intersection with Moray-Carmichael Road, once the road alignment has been determined (Appendix 5). I support this commitment and require it to be undertaken.

Furthermore, I have included a recommendation in Appendix 4 that the proponent complete any necessary road upgrade works before commencement of project traffic on the state-controlled road network.

Rail

Coal from the project is proposed to be transported by rail to the Abbot Point Coal Terminal located at the Port of Abbot Point. The EIS states that the future Galilee Basin rail system is likely to be a dedicated coal transport system and is not likely to be used for passenger services.

Impacts

At peak production, the project would be serviced by an average of six coal trains per day, with an estimated maximum of eight trains per day. Each train will have a capacity of 20,000 to 25,000 tonnes with 4 diesel locomotives.

The project's on-site rail loop and train loading facility (shown on Figure 2.5) is proposed to connect to an off-site rail spur which would connect the mine site to a future rail line from the central Galilee Basin to the Abbot Point Coal Terminal. The future alignment of the rail line and the location of the off-site rail spur are yet to be determined and would be subject to a separate environmental assessment and approval process.

Submissions raised concerns that the draft EIS did not discuss how the new rail infrastructure required to transport coal from the project to the Abbot Point Coal Terminal would interface with the existing Newlands rail system, operated by Aurizon Network. The EIS states that off-lease infrastructure for the project (including rail connection to port) would be subject to a separate environmental assessment and approval process. The scope of this environmental assessment is yet to be determined, however, it is expected to include a requirement to evaluate the impact of the interface and interoperability of Aurizon's existing rail network.

Air transport

The EIS states that a private airstrip is proposed to be constructed in the south-eastern part of the project area at the end of Project Year 1. The airstrip is to be used primarily for the transport of the construction and operations workforce and materials. Airstrip facilities would include baggage handling and passenger security.

The EIS states that project air traffic control would be coordinated with the airports at the workforce source locations as well as the CCM&RP airstrip.

Impacts and proposed mitigation measures

The EIS estimates that there would be 40 flights per week carrying approximately 200 persons per trip during operations, from various coastal centres including Brisbane, Gold Coast, Wide Bay, Townsville and Cairns.

Submissions from adjoining landowners raised concerns that air traffic using the project's proposed airstrip would adversely impact livestock mustering activities currently undertaken by helicopter on adjoining properties. The EIS states that the airstrip is unlikely to have a significant impact on low-level helicopter mustering and the proponent has committed to design, construct and operate the airstrip in accordance with the CASA regulations and guidelines. The proponent will be required to obtain the necessary approvals under the *Civil Aviation Act 1988* and Civil Aviation Regulations 1998 for the proposed airstrip.

In addition, I recommend (Appendix 4) that the proponent consult with the community regarding the proposed location, design and operation of the airstrip at least 3 months prior to the airstrip construction activities commencing, to ensure air traffic does not adversely impact existing cattle mustering activities on adjoining land.

5.7.2 Coordinator-General's conclusion – traffic and transport

Further information is required to inform the RIA on impact analysis and mitigation strategies to adequately address negative impacts to the state-controlled road network and potential road safety risks. I require the proponent to consult with DTMR to prepare and finalise a TIA for the project that analyses and addresses impacts on the safety, efficiency and condition of state-controlled and local roads and identify and agree on adequate impact mitigation strategies.

I also require the proponent to prepare a RUMP and traffic management plan (TMP) for DTMR's approval. Furthermore, I require the proponent to complete any necessary

road upgrade works before commencement of project traffic on the state-controlled road network. My recommendations about these matters are included at Appendix 4 of this report.

I am satisfied that the implementation of my recommended conditions, supported by the commitments and mitigation measures in the EIS, such as consulting with IRC about the location of the new mine access road, would ensure any potential impacts to local and state-controlled road networks resulting from project related traffic during construction and operations would be managed appropriately.

I also consider that concerns about the operation of the airstrip would be addressed through consultation with the local community, as per my recommendation in Appendix 4, and through its design, construction and operation in accordance with the CASA regulations and guidelines.

5.8 Hazard and risk

This section of the report evaluates the potential hazards and risks of the project. The EIS includes a preliminary hazard assessment (PHA) which included potential hazards and risks for health and safety, to people and property from the construction, operation and decommissioning of the project.

The PHA was undertaken in accordance with the New South Wales (NSW) Department of Planning – *Hazardous Industry Planning Advisory Papers* (HIPAPs). *HIPAP 6 – Hazard Analysis* is considered best practice for conducting preliminary assessments of hazards across Australia. Potential hazards and risks are recognised and discussed in the EIS. Most of the issues were assessed as having a low to medium-risk level. Those assessed as having a high-risk level, predominately due to fatality or serious injury to humans, were determined to be rare to unlikely to occur.

However, the EIS confirmed that the proponent will develop a safety and health management system (SHMS) which will include a high-level integrated risk management plan which will be for the life of the project (construction, operation and decommissioning). Under this plan, a series of principal hazard management plans and an emergency response management plan (ERMP) will be developed to manage specific hazards at the site.

Submissions received

Submissions received on the draft EIS raised issues about hazards and risks associated with:

- disease vectors such as mosquitos, and other communicable diseases
- emergency response management
- bushfire management and water supply in the event of a fire
- spontaneous combustion management
- storage, transport and use of hazardous substances and explosives
- mine-affected water storages.

I have considered issues raised in submissions in my evaluation of the EIS, and how the information provided by the proponent addresses these issues.

5.8.1 Impacts and mitigation

The EIS outlined the assessment of hazards and risks in accordance with the guidelines of Australian/New Zealand Standard (AS/NZS) ISO 31000:2009 *Risk Management – Principles and Guidelines*. The assessment identified, prioritised, managed and compared hazards and risks of the project. Concerns were raised in submissions regarding the potential occurrence of 16 hazards across the project. Additional information was provided in the AEIS in response to issues raised in the submissions on the draft EIS.

Disease vectors

The preliminary hazard analysis presented in the EIS identified possible avenues for disease vectors (including mosquitoes and vermin) to be a potential hazard on the site and provided an assessment of the possible consequences. There are potential breeding sites for mosquitos across the project area. Concerns were raised in the submissions on the draft EIS regarding appropriate disposal of liquid wastes and the need to contour the ground so ponding of water or other liquids does not occur, which can create breeding sites and poor site hygiene.

The EIS proposed risk control measures to reduce the spread of disease from vectors, including water management measures designed to avoid unnecessary ponding of water and regular circulation of stored water to prevent stagnant areas. The EIS also includes a commitment to prepare and implement a waste management system for the project. The waste management system would ensure the appropriate disposal of waste materials to avoid attracting vermin and creating breeding sites (see section 5.5—Waste of this report for further discussion on the waste management system).

With the implementation of control measures, the EIS concluded that the disease vector hazard is low-risk. The EIS includes a commitment to implement these measures and I require the proponent to undertake this commitment.

Emergency response planning

A concern was raised in submissions on the draft EIS that the emergency management planning should address non-mining related matters given the project area is in a remote location (i.e. transport emergencies as a result of travelling to the project area, mass medical treatment and/or evacuations within the accommodation village community). As a result of this issue being raised, the proponent made a commitment in the AEIS that the ERMP would include non-mining related emergency response planning. I fully support this commitment and require it be undertaken.

The EIS acknowledges that the *Work Health and Safety Act 2011* (WH&S Act) applies to all phases of the project, including the construction phase. Through compliance with this legislation, the level of risk would be reduced to low. I have also stated a condition as part of the draft EA, requiring the proponent to notify the State of any emergency incidents and what action was been taken (Appendix 2).

Bushfire management

The EIS includes a bushfire assessment against the State Planning Policy (SPP), which identified that the majority of the project area (including the mine infrastructure) is subject to a 'medium potential intensity' risk. Some areas in the northern part of the project area are subject to a 'high potential intensity' and 'very high potential intensity' risk according to the SPP Interactive Mapping System.

Submissions on the draft EIS highlighted the need to conduct a bushfire risk assessment. The EIS confirmed that as part of the SHMS, a bushfire management plan (BMP) would be developed to address the bushfire risks and management. As part of the BMP, a site assessment would be conducted to determine the level of bushfire risk at the project area. The EIS states that the BMP would include details of firebreaks, fuel reduction, adequate access for firefighting and other emergency vehicles, and adequate and accessible water resupply for firefighting purposes. I expect the proponent to work closely with Queensland Fire and Emergency Services (QFES) to develop the BMP to minimise bushfire risk.

QFES have prepared guidance material for bushfire hazards to support the SPP in the form of a model code (*Bushfire Hazard Code*). The model code has been developed to meet QFES operational needs and adopt key recommendations for bushfire mitigation.

The proponent has committed to preparing a BMP and that the model code will be consulted during its preparation. I support this commitment and require it to be undertaken.

Spontaneous combustion management

Coal from the Galilee Basin has a high propensity for spontaneous combustion if not properly managed. Spontaneous combustion is the process by which coal ignites as the result of heat being generated by internal chemical reactions faster than it can be lost to the environment. A submission on the draft EIS raised concerns over the lack of a spontaneous combustion management plan (SCMP) for the project.

All mines in Queensland are required to submit their SHMS to the State Mining Inspectorate before commencing operations. The SHMS is regulated under the Coal Mining Safety and Health Regulation 2001. The SHMS would include measures to assess, detect and control the risk of spontaneous combustion in the open-cut mine pits, the underground operations and in the run-of-mine and product stockpiles.

The SHMS would be developed by a risk-based process using relevant industry experts and technical reference documents, such as *Spontaneous Combustion in Australian Coal Mines* prepared by the Safety in Mines Testing and Research Station, and the NSW Government Mining Design Guidelines (*MDG 1006 – Spontaneous Combustion Management guidelines*).

A risk profile of the coal would be developed based on analysis of coal properties, operational parameters and potential likelihood of occurrence. The EIS includes a commitment to test coal propensity for spontaneous combustion, which will be undertaken as part of the development of the SHMS, and to develop operating procedures for surface activities that have a significant risk of spontaneous combustion

outbreaks. Management measures to address the potential for spontaneous combustion in surface activities are well established in the coal mining industry. I support this commitment and require it to be undertaken.

I have also stated a condition for the draft EA (Appendix 2) that the remaining open-cut mine pits are to be backfilled to a level above the pre-mining groundwater level at the end of mining, which will ensure coal is not left exposed to spontaneous combustion risk following mine decommissioning.

I am satisfied that through the development and implementation of a SHMS, the commitments in the EIS and my stated draft EA condition, the potential risk of spontaneous combustion can be managed.

Hazardous substances and explosives

The EIS assessed the nature and quantity of hazardous materials to be handled or stored as part of the project. Hazardous materials are materials which in sufficient quantities can cause harm to people, property or the environment. The EIS identifies a number of controls that the proponent will implement to reduce the risk associated with the transport, storage and use of hazardous materials, such as complying with relevant legislation and guidelines, regular inspection programs to ensure structural integrity of fuel tanks and bunds and a spill management plan as part of the ERMP. Chapter 22 of the draft EIS identifies the hazardous substances and dangerous good for the project.

Most issues stemming from hazardous materials, such as loss of storage containment and diesel tank fires, were assessed in the EIS as having a likelihood of low to medium-risk level. Those materials assessed as having a significant consequence risk level, predominately due to fatality or serious injury to humans, such as the failure of transport containment, were assessed as an unlikely occurrence with adequate management and mitigation measures in place.

The storage of explosives on the project area was identified as a key hazard in the EIS. The storage of these explosive is regulated under the *Explosive Act 1999* and the *Coal Mining Safety and Health Act 1999*. The proponent would be required to meet the safety measures under these Acts.

The EIS includes a commitment that all the chemical and proprietary substances used for the project would carry a material safety data sheet (MSDS). This MSDS identifies if a substance is hazardous and the appropriate safety measures to be provided to ensure best practice management measures are applied. The EIS also includes a commitment to developing a detailed risk register for the project, which will identify hazards and management controls to reduce risks. There are further commitments relating to hazardous substances at Appendix 5 of this report.

I support the proponent's commitments and I require them be undertaken. I have also stated a condition for the draft EA (Appendix 2), that all explosives, hazardous chemicals, gases and dangerous goods be stored and handled in accordance with the current Australian standards.

Mine-affected water storages

The EIS detailed the expected sources and quantities of mine-affected water to be generated by the project and the proposed storage, re-use and/or treatment, and discharges into the downstream receiving waters. Details on the mine water management system is discussed in section 6—MNES of this report.

The EIS assessment was undertaken in accordance with the DES guideline - *Structures which are dams or levees constructed as part of ERAs (ESR/2016/1934)* and concluded that the mine-affected water dams are likely to have a low-risk consequence and will not be classified as regulated dams. The EIS includes a commitment to undertaking detailed consequence category assessment during the detailed design stage of the project to confirm whether any of the mine-affected water dams will be regulated structures under the EP Act.

The EIS states that the dams will be designed and constructed in accordance with relevant design standards and licence requirements. The designs will address structural integrity of containment walls during climatic extremes (e.g. drought and flood) and will reduce the risk of any unplanned or unmanaged released from mine-affected water storages.

The EIS concluded that the risk of discharge of contaminated water into receiving water is minor once control measures are applied. The EIS proposed a number of control measures and commitments including:

- the design and engineering of water storages to accepted design standards to maintain integrity
- the design of storage capacities to minimise risk of water levels reaching overflow level
- the design and construction of water storage will be undertaken using a suitably qualified engineer
- the undertaking of an annual assessment of the consequence category for all structures that are dams or levees following construction.

To further ensure the risk of unplanned releases of mine-affected water and tailings is managed, I have stated draft EA conditions for management of regulated structures in Appendix 2 of this report. I am satisfied that my stated conditions and the proponent's commitments would reduce the risk of any unplanned releases of mine-affected water and tailings.

5.8.2 Coordinator-General's conclusion – hazard and risk

The EIS outlined the assessment of hazard and risk in accordance with Australian/New Zealand Standard (AS/NZS) ISO 31000:2009 *Risk Management – Principles and Guidelines*. The assessment identified, prioritised, managed and compared risks and hazards of the project.

I am satisfied that the emergency management planning processes for the project are consistent with current industry practice for emergency management and that the

proponent is committed to meet its obligations under workplace, health and safety, environmental and other relevant legislation.

I am satisfied that the management measures, including the implementation of a SHMS, ERMP, BMP and controls identified in the EIS, along with the commitments described in the above sections, are adequate to safeguard against any health and safety consequences from hazards associated with the project. The commitments are included in Appendix 5 and I require that they be undertaken. To further ensure the project's hazards and risks are managed, I have stated a number of conditions in Appendix 2 for the draft EA.

5.9 Cultural heritage

This section of the report evaluates the proponent's assessment of the potential impacts from the mine and associated infrastructure areas on Aboriginal and Torres Strait Islander peoples' cultural heritage values and Queensland cultural heritage values.

5.9.1 Aboriginal and Torres Strait Islander cultural heritage

Context

The *Aboriginal Cultural Heritage Act 2003* (Qld) (ACH Act) imposes 'a duty of care' upon all persons undertaking development activities to take 'all reasonable and practicable' measures to ensure that their activities do not harm matters of Aboriginal and Torres Strait Islander peoples' cultural heritage. To comply with the duty of care provisions of the ACH Act, proponents of projects that require an EIS must prepare a CHMP which provides for the management of Aboriginal and Torres Strait Islander peoples' cultural heritage. CHMPs are assessed and approved by the Department of Aboriginal and Torres Strait Islander Partnerships (DATSIP).

Native title

The project area is located within a native title claim lodged by the Wangan and Jagalingou People (Federal Court No. QUD85/2004, NNTT number QC 2004/06). The map of the claim area is included as Figure 5.8.

An assessment of native title rights and interests was not required to be undertaken as part of the EIS process, however, it will need to be undertaken prior to a decision being made on the mining lease application in accordance with the *Native Title Act 1993* (NT Act) (Cwth) and the *Land Act 1994*.

In accordance with Division 3 of the NT Act, the proponent will need to reach an agreement with the Wangan and Jagalingou people, about how land and waters in the mine area would be used and managed. The agreement is known as an Indigenous land use agreement (ILUA). The CHMP can form part of the ILUA.

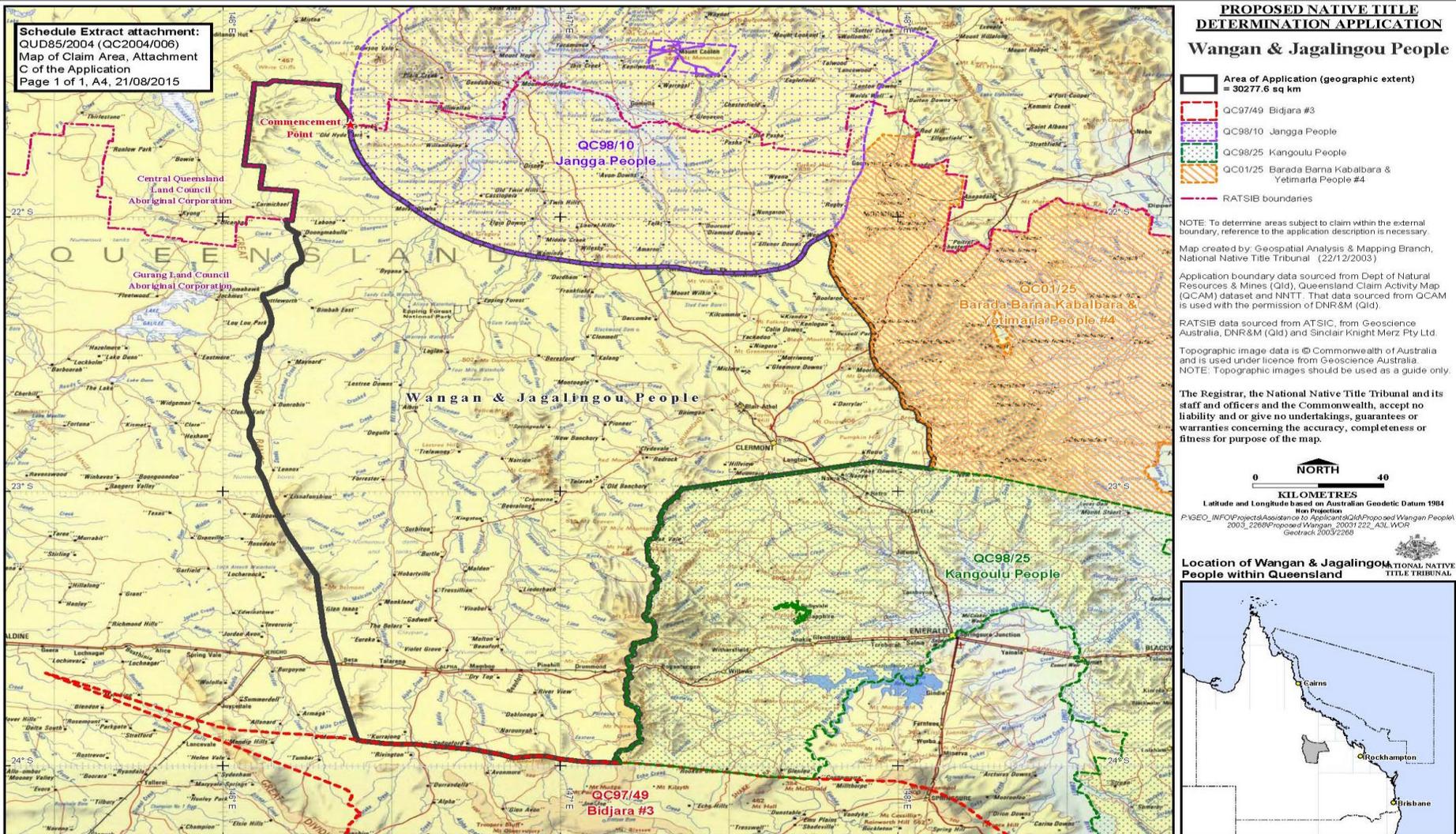


Figure 5.8 Native title claim area - Wangan and Jagalingou People

Submissions received

Key issues raised in submissions on the draft EIS included the following:

- the management and resolution of native title rights and interests on the land and the identification of state land dealings to enable the project, have not been addressed. As the project would be located on land administered by DNRME under the *Land Act 1994*, these matters must be addressed prior to mining tenures being considered and decided by DNRME
- cultural and historical values associated with the stock route network have not been addressed
- the CHMP has not been finalised
- the impacts of the project on Aboriginal and Torres Strait Islander peoples' cultural heritage should be addressed and mitigation measures should be in place prior to the approval of the project
- the potential impact on songlines and the animals and plants special to the Native Title claimants, the Wangan and Jagalingou People
- potential impact of groundwater drawdown on the Doongmabulla Springs Complex (DSC) sacred site and its environmental value as a source of water
- the EIS did not adequately address the impacts of the project on cultural values as required by the terms of reference for the EIS
- the proponent did not consult with the Traditional Owners during the preparation of the EIS as required by the stakeholder engagement strategy in accordance with the terms of reference for the EIS.

Impacts

Potential impacts of the project on Aboriginal and Torres Strait Islander peoples' cultural heritage values were identified as part of the targeted community and stakeholder engagement undertaken for the EIS described in section 5.10—Social impacts of this report. However, the EIS stated that the impacts of the project on Aboriginal and Torres Strait Islander peoples' cultural heritage were not assessed during the preparation of the EIS, but that they would be addressed prior to the commencement of construction.

The EIS included an assessment of potential groundwater impacts on the DSC caused by mine dewatering for the project. The groundwater modelling concludes that there would be no impact on the DSC from groundwater drawdown or depressurisation. The potential impacts of the project on the DSC are examined in section 6—MNES of this report. Therefore, I am satisfied there will be no impact to the Aboriginal and Torres Strait Islander peoples' cultural heritage value of the DSC from the project.

However, to ensure this outcome I have recommended a condition (Appendix 3) to the Commonwealth Minister for the Environment for the approval under the EPBC Act that the project will have no direct or indirect impacts to the DSC. I have also recommended the requirement for monitoring bores between the mining lease and the DSC for early identification of drawdown impacts south of the mine site.

Mitigation Measures

The EIS did not include specific mitigation measures for specific impacts to Aboriginal and Torres Strait Islander peoples' cultural heritage as potential impacts were not assessed. However, the EIS includes a commitment to negotiate a CHMP with the Wangan and Jagalingou People, prior to commencement of mining activities. The EIS also includes the following commitments in relation to Aboriginal and Torres Strait Islander peoples' cultural heritage:

- impacts on Aboriginal and Torres Strait Islander peoples' cultural heritage will be managed in accordance with the CHMP
- employment of a dedicated Aboriginal and Torres Strait Islander peoples' liaison officer for ongoing community engagement during the construction and operation of the project
- cultural heritage management and mitigation measures will be provided during pre-clearing and construction stages of the project to manage the possibility of discovering objects, remains and areas
- cultural heritage management and mitigation measures procedures will include cultural awareness training for all on-site personnel, cultural heritage find notification procedures, and an impact management and monitoring strategy as part of the corporate employment and induction programs and environmental management plans.

I support these commitments included in Appendix 5 of this report and require them to be undertaken.

Additionally, I note that the ILUA required for the project will include mitigation measures prepared in close consultation with the Wangan and Jagalingou People. I am satisfied the CHMP and ILUA processes will ensure the protection of Aboriginal and Torres Strait Islander peoples' cultural heritage within the project area.

5.9.2 Queensland cultural heritage

Context

The *Queensland Heritage Act 1992* (QH Act) regulates the conservation and management of Queensland's heritage places.

Submissions received

Submissions stated that the draft EIS did not address cultural and historical values associated with the stock route network which traverses the project area.

Impacts

A cultural heritage assessment was undertaken in accordance with the requirements of the QH Act for the project area, including site inspections, interviews with the lessees of the pastoral holdings, searches of state, local and Commonwealth Government heritage databases, and consultation with local residents and landowners. The area

was settled by pastoralists in the late 1800s and early 1900s. It is heavily treed and is used for grazing.

The EIS confirmed a stock route traverses the southern part of the project area from south-west to north-east. The stock route is within the proposed open-cut mining area and would be severed by mining operations. The assessment identified a watering hole and campsite used during cattle drives. The initials carved in the rocks at the campsite were examined and analysed for historical significance in accordance with the QH Act criteria. The EIS concluded this site is not of cultural heritage significance. The EIS found there were no other sites or areas of Queensland cultural heritage significance in the project area.

The EIS recognised that Queensland cultural heritage objects, remains, and places may be unearthed during the pre-clearing and construction stages of the project. Vegetation clearing, construction earthworks and mining operations have the potential to impact on these matters.

Mitigation measures

To manage the possibility of discovering Queensland cultural heritage objects, remains and areas during pre-clearing and construction in the project area, including the stock route, the EIS includes a commitment to put in place contingency planning procedures for on-site clearing and construction activities.

These procedures will include cultural awareness training for all on-site personnel, cultural heritage find notification procedures, and an impact management and monitoring strategy as part of the corporate employment and induction programs and environmental management plans.

I support these commitments included in Appendix 5 of this report and require them to be undertaken.

5.9.3 Coordinator-General's conclusions – cultural heritage

Aboriginal and Torres Strait Islander peoples' cultural heritage

I recognise that the impacts of the project on Aboriginal and Torres Strait Islander peoples' cultural heritage values are unable to be confirmed until a CHMP has been prepared and approved by DATSIP. However, I am satisfied there will be no impact to the Aboriginal and Torres Strait Islander peoples' cultural heritage value of the DSC from the project.

The EIS includes commitments to prepare a CHMP and protect Aboriginal and Torres Strait Islander peoples' cultural heritage during construction and operations. The proponent is aware of the requirement to negotiate with the Wangan and Jagalingou People to prepare an ILUA.

I am satisfied that the provisions of the ACH Act and NT Act will ensure a CHMP and/or an ILUA are prepared and approved prior to the commencement of mining activities and that the CHMP and/or ILUA processes will ensure the protection of Aboriginal and Torres Strait Islander peoples' cultural heritage values within the project area.

Queensland cultural heritage

I am satisfied the proponent has assessed Queensland cultural heritage matters and that there are no known matters of significance recorded within the project area.

I accept the commitment in the EIS to prepare contingency plans, which would address action to take should matters of Queensland cultural heritage value be found during the pre-clearing and construction stages of the project, and report any conservation or heritage matters as required by the QH Act.

5.10 Social impacts

This section provides an evaluation of the project's social impact assessment (SIA) report that forms part of the EIS. The SIA report details the project's potential social impacts and proposed management measures. I have evaluated the SIA report in the context of the following matters:

- community and stakeholder engagement
- workforce management
- housing and accommodation
- local business and industry procurement
- health and community wellbeing
- combined impacts with other projects proposed in the northern Galilee Basin.

Methodology

The proponent completed the SIA for the EIS in 2015 and at my request, provided additional information for the SIA in December 2016. The SIA was undertaken in accordance with my SIA Guideline dated July 2013, which was current at the time.

The *Strong and Sustainable Resource Communities Act 2017* (SSRC Act) was introduced to Parliament in November 2016, achieved Royal Assent on 31 August 2017 and commenced on 30 March 2018. As the EIS for the project had already been publicly notified prior to commencement of the SSRC Act, it is not subject to the new SIA provisions in the SSRC Act. However, my evaluation has been informed by the legislation and the SIA Guideline that was drafted when the proponent provided the additional information for the SIA.

The proponent's SIA was undertaken between 2013 and 2015 and involved targeted community and stakeholder engagement through the following phases:

- identification of the project's local and regional study areas
- development of the social baseline for those areas
- identification of the potentially positive and negative social impacts during the first 20 years of construction and operation
- development of social impact mitigation and benefit enhancement strategies (management measures).

The following study areas were identified for the SIA:

- local study area – Charters Towers and Isaac local government areas
- regional study area – Townsville and Mackay regions
- potential home base locations for the fly-in, fly-out (FIFO) element of the workforce – Cairns, Townsville, Wide Bay Burnett, Sunshine Coast, Brisbane and Gold Coast regions.

The local communities for the project are Charters Towers and Clermont. The communities are by road approximately 285 km north and 260 km east from the mine, respectively. There are no towns along the Gregory Developmental Road between Charters Towers and Clermont; however, there is a single settlement named Belyando Crossing. It consists of a roadhouse, a service station and a caravan park. It is approximately 160 km east of the mine by road.

Changes to social conditions and trends can occur over time and the SIA confirms the proponent has committed to review the SIA 12 months prior to commencement of construction. The proponent has also committed to reassess the social baseline and the project's potential social impacts five years prior to the end of the first 20 years of the project.

I am satisfied with the proponent's methodology for the SIA. The social baseline in the SIA report provided an adequate benchmark against which the potential social impacts of the project were assessed, and management measures were identified. To support the proponent's commitments to review the SIA, I have imposed a condition (Appendix 1) requiring regular updates to the SIA report.

Submissions received

Submissions received on the EIS identified the following key issues relating to social matters:

- perceptions of insufficient stakeholder engagement with Aboriginal and Torres Strait Islander peoples and potentially affected landholders in the community resulting in an incomplete social baseline
- perceptions of insufficient stakeholder engagement about mine closure and rehabilitation
- opposition to proposed workforce management approach including any proposals to source labour from international markets to mitigate potential labour supply issues
- potential impacts related to FIFO employment including the mental health of workers
- potential impacts on emergency services
- potential impacts on road safety and access for the community
- potential impacts on directly affected and potentially affected landholders including reduced pasture quality, loss of a stock route, impacts to groundwater and surface water resources, increased road traffic and spread of weeds
- potential noise, dust and visual amenity impacts to rural residences

- potential combined impacts in relation to other proposed projects in the Galilee Basin including the CCM&RP, Alpha Coal project, Galilee Coal project, Kevin's Corner Coal project and South Galilee Coal project.

I have considered the submissions and the proponent's responses in my evaluation of the potential social impacts of the project, and my assessment is provided below.

5.10.1 Community and stakeholder engagement

Engagement for the SIA and EIS

The proponent commenced community and stakeholder engagement for the project in November 2012 shortly following project declaration under the SDPWO Act. Community and stakeholder engagement informed the SIA including the social baseline study, the identification of potential social impacts, and the development of management measures.

The SIA confirms the proponent engaged with the following stakeholders during preparation of the SIA and EIS:

- directly affected landholders
- local governments
- state government agencies
- the former Commonwealth Department of the Environment
- commercial stakeholders and industry groups
- education and training providers
- community and environmental groups.

The proponent did not appear to engage with potentially affected landholders during preparation of the SIA and EIS. Potentially affected landholders include the landholders of properties adjoining those directly affected by the project and landholders potentially affected by other project impacts such as traffic and transport and groundwater.

The proponent consulted with a total of 180 stakeholders to inform the project's SIA. Key aspects of the proponent's community and stakeholder engagement program included:

- 20 stakeholder meetings to provide an overview of the project, the associated EIS process and to discuss matters of special interest to stakeholders
- 27 stakeholder meetings to inform the social baseline of the local and regional study areas and the identification and assessment of potential social impacts
- survey of 85 businesses from Clermont and Charters Towers that identified potential barriers to supply goods and services to the mine and suggested management measures to address barriers
- circulation of community information sheets to stakeholders at key points in the EIS process.

The proponent engaged with stakeholders to address potential issues regarding pre-construction, construction and operation of the project, however, I note that

submissions received on the EIS raised issues that the proponent's engagement did not address mine closure and rehabilitation. The proponent engaged with the appropriate stakeholders, but I note that submissions also raised issues about the extent of the proponent's engagement with Aboriginal and Torres Strait Islander peoples and potentially affected landholders.

I consider the stakeholder engagement undertaken by the proponent to inform the SIA to be generally adequate for this stage of the project's development. I have set conditions in this report requiring enhanced and considered stakeholder engagement and involvement as the project advances.

Post-SIA and EIS engagement

The outline of the stakeholder consultation strategy in the SIA report includes the following three components:

- stakeholder engagement plans for pre-construction, construction and operation
- a complaints and grievances system for the life of the project
- evaluation, review and reporting procedures for the life of the project.

The objectives and approach for engaging with stakeholders described in the outline of the stakeholder consultation strategy includes:

- engaging in open and transparent communication with any interested or impacted stakeholders
- seeking to understand and address the concerns of stakeholders
- proactively and effectively managing community expectations in relation to employment, training, accommodation, transport, economic and development opportunities
- developing a landholder engagement protocol that provides a personalised program of consultation and engagement for directly affected landholders that is specific to their property and issues of concern
- ensuring a coordinated approach to project communications
- appointing a community liaison officer; the officer would interact with key stakeholders including directly affected and potentially affected landholders and the community
- appointing an Aboriginal and Torres Strait Islander peoples' liaison officer prior to commencement of construction. The officer would engage with Aboriginal and Torres Strait Islander peoples about employment, local content and training opportunities.

I support the outline of the stakeholder consultation strategy in the SIA report and to ensure that the proponent's engagement activities are effective and responsive to stakeholder concerns during the full life-cycle of the project, I have imposed a condition (Appendix 1) requiring the proponent to prepare a community and stakeholder engagement plan (CSEP). The CSEP must provide details of the matters outlined in the stakeholder consultation strategy and must be submitted for my review and approval 12 months prior to the commencement of construction.

The CSEP condition also requires the proponent to consider feedback received through community and stakeholder engagement in informing and updating project specific management measures and the social impact management plan.

The proponent will need to engage with the relevant native title holders to negotiate an Indigenous land use agreement and to prepare a cultural heritage management plan for the project. Refer to section 5.9—Cultural heritage of this report for my consideration of the project's potential impacts on Aboriginal and Torres Strait Islander peoples' cultural heritage.

The proponent proposes, in the outline of the stakeholder consultation strategy, to engage with Aboriginal and Torres Strait Islander peoples about employment, local content and training opportunities associated with the project. I consider, however, that the proposed outline needs to capture engagement about potential cultural, social and economic impacts for Aboriginal and Torres Strait Islander peoples. Therefore, I have imposed a requirement within the CSEP condition for the proponent to develop culturally appropriate strategies for engaging with Aboriginal and Torres Strait Islander peoples on potential cultural, social and economic impacts, which, along with engagement about training, employment and local content, will work to ensure better information sharing for these stakeholders.

For after the mine's operations phase, the proponent has advised that a stakeholder engagement plan for mine closure would be developed during the mine's operational stage. I consider this approach appropriate.

5.10.2 Workforce management

The proponent has committed to providing employment opportunities for local and regional communities during the construction and operation of the project. A labour market study was completed for the SIA to assess the capacity of all the statistical regions in Queensland to support the project's construction and operational labour requirements. This study informed the proponent's workforce management approach.

Construction

The average annual direct workforce, stated in the SIA report, during the five-year construction stage of the project would be 3,249 workers. The construction workforce would peak in the fourth year at 3,892 workers. The workforce would operate on a 7-day-on/7-day-off roster.

The social baseline in the SIA report identified that the local communities have limited capacity to supply workers for construction and early works, given their small resident populations. The proponent therefore expects that most of the workforce will be non-resident, long-distance commuters (FIFO), but has committed to recruit workers locally, where available. Based on the outcomes of the labour market study, the proponent proposes to recruit the FIFO element of the workforce from home base locations such as Cairns, Townsville, Wide Bay Burnett and South-East Queensland.

Operation

The direct average annual workforce, stated in the SIA report, during stage one of operation (Project Years 6–31), when the open-cut and underground mines would operate concurrently, would be 3,119 workers. The operational workforce during stage one would peak at 3,391 workers in Project Year 8.

The direct average annual workforce during stage two of operation (Project Years 32–49), when only the northern underground mine would be operational, would be 1,221 workers. The operational workforce in this period would peak at 1,377 workers during Project Years 32–33. The workforce would operate on a 7-day-on/7-day-off roster, with 12-hour shifts.

The SIA report includes a statement that the workforce would be sourced from local, state, national and potentially international labour markets during operation. However, the proponent has confirmed that it does not currently intend to recruit overseas workers.

The proponent proposes to use a mostly FIFO workforce for the operations phase due to the remote location of the project area, the condition of the surrounding regional road network and the size of the workforce required for the project. As with the construction phase, given the outcomes of the labour market study, the proponent proposes to recruit the FIFO element of the workforce from potential home base locations such as Cairns, Townsville, Wide Bay Burnett and South-East Queensland. Workers from these potential locations are likely to be a combination of existing residents and new residents who have relocated to the home base locations to take up employment at the project.

The proponent proposes for the residents of Charters Towers and Clermont to be considered for recruitment. Due to fatigue safety concerns, only workers who live within one hours' drive of the mine would be permitted to drive-in, drive-out to work. Bus transport to the project site would be offered to operational workers residing permanently in Charters Towers or Clermont, if warranted by demand.

Strong and Sustainable Resource Communities Act 2017

The SSRC Act contains 100 per cent FIFO prohibition and anti-discrimination provisions that apply to all operational large resource projects in Queensland with a nearby regional community. These provisions ensure that residents of communities near large resource projects benefit from them. A nearby regional community is one that is within 125 km radius of a large resource project and has a population of more than 200 residents, or a greater or lesser distance or smaller population decided by the Coordinator-General. Unless the Coordinator-General decides otherwise, the project's operational phase will not be subject to the 100 per cent FIFO prohibition and anti-discrimination provisions of the SSRC Act because it does not currently have a nearby regional community.

Under section 12 of the SSRC Act the Coordinator-General must, as part of evaluating the project's EIS, decide whether to nominate a large resource project as a project for which a person employed during the construction phase is a worker for the SSRC Act.

A decision to nominate a project would mean that the 100 per cent FIFO prohibition and anti-discrimination provisions would apply to the project's construction phase, if the project has a nearby regional community. As there are currently no nearby regional communities for the project and the closest towns have limited capacity to supply workers for the construction phase of the project, I decided not to nominate the project.

Potential impacts and management measures

Potential social impacts relating to workforce management include the effect of employment arrangements (roster arrangements, shift length, FIFO arrangements) on workers and communities. A potential workforce management benefit of the project is the opportunity to deliver jobs to under-represented groups in the mining industry, for example, women, persons with a disability and Aboriginal and Torres Strait Islander peoples.

Submissions on the EIS raised issues about potential impacts relating to FIFO workers including the mental health of workers and that workers new to FIFO employment may experience challenges transitioning, including being away from their families for long periods. Submissions also raised issues about workers using drugs and alcohol as well as trespassing on / causing damage to private property.

The SIA report includes an outline of the proposed workforce management plan which contains details of initiatives to manage the potential social impacts and maximise the potential social benefits associated with the project's workforce. The workforce management plan in the SIA report outlines:

- a mentoring strategy designed to support the retention of employees new to long-distance commuting or new to the mining industry
- an employee wellbeing plan to support a healthy workforce, manage workforce wellbeing and respond to the prevalence of high turnover rates in the industry
- an employee assistance program to assist employees in dealing with personal issues
- a workforce code of conduct that would describe procedures for managing drug and alcohol use, handling complaints and managing worker behaviour
- a training and skilling strategy to facilitate successful recruitment and retention of appropriately skilled workers and to manage the anticipated challenges around the availability of and competition for local labour
- a tailored local employment strategy to facilitate employment opportunities to residents of the Charters Towers and Isaac local government areas
- an Aboriginal and Torres Strait Islander participation strategy that will support employment opportunities for Aboriginal and Torres Strait Islander people
- a workforce diversity strategy to encourage a higher rate of employment amongst under-represented groups.

I am satisfied that the outline of the workforce management plan in the SIA report provides an appropriate framework for a detailed workforce management plan. I have imposed a condition (Appendix 1) requiring a detailed workforce management plan be submitted to the Coordinator-General for approval 12 months prior to the

commencement of mining activities and updated regularly. The detailed workforce management plan would form part of a social impact management plan (SIMP) for the project. I have also imposed a condition (Appendix 1) requiring the proponent to provide an annual report to the Coordinator-General during construction and for the first five years of operation of the project. The report is to detail the effectiveness of the management measures detailed in the SIMP, including those for workforce management, following their implementation.

I consider that the proponent's labour market study in the SIA report provided an adequate benchmark on which to develop the project's outline of the workforce management plan. Changes to social conditions and trends, including labour markets, however, can occur over time. To ensure that the detailed workforce management plan for the project is based on the most up-to-date labour market information, I have required that the updated SIA report for the project (Appendix 1) include the findings of an updated labour market study.

5.10.3 Housing and accommodation

The housing market in the project's local and regional study areas, was described in the social baseline, including the affordability and availability of properties for rent and sale. Short-term accommodation in the local study area was also described in the social baseline.

The remote location of the mine precludes shift-based employment where the worker is able to return home on a daily basis. All employees for the construction and operation phases of the project would therefore be required to reside in the project accommodation village for the duration of their shift roster.

Construction

The construction workforce is proposed to be accommodated in an on-site construction accommodation village comprising approximately 560 rooms with a capacity of approximately 1,120 persons. The accommodation village would operate on a motelling basis; workers would have their own room for the duration of their roster, but the room may change from one roster to the next.

It is planned to construct the construction accommodation village in Project Year 1. The workers required to construct the construction accommodation village would reside in the existing exploration camp and progressively move into the construction accommodation village as it is completed. Any construction workforce unable to be accommodated in the construction accommodation village would be accommodated in the operation accommodation village as its construction progresses.

It is expected that Charters Towers would be used as a rest stop for transport contractors delivering construction materials from the Townsville region. A surplus capacity of short-term accommodation in Charters Towers was identified in the SIA report, despite tourist demand.

Operation

The operational workforce would be accommodated in the operational accommodation village comprising 3,050 beds. The operational accommodation village would be located beside the airstrip. It would be constructed over 20 months in Project Years 1 and 2.

The operational accommodation village would operate on a cold bed system; each employee would have their own room that would remain empty when they are not on roster.

Potential impacts and management measures

The EIS states that the project is unlikely to significantly impact on the demand for housing in the local study area during construction and operation as the workforce is proposed to be accommodated on-site. Analysis in the SIA report indicates that there may be some demand from people moving to the local study area to work in local businesses that may provide goods and services to the project during construction, however the extra demand is unlikely to exceed current housing and accommodation forecasts.

Reduced accessibility to short-term accommodation options for tourists in Charters Towers during construction and operation was identified in the SIA report as a low risk.

The SIA included an assessment of the potential impacts on the proposed home base locations for the FIFO element of the workforce. It assumed that the project's FIFO workers would likely be a combination of existing residents at the home base locations and new residents, relocated to the home base locations to take up employment at the project. These proposed home base locations have sizeable populations with the ability to absorb the relatively minor population growth expected. Any potential project-induced population growth is unlikely to significantly affect housing affordability or availability in the FIFO home base locations.

The SIA report includes an outline of the proposed housing and accommodation management plan which lists initiatives to monitor and manage any project related housing impacts. The housing and accommodation management plan in the SIA report outlines:

- recording of employees' residential location
- the provision of timely information to the relevant local governments to ensure that they remain informed of the size of any incoming project-related population
- monitoring the availability and cost of rental housing in Charters Towers and the proposed home base locations for the FIFO workforce to ensure the housing demands of the construction and operation workforces do not impact on affordability in these areas
- liaison with real estate agents, short-stay accommodation providers and emergency accommodation providers in the proposed home base locations about any housing issues

- undertaking early consultation with accommodation providers in the proposed home base locations to discuss peak employment periods during the construction and operation phases of the project and their capacity to absorb an in-migrating workforce.

I am satisfied that the outline of the proposed housing and accommodation management plan in the SIA report provides an appropriate framework for a detailed housing and accommodation management plan. I have imposed a condition (Appendix 1) requiring a detailed housing and accommodation management plan be submitted to the Coordinator-General for approval 12 months prior to the commencement of construction and updated regularly. The detailed housing and accommodation management plan would form part of a SIMP for the project.

I have also imposed a condition (Appendix 1) requiring the proponent to report on the progress and effectiveness of the management measures detailed in the SIMP, including those for housing and accommodation management, following their implementation.

The stakeholder engagement strategy outlined in the SIA report includes engagement with Charters Towers Regional Council and short-term accommodation providers prior to and during construction and operation about potential housing and accommodation demands.

5.10.4 Local business and industry procurement

The economies of the Charters Towers Regional Council and Isaac Regional Council local government areas are based primarily on mining, agriculture, beef grazing and education. At the time of the SIA, local businesses had few links with the mining industry and Clermont was experiencing an economic decline following the early closure of the Blair Athol Mine, with which local businesses in Clermont had strong relationships.

The business capability survey completed for the SIA identified the following barriers to entry for local businesses in Charters Towers and Clermont:

- local businesses are unfamiliar with the procurement process
- local businesses find it difficult to become a preferred supplier
- local businesses are concerned about unsuitable payment terms.

Potential impacts and management measures

Construction and operation of the project could provide potential opportunities for local businesses to supply goods and services to the project. The SIA assumed that most of the goods required for the project would be transported from the Townsville region to the site via Charters Towers resulting in increased demand for freight, transport, accommodation and mining related businesses along the supply chain route. In addition, given Clermont's proximity to the project and its established mining services industry, it was identified in the SIA report that some mining services would be sought from local businesses in Clermont.

To ensure that capable local businesses have a full, fair and reasonable opportunity to participate in the procurement process, the proponent has committed to prepare a local business and industry content plan that would incorporate the Queensland Resources Council's (QRC) *Queensland Resources and Energy Sector Code of Practice for Local Content 2013*. The SIA report includes an outline of the proposed local business and industry content plan which contains details of strategies to reduce barriers to entry for capable local businesses. The local business and industry content plan in the SIA report outlines:

- communication with local industry and providing support and guidance to suppliers regarding requirements and processes for supplier registration, pre-qualification and tendering
- public briefings for local contractors in Charters Towers and Isaac local government areas explaining available opportunities and anticipated timelines
- the appointment of a dedicated procurement officer for the project
- an outline of payment terms in the local business and industry content plan.

I am satisfied that the outline of the local business and industry content plan provides an appropriate framework for a detailed local business and industry content plan that would reduce barriers to entry for local businesses. I have imposed a condition (Appendix 1) requiring a detailed local business and industry content plan be submitted to the Coordinator-General for approval 12 months prior to commencement of construction and updated regularly. The detailed local business and industry content plan would form part of a SIMP for the project.

I have also imposed a condition (Appendix 1) requiring the proponent to provide an annual report to the Coordinator-General during construction and for the first five years of operation of the project. The report is to detail the effectiveness of the management measures detailed in the SIMP, including those for local business and industry content, following their implementation.

5.10.5 Health and community wellbeing

The local study area is characterised by the rural landscape. Cattle grazing businesses operate on the properties directly affected by and adjacent to the project. The businesses rely on groundwater and surface water supplies, a local stock route and local road transport networks to operate.

Emergency assistance for the project would come from the nearest health and emergency services (fire, police and ambulance) in Charters Towers and Clermont, over 250 km away by road. The limited capacity of emergency services in Charters Towers to respond to traffic incidents along the Gregory Developmental Road, Elgin-Moray Road and Moray-Carmichael Road were identified in the SIA report. It was also identified in the SIA report that they do not have the appropriate equipment to respond to a heavy vehicle incident. In such cases assistance would be requested from Townsville. The Gregory Developmental Road has poor telecommunication coverage, preventing timely emergency service response.

Charters Towers has several medical facilities including two general practitioner clinics, a public mental health unit and a 25-bed public hospital. The nearest referral hospital is the Townsville Base Hospital. Clermont has one general practitioner clinic and a 16-bed medical facility. The nearest referral hospital is the Mackay Base Hospital, over 450 km away by road.

The Charters Towers community has access to a community support program, family support program, disability support program, carer respite program, healthy lifestyle program, mother's group, a home for disabled persons and an emergency relief program. A community housing program is also available. Community services available in Clermont include domestic violence counselling, legal aid and Centrelink services.

Potential impacts and management measures

Health and emergency services

Construction and operation of the project may increase pressure on local and regional emergency services based in Charters Towers and Clermont due to increased risk of traffic incidents along local and regional roads. Submissions on the EIS also raised issues with the project's potential burden on emergency services and potential impacts on road safety.

The Gregory Developmental Road, Elgin-Moray Road and Moray-Carmichael Road are expected to experience an increase in traffic due to the construction and operation of the project. My evaluation of potential impacts on these roads is addressed in section 5.7—Traffic and transport of this report.

The proponent has identified the potential to impact on local health services at Charters Towers and Clermont as well as emergency services due to potential incidents on the project area. My evaluation of the proponent's emergency response planning for potential incidents on the project area is addressed in section 5.8—Hazard and risk of this report.

The SIA report includes an outline of the proposed health and community wellbeing management plan, which contains details of proponent commitments for initiatives to manage the potential social impacts on health and emergency services. The health and community wellbeing management plan in the SIA report outlines:

- development of a project services strategy to ensure the coordinated delivery of health services for the project workforce
- preparation and implementation of an emergency response management plan prior to commencement of construction
- proactive engagement with local emergency service providers and traffic authorities to ensure all stakeholders are informed of key construction activities, anticipated traffic movements and road closures
- a donation of a heavy vehicle rescue kit to the Queensland Fire and Emergency Service in Charters Towers

- preparation of a communications strategy to inform road users of potential traffic changes and delays during construction.

In addition to these initiatives, the proponent has committed to coordinate project infrastructure upgrades, including communication infrastructure, with local emergency services and Adani to enable cost-effective expansion of emergency service communications along the Gregory Developmental Road. The project would also implement a road use management plan to reduce the risk of road accidents that may be attributed to the project.

I am satisfied that the outline of the health and community wellbeing management plan provides an appropriate framework for a detailed health and community wellbeing management plan. However, I note the proponent's proposed measures to manage potential impacts on health and emergency services do not cover the operations stage of the project.

I have imposed a condition (Appendix 1) requiring a detailed health and community wellbeing management plan be submitted to the Coordinator-General for approval 12 months prior to commencement of construction and updated regularly. The detailed health and community wellbeing management plan would form part of a SIMP for the project and is required by the condition to include measures to manage potential impacts on emergency services during both the construction and the operations phases of the project.

I have also imposed a condition (Appendix 1) requiring the proponent to provide an annual report to the Coordinator-General during construction and for the first five years of operation of the project. The report is to detail the effectiveness of the management measures detailed in the SIMP, including those for health and community wellbeing, following their implementation.

Amenity and livelihood

Submissions on the EIS raised issues about the project's impacts on the rural character of the area, including impacts to noise, air quality and visual amenity. Refer to sections 5.1—Land use and rehabilitation, 5.3—Air quality and 5.6—Noise of this report, for my assessment of the project's potential impacts on these matters.

Construction and operation of the project could impact on the property management practices of directly affected and potentially affected landholders. Potential project impacts on directly affected and potentially affected landholders include:

- removal of grazing land and part of a stock route (section 5.1—Land use and rehabilitation)
- impacts on groundwater and surface water resources (section 6.3.2—Groundwater and 6.3.3— Surface water)
- increased traffic on roads used to access properties (section 5.7—Traffic and transport)
- increased air traffic and impediments to helicopter mustering practices (section 5.7—Traffic and transport)
- potential spread of weeds (section 6—MNES).

I have evaluated these potential impacts in the relevant sections of my report, as indicated above.

The proponent has committed to prepare a landholder engagement protocol to facilitate transparent engagement with directly affected and adjoining landholders. The proponent has committed to prepare the protocol one month prior to the granting of the mining lease for the project.

The SIA report includes a description of the purpose of the landholder engagement protocol, which includes:

- provide an overview of the approach employed by the proponent when engaging with directly affected and adjoining landholders
- reassure landholders that the proponent is committed to resolving problems, improving relations and building trust with landholders
- explain how landholders may access and engage with the proponent
- describe the process for resolution of concerns
- explain the process to gain access to landholder property.

The proponent has also committed to provide nearby landholders with direct access 24 hours a day to a senior site personnel to communicate issues relating to construction and operation of the project.

I am generally satisfied that the proponent's proposed landholder engagement protocol provides a framework for engagement with directly affected and adjoining landholders, however, I consider that the protocol should also include potentially affected landholders. I also consider that the proposed timing for preparation of the protocol need to be reconsidered by the proponent as they must engage with landholders well before a mining lease is granted in order to fully understand and manage landholder issues. I have imposed a condition (Appendix 1) requiring a detailed landholder engagement protocol, that includes strategies for engagement with potentially affected landholders, be submitted as part of the CSEP for the project. The CSEP for the project must be submitted to the Coordinator-General for review and approval 12 months prior to the commencement of construction.

5.10.6 Combined impacts with other Galilee Basin projects

The project would be located in the Galilee Basin, where several other large coal mines are also proposed including the CCM&RP, Alpha Coal mine, Galilee Coal mine, Kevin's Corner coal mine, and South Galilee coal mine.

The SIA report included an assessment of the project's combined impacts with projects proposed in the northern Galilee Basin; the CCM&RP and its associated Moray Power Project. The CCM&RP is proposed to have a long mine life operated by a majority FIFO workforce. The Moray Power Project, CCM&RP and the project would be accessed via the same local and regional roads.

I consider the proponent's approach to focus the combined impact assessment on the CCM&RP and Moray Power Project to be appropriate as the other projects are in the southern Galilee Basin and geographically separated from the project and CCM&RP.

The local communities for the projects in the southern Galilee Basin are different to those for CCM&RP and the project.

Potential impacts and management measures

Potential combined social impacts with other Galilee Basin projects, include:

- pressure on labour markets
- pressure on housing and accommodation in FIFO home base locations
- pressure on local and regional transport networks and emergency services

Workforce management

The construction and operation stages of any of the projects in the Galilee Basin may overlap, resulting in the projects sourcing labour with the same skills at the same time. This could result in pressure on labour markets by reducing the availability of skilled workers for the mining industry.

The proponent has committed to update the labour market study closer to commencement of construction to identify locations with capacity to supply FIFO labour for the project. The results of the study would inform the project's workforce management plan. A training and skilling strategy would also be prepared as part of the workforce management plan, that aims to increase participation in the mining industry.

The outline of the SIMP in the SIA report that addresses the combined impacts of other Galilee Basin projects, includes regular and ongoing discussions with the proponent for the CCM&RP to manage the impacts associated with workforce management, including recruitment. I consider the proponent's approach to manage potential combined impacts on labour markets to be adequate because it seeks to recruit workers from areas with capacity to supply labour and avoid recruiting from areas targeted by the proponent for the CCM&RP, thereby dispersing pressure on the labour market.

Housing and accommodation

The CCM&RP and the project propose to employ predominantly FIFO workers. Sourcing FIFO workers from the same home base locations could add pressure to housing markets in those locations. The SIA report forecasts that population growth in the proposed home base locations, as a result of potential FIFO workers and their families moving to the home base locations for each of these projects, would be less than two per cent, which would result in insignificant impacts to housing and accommodation.

To mitigate any potential combined impacts on housing and accommodation, the proponent proposes to source FIFO workers from several home base locations. This would disperse potential impacts. The outline of the SIMP for the project includes the establishment of a consultative forum with the proponent for the CCM&RP, regulators and key service providers that would provide an opportunity for open discussion around combined impacts and the setting of potential management strategies. I consider the proponent's approach to manage potential combined impacts on housing and

accommodation is adequate because it is commensurate with the potential impact identified by the proponent.

Emergency services

The CCM&RP and the project would use the same road transport networks: the Gregory Developmental Road, Moray-Elgin Road and Moray-Carmichael Road. Increased traffic on these roads increases the risk of road accidents and increases pressures on local emergency services. Combined impacts from other Galilee Basin projects to road infrastructure is addressed in section 5.7—Traffic and transport.

The SIA report includes an outline of the proposed SIMP, which contains details of initiatives to manage the combined impacts on emergency services of Galilee Basin project on these road networks. The SIMP in the SIA report outlines:

- establishment of a consultative forum with the proponent for the CCM&RP, regulators and key service providers to discuss the combined impacts and set potential management strategies
- preparation of emergency and evacuation planning and response procedures in consultation with state, regional and local emergency service providers
- ongoing liaison with emergency service providers and local hospital services
- provision of first aid and firefighting services at the project area
- establishment and maintenance of contingencies to deal with emergency situations
- conduct of periodic emergency simulation drills and regional emergency service providers over the life of the project.

I consider the proponent's approach to manage potential combined impacts on emergency services is adequate because they complement the measures proposed to mitigate the project's impacts on emergency service capacity to respond to road accidents.

I am satisfied that the outline of the SIMP provides an appropriate framework for a detailed cumulative SIMP. I have imposed a condition (Appendix 1) requiring a detailed cumulative SIMP be submitted to the Coordinator-General for approval 12 months prior to commencement of construction and updated regularly. The detailed cumulative SIMP would form part of an overarching SIMP for the project.

I have also imposed a condition (Appendix 1) requiring the proponent to provide an annual report to the Coordinator-General during construction and for the first five years of operation of the project. The report is to detail the effectiveness of the management measures detailed in the SIMP, including those for combined social impacts, following their implementation.

5.10.7 Coordinator-General's conclusion – social impacts

I am satisfied with the proponent's methodology for the SIA and I consider the stakeholder engagement undertaken by the proponent to inform the SIA to be generally adequate.

I consider the proponent's commitments and management measures identified in the outlines in the EIS for the following plans appropriate:

- workforce management plan
- housing and accommodation management plan
- local business and industry content plan
- health and community wellbeing management plan
- cumulative social impact management plan.

Overall, I consider that the project presents opportunities for social benefits for the local and regional area through employment and business opportunities, upgraded road and telecommunications infrastructure and enhanced emergency service capabilities.

I have set conditions in this report that seek to further enhance community benefits by ensuring that:

- all relevant stakeholders, including Aboriginal and Torres Strait Islander peoples and potentially affected landholders, are engaged when updating the SIA report and that their feedback is considered in the development of management plans for the project
- local industry service providers and job seekers receive timely notification regarding potential project opportunities
- potential social impacts on Aboriginal and Torres Strait Islander peoples and emergency services are effectively managed
- stakeholder feedback is considered in informing and updating project specific management measures and the SIMP.

To ensure that the project's social impact management measures remain current and effective, I have imposed conditions (Appendix 1) requiring the proponent to submit to the Coordinator-General:

- regular updates to the SIA report, which must be based on up to date social baseline information
- a CSEP 6 months prior to commencement of construction for the review and approval by the Coordinator-General
- a SIMP 12 months prior to the commencement of construction for approval by the Coordinator-General and then update it regularly during construction and operation. The SIMP is to be informed by the updated SIA and include details of the matters outlined in the management plans listed above
- an annual social impact management report during construction and for the first five years of operation of the project. The report is to detail the effectiveness of the SIMP measures to manage the social impacts of the project. The proponent is required to make these reports publicly available on their website.

I have imposed a condition (Appendix 1) requiring the proponent to advise the Coordinator-General in writing that construction has commenced, within 7 days of commencement of construction, and that operations has commenced, within 7 days of operations.

5.11 Economic impacts

The resources sector is the largest contributor to Queensland's economy, with coal mining recording the largest contribution to total direct expenditure of the minerals and energy sector in Queensland at \$19.9 billion for 2017-18⁸. Recent data produced by the Queensland Government Statistician's Office (QGSO) reports coal as also the state's largest export commodity, accounting for \$34 billion of the state's total \$77 billion in commodity exports in the 12 months ending September 2018⁹.

The project proposes to establish a greenfield open-cut and underground coal mine in the Galilee Basin as a commercial energy resource for the supply of thermal coal to overseas markets. At peak operations the project would open-cut and underground mine up to approximately 55 Mtpa of ROM coal, which equates to approximately 38 Mtpa of thermal coal product for the export market.

The EIS states that the proposed project's mine infrastructure would include coal handling and preparation plants, stockpiles, conveyors, rail loop and train loading facilities, workshops, dams, tailings storage facility and a power station. A workforce accommodation village and private airstrip would also be constructed on the project area.

The proponent estimates the project would require capital expenditure of approximately \$6.7 billion.

For the 5-year construction and early works phase, at peak, the project would require 3,892 direct full time equivalent (FTE) jobs. The operations phase would require 3,391 direct FTE jobs.

The EIS states short-term outlook for coal exports from Queensland is likely to reflect continued high demand for coal, which will be further heightened by the ongoing closure of coal mining capacity in China. Should this scenario be realised it could represent ongoing export opportunities for the Queensland economy, contributing to economic growth in Queensland and its coal mining regions.

Overall, despite any fluctuations over the short to medium-term in the levels of supply and demand for Queensland-produced coal, the Queensland Government is committed to an environmentally sustainable resources industry, providing jobs and generating mineral royalties for the state.

Submissions received

Submissions on the EIS raised issues including:

⁸ Queensland Resources Council (2017) Economic impact of the minerals and energy sector on the Queensland Economy 2016-17 viewed at <https://www.qrc.org.au/contributiontoqueensland/contributiondata/>

⁹ QGSO Exports of Queensland goods overseas, February 2018 viewed at <http://www.qgso.qld.gov.au/products/reports/exports-ql-d-goods-overseas/exports-ql-d-goods-overseas-201809.pdf>

- the economic assessment methodology used for the project is not suitable to properly inform the assessment of the true costs and benefits of the project
- the project offers no economic benefit to the community and there will be long-term economic costs from climate change and the significant environmental impacts of the project
- the economic assessment does not take into account the adverse impact on large-scale livestock businesses operating on the project area and the regional livestock industry
- the project is unviable due to the depressed thermal coal market resulting from structural oversupply.

I have considered issues raised in all submissions on the EIS in my evaluation, and how the information provided by the proponent in the EIS addresses these issues.

5.11.1 Impacts and mitigation

The EIS found that the project could help deliver one of the Queensland Government's key priorities of generating economic activity and growth in the regions, including driving enterprise development, economic growth and job creation in central Queensland.

Economic modelling methodology

The project's economic impact assessment was undertaken by the Centre for International Economics (CIE) in 2015. The CIE adopted a computable general equilibrium (CGE) model to assess the economic impacts of the project.

The EIS confirms the CGE model is constructed using national and international economic data, which is used to simulate the economic activity of the project to generate the change in state, regional and local economic activity if the project proceeds. The model used four sets of variables to measure the economic impacts of the project at a state and national level as follows:

- gross domestic product (GDP), gross state product (GSP) and gross regional product (GRP)
- national and regional employment
- household consumption at national, state and regional level (as an indicator of net economic welfare change)
- changes in federal and state government revenues.

The model examined the impacts of the construction and operational phases of the proposed project separately, and for each phase, the economic impacts were separated into four geographical areas:

- the local area consisting of the Isaac and Charters Towers local government areas (LGAs)
- the regional area consisting of the Mackay and Townsville regions
- the State of Queensland

- Australia.

The CGE model assessed and predicted the economic impacts for the life of the project (53 years). The EIS acknowledges the limitations in predicting potential social and economic impacts for the life of the project given the socio-economic baseline will continue to evolve and change over time.

The EIS includes a commitment to reassess the socio-economic baseline and impacts against the baseline five years prior to the end of the first 20-year period of the project (Appendix 5). I note that the commitment does not specify whether the CGE model will be re-run to inform the updated assessment.

I expect the proponent to review the economic baseline and potential impacts and re-run the CGE model if required to allow for a greater level of accuracy in predicting potential impacts and account for any changes in the socio-economic baseline for the remaining life of the project (33 years).

Assumptions

I acknowledge that the CGE model results in the EIS were based on many assumptions, including:

- the local and regional impacts were determined by the share of employment and expenditure sourced locally
- as the Isaac LGA and Mackay region are heavily affected by mining, labour is intended to be sourced from outside these areas
- the majority of goods and services for construction and operations would be purchased in the Townsville region and transported to the site
- adoption of the International Monetary Fund projections which provides global economic outlook to 2018
- a gradual convergence to three per cent growth for all economies to the year 2100
- annual population growth in the greater Brisbane region projected to be 0.3 per cent higher than the rest of Queensland
- the rate of productivity growth expected to continue to 2018. Between 2018 and 2030, productivity reverts to pre-boom levels. After 2030, productivity growth converges over 50 years to one per cent per annum.

Many key project assumptions were used as inputs for the CGE model, including the direct number of jobs associated with the mining project.

Impacts

The economic impacts were identified based on information collected during baseline profiling, the results of a business capability survey, and consideration of impacts from other development taking place in the Galilee and Bowen Basins. The economic impact assessment identified national, state, regional and local impacts of the project, during both construction and mine operations.

As these impacts were estimated using a CGE model, they reflect the full net economic impacts (both direct and indirect effects). State impacts are apportioned to determine

impacts on the local (comprising Isaac and Charters Towers LGAs) and regional areas (comprising Mackay and Townsville).

The EIS states that the overarching project-wide beneficial economic impacts would include:

- for the 5-year construction and early works phase: direct average annual employment of 3,249 FTE people with an anticipated peak workforce of 3,892 in Project Year 4
- for operations phase 1 (open-cut and underground works, years 6-31): direct average annual employment of 3,119 FTE people during Project Years 6 to 31, with a peak of 3,391 workers
- for operations phase 2 (underground mining only, years 32-49): an average of 1,221 direct jobs would be required, with a peak of 1,377 jobs
- for the decommissioning and rehabilitation phase (years 50-53): an average of 234 direct jobs would be required, with a peak of 275 jobs
- additional direct and indirect employment opportunities in the regional area of approximately 3,731 FTE in the construction phase, 3,810 FTE in operations phase 1, then 1,291 in operations phase 2 and 234 FTE in the decommissioning and rehabilitation phase
- additional local direct and indirect employment opportunities of approximately 3,307 FTE in the construction phase and 3,251 FTE in operations phase 1, then 1,232 FTE in operations phase 2 and 234 FTE in the decommissioning and rehabilitation phase
- an annual average increase in the local area of \$1,195 million in industrial value added in the construction phase and \$1,513 million in the operations phase 1
- predicted annual average of \$76.84 million in royalty payments from coal production to the Queensland Government, \$188.26 million during operational phase 1 and \$33.41 million during operational phase 2, equating to approximately \$5.88 billion over 49 years
- state and federal government taxes and charges including mining lease fees, payroll tax, company tax, income tax and goods and services tax.

In addition, the EIS found the project could deliver the following socio-economic benefits:

- direct and indirect local, regional and Aboriginal and Torres Strait Islander peoples' employment opportunities beyond the traditional agricultural sector roles
- direct and indirect economic opportunities for local and Queensland suppliers and businesses, especially in training, technology and manufacturing, through project expenditure and flow-on activity.

The EIS predicted that the proposed project would affect the GDP by less than 0.1 per cent over the 'business as usual' (BAU) level for the first 25 years of operations. The project would have a more significant effect on the Queensland economy by:

- increasing GSP by around 0.7 per cent above the BAU level in the 2020s (the early years of operations phase 1)

- adding \$951.9 million per annum to GSP during the construction phase, rising to \$1,513 million per annum during operations phase 1 and \$182.9 million per annum during operations phase 2
- increasing real wages by 0.39 per cent (annual average) during the construction phase, 0.28 per cent during operations phase 1, and 0.02 per cent during operations phase 2 given increased demand for labour, an assumed 'tight' labour market and increased economic activity throughout the state
- increasing household consumption by up to 0.5 percentage points, due to the higher wages and subsequent purchasing power.

The EIS predicted that the GRP impacts would be higher than the figure for GSP as the increased activity in the local and regional areas would be offset slightly at the state level by decreased economic activity in the state due to resources transfer. For the Mackay and Townsville regions, the project is projected to:

- add, on average, \$1,364.2 million per annum to GRP during construction, \$1,738 million per annum during operation phase 1 and \$262.8 million during operations phase 2
- increase employment and real wages as individuals leave employment throughout the state to take up employment on the project and supply chain services in these areas. However, the attraction of labour from other industries could lead to employment contraction in other industries including agriculture, other mining, and manufacturing.

The economic consequences of not proceeding with the project are detailed in the EIS as:

- the ongoing global demand for coal could be lost to an international competitor, with unrealised export revenue, coal royalties, employment opportunities and business opportunities for Queensland and regional areas
- unrealised government revenue from royalty charges would be forfeited
- potential direct and indirect employment would be lost.

The EIS also acknowledges that the social and environmental impacts of the project would not eventuate should the project not proceed.

5.11.2 Coordinator-General's conclusion – economic impacts

I have evaluated the economic assessment included in the EIS entitled 'Economic Impact Assessment' and the 'Socio-Economic Impact Assessment for MacMines Australia' undertaken in 2015 by Hansen Bailey for the China Stone Coal project. I have reviewed the methodology, assumptions and nature of the economic impacts followed by an assessment of the forecast economic impacts of the project, including economic activity, welfare impacts (consumption impacts), the impacts on employment and the impacts on government revenue. I have also considered the information about forecasts on trade of coal and with respect to the statements made about the project need.

I conclude that CGE modelling is an appropriate analysis as it includes constraints on resources, such as labour and capital. I have considered the submission issues relating to the economic modelling and conclude that the CGE modelling methodology adopted for the economic assessment provided a sufficiently realistic evaluation of the project's likely economic impact. I expect the proponent to undertake their commitment to reassess the socio-economic baseline and impacts against the baseline five years prior to the end of the first 20-year period of the project

I note that the financial information about the project provided by the proponent to CIE may not have included the cost to the proponent of the fuel source for the on-site power station that is using raw coal and coal rejects. I expect the proponent to include this cost when they re-run the CGE model using up-to-date information and including as an input to the model the cost of royalty payments for the raw coal and coal rejects to be used in the on-site power station.

I consider that a revision of the economic modelling utilising a CGE model would produce different outcomes to those provided in 2015. I believe that this commitment will address economic assessment modelling concerns raised in submissions on the EIS. I have also imposed conditions requiring the proponent to monitor and report on the management of social impacts of the project in the local and regional context (Appendix 1) which further addresses these concerns.

5.12 Power supply

To meet the operations phase power supply needs of the project the proponent proposes to construct a coal-fired power station within the project area.

The proposed power station was identified and assessed as an integral component of the project throughout the EIS. The EIS assessment was based on the power station output powering only the mining activities on the mining lease. The proponent confirmed in the AEIS that it does not intend to supply power to consumers off the mining lease.

Any off-lease supply of power would be subject to separate approvals under the *Electricity Act 1994* and Electricity Regulation 2006, or relevant legislation at the time of seeking approval to supply power to consumers off-lease.

This section of the report summarises my evaluation of the EIS as it relates to the proposed power supply for the mine and the impacts associated with the proposed construction and operation of the power station.

In summary, I have found that further information about the proposed power supply is required, and so construction of the power station and the power station waste storage facility (PSWSF) cannot proceed at this stage.

The further information is to be provided to, and assessed by DES as part of the project's EA.

Further, I require this information to be provided prior to public notification of the EA application, to enable DES to assess the information and allow the opportunity for the public to consider and comment on the information.

Submissions on the draft EIS

Submissions on the draft EIS about the power station raised a number of concerns including:

- the need to justify the operational scale of the power station related to forecast power demands of the mine
- that alternative power supply options, including renewable energy alternatives, were not considered in the draft EIS
- the potential air quality and GHG impacts of the power station
- the impact of potential solid, liquid and gaseous waste streams from the power station
- the water supply to the proposed power station was not adequately identified.

I have considered concerns raised in submissions in my evaluation of the EIS, and how the information provided by the proponent addresses these concerns.

Policy context

The *Powering Queensland Plan* (released in 2017) sets out the Queensland Government's strategy to guide the State through the short-term and long-term challenges facing Australia's energy markets. The *Powering Queensland Plan* recognised that thermal (coal) generation currently comprises around 80 per cent of Queensland's generation capacity. The plan identifies that coal-fired generation will continue to play an important role in providing energy to Queensland while the transition to renewable energy sources is occurring.

In July 2017, the Queensland Government released the *Queensland Climate Transition Strategy 'Pathways to a clean growth economy'*¹⁰, which commits to setting an interim GHG emissions reduction target of at least 30 per cent below 2005 levels by 2030, and a target for zero net emissions by 2050. The Climate Transition Strategy also commits to powering Queensland with 50 per cent renewable energy by 2030.

While coal-fired power generation has a role to play during the transition to renewable energy sources, any new proposal for a coal-fired power station must be considered against the backdrop of the interim emissions target and target for zero emissions by 2050, both of which are within the life of the proposed project.

¹⁰ <http://www.ehp.qld.gov.au/assets/documents/climate/qld-climate-transition-strategy.pdf>

Power station design and capacity

The EIS states that the proposed power station is located within the mine's central infrastructure area, as shown on Figure 2.5, and would include coal stockpiles, conveyors, boilers, transformers, warehouses, storage areas and administrative facilities, covering an area of approximately 19 ha.

The power station would also require a PSWSF which would cover an area of around 80 ha and have a storage capacity of 16.4 Mm³. The PSWSF would have sufficient capacity to store power station waste for the first 10 years of operation, after which the EIS proposes the power station waste would be co-located with the open-cut mine overburden shown on Figure 5.2.

The EIS identified that two 350 MW operating units would be required to supply the potential maximum power demand of the mine with an additional third 350 MW unit in place for redundancy. I requested further information regarding the need for redundancy and the forecast power demands, which was provided by the proponent in the AEIS. The breakdown of power demands confirmed the potential peak power demand for the project during operations is 388 MW.

The total capacity of the operating power station (1,050 MW) was justified in the EIS on the basis that the smallest available supercritical generating units are 350 MW, therefore requiring two units to meet the peak demand of 388 MW. The third unit, which would provide redundancy in the event of failure of one or the other of the primary units, would also necessarily have a capacity of 350 MW. As the proponent cited the intention to source the generator units from a business partner, the AEIS confirms other sources or types of power generators were not investigated.

Supercritical generating units, which the proponent proposes to utilise, differ from traditional coal-fired power plants because the water running through the units works as a supercritical fluid, meaning it has properties and behaviours between that of a liquid and a gas. These properties occur when water reaches a critical point under high pressures and temperatures, specifically at 22.064 MPa and 374 degrees Celsius. At this critical point, the amount of energy needed to change the water into steam reduces and the water's vaporisation phase change is instant. This reduces the amount of heat transfer to the water that is normally needed in a conventional coal-fired power plant, which means that less coal needs to be used to heat an amount of water. This increases a plant's thermal efficiency considerably¹¹.

Efficiencies for coal-fired power plants are described in terms of sent-out electricity (SO), expressed as a percentage and calculated by dividing total production energy by total input energy. Efficiencies for supercritical coal-fired power plants can reach around 44 per cent, compared to traditional coal-fired power plants that operate around

¹¹ Bright Hub engineering. (18 June 2015). What is a supercritical power plant? [Online], Available: <http://www.brighthubengineering.com/power-plants/32893-what-is-a-supercritical-power-plant/>

33 per cent¹². A corresponding decrease in emissions would be expected because supercritical plants require less fuel for the same output.

The EIS states that the power station would require up to 3,000 ML/pa (3 GL/year) of raw water and that the source of the raw water supply and any related impacts would be addressed in a separate environmental assessment and approvals process. Although the estimated water supply requirements of the power station were presented in the EIS it is unclear whether those estimates are based on the actual performance requirements of the generator units which would be commissioned should the power station be approved. I accept that the estimated raw water requirements are sufficient to indicate that a substantial off-site water supply is required should the project continue with its current power supply proposal.

Submitters expressed concerns in relation to the reliability and security of an off-site water supply for the power station. As this is critical to the project proceeding, the proponent will need to secure a raw water supply, the impacts of which would be subject to a separate approvals process.

Alternative power supply options

The EIS found that the financial costs associated with connecting to the electricity grid and purchasing power would be considerable and outweigh the capital expenditure to construct and operate an on-site coal-fired power station with an operating life of approximately 50 years.

No further assessment of the environmental impacts and benefits associated with alternatives to an on-site coal-fired power station or different types or sources of power station generating units was presented in the EIS. This issue was raised in submissions and by advisory agencies during the EIS process for the project.

I find that given the peak power demand for the project is estimated at 388 MW, the proposed 1,050 MW capacity of the proposed power station is an issue of concern. The proposed capacity is based on the use of a single type of generator unit, which can only be configured as one or more blocks of 350 MW. The proposed configuration does not consider alternate units or technologies. I note that the addendum to the AEIS identifies that alternative units are commercially available.

Although I accept supercritical units are more efficient than traditional power plants, I require the proponent to consider other types of units such as ultra-supercritical generating units or smaller size units, particularly given considerable GHG emissions from the power station are predicted, as discussed in section 5.4—GHG and climate change of this report.

Furthermore, I require the proponent to consider the environmental costs and benefits associated with alternative power supply options, such as renewable energy, for all or

¹² International Energy Agency (2012). Technology roadmap, high-efficiency, low emissions coal-fired power generation.

part of the power demands of the project. If renewable energy options can be adopted, there may not be a need for the coal-fired power station, or for three generating units if a combination of renewable energy and a smaller power station is viable.

Therefore, I have imposed a condition (Appendix 1) requiring a comprehensive assessment of alternative power generation options, with a justification for the selected option based on environmental, as well as economic grounds. This assessment is to be provided to the administering authority for the EP Act prior to the public notification of the draft EA which includes ERA 14 2(b) - Electricity generation, which is required for a power station on the mining lease. The construction, including vegetation clearing, of the power station cannot proceed until the information has been provided and assessed and, should it be found to proceed, conditions for ERA 14 have been included in an EA for the project.

5.12.1 Impacts and mitigation

Impacts on MSES from the power station

Assessment methodology

Surveys were undertaken for the EIS to identify MSES within the project area, including the proposed power station and PSWSF sites. As the site is 20,000 hectares, ground truthing surveys were not conducted over the whole site at the EIS stage of the project. The assessment of impacts on MSES in the EIS broadly considered potential impacts associated with the whole project, including the proposed power station and PSWSF. The EIS did not clearly identify the MSES in the footprint of the power station and PSWSF. The EIS includes a commitment that further surveys would be undertaken prior to commencement of any vegetation clearing for the project, including the proposed power station site, to identify any further MSES and I have imposed conditions to ensure that these ground surveys are completed.

Impacts and mitigation measures

The EIS assessed the potential impacts of the proposed power station as a result of clearing vegetation on MSES.

I have not stated conditions for the draft EA for the power station in Appendix 2. Therefore, the stated conditions for the draft EA for the project explicitly exclude the footprint of the proposed power station (approximately 19 ha) and the PSWSF (approximately 80 ha) from the authorised clearing extent for the project. Should the administering authority authorise ERA 14 as part of an EA for the project, I expect that the vegetation clearing required for the power station and PSWSF will be appropriately conditioned as part of the EA conditions.

To ensure that significant residual impacts on MSES are appropriately offset, I have stated a condition at Appendix 2, which sets maximum disturbance limits for MSES known from the project site. Should pre-clearing surveys identify additional significant residual impacts on MSES and their habitat, these must be included as an environmental offset in the environmental authority under the EP Act.

I expect my imposed and stated conditions relating to pre-clearing surveys for threatened species and the delivery of offsets will be applied in full to any clearing associated with the power station and PSWSF. My assessment of impacts on MSES is included in section 5.2—MSES of this report.

Coordinator-General's conclusion

I accept the findings in the EIS in relation to impacts on MSES, however I require (Appendix 1) that further survey work is required to establish with certainty the location and extent of MSES and their habitat and the impact of the project on these MSES and their habitat, including within the proposed power station and PSWSF footprint.

I consider that the combination of proponent commitments and my imposed, stated and recommended conditions have appropriately addressed risks to MSES. I am satisfied that potential impacts will be identified, mitigated and residual significant impacts offset as appropriate.

While MSES have been described and assessed in the EIS, the conditions I have stated for the draft EA for the project in Appendix 2 have explicitly excluded the footprint of the proposed power station and PSWSF from the authorised clearing extent for the project.

Should the administering authority for the EP Act authorise the power station in an EA for the project, I expect appropriate conditions will be included in the EA related to the land clearing required for the power station and PSWSF.

Air quality and greenhouse gas emission impacts from the power station

Assessment methodology

Combustion emissions

The EIS presented estimates of emissions from the power station which assumed that the plant would be designed to meet NSW emission limits for oxides of nitrogen (as NO₂), particulate matter and carbon monoxide. Emissions of other pollutants including sulfur dioxide and metals were based on the NPI EET manual for fossil fuel electric power generation. The emissions profile presented in the EIS also incorporated site-specific information relating to the quality of project coal and I commend the proponent for factoring site-specific characteristics into their emissions estimates.

While these estimates are appropriate for reporting against the NPI framework, agencies have advised that the EIS did not provide detail of the actual performance and emissions of the power station generator units. Therefore, I have not stated conditions for the draft EA in Appendix 2 related to release limits from the power station generator stacks.

To ensure that relevant information is provided to the administering authority to inform the application for ERA 14 - Electricity generation and allow an assessment of impacts associated with the activity, I have imposed conditions at Appendix 1 which specify the information that must support the application. These conditions require that the nameplate (actual) performance of the generator units is presented and considered in

the assessment of emissions estimates. A full evaluation of air quality issues for other aspects of the project is provided in section 5.3—Air quality of this report.

Greenhouse gas emissions

The EIS estimated the GHG emissions from the power station, in accordance with the *National Greenhouse and Energy Reporting (Measurement) Determination 2008* (NGER Determination), the *National Greenhouse Accounts Factors* (July 2013) and the *Greenhouse Gas Protocol*. I am satisfied that the GHG assessment presented in the EIS is consistent with relevant standards and appropriate for the purposes of impact assessment. However, a GHG emission impact assessment combining emissions from other known projects in the Galilee Basin, was not provided in the EIS; therefore, I have imposed a condition requiring a cumulative impact assessment in Appendix 1 to inform the ERA 14 considerations.

Impacts and mitigation

Particulates and dust

The potential impacts of the proposed power station on air quality were described in the EIS and are fully evaluated in section 5.3—Air quality of this report. The air quality assessment conducted by the proponent and described in the EIS includes the proposed power station in relevant modelling, however it did not clearly identify the power station impacts as separate from other mining activities.

The EIS modelling found that for all sensitive receptors, the closest of which are Dooyne Outstation (9.9 km east) and the proposed Carmichael Coal Mine Accommodation Village (27.7 km south-east), the dust impacts resulting from the project, including the proposed power station are predicted to be within acceptable levels specified in *the Environmental Protection (Air) Policy 2008* (EPP (Air)).

The primary mitigation measure to minimise potential emissions of particulate matter from the proposed power station is the installation of electrostatic precipitators. These are devices that remove suspended dust particles from a gas or exhaust by applying a high-voltage electrostatic charge and collecting the particles on charged plates. I am satisfied that this approach is consistent with current best practice in the management of particulate and dust emissions from power stations.

However, as the EIS did not clearly identify the power station impacts as separate from other mining activities, I do not have the information to set conditions for the power station relating to particulates and dust. Therefore, I have imposed conditions (Appendix 1) which will ensure that the administering authority is provided with further information to assess the particulate and dust impacts of the power station prior to public notification of the EA application. Refer to section 5.3—Air quality of this report for further information.

Combustion emissions

The EIS predicts that combustion emissions from the power station, including NO₂, SO₂ and CO, and other air toxicants would be well below the relevant criteria at all sensitive receptors. Information presented in the EIS is based on modelling which makes

assumptions around the emissions profile based on published guidance material. As such the assessment is based on the emissions produced by a standard coal-fired power station and is not specific to the nameplate (actual) performance of the plant proposed to be constructed on-site.

The proponent has not provided information on the power station emissions profile, separate from the whole project emissions, to enable me to fully assess the potential air quality impacts associated with combustion emissions from the power station. As a result, Appendix 2 does not contain draft EA conditions for the power station ERA 14 – Electricity generation.

I require the proponent to provide additional information on the power station emissions profile to DES for assessment prior to any notification of the draft EA application. I have stated conditions at Appendix 1 to ensure that this occurs. Refer to section 5.3—Air quality of this report for further information.

Greenhouse gas emissions

The potential impacts of the proposed power station in terms of GHG emissions were described in the EIS and are evaluated in section 5.4—GHG and climate change of this report. Approximately 159,868,000 t of coal would be burnt in the power station for electricity generation, generating 230,666,000 tCO₂-e over the life of the mine, or 87.6 per cent of the total GHG emissions associated with the project.

Based on these figures, the project's total annual GHG emissions would contribute approximately 3.2 per cent to Queensland's total annual emissions, and 0.9 per cent to Australia's annual GHG emissions.

I note the Queensland Government's commitment to setting an interim GHG emissions reduction target of at least 30 per cent below 2005 levels by 2030, and a target for zero net emissions by 2050. The State's Climate Transition Strategy commits to powering Queensland with 50 per cent renewable energy by 2030.

I accept that energy supply is a key requirement to opening up the Galilee Basin and the jobs and investment the projects can provide, however, the EIS has not sufficiently justified the need for a new coal-fired power station instead of alternative non-coal burning power supply options. The EIS did consider the option of connecting to the existing electricity grid and purchasing power, which the EIS states is more expensive than building and operating a power station. My imposed condition (Appendix 1) requires the proponent to undertake a thorough assessment of cost, viability and impacts of alternative power supply options, including renewable energy technologies such as wind, solar and hybrid technologies or alternative fuel sources, for all or part of the project's power demands from mining activities on the proposed mining lease.

The proponent must submit the assessment of alternatives to the administering authority for the EP Act prior to public notification of the EA application including ERA 14 – Electricity generation, so that the authority can consider the information as part of its assessment and preparation of conditions for the EA application, should it find the proposal may proceed.

Given the importance of Australia's commitment to its obligation under the Paris Agreement, the Queensland Government's commitments to emission reductions by 2030 and the significant GHG emission contribution of the proposed project, I have imposed a condition (Appendix 1) requiring the proponent to develop a power station GHG emissions reduction and management plan (PSGHG Plan) for my approval that details how, should the power station proceed, the proponent will minimise, monitor and manage GHG emissions of the power station.

Coordinator-General's conclusion

Particulates and dust

I am satisfied that my imposed and stated conditions would ensure that the project's potential air quality and odour impacts are appropriately managed. However, additional information is required to allow DES to set conditions for releases from the power station, and I have imposed conditions at Appendix 1 to ensure that this information is provided.

Combustion emissions

The EIS has not provided information on the power station emissions profile to enable me to fully assess the potential air quality impacts associated with combustion emissions from the power station in isolation from the whole project. As a result, Appendix 2 does not contain draft EA conditions for the power station ERA 14 – Electricity Generation.

I require the proponent to provide additional information on the power station emissions profile to DES for consideration prior to notification of the EA application and I have imposed a condition at Appendix 1 to ensure that this occurs.

Greenhouse gas emissions

The EIS provided information to justify the proponent's the need for a new coal-fired power station for the mine. However, I require options to be presented on alternative non-coal burning power supply technologies. This is particularly important given Australia's commitment to its obligation under the Paris Agreement, the Queensland Government's commitment to accelerating the transition to sustainable energy production and the significant GHG emission contribution of the proposed project. My imposed condition (Appendix 1) requires the proponent to undertake a thorough assessment of cost and viability of alternative power supply options, including renewable energy technologies such as wind, solar and hybrid technologies or alternative fuel sources, for all or part of the mining activities on the lease.

Should the administering authority for the EP Act approve ERA 14, I have imposed a further condition (Appendix 1) requiring the proponent to develop a PSGHG Plan for my approval that details how the proponent will minimise, monitor and manage GHG emissions of the power station.

The merits of constructing a new coal-fired power station will be considered by the administering authority for the EP Act once sufficient information is provided for the ERA 14 application as part of the EA. I am satisfied that my imposed conditions require

the proponent to provide information to make an appropriate determination of that application and, if appropriate, for the authority to develop conditions of approval for the EA, should it be found the proposal may proceed.

Waste impacts from the power station

Assessment methodology

The EIS identified that the proposed power station would generate dry waste material in the form of fly ash, bottom ash and clinker. These dry waste materials would be transported to the PSWSF by truck. In terms of the liquid waste stream from the power station, the EIS states that the power station would be air-cooled and would be designed to be a zero-discharge liquid waste plant. The EIS also presented a geochemical characterisation of power station waste material. I am satisfied that the solid and liquid waste streams generated by the power station have been appropriately described.

Impacts and mitigation measures

The potential waste impacts of the proposed power station were described in the EIS and are fully evaluated in section 5.5—Waste of this report. Waste material produced by the power station was considered as mining waste in the EIS.

The EIS estimates that over the life of the project, 16.4 Mm³ of power station waste would be generated. In the first 10 years of the project this waste would be stored in the PSWSF. Once the PSWSF reaches capacity, waste from the power station would be placed within the open-cut mine overburden emplacement areas.

The EIS describes the geochemical assessment undertaken for the power station waste materials. The geochemical assessment concluded that the tailings and power station waste material are likely to be non-acid forming. The EIS concludes that these wastes are therefore unlikely to present any environmental issues for on-site or downstream water quality.

The EIS states that quarterly monitoring of surface run-off and seepage from the TSF and PSWSF will be undertaken to ensure key water quality parameters for surface water and groundwater remain within relevant criteria for pH, electrical conductivity, TSS and a range of dissolved trace metals/metalloids and major ions.

In order to validate the sampling and geochemical assessment undertaken for the EIS and ensure ongoing monitoring of the potential impacts on mining waste, I have stated a condition for the draft EA requiring the proponent to develop a mineral waste management plan (MWMP) prior to commencement of mining activities. The MWMP must be subject to a third-party audit and provided to the administering authority for the EP Act once undertaken. The MWMP requirements are detailed in Appendix 2, and include a program of progressive sampling to predict the quality of run-off and seepage, classifying waste rock zones, placement and use on the basis of sampling results and monitoring and management measures.

I have also stated a condition for the draft EA requiring a mining waste and rejects management plan (MWRMP) (Appendix 2) which is applicable to disposal and

rehabilitation activities. The MWRMP would ensure disposal and rehabilitation is carried out in a way that minimises the potential impacts of waste rock, spoil and rejects disposal, including salinity, acidity and alkalinity in run-off and seepage, on surface water or groundwater quality. The MWRMP must include a disposal plan demonstrating how potentially acid-forming waste rock, spoil and rejects will be selectively placed or encapsulated back in the open-cut pits or overburden emplacement areas to minimise generation of acid mine drainage.

I am satisfied the MWMP and MWRMP would ensure potential impacts of mining waste can be appropriately identified, mitigated and managed.

Submissions on the draft EIS raised concerns regarding the potential environmental, human and land use impacts from the power station fly ash wastes, which contain radioactive contaminants and heavy metals. I requested further information on this matter, and the AEIS states that screening of coal ash undertaken as part of the draft EIS established that there are low levels of radioactive elements present in the coal because the elements were below the laboratory limit of recording. The AEIS considered that, as the screening levels are low, it is not necessary to undertake a detailed radionuclide assessment for the coal ash samples. However, given the potential risks associated with radioactive contaminants and heavy metals I consider that further radioactivity assessment of coal ash waste is required.

Should the administering authority for the EP Act authorise the power station, I have imposed a condition in Appendix 1 requiring the proponent to undertake a detailed radionuclide assessment of coal ash waste prior to commencement of construction of the power station and PSWSF and submit it for approval. The radionuclide assessment report must address proposed mitigation, management and monitoring measures. As the power station waste is proposed to be stored in the overburden after Project Year 10, my condition also ensures waste would be fully contained should the radioactivity be considered too high by independent expert testing.

Coordinator-General's conclusion

I accept that the power station waste materials would be relatively benign in nature and can be managed by the conditions I have stated in Appendix 2. However, I have also imposed a condition (Appendix 1) requiring the proponent to undertake a detailed radionuclide assessment of fly ash waste at the commencement of power station operations. If radioactivity is too high for safe short and/or long-term storage, a radionuclide assessment report must detail how the coal ash waste would be contained. The report is to be approved by the administering authority for the EP Act prior to construction of the power station and the PSWSF.

I also require continued monitoring of radioactivity of PSWSF run-off and seepage and prepare reports for submission to DES two years following commencement of mining activities and then every five years. If any impacts to groundwater are detected through monitoring, the groundwater management and monitoring program required by my imposed condition, is required to outline the investigation measures and actions to be undertaken to prevent the impact from continuing, and any measures already undertaken to repair the impact.

I consider the proponent's proposed mitigation and monitoring measures, along with my stated draft EA conditions and imposed condition for fly ash waste assessment would satisfactorily reduce the risks associated with handling and storage of mineral waste in the PSWSF to an acceptable level.

Additionally, I have stated draft EA conditions relating to regulated structures (Appendix 2) which would ensure that dams and levees are appropriately designed, constructed and operated to prevent failure and contaminated land (Appendix 2), and imposed conditions for surface water (Appendix 1) and groundwater (Appendix 1) which will ensure any potential impacts arising from power station waste such as soil, groundwater and surface water contamination are monitored, managed appropriately and reported.

Impacts on MNES from the power station

Groundwater

Assessment methodology

The EIS identified that the construction of the PSWSF has the potential to generate leachate and give rise to groundwater contamination. Potential impacts on groundwater are also specifically considered by the EIS as a component of the water resource controlling provision (24D and E) under the EPBC Act.

The EIS characterises potential leachate from the PSWSF and presents mitigation strategies to ensure that potential groundwater impacts are minimised, including designing the facility to minimise risk of leachate seepage. I am satisfied that the assessment approach taken in relation to groundwater impacts (including impacts to MNES) associated with the proposed power station and PSWSF is appropriate.

I have assessed these impacts and discussed them in section 6.3.2—MNES - groundwater of this report, including conditions I have stated for the draft EA to minimise and manage the impacts of the PSWSF on groundwater resources, and conditions I have imposed requiring groundwater monitoring and further information required to assess the EA application.

Impacts and mitigation

The primary risk to groundwater from the PSWSF relates to leachate seepage. The EIS stated that the PSWSF would be designed to prevent leachate seepage reaching groundwater, including installation of seepage collection systems to collect and contain any seepage. The proponent has made a commitment to monitor groundwater quality around the PSWSF to identify any leachate seepage. I require the proponent to prepare a groundwater management and monitoring program which sets out actions to be undertaken if groundwater seepage is detected. I have imposed a condition at Appendix 1 which requires the proponent to submit the groundwater management and monitoring program to the administering authority for the Water Act.

To ensure groundwater resources are protected, I have imposed a condition to require a groundwater monitoring and management program and I have stated a condition (Appendix 2) for the draft EA requiring a mineral waste management plan to be

developed. The plan would include a program of progressive sampling and characterisation of mine waste to predict the quality of any potential seepage generated including salinity and acidity. The plan would also need to demonstrate how potentially acid-forming waste rock, spoil and rejects would be selectively placed and/or contained to minimise the potential acidic liquids draining from the waste rock to groundwater and include sampling and monitoring plans.

I have also stated a condition (Appendix 2) for the draft EA requiring tailings disposal and management procedures to be set out within the plan of operations. The plan would need to include procedures for:

- containment of tailings
- the management of seepage and leachates both during and post operations
- a program of progressive sampling and characterisation to identify acid producing potential and metal concentrations of tailings
- maintaining records of relative locations of other waste stored within tailings
- a rehabilitation strategy
- monitoring of rehabilitation, research and/or trials to verify the requirements and methods for decommissioning and final rehabilitation of tailings.

My imposed and stated conditions will ensure that waste from the power station is appropriately managed to avoid groundwater impacts.

Coordinator-General's conclusion – groundwater impacts of the power station

I am satisfied that risks to groundwater quality associated with the proposed power station and PSWSF have been adequately addressed by the proposed leachate collection systems for waste facilities. My stated conditions requiring a mineral waste management plan and tailings disposal and management procedures would ensure that the risk of groundwater contamination associated with leachate from the PSWSF is effectively managed, should DES find the power station can proceed.

Surface water

Assessment methodology

The EIS considered potential surface water impacts associated with both the power station and the PSWSF including impacts of run-off, reduction in surface water catchment and water infrastructure requirements. Potential impacts on surface water are also specifically considered by the EIS as a component of the water resource controlling provision (24D and E) under the EPBC Act. The power station and PSWSF were identified on conceptual site drainage plans, final landform plans and in water management strategies.

I am satisfied that the EIS presents sufficient information regarding potential surface water impacts, including impacts on MNES associated with the proposed power station and PSWSF. I have assessed these impacts and discussed them in section 6.3.3— MNES – Surface water of this report, including conditions I have stated for the EA in

Appendix 2 to minimise and manage the impacts of the PSWSF on surface water resources.

Impacts and mitigation measures

Possible surface water impacts associated with the proposed power station include interruption of overland flow and run-off from stockpiles and the PSWSF.

The EIS states that run-off and seepage from the PSWSF would be stored in the TSF central decant water pond. A low water level would be maintained in the decant pond by pumping collected water to the Return Water Dam for storage and re-use in the CHPP.

One submitter raised concerns regarding drainage management off the top of the TSF and the PSWSF. Specifically, the submitter was concerned that insufficient information was provided in the EIS demonstrating how water shedding and run-off management from the TSF and PSWSF can be managed to prevent flow paths from developing that would cause erosion.

The proponent has revised the PSWSF landform so that it is integrated with the TSF final landform. To prevent the downslope movement of contaminated water from the TSF (which includes the PSWSF), I have stated a condition (Appendix 2) for the draft EA requiring the installation of a surface water and seepage collection system along the downstream toe of the TSF embankment to intercept any surface expression of seepage or leachate. I am satisfied that this approach will minimise the risk of surface water contamination due to run-off from the PSWSF.

Coordinator-General's conclusion

The primary concern relating to impacts on surface water associated with the proposed power station is the mobilisation of contaminated run-off from the PSWSF.

I have stated conditions for the draft EA to ensure tailings are managed to prevent the downslope movement of contaminated water. I have also stated conditions requiring the preparation of a TSF rehabilitation and monitoring strategy to ensure the methods for decommissioning and final rehabilitation include the prevention and management of acid mine drainage, erosion minimisation and establishment of vegetation cover. I am satisfied that impacts on surface water, resulting from the construction and operation of the proposed power station, can be avoided or appropriately mitigated and managed.

Threatened species and communities

Assessment methodology

The EIS considered the potential impacts of the proposed power station and PSWSF on threatened species and communities, and migratory species listed under the EPBC Act. I am satisfied that potential impacts on these matters have been appropriately described in the EIS and that my imposed and stated conditions, and recommendations are sufficient to ensure that significant residual impacts on these species and communities as a result of the construction and operation of the power

station and PSWSF are identified and offset. A full evaluation of impacts on MNES is provided in section 6.3.2—MNES – threatened species and communities of this report.

Impacts and mitigation measures

In relation to listed threatened species and communities, and migratory species, impacts are primarily associated with the physical footprint of the infrastructure.

The yakka skink is the MNES with potentially the greatest area of habitat on the project site, at 11,112 ha. The proposed power station contributes a total of 19 ha, or approximately 0.2 per cent of the overall area of approximately 11,000 ha of potential yakka skink habitat to be cleared for the project, while the PSWSF would require 80 ha of vegetation clearing, or approximately 0.7 per cent of the overall area of the overall area of yakka skink habitat which would be cleared for the project. In combination, the proposed power station and PSWSF contribute 0.9 per cent of the maximum extent of clearing of MNES habitat required for the project.

I note the proponent's commitment to prepare a Biodiversity Offset Strategy in accordance with Commonwealth and state government legislation, guidelines and policies and provide for offset areas in respect of the areas proposed to be disturbed by the project. I have made a recommendation to the Commonwealth Minister for the Environment to include in any approval a requirement for biodiversity offsets to be provided for all significant residual impacts, including impacts associated with the construction of the proposed power station and PSWSF.

I accept the proponent's commitment to undertake surveys to identify any MNES which may not have been identified during the EIS process. I have recommended to the Commonwealth Minister for the Environment that, prior to the clearing of vegetation on the site of the proposed power station and PSWSF, the approval holder must undertake pre-clearance surveys in the disturbed areas to identify the presence and extent of any EPBC Act listed threatened species and their habitat (Appendix 3). Such surveys would cover the proposed power station and PSWSF and a report on the findings of the surveys would be required to be submitted to DEE within thirty days of completion of the surveys. The report must include details of mitigation and management measures and proposed offsets would be identified. Additional impact assessment and modification of the Biodiversity Offset Strategy may be required, and this process is outside the scope of my evaluation (section 6 – MNES) but would be dealt with under DEE's jurisdiction.

Coordinator-General's conclusion

The EIS included the proposed power station and PSWSF in the assessment of impacts on EPBC Act listed threatened species and communities, and migratory species. As such, conclusions reached, and commitments made in relation to significant residual impact and biodiversity offsets appropriately consider the 99 ha footprint of the proposed power station and PSWSF.

I have made a recommendation to the Commonwealth Minister for the Environment to require biodiversity offsets for the disturbance areas identified in the EIS, a biodiversity offset strategy and offset area management plans for EPBC Act listed threatened

species (Appendix 3). These strategies and plans would account for the habitat disturbance impacts associated with construction of the proposed power station and PSWSF.

Coordinator-General's conclusion—MNES impacts of the power station

The potential impacts of the proposed power station and PSWSF on MNES were described in the EIS and are evaluated in section 6—MNES of this report. Potential impacts on MNES associated with the power station and PSWSF include land clearing (and subsequent impacts on threatened species and communities, and migratory species), release of contaminated run-off to surface water and leaching of contaminants to groundwater.

In addition to my imposed and stated conditions, I have recommended conditions for the Commonwealth Minister for the Environment to avoid, minimise, mitigate and manage impacts and offset residual significant impacts to MNES, as relevant. I am satisfied that through the implementation of the proponent's commitments and my conditions and recommendations that impacts to MNES can be appropriately managed or offset.

Economic assessment

Economic modelling and impact assessment presented in the EIS did not include the full cost to the proponent of the fuel source for the on-site power station, including the payment of royalties for burning raw coal and coal rejects from the project's mine. The EIS also did not present the benefit to the state from the royalties paid to use this coal. The proponent's assessment was essentially that the coal could be burnt at no financial cost. As such, should the proponent receive approval for ERA 14 and operate a power station using reject coal, I expect the proponent to include these project costs when the economic modelling is re-done in the future as per the commitment in the EIS.

I expect the proponent to re-run the CGE modelling utilising the latest key economic, business, population, and project information. The report must include financial information in the modelling inputs about the cost to the proponent (royalty payments) for the fuel source for the on-site power station, that is the use of raw coal from the mine and coal rejects. I expect the proponent to consider this cost when undertaking the assessment of alternative power generation options (Appendix 1) for the project such as use of alternative fuel sources, power station generating units, connecting to the electricity grid and/or using renewable energy sources.

Power station impact assessment combined with other Galilee Basin projects

Methodology

The EIS included an assessment of impacts associated with the Moray Power Project (MPP) combined with the project, including the project's proposed power station. The MPP is located adjacent to the proposed CCM&RP site approximately 23 km to the south-east of the project site. This assessment focused on estimates of particulates as PM₁₀ and nitrogen dioxide (NO₂). Sufficient information was not provided in relation to the actual performance of the project's proposed power station generator units for me

to be satisfied that impacts are acceptable or can be conditioned appropriately. Furthermore, this assessment did not include a GHG emissions assessment combined with the MPP emissions.

Impacts and mitigation

The EIS predicts that combined NO₂ emissions from the project's proposed power station and the MPP would be below the maximum 1-hour average EPP (Air) objective of 250 µg/m³ at sensitive receivers. Combined predicted PM₁₀ concentrations were also predicted to be below the Air EPP objective at all receptors other than Dooyne Outstation (9.9 km east) and the proposed Carmichael Coal Mine Accommodation Village (27.7 km south-east).

The EIS states that combustion emissions from the power station, including NO₂, SO₂ and CO, and other air toxicants would be well below the relevant criteria at all sensitive receptors. However, the EIS also states that the final specifications of the power station have not been confirmed. Therefore, the proponent is required to provide information on the power station emissions profile once specifications have been confirmed to enable me to fully assess the potential air quality and GHG emission impacts of the power station. As a result, Appendix 2 does not contain stated conditions for the draft EA for the power station ERA 14 – Electricity generation.

I have imposed a condition (Appendix 1) requiring the proponent to provide additional information on the power station emissions to the administering authority for the EP Act to assess the power station air quality and GHG emission impacts. Information about the best practice performance of the power generating units must also be provided for consideration in the assessment. This information would also inform a revised cumulative impact assessment.

Coordinator General's conclusion – power station impact assessment

As the proponent has not provided sufficient information on power station emissions to enable an assessment in combination with other power stations proposed in the Galilee Basin, I have imposed a condition (Appendix 1) which requires that an updated air quality and GHG emissions assessment combined with other emissions data, be provided to the administering authority for the EP Act for approval prior to notification of the EA application.

5.12.2 Coordinator-General's conclusion – power supply

While the EIS considered impacts associated with all aspects of the proposed project, I do not have itemised information on the power station impacts to allow me to state conditions for the draft EA which would be required to construct and operate the proposed power station. Accordingly, I have not stated conditions for ERA 14 – Electricity generation in this report.

The disparity between the maximum power demand for the project (388 MW) and the proposed power station capacity (1,050 MW) as described in the EIS is of ongoing concern. The construction of a new coal-fired power station is generally inconsistent with the government's climate transition strategy and broader policy position relating to

renewable energy. Further information is required to allow the proposal to be fully assessed on its merits.

Additional information is required to allow the administering authority to consider the merits of the application and set conditions for releases from the power station, including an updated emissions profile, further information relating to water supply reliability and security and a comprehensive assessment of cost and viability of alternative power supply options.

I have imposed conditions at Appendix 1 to ensure that this information is provided by the proponent prior to public notification of the EA application. This will also provide opportunity for the public to comment on the information. The construction of the power station and PSWSF components of the project cannot proceed until the information has been provided and assessed, and conditions for ERA 14 – Electricity generation have been included in an EA for the project by the administering authority for the EP Act, as well as any other relevant approvals, including the EPBC Act approval and the grant of the mining lease approval.

For the purposes of MNES, I consider the EIS has addressed the potential impacts of the proposed power station and PSWSF on groundwater and surface water, listed threatened species and communities and listed migratory species under the EPBC Act. I am satisfied that my imposed, stated and recommended conditions are sufficient to ensure that significant residual impacts on MNES are identified, managed and offset as appropriate.

6. Matters of National Environmental Significance

This section addresses the potential impacts of the China Stone Coal project (the project) on matters of national environmental significance (MNES) protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

On 1 October 2014 under section 68 of the EPBC Act, MacMines Austasia Pty Ltd (the proponent) referred the project, reference number EPBC 2014/7353 for consideration as a controlled action. On 30 October 2014 the Commonwealth Minister for the Environment determined the project was a controlled action under the EPBC Act for the following controlling provisions:

- A water resource, in relation to coal seam gas development and large coal mining development (section 24D)
- Listed threatened species and communities (sections 18 and 18A)
- Listed migratory species (sections 20 and 20A).

On 14 May 2015 a correction notice was given under the EPBC Act to provide that section 24E applies to the project in addition to section 24D.

The EIS process has been assessed by an accredited assessment process. The project was not assessed under the bilateral agreement. The Commonwealth Minister for the Environment will use the information in this section to make an informed decision under section 133 of the EPBC Act whether or not to approve the controlled action, and if approved, apply conditions to the approval necessary to manage the impacts on MNES.

The following subsections summarise the Queensland Government's assessment of the project against each of the above controlling provisions.

6.1 Project description

The EIS states the project involves the construction and operation of a greenfield, thermal coal mine and associated infrastructure on the mining lease.

Mining would target the A, B, C and D coal seams of the Galilee Basin producing, at peak, 38 million tonnes per annum (Mtpa) of product coal in the early years of the 50-year mine life. Coal would be washed and processed on-site and transported via rail for export at the Abbot Point Coal Terminal.

The proposed project involves nine key elements:

1. one open-cut mine
2. three underground mines
3. mine infrastructure areas and workshops
4. coal handling and preparation plant (CHPP), stockpile areas and coal conveyors
5. tailings storage facility and dams

6. rail loop and train-loading facilities
7. power station and associated power station waste storage facility
8. airstrip
9. accommodation village.

Approximately 11,000 ha of land would be cleared in stages for open-cut mining, mine infrastructure areas, a drainage infrastructure channel and the construction of remedial drains; 9,000 ha would be the subject of underground mining.

6.2 Project location

The project is located within the Galilee Basin. Six other projects approved by the Commonwealth Minister for the Environment are located within the Galilee Basin. The projects are Alpha Coal Mine and Rail, Galilee Coal and Rail, Kevin's Corner, South Galilee Coal, Carmichael Coal Mine and Rail (CCM&RP).

The project is proposed to be located at a 20,000 ha site ('the project area') in the central Galilee Basin, within mining lease application (MLA) areas held by the proponent (MLA 70514, MLA 70515, MLA 70516, MLA 70517 and MLA 70518) (Figure 2.1)

The project area is approximately 300 km west of Mackay and 190 km west of the regional centre of Moranbah, within the Isaac Regional Council area. Access to the project area is via 130 km of unsealed road from the Gregory Development Road. The nearest townships by road are Charters Towers (285 km to the north) and Clermont (260 km to the south-east).

6.3 A water resource, in relation to coal seam gas development and large coal mining development

6.3.1 Independent Expert Scientific Committee

The project proposes the taking of an action that is likely to have a significant impact on water resources. In accordance with section 131AB of the EPBC Act, advice was sought from the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC).

On 24 August 2015, I submitted to the IESC a joint request for advice with the then Commonwealth Department of the Environment (now Department of the Environment and Energy (DEE)) on water matters for the project. The IESC provided its advice on 9 October 2015.

Key issues and potential impacts raised by the IESC as part of its advice included:

- uncertainty with the hydrogeological conceptualisation and numerical groundwater modelling undertaken for the EIS
- drawdown of groundwater, reduced pressure and flow within the Great Artesian Basin (GAB) aquifers during operations and post-mining, and subsequent reduced

groundwater supply to the Doongmabulla Springs Complex (DSC) and groundwater bores

- subsidence impacts including enhancement of inter-aquifer connectivity and cracking of the bed of the Northern Seasonal Wetland
- hydrological and ecological impacts from mine water discharge
- cumulative impacts with the adjacent proposed CCM&RP.

This advice informed my decision about the scope of additional information required to complete my evaluation. I have responded to each of these matters in the following groundwater and surface water sections of this report.

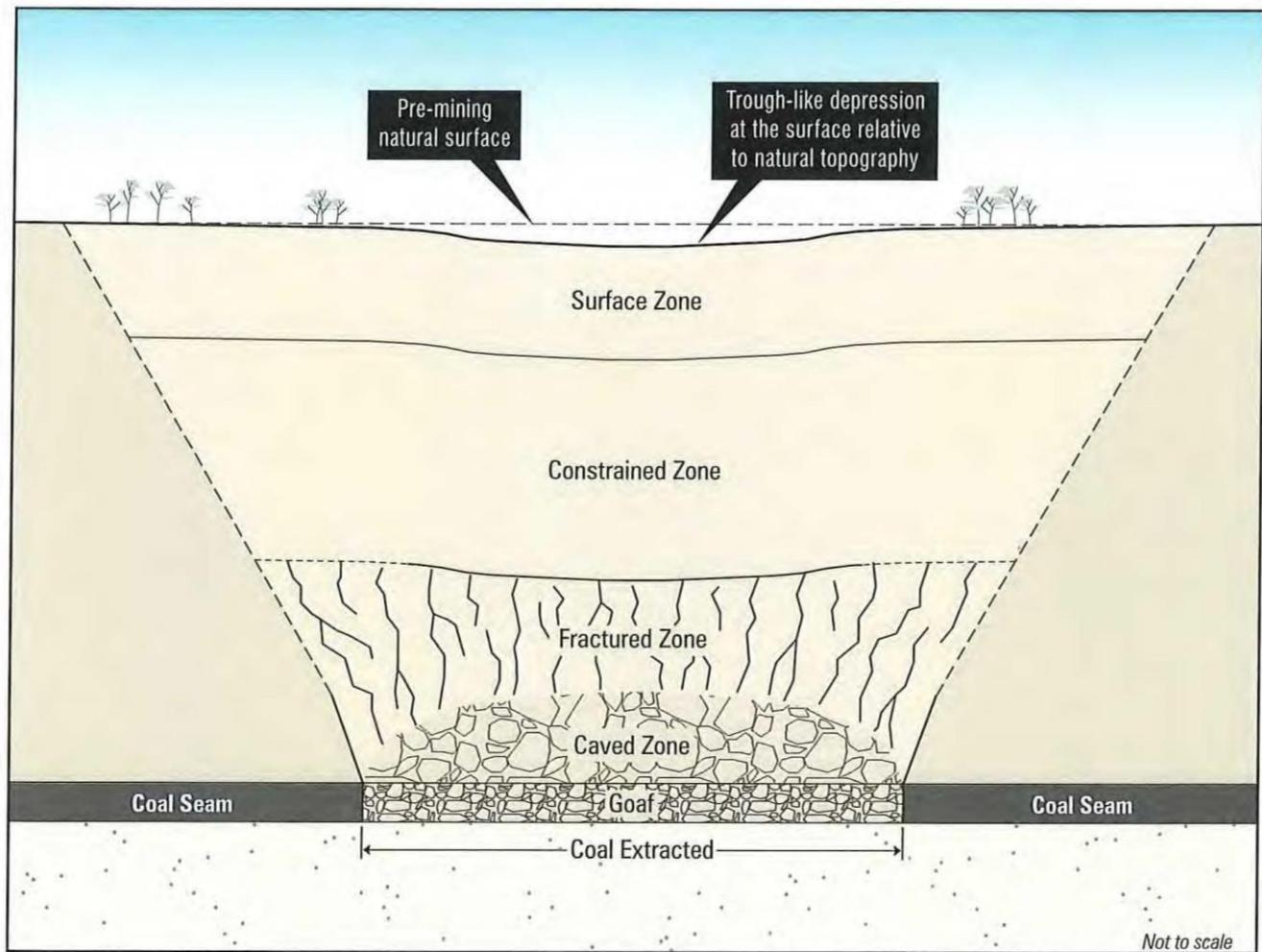
In addition to the IESC advice, I received technical advice from professional groundwater and surface water experts at the Department of Natural Resources, Mines and Energy (DNRME), Department of Environment and Science (DES) and DEE plus advice from an independent peer reviewer of the project's groundwater modelling. I also received submissions from the public during the public notification period for the draft environmental impact statement (EIS). My conclusions in this section are based on an analysis of the EIS technical reports, IESC advice, advice from Australian and Queensland state government agency experts, the independent peer review advice and key issues raised in public submissions.

6.3.2 Groundwater

The EIS found that open-cut and underground longwall mining operations would intersect groundwater, which would then seep into the open-cut mine pits (pits) and longwall panels. Removal of the groundwater (dewatering) would be required to allow safe working conditions to access the coal resource.

During mining, the mined areas would be actively dewatered by pumping the groundwater to a mine affected water dam on the project area. This dewatering by the project would create a hydraulic groundwater gradient and induce further groundwater flows toward the pits, which would in turn be dewatered.

The underground longwall operations would also result in the controlled collapse of the layers of sedimentary rock and soil (strata) overlying the space underground (goaf or voids) where the coal has been extracted. Subsidence cracking would spread upwards in the strata above the goaf until the tensile strength of the strata above is sufficient to support the overburden (see Figure 6.1). This change in strata could create a fracture network and change hydraulic conductivity (permeability) of the overlying geological units and increase connectivity between these units.



Plan based on MSEC Figure

PROJECT CHINA STONE



Subsidence Schematic

Figure 6.1 Subsidence schematic

Dewatering and subsidence cracking would create changes to the groundwater regime on the project area and in the surrounding area, including groundwater drawdown. The mining operations would reduce water pressure in surrounding geological units and create a zone of depressurisation (zone of drawdown). The drawdown is greatest at the working face where coal has been removed and gradually reduces with distance from mining, depending on a range of factors including the properties (for example, permeability) of geological units and the fracture network created by subsidence. The zone of depressurisation is defined in the EIS by a one metre lowering of the potentiometric groundwater surface (groundwater level), as one metre is within the likely natural range of groundwater level fluctuations.

Groundwater quality could also be impacted by seepage from the tailings storage facility, overburden emplacement areas, landfill and hydrocarbon and chemical storage areas and the proposed final (residual) open-cut mine pit lakes.

These changes to the groundwater regime could potentially impact users of groundwater including landowners with groundwater bores and groundwater dependent ecosystems (GDEs). The viability of bore water and GDEs is strongly affected by groundwater levels, pressure and quality.

Groundwater assessment documents

Key draft EIS documents evaluating the potential impacts of mining on groundwater quality, quantity and availability that were considered in the assessment of the project include:

- Chapter 12 Groundwater
- Appendix I Groundwater Report
- Chapter 6 Subsidence Report
- Chapter 8 Rehabilitation report
- Chapter 9 Terrestrial ecology
- Chapter 10 Aquatic ecology
- Chapter 11 Matters of National Environmental Significance
- Chapter 24 Environmental Management Plan.

The additional information to the draft EIS (AEIS), provided updated information about potential impacts. Key AEIS documents on groundwater that have been considered in this assessment include:

- Attachment D Additional Information on Groundwater
- response to IESC advice
- response to DNRME
- response to DES
- response to DEE.

Submissions received

Public submissions on the draft EIS and advisory agency submissions on the draft EIS and AEIS raised issues in relation to the project's potential impacts on groundwater, including:

- concerns with the groundwater modelling and assessment methodology for the project
- groundwater drawdown, depressurisation and reduced flow within the GAB and other regional aquifers and impacts to GDEs
- impacts on landowners who rely on groundwater bores for stock watering
- subsidence impacts on the groundwater regime
- groundwater contamination
- cumulative impacts with the proposed CCM&RP.

I have considered issues raised in submissions in my evaluation of the EIS, and how the information provided by the proponent addresses these issues.

EIS groundwater impact assessment methodology

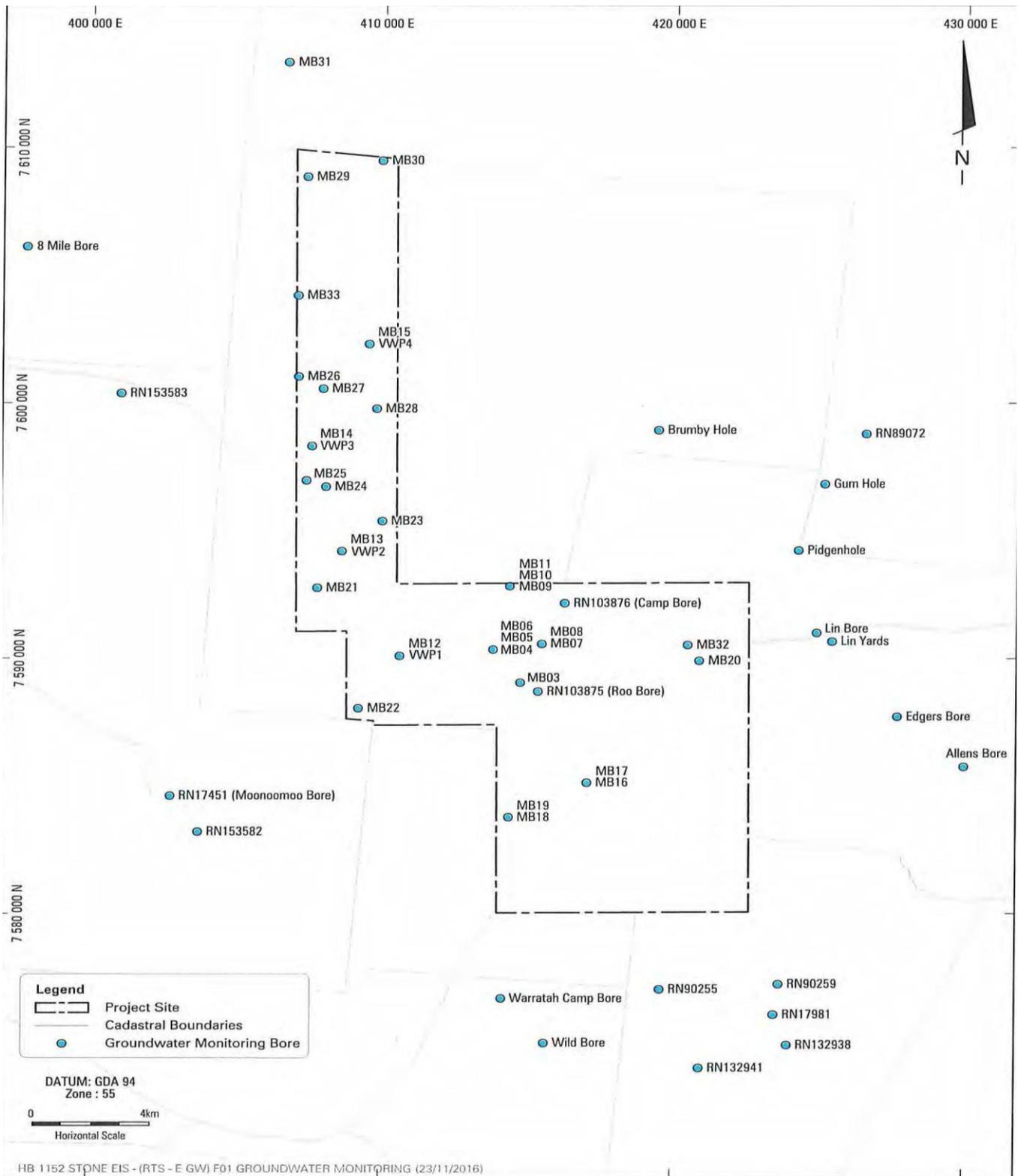
The methodology for the groundwater impact assessment for the EIS included development of a conceptual groundwater model and a three-dimensional (3D) groundwater numerical model. The model boundary extends 75 km from west to east and 85 km from north to south (6,375 km²), which was determined to cover sufficient area to capture the full extent of any potential impacts on the groundwater regime. The model area includes the proposed CCM&RP, the Carmichael River and nationally important DSC and Lake Buchanan.

Groundwater modelling was primarily used to understand the hydrogeological setting and assess groundwater impacts (including cumulative impacts with the proposed CCM&RP) during operations and 200 years post-mining, and to develop mitigation and management measures and a monitoring plan.

Conceptual model

Geological and hydrogeological data from existing groundwater bores on and around the project area was reviewed for the draft EIS to develop an understanding of the hydrogeological setting and to develop the groundwater conceptual model. Between 2011 and 2014, the proponent also installed 31 dedicated monitoring bores and 11 vibrating wire piezometers (VWPs) within the project area, and one VWP to the north of the project area. The monitoring bore locations are shown on Figure 6.2.

A bore census was conducted for the draft EIS to identify bores potentially impacted by the project's mine dewatering and inform the conceptual model. The bore census was conducted within a radius of 20 km beyond the project area boundary in areas that had the potential to be impacted as shown in project modelling. The 20 km radius includes the maximum zone of predicted depressurisation during and post-mining, including sensitivity analyses as shown on maps provided in the AEIS. Figure 6.3 shows the groundwater users within 20 km of the project area.



PROJECT CHINA STONE



Groundwater Monitoring Program

Figure 6.2 Monitoring bore locations

Subsequent to the draft EIS, the proponent collected an additional 23 months of groundwater level data from the monitoring bore data loggers and presented the data in the AEIS to support the groundwater conceptualisation. The conceptual groundwater regime and hydrogeological cross sections can be seen on Figure 6.4.

Geology and hydrogeology

The EIS describes the geology within the model boundary as broadly comprising the following stratigraphy, which can also be seen in Figure 6.5, Figure 6.6 and Figure 6.7:

- Quaternary sediments and Tertiary sediments
- Jurassic sediments of the Ronlow Beds
- Triassic sediments of the Moolayember Formation, Clematis Sandstone and Rewan Formation
- Permian Betts Creek Beds including the targeted coal seams
- Carboniferous Joe Joe Group.

The key features of the stratigraphy, as described in the EIS, is summarised as follows:

QUATERNARY SEDIMENTS

The Quaternary sediments are localised to present day drainage features and limited to patches of mud and gravel less than one metre thick. Extensive, deep alluvium and associated shallow groundwater are reported as being largely absent from the project area and surrounding area.

TERTIARY SEDIMENTS

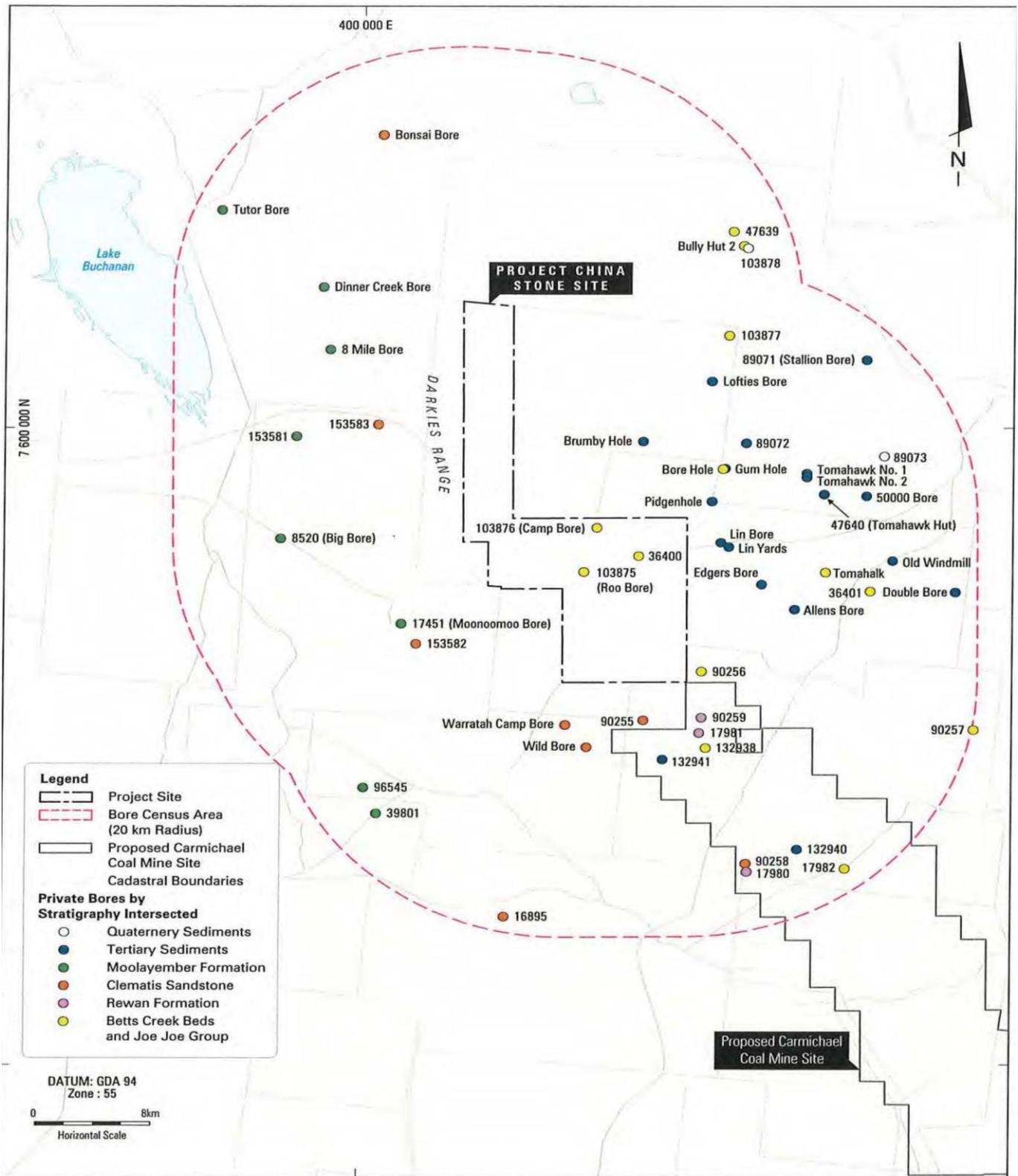
The Tertiary sediments comprise fine to coarse-grained sandstone and siltstone with claystone. The Tertiary sediments cover much of the low-lying areas either side of Darkies Range and vary in thickness within the project area from zero to 60 m.

A water table forms within the Tertiary sediments in the south-east of the project area with the hydraulic gradient being to the east, reflecting the regional topography and surface water catchment. Within the project area the water table is approximately 25 m to 55 m below ground level and is reported as being disconnected from local surface water features. Groundwater from this unit is recharged primarily where topography transitions from sloping ridges to flatter plains and is likely to discharge to the Belyando River.

A total of 18 landowner bores target groundwater within the Tertiary sediments within 20 km of the site and yield fresh to slightly brackish water suitable for stock watering.

RONLOW BEDS

The Ronlow Beds is a regional aquifer which outcrops approximately 26 km west of the project area. Given the distance from the site, and negligible predicted project impacts to this formation, the EIS does not contain information about the geology and hydrogeology of the Ronlow Beds.

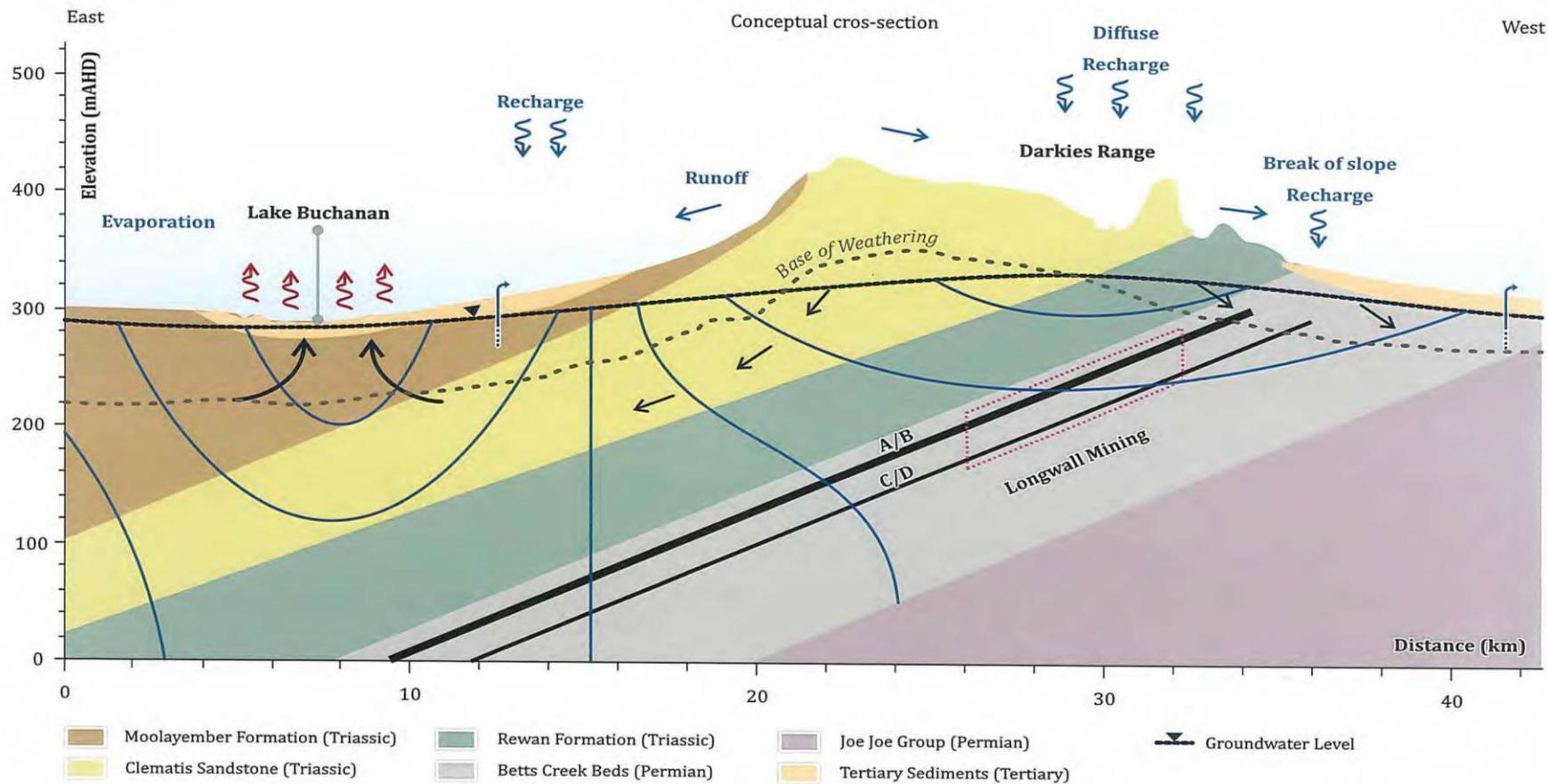


PROJECT CHINA STONE



Groundwater Users

Figure 6.3 Groundwater users



Conceptual groundwater regime

Figure 25

Project China Stone (G1587)



Figure 6.4 Conceptual groundwater regime

MOOLAYEMBER FORMATION

The Moolayember Formation is a regional aquifer that sub-crops within 7 km to the west of the project area and is a low-permeability unit that confines the underlying Clematis Sandstone. Recharge to this unit is via run-off from Darkies Range and the overlying Tertiary sediments. Groundwater flow reflects topography toward the west and discharge is inferred to Lake Buchanan 20 km west of the project area. A total of eight landowner bores target groundwater from this unit and yield salty to slightly brackish water suitable for stock watering.

CLEMATIS SANDSTONE

The Clematis Sandstone is a massive sandstone unit and aquifer that outcrops as the western slopes of Darkies Range within the project area. The Clematis Sandstone overlies the Rewan Formation in the northern part of the project area but is mostly absent from the southern part of the project area, except for a small portion present in the south-west, as can be seen on Figure 6.5.

Within the northern underground mining area, there is a fault running roughly north-south within the Clematis Sandstone and underlying units. The EIS suggests the fault breaks the continuity of the permeable Clematis Sandstone and places this unit in direct contact with the low-permeability Rewan Formation. Groundwater effectively pools against the low-permeability unit and the fault forms a localised flow boundary. The fault therefore controls and retards local groundwater flows.

The Clematis Sandstone is generally dry and unsaturated within the project area. Where groundwater is present in the Clematis Sandstone it is at depths more than 100 m, however to the east of the fault, the Clematis Sandstone is conceptualised as locally saturated to a depth of approximately 50 m close to the fault, reducing in depth gradually to the east. The Clematis Sandstone is reported as dry on the western side of the fault.

The dry nature of the Clematis Sandstone within the vicinity of the project area is conceptualised as indicating low rates of recharge to this unit in the area. Groundwater flow is predominantly to the west and Lake Buchanan is conservatively inferred to be an indirect discharge zone for the Clematis Sandstone, via the Moolayember Formation and Tertiary sediments. A total of eight landowner bores target groundwater in the Clematis Sandstone within 20 km of the project area and yield fresh to slightly brackish water suitable for stock watering.

REWAN FORMATION

The Rewan Formation contains an interbedded sequence of siltstone, claystone and fine-grained sandstone and is a recognised regional aquitard that typically prevents significant inter-aquifer transmission of water. The Rewan Formation outcrops on the eastern margins of Darkies Range. Within the project area it overlies the Betts Creek Beds and confines the overlying Clematis Sandstone.

The formation is largely dry and unsaturated within the project area, however where groundwater is present it is approximately 100 m below ground level. Recharge rates to

this formation are low due to limited diffuse rainfall infiltrating Darkies Range and the low-permeability of the formation. Discharge rates are also low. Groundwater flow is a reflection of topography and surface water catchments (that is from elevated areas to lower-lying areas). A total of three landowner bores may intersect local fractures within the Rewan Formation and are expected to yield fresh to moderately saline water, however this is unconfirmed.

BETTS CREEK BEDS

The Betts Creek Beds is the main unit that would be directly dewatered during mining and is the northern correlative to the combined Bandanna Formation and Colinlea Sandstone that lie to the south. The unit is up to 180 m thick and comprises interbedded sandstone, mudstone, shale and coal. The Betts Creek Beds sub-crop to the east of the project area and are at depths ranging between 200 m and 450 m deep within the project area, dipping away to the west. Seven coal seams exist within the Betts Creek Beds named from A to G and the cumulative thickness of the coal seams is approximately 35 m. The coal seams are the primary water bearing strata within the unit.

Recharge occurs predominantly at the break of slope from Darkies Range although the recharge rate is very low, as are discharge rates. Darkies Range acts as a groundwater flow divide for this unit and groundwater flows west to Lake Buchanan and east to south-east following surface water catchments.

A total of 13 landowner bores within 20 km of the project area target the Betts Creek Beds and underlying Joe Joe Group, mostly in the shallower parts of the unit closer to the sub-crop. Groundwater quality is highly variable yielding fresh to brackish water suitable for stock watering.

JOE JOE GROUP

The Joe Joe Group underlies the Betts Creek Beds (at depths in excess of 450 m) and forms the base of the Galilee Basin. The Joe Joe Group sub-crops to the east of the project area. There is little interaction with overlying units and recharge and discharge mechanisms are expected to be the same as the Betts Creek Beds.

In summary, groundwater storage and movement occurs predominantly within the Clematis Sandstone, the Betts Creek Beds coal seams and the Tertiary sediments. Other units have low permeability and are confining units between these primary water bearing aquifers.

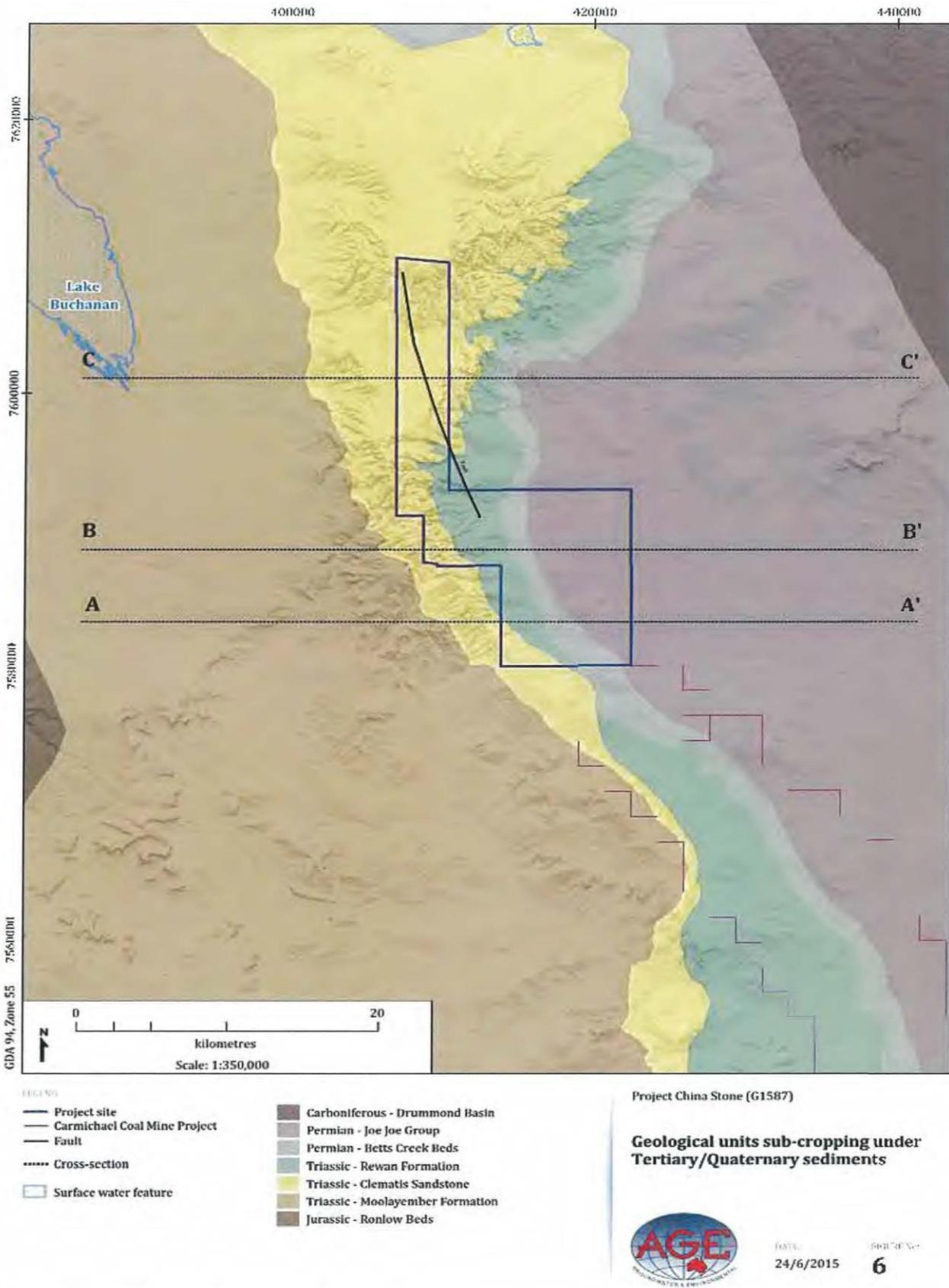
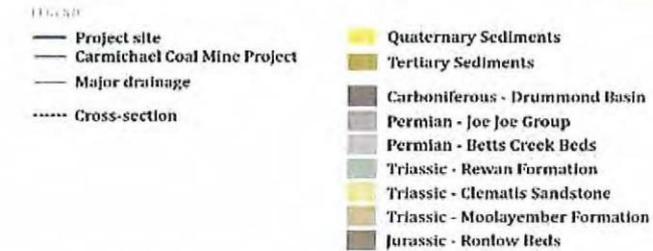
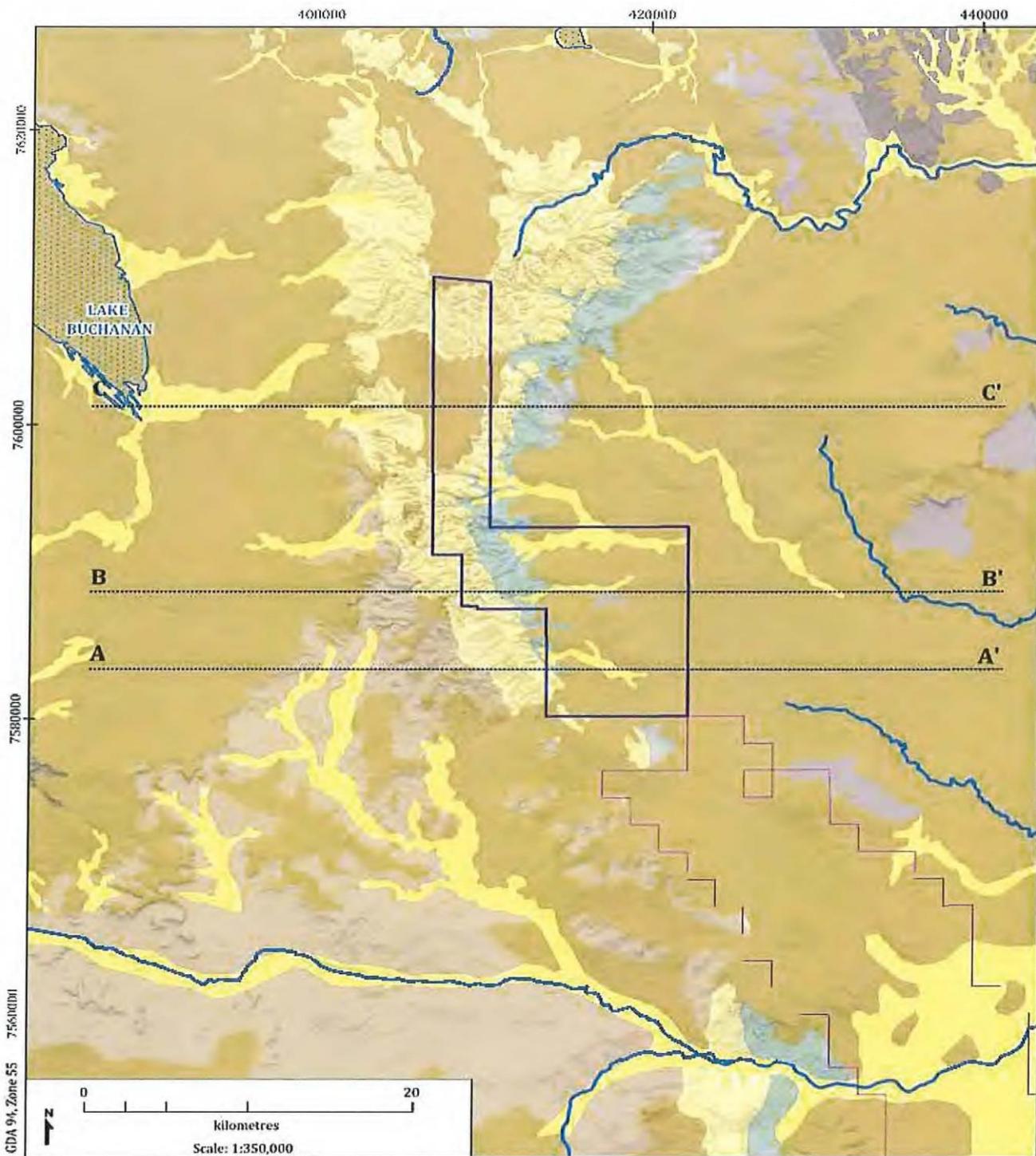


Figure 6.5 Surface geology



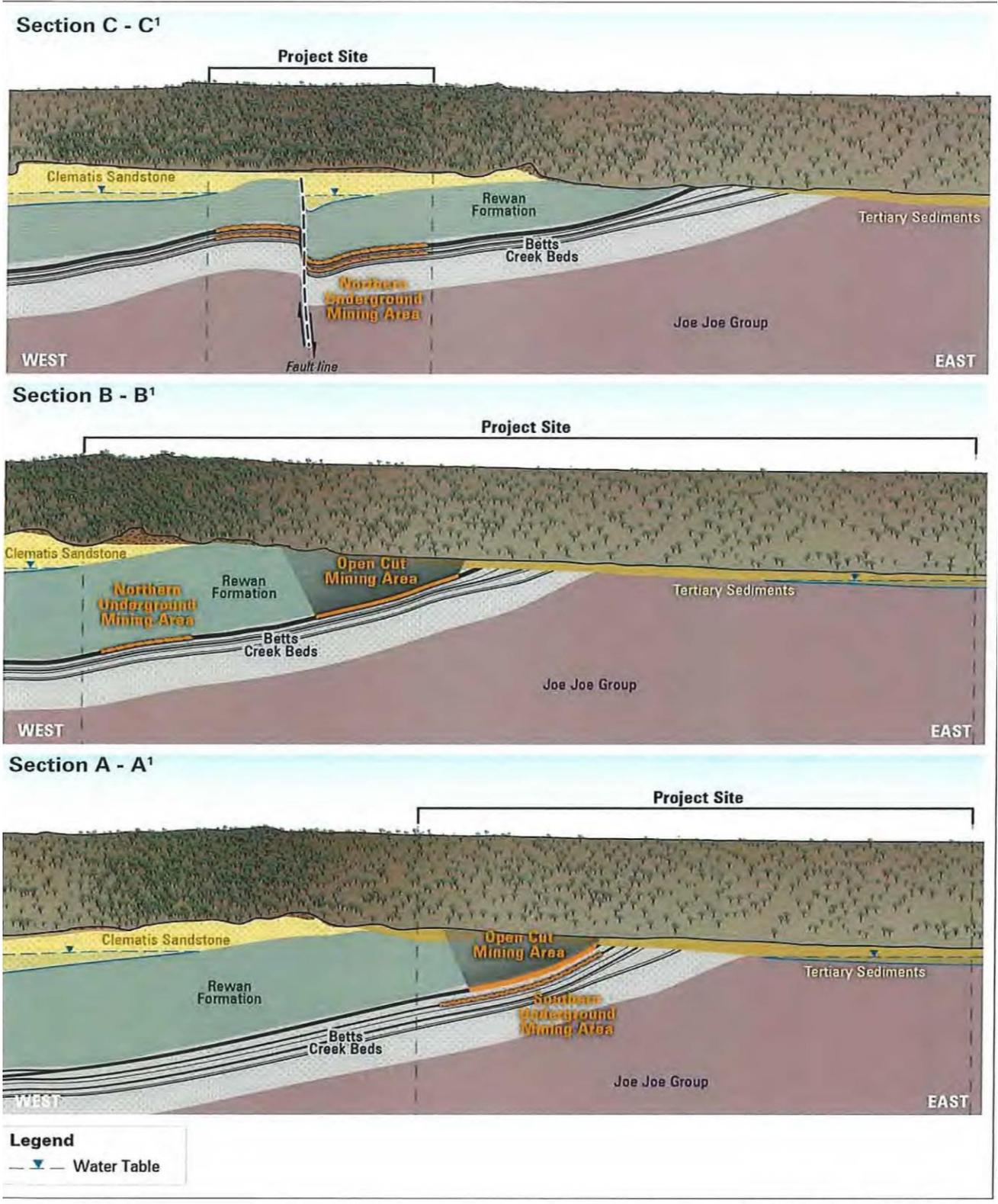
Project China Stone (G1587)

Surface geology



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Figure 6.6 Geological units sub-cropping under Tertiary/Quaternary sediments



PROJECT CHINA STONE



Hydrogeological Cross Sections of Project Site

Figure 6.7 Hydrogeological cross-sections

Groundwater numerical model

The conceptual model was used to develop the 3D groundwater numerical model (MODFLOW SURFACT). The purpose of the numerical model is to simulate the existing conditions of the groundwater regime and provide predictions of potential mining related impacts on groundwater resources, groundwater users and GDEs. Modelling was undertaken to simulate 200 years of groundwater recovery post-mining. Monitoring and mitigation measures were then developed based on the impacts predicted by the model.

Sensitivity analysis of the model was carried out to assess changes to the model outputs when input parameters were varied. Parameters were adjusted to address areas of uncertainty. The sensitivity analysis included (but was not limited to) changes in horizontal and vertical hydraulic conductivity, groundwater storage capacity of all units, recharge rates, and testing the influence of the fault on the predicted results.

The EIS states that the modelling represents worst-case scenarios for potential groundwater impacts because conservative parameters and values were used and that a robust sensitivity analysis was undertaken. However, the IESC advice, public submissions on the draft EIS and advisory agency submissions on the draft EIS and AEIS raised a range of concerns related to the groundwater modelling, including:

- concerns hydrological data is insufficient to support the underpinning conceptualisation and parameters of the groundwater model, and model predictions
- the EIS approach of reducing the horizontal hydraulic conductivity with depth in the coal seams has not been tested previously in the Galilee Basin and was not adequately documented or justified in the draft EIS. The approach has potentially underestimated groundwater drawdown to the west of the site.
- the model adopted low rates of recharge (between one to five orders of magnitude lower than those used in other studies in the Galilee Basin), which led to concern about possible underprediction of drawdown impacts on the GAB. However, an error was identified on a draft EIS figure and once amended, recharge rate increased.
- there is a lack of evidence on the characteristics of the fault and its potential influence on the groundwater regime.
- a steady-state calibration of the model was undertaken instead of a transient calibration, which has resulted in a low-level of confidence in the model. The draft EIS stated that transient calibration was not undertaken because water levels in monitoring bores did not significantly vary during the monitoring timeframe, which coincided with a drought period. (I received advice from DNRME that, at this stage of the project, a steady state calibration is acceptable and that regionally, there is limited change in water levels over time. However, the proposed monitoring network should be further developed to provide adequate data to enable transient calibration in future).
- a peer review of the model was not undertaken by the proponent for the draft EIS, which is a requirement of the IESC assessment guidelines.

In summary, there are a range of uncertainties about the model and concern that the model inputs resulted in underestimation of impacts.

As part of my request for additional information to the draft EIS, I requested a revised groundwater impact assessment to address key matters raised by IESC, DEE, state agencies and the public, including issues related to the groundwater model.

With respect to the modelling issues, the proponent responded to each submission in the AEIS by providing further justification and clarification about the model. Information in the AEIS relating to the groundwater modelling included:

- evidence that hundreds of exploration holes were utilised to determine fault position and characteristics. The remaining unresolved issue relates to the fault's potential influence on the groundwater regime
- figures to justify reducing the coal seams' hydraulic conductivity with depth
- figures showing sensitivity analysis of modelled depressurisation predictions in the Tertiary sediments, Clematis Sandstone and Betts Creek Beds, including sensitivity analysis of a more moderate reduction (supported by field data) of hydraulic conductivity values with depth in the coal seams
- a figure illustrating an example of the modelled factors applied to reflect the effects of subsidence on vertical hydraulic conductivity
- an updated figure rectifying the low-rates of recharge adopted in the draft EIS.

While the additional information satisfactorily addressed some IESC and agency comments, there are a number of unresolved issues related to the EIS modelling which I have addressed with conditions. These issues and conditions are discussed in the subsequent groundwater impacts sections of this report.

Groundwater model peer review

Given the range of uncertainties with the groundwater model and predicted impacts, I commissioned an independent peer review of the project's groundwater model by an experienced hydrogeologist and modeller, Hugh Middlemis of Hydrogeologic Pty Ltd. I targeted the review to questions developed in consultation with DNRME. The questions covered the key remaining areas of uncertainty with the groundwater modelling:

1. Is the conceptualisation of pre-mining groundwater flow directions determined by Australasian Groundwater and Environmental Consultants Pty Ltd (AGE), the proponent's groundwater modelling consultant, representative of the aquifer systems based on the information available to the proponent?
2. Is the extent of the reduction in horizontal hydraulic conductivity with depth in the coals seams that has been modelled for the project, justified and supported by local data? If the revised horizontal hydraulic conductivities in the coal seams (July 2017) are supported, should additional sensitivity analysis be carried out using these revised parameters as part of the base case scenario?
3. Are the modelled recharge rates within acceptable ranges based on the information and data available?
4. Has the fault in the northern underground mining area been modelled appropriately to represent the likely impacts on groundwater flow and mining-induced drawdown?

5. Is there sufficient evidence to support the concept that the open-cut mine pit remaining after mine closure will act as groundwater sinks (as the open-cut mine pit water balance modelling shows), rather than groundwater through-flow systems that may pose a risk to groundwater quality?
6. Is the groundwater model capable of predicting potential impacts, at an appropriate scale, to:
 - (a) Doongmabulla springs
 - (b) Lake Buchanan
 - (c) landholder bores?

The response to this question should consider the approach taken with regard to predicting cumulative impacts of the project and the adjacent Carmichael mine.

I requested that where appropriate, responses to questions provide recommendations to refine the model and enhance the level of confidence in its impact predictions.

The peer review report is included at Appendix 7 of this report. I have considered the peer reviewer's findings and recommendations in my evaluation of groundwater impacts in the subsequent parts of this section.

The key recommendation of the peer review was that a combination of realistic parameter settings should be applied to the base case model and then all sensitivity analyses should be re-run to properly evaluate the potential effects of the fundamental parameter changes.

Therefore, I have imposed a condition (Appendix 1), requiring that all necessary amendments to the model recommended by the peer reviewer and DNRME should be made and an updated groundwater assessment based on the updated model be submitted to the administering authority for approval. Updates to the monitoring and management strategies would also be required if the revised modelling predicts impacts different to those presented in the EIS.

I have also imposed a condition (Appendix 1) requiring that reviews of the model be undertaken within two years following issuance of the environmental authority (EA) and mining lease and every five years after that, taking into consideration additional monitoring data, and are to include a transient calibration. This would ensure ongoing review and validation of the model over time as data is obtained to continually refine impact predictions.

Groundwater monitoring program

The EIS includes a commitment that the groundwater monitoring program established as part of EIS groundwater investigations would be continued throughout the life of the project. The groundwater monitoring would confirm the actual extent of impacts and validate the model impact predictions. The IESC and agencies raised concerns about the adequacy and suitability of the existing baseline and proposed operations phase monitoring bore networks. Their concerns included the lack of groundwater quality data, insufficient coverage of geological formations and details about each proposed monitoring bore. An updated operations phase monitoring network plan was provided

in the AEIS to respond to these concerns (refer to Figure 6.2 – Monitoring bore locations).

The AEIS notes that 19 existing bores outside the mining lease area are proposed to be included in the operations phase monitoring network subject to landowner permission. I have concerns about the suitability of these bores as construction and strata details have not been provided. Landowner bores are not always constructed to be suitable for monitoring mining impacts. The only landowner bores that would be accepted for groundwater monitoring purposes are those that have been constructed by a water bore driller according to Queensland's bore construction standards, and these bores should be relatively new. Evidence that bores have been properly constructed and permission from landowners to use these bores for monitoring needs to be provided by the proponent. Information is also required to confirm how drawdown impacts from landowners pumping water from their bores would be identified in contrast to any drawdown impacts from mining operations.

I have imposed a condition (Appendix 1) requiring the proponent to prepare a Groundwater Management and Monitoring Program (GMMP), which is to contain amongst other matters, the additional construction and access details about the bores. The GMMP is required to be updated once mining and monitoring of impacts commences, with the updates timed to coincide with the groundwater model reviews. Over time the monitoring data should provide an increasingly accurate representation of the groundwater system and potential impacts and greater certainty in the outcomes of future reviews of the groundwater model. Adaptive management and monitoring measures can also be included in GMMP updates as required.

I require the proponent to provide additional monitoring bores in the Betts Creek Beds to the north, south and west of the project area to enable an accurate understanding of the mining impacts on this formation. This is particularly important given the number of mines in the Galilee Basin that propose to mine the coal seams in the Betts Creek Beds. The bore to the west should monitor multiple seams. My imposed condition (Appendix 1) to provide a baseline monitoring network program requires additional bores to monitor the Betts Creek Beds with bore locations to be determined in consultation with DNRME. These Betts Creek Beds bores are to be included in the ongoing GMMP.

Consistent with other Galilee Basin projects, the proponent must provide DNRME with its existing monitoring bore data to contribute to Queensland's monitoring bore database. I have imposed a condition (Appendix 1) requiring the proponent to provide the monitoring bore data within 60 days of publication of this evaluation report and at future intervals as requested by DNRME.

Due to remaining concerns with the monitoring network and the lack of background groundwater quality data, Appendix 2, Part 1, does not contain a full set of stated groundwater conditions for the draft EA. The administering authority (DES) would be required to develop further conditions for inclusion in the draft EA once the proponent provides the necessary groundwater quality data, a GMMP and analysis of the model revisions, as required by my imposed conditions. I have also imposed a condition (Appendix 1) for the proponent to provide a baseline monitoring network program to

DES for approval to ensure adequate baseline data is collected prior to the notification of the draft EA application, which would allow the public to comment. Mining activities that would impact on groundwater cannot commence until an EA is issued that contains a full set of groundwater conditions (in addition to other necessary approvals).

Coordinator-General's conclusion – groundwater impact assessment methodology

I consider that the EIS groundwater assessment provides an adequate prediction of the potential project impacts. I have imposed a set of conditions to improve the groundwater assessment methodology and provide more certainty of project impacts prior to the public notification of the EA application.

Groundwater systems are complex and the ability to model and comprehensively evaluate impacts to them requires sufficient spatial and time series data. Groundwater modelling is an iterative process which is improved by ongoing monitoring data and studies. Undertaking groundwater modelling prior to mining commencing can predict the groundwater impacts, however the true impacts can only be ascertained once mining commences. Therefore, I have imposed a condition (Appendix 1) which requires ongoing monitoring data to refine the groundwater numerical model, improve prediction of impacts and allow for implementation of adaptive management measures if required once mining commences.

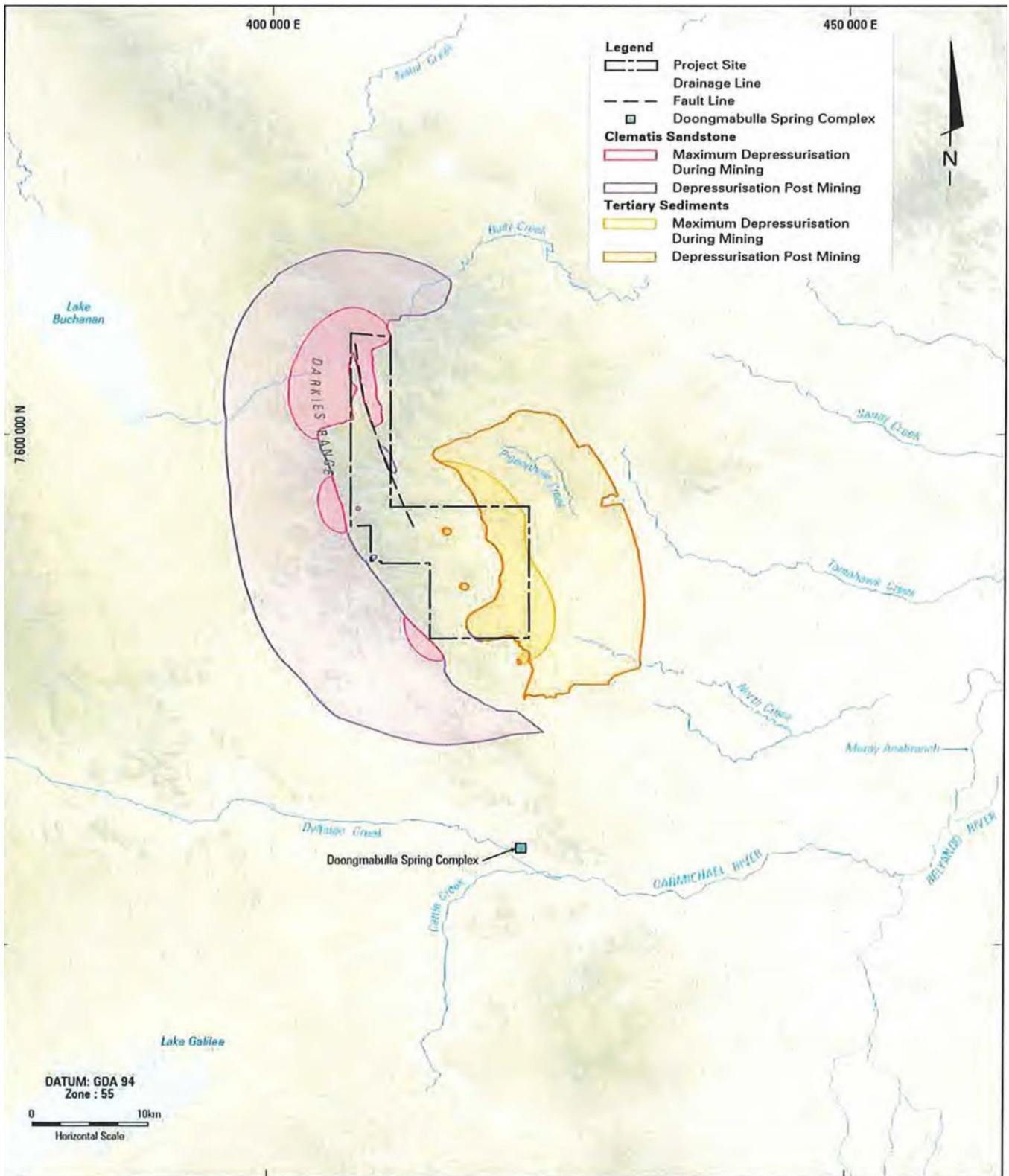
More conditions are discussed in the remaining parts of this section to further address potential impacts. I believe these conditions would address groundwater assessment issues raised by the IESC, government agencies and the public submissions.

Great Artesian Basin (GAB) and other regional aquifers

The EIS included an assessment of the project's predicted impacts on GAB aquifers, particularly the Clematis Sandstone, within and adjacent to the site. The Clematis Sandstone supplies water to eight landowner bores within 20 km of the project area and is the likely source of groundwater for the DSC.

The subsidence report predicts that in the northern underground mine area, the height of connective cracking would extend up to 180 m above coal seam A. At this height, the connective cracking would intersect the Clematis Sandstone and would potentially result in hydraulic connection between the underground mine and the overlying Clematis Sandstone. This connection could cause groundwater to flow into the underground mining area from the saturated part of the Clematis Sandstone on the eastern side of the fault and result in a lowering of the groundwater level by up to 33 m in this area.

Beyond the subsidence area, the depressurisation effects within the Clematis Sandstone diminish with distance. The extent of depressurisation in the Clematis Sandstone can be seen in Figure 6.8.



PROJECT CHINA STONE



Hansen Bailey
ENVIRONMENTAL CONSULTANTS

Depressurisation Extents

Figure 6.8 Depressurisation extents

In the southern mine area, the Clematis Sandstone would only be impacted indirectly by depressurisation in the Rewan Formation as it is exposed or fractured by mining, resulting in a pressure reduction through to the Clematis Sandstone.

The EIS stated that groundwater take from the GAB due to mine dewatering would gradually increase over the life of mining to approximately 4 ML/day (1,460 ML/year). A spike in water take to 9 ML/day (3,285 ML/year) would occur when fracturing from the northern underground mining area first intersects the saturated Clematis Sandstone after year 30. During mining, groundwater take and depressurisation from the project is not predicted to affect any landowner bores accessing the Clematis Sandstone.

Post-mining the long term take from the GAB would peak at 0.5 ML/day (183 ML/year) due to the open-cut pit and underground mines gradually filling with groundwater. Four landowner bores which target the Clematis Sandstone are predicted to be impacted in the post-mining phase.

The EIS stated the project is unlikely to result in a significant impact to GAB recharge as the recharge zone extends for several thousand kilometres and the project would occupy only a small portion of the recharge area and result in localised depressurisation. Therefore, no short or long-term loss of recharge to the GAB is predicted.

As previously mentioned, the peer review of the groundwater numerical model found there was uncertainty with the model predictions and that drawdown impacts could have been underestimated. Therefore, I have imposed a condition (Appendix 1), requiring the model to be reviewed based on a revised set of parameters which should improve the model predictions and provide more certainty about the predicted volume of groundwater take.

Legislative changes relating to the water licence requirements and Clematis Sandstone

When the draft EIS was submitted in 2015, the *Water Resources (Great Artesian Basin) Plan 2006* (GAB WRP) was in effect. The GAB WRP identified the Clematis Sandstone as a GAB aquifer and required the proponent to obtain a water licence for the take of water from the GAB via the Clematis Sandstone. A separate water licence was also required for groundwater take from the Betts Creek Beds and Joe Joe Group under the Greater Western Sub-Artesian Area.

In December 2016 section 334ZP of the *Mineral Resources Act 1989 Qld* (MR Act) commenced which provides holders of mining leases or mineral development leases with a statutory right to take 'associated water'; that is groundwater taken during the course of, or which results from the carrying out of an authorised activity for the mining lease. Examples include mine dewatering to achieve safe working conditions and the take of water related to groundwater evaporation from an open mine pit.

Transitional arrangements for section 334ZP in the MR Act provide that where a mining lease holder has started or completed their environmental assessment process but not yet obtained a water licence, they are required to hold an 'associated water licence' (AWL) under the *Water Act 2000* (Water Act) before they can take associated water.

This transitional arrangement applies to the project and therefore an AWL under the Water Act would be required.

In September 2017, DNRME released the *Water Plan (Great Artesian Basin and Other Regional Aquifers) 2017* (GABORA Water Plan) which replaced the GAB WRP. The amendments to the MR Act mean that the take of associated water is not regulated under the GABORA Water Plan; it is now regulated directly by the Water Act. The proponent would not be required to obtain water licences under the GABORA Water Plan or the Greater Western Subartesian area (as described in the EIS) as it is now required to obtain an AWL under the Water Act.

The GABORA Water Plan regulates both GAB and non-GAB aquifers. However, unlike the previous water plan, the GABORA Water Plan does not identify GAB or non-GAB aquifers and can no longer be used to help identify whether DNRME considers an aquifer to be a GAB aquifer or not. DNRME consider the appropriate point of reference for identifying the aquifers that constitute the GAB is now the GAB Atlas, published in 2015 by Geoscience Australia. The GAB atlas excludes the Clematis Sandstone (Galilee Basin/Triassic group) from the GAB.

The basis for the GAB Atlas was the Water Resource Assessment for the GAB of 2013 prepared by CSIRO (supported by GeoScience Australia) which did not treat the Clematis Sandstone as part of the GAB. Instead, the assessment report put forward a new consistent, basin-wide geological definition, based on stratigraphic age, which constrained the GAB to the Jurassic – Cretaceous sequence. The assessment report recognised the new definition had implications in Queensland where the Clematis Sandstone was included in the GAB WRP.

Although the Clematis Sandstone is no longer considered by DNRME to be a GAB aquifer, the Clematis Sandstone is still included in the GABORA Water Plan as an important regional aquifer as it provides water for landowner bores and is the likely source of groundwater for the DSC (see section 6.4.1—Threatened ecological communities of this report for discussion about the source aquifer for the DSC).

Notwithstanding the GeoScience Australia assessment that the Clematis Sandstone is a non-GAB aquifer, and DNRME's support of the assessment, the Commonwealth Government's listing for the DSC under the EPBC Act (sections 18 and 18A) as an endangered 'community of native species dependent on natural discharge of groundwater from the Great Artesian Basin' remains unchanged and is discussed in section 6.4.1 of this report.

The Ronlow Beds (also referred to as the Hutton Sandstone), located 26 km west of the project is now the closest aquifer to the project classed as a GAB aquifer by DNRME.

GAB impacts

Based on the current groundwater numerical model predictions (including sensitivity analysis) for the project, there would be no groundwater take from the GAB Ronlow Beds during mining. Post-mining there is predicted to be a small groundwater take from

the Ronlow Beds of 0.015 ML/day (5.4 ML/year) due to a reduction in flow from the Clematis Sandstone through the Moolayember Formation to the Ronlow Beds.

While there is a potential for the revised groundwater modelling to predict an increased take from the Ronlow Beds, based on advice from DNRME I consider the sensitivity analysis to be an appropriate test of the worst-case impact on the GAB.

The peer review of the groundwater model found that the EIS has a focus on 'take' during mining but did not quantify changes in groundwater outflows to the west of the model boundary toward the GAB. Changes to groundwater flows resulting from mining activities is a potential impact on the GAB that has not been explored in detail in the EIS. I have imposed a condition (Appendix 1) to require improvements to the analysis of model results to quantify and interpret changes in groundwater outflows to the west. The analysis is to be presented in the updated groundwater assessment report, which is to be prepared following revision of the groundwater numerical model.

Impacts on other regional aquifers

As noted, the Clematis Sandstone is still considered an important regional aquifer. Dewatering and depressurisation would also affect the Betts Creek Beds, Rewan Formation and Tertiary sediments on and around the site. These impacts would be enhanced by increased hydraulic conductivity of strata subject to subsidence cracking.

Operations phase impacts

The EIS states the Clematis Sandstone would be impacted in the northern underground mining area where subsidence cracking would result in a lowering of the groundwater level by up to 33 m in this area during mining. In the southern mining area, the Clematis Sandstone would not be directly impacted, but indirect impacts may occur as mining reduces groundwater pressure in the Rewan Formation.

In the northern underground mining area, mining would dewater the Betts Creek Beds and depressurisation would affect the overlying and underlying strata, including the Rewan Formation and Clematis Sandstone. The extent of depressurisation in the Betts Creek Beds and Rewan Formation is predicted to be limited to a radius of approximately 2 km and 4 km respectively from the underground mine during operations. The Tertiary sediments do not occur on Darkies Range in the northern underground mining area and therefore would not be affected by the northern underground mining area operations.

In the southern mining area, indirect impacts to the Clematis Sandstone would result in a lowering of groundwater levels up to 2 m and a depressurisation zone extending 2 km to the south-west from the project area during operations as can be seen on Figure 6.8. Depressurisation of the Tertiary sediments would occur within a radius of up to 5.5 km to the east and north of the open-cut mining area during operations. The extent of depressurisation in the Betts Creek Beds is predicted to be limited to a radius of approximately 2 km from the southern mine area.

Inflow rates to the northern underground mining area vary but are predicted to be up to 2 ML/day (730 ML/year) for the first 30 years then increase to 9 ML/day (1,460 ML/year) when connective cracking intercepts the Clematis Sandstone, and

then reduce to approximately 4 ML/day (1,460 ML/year) for the rest of mining operations.

Inflow volumes to the open-cut pits vary each year but are up to 12 ML/day (4,380 ML/year) over the 30 years of open-cut mining. Inflow to the southern underground C seam longwall mine is up to approximately 8 ML/day (2,920 ML/year) over the 13 years of C seam mining.

Total inflow for the project area varies each year depending on the stage of mining activities but is predicted to be up to approximately 16 ML/day (5,840 ML/year) for the first 30 years of mining and then reduce to 4 ML/day (1,460 ML/year) for the remainder of mining operations. Water take during mining can be seen in Figure 6.9.

In summary, the EIS indicates the following potential impacts during mining:

- Tertiary sediments – depressurisation up to 5.5 km east and north of the southern open-cut and underground mining area. The Tertiary sediments supply 18 bores within 20 km of the project area and potentially provide groundwater for GDEs on and near the site.
- Clematis Sandstone – groundwater levels predicted to reduce by up to 33 m in a limited zone constrained by the fault and by up to 2 m extending 2 km to the south-west from the project area. A depressurisation zone extends approximately 5 km to the west of the northern underground mining area. The Clematis Sandstone supplies 8 bores within 20 km of the project area and is the likely source aquifer for the DSC located to the south.
- Rewan Formation – depressurisation up to 4 km from the mining areas. A total of 3 bores intersect the Rewan Formation within 20 km of the project area.
- Betts Creek Beds – depressurisation up to 2 km of mining areas. A total of 13 bores intersect the Betts Creek Beds within 20 km of the site.

The EIS identified a maximum drawdown of between 0.01 m and 0.54 m at 17 private bores located off the project area during mining operations. The EIS states that this does not impact the operational water extraction from these bores. However, DNRME had concerns, supported by the peer reviewer, that the extent of drawdown (and therefore bore owner impact) may have been underestimated because of the way the relationship between horizontal hydraulic conductivity and depth in the coal seams has been modelled, and was not justified by local data.

The AEIS contained figures showing the results of an additional sensitivity analysis of the effects of increasing the hydraulic conductivity values in the coal seams with depth. DNRME found these revised parameters more acceptable but advised that the parameters should be applied to the base case model scenario and further sensitivity analysis carried out on the new base case.

Therefore, the conclusion about potential impacts would need to be reviewed again by DNRME once the revised groundwater numerical model is run (as required by my imposed condition (Appendix 1) in case the predicted number of bores or bore water level impacts change as a result of the updated modelling.

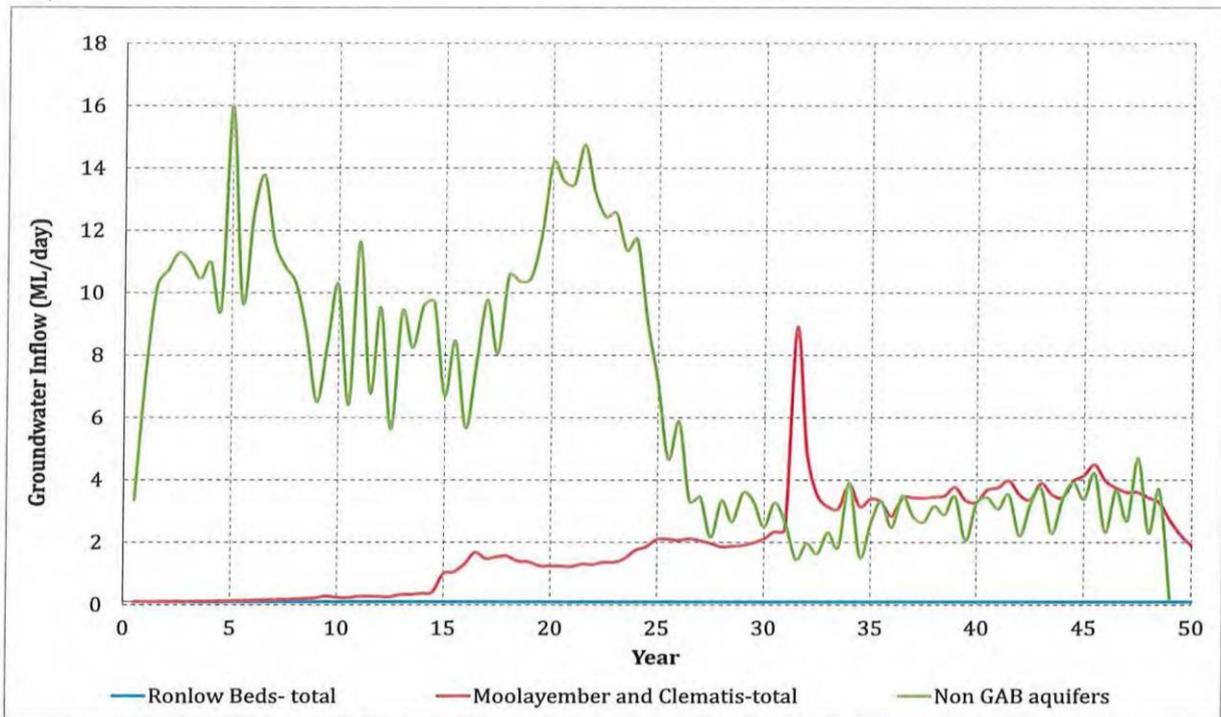


Figure 42 'Water take' – during mining

Figure 6.9 Water take – during mining

Impacts to landowner bores are further discussed in the Groundwater security for landowner bores in this section, including my recommendation (Appendix 4) to DNRME to ensure landowners are compensated via 'make good agreements' for any impacts from the project to their bores.

Post-mining impacts

The EIS states that the open-cut mine pits and underground mines would gradually fill with groundwater over time. This process would reduce the hydraulic gradient and magnitude of drawdown immediately surrounding the mined areas and cause the zone of depressurisation to expand as water from the surrounding groundwater systems flow into the mined areas.

Figures in the EIS indicate the following potential zones of depressurisation from the project area post-mining:

- Tertiary sediments – zone of depressurisation extends up to 11 km east, north and south
- Moolayember Formation – zone of depressurisation extends up to 11 km west and south-west
- Clematis Sandstone and Rewan Formation – zone of depressurisation extends up to 11 km south-west and north
- Betts Creek Beds – zone of depressurisation extends up to 6 km west and south of the southern underground mining area, and up to 10 km to the east of the northern underground mining area.

The EIS indicates these zones are likely to have been over-predicted because the model allows perfect hydraulic interconnection between geological units in the model, which does not represent the real-world heterogeneity of the geology.

Groundwater take is predicted to be approximately 5 ML/day (1,825 ML/year) following completion of mining as the open-cut mine pits and underground longwall panels fill with water. The take is predicted to reach an equilibrium of 0.5 ML/day (183 ML/year) once the pits and panels are full and the pits are subject to ongoing evaporation. Post-mining groundwater take is predicted to affect up to 19 landowner bores by year 200 post-mine closure; 5 of the bores were owned by Adani at the time of the bore census.

The independent peer review noted low confidence in the predictions of regional extent and magnitude of depressurisation post-mining primarily due to the modelling procedure used for the EIS. Further discussion about the pits is contained in the final open-cut mine pit section.

I have imposed a condition (Appendix 1) requiring revision of the groundwater model to include the revised parameters, including that of hydraulic conductivity in the coal seams with depth and aquifer storage in the base case model scenario and further sensitivity analysis carried out on the new base case. This would update the impact predictions and should increase confidence in the predictions of regional extent and magnitude of depressurisation.

Mitigation and monitoring measures for the GAB and other regional aquifers

The EIS did not include mitigation measures for impacts to the GAB or other aquifers. However, the EIS includes a commitment to consult with DNRME in relation to its obligations under the Water Act and comply with the relevant requirements for groundwater take. However, I am not satisfied with the proponent's approach to mitigating impacts on other regional aquifers. Therefore, I have recommended a condition to the Commonwealth Minister for the Environment (Appendix 3) for an offset to counterbalance the impacts on groundwater resources during mining and I have stated a condition (Appendix 2) to partially backfill the open-cut mine pits to reduce impacts post-mining. These two conditions are discussed in the following section.

I have also imposed a condition (Appendix 1) requiring ongoing monitoring to confirm the actual extent of groundwater impacts, to validate the model predictions and to confirm the bores that would be impacted by the project. For further discussion about impacted bores refer to the following Groundwater security for landowner bores section.

Offsets for impacts to groundwater

While the proponent would require an AWL for the take of associated water, I consider that an offset should be provided by the proponent to counterbalance the impacts on groundwater resources during mining from the take of associated water authorised. I have recommended a condition (Appendix 3) to the Commonwealth Minister for the Environment to require an appropriate groundwater offset that would return water to affected regional aquifers to minimise potential impacts of the mine dewatering. The final offset measure is to be determined through the preparation of an offset strategy in consultation with DEE and DNRME following further model updates and completion of other relevant studies.

Backfilling of final open-cut pit

To reduce the impact of the ongoing loss of groundwater by evaporation post-mining, I have stated a condition (Appendix 2) for the draft EA which requires that the open-cut pit is backfilled to a level above the pre-mining groundwater level. This would prevent formation of an air space below the pre-mining groundwater level that groundwater could flow into, therefore groundwater would not be lost to an ongoing cycle of evaporation. This would significantly reduce post-mining impacts to the groundwater regime, groundwater users and GDEs. For further discussion about backfilling the open-cut mine pit, refer to the Groundwater impacts in the final open-cut pit section.

Rewan Formation connectivity

The EIS states that a conservative approach to groundwater modelling has been adopted, including allowing for the potential of full fracturing of the Rewan Formation so that it would respond as a fractured sandstone aquifer not an aquitard. Understanding how the Rewan Formation would react to mining activities (including subsidence and fracturing) is important in terms of understanding potential groundwater impacts. For example, groundwater could drain from the Clematis Sandstone through the Rewan Formation via geological fault structures into the Betts Creek Beds.

The IESC had concerns about the modelled properties of the Rewan Formation (for example hydraulic conductivity values). The properties of the Rewan Formation within and adjacent to the project area, and how it would react to mining in terms of permitting groundwater transmission and flow rates and volumes of water, remain an area of uncertainty. Therefore, I have made a recommendation to the Commonwealth Minister for the Environment (Appendix 3) that the proponent must prepare a Rewan Formation Connectivity Research Plan to determine the type, extent and location of faulting and fracturing and examine the hydraulic properties of the Rewan Formation. This would better characterise the Rewan Formation and the contribution of fractures and faults to connectivity. This is a similar condition to that applied to other proposed coal mining projects in the Galilee Basin including the CCM&RP, South Galilee Coal project and the Kevin's Corner project.

Coordinator-General's conclusion – GAB and other regionally significant aquifer impacts

I am satisfied that the project is unlikely to have a significant impact on the GAB as the nearest GAB aquifer is considered to be the Ronlow Beds located 26 km to the west and the model predicts minimal impacts during the post-mining phase only. However, the project would result in lowering of groundwater levels and depressurisation impacts to other regional aquifers, including the Clematis Sandstone and Betts Creek Beds. I have made a recommendation to DNRME to ensure landowners are compensated for any impacts to their bores. I have made recommendations to the Commonwealth Minister for the Environment to ensure there are no impacts to GDEs, particularly the DSC and Lake Buchanan.

I have also made a recommendation to the Commonwealth Minister for the Environment to require an appropriate groundwater offset that would return water to regional aquifers to minimise potential impacts of the mine dewatering.

I have also imposed a set of conditions to revise and regularly update the groundwater model and monitor groundwater impacts throughout the life of the mine (Appendix 1). Adaptive management measures should be included in GMMP updates as required.

I consider these measures would address the IESC, public and agency comments related to GAB impacts and depressurisation and drawdown in other regional aquifers.

Final open-cut pit

The proponent does not propose to backfill the open-cut pit once mining ceases to bring it back to pre-mining ground level, due to the financial cost of moving the overburden soil material from the proposed overburden stockpile site into the mine pit. After rehabilitation has been completed, the proposed landform would include an unfilled open-cut pit of approximately 3,400 ha and two lakes with a total surface area of approximately 264 ha. The two lakes would be situated within the north and south of the open-cut pit area, as can be seen on Figure 6.10. The pit would have a depth of up to approximately 300 m in the deepest part of the pit. Section 5.1 of this report describes the proposed final landform, pit area management, mine closure plan and my assessment of other non-groundwater impacts of the mine pits in more detail.

The EIS states that dewatering operations would cease in the open-cut mining area after approximately year 30 of the 50-year project life, which would result in groundwater gradually seeping into the final open-cut mine pit and creating two permanent lakes. Modelling indicates that the lakes would reach a final equilibrium (average) level of approximately 255 m Australian Height Datum (AHD), which is 50 m below the proposed spill point elevation of approximately 305 m AHD at the top of the final open-cut mine pit. The lakes would be in an elongated shape trending in a north-south direction and approximately 4.8 km (the southern lake) and 2 km in length (northern lake).

Groundwater impacts

At 255 m AHD, the two lakes would stabilise below the pre-mining groundwater level, which is approximately 300 m AHD in the area of the lakes. Therefore, the hydraulic gradient would draw groundwater toward the lakes and the lakes would act as a groundwater discharge zone for the local groundwater regime. Water would continue to evaporate from the lakes over time, which means groundwater would continue to flow into the lakes in perpetuity.

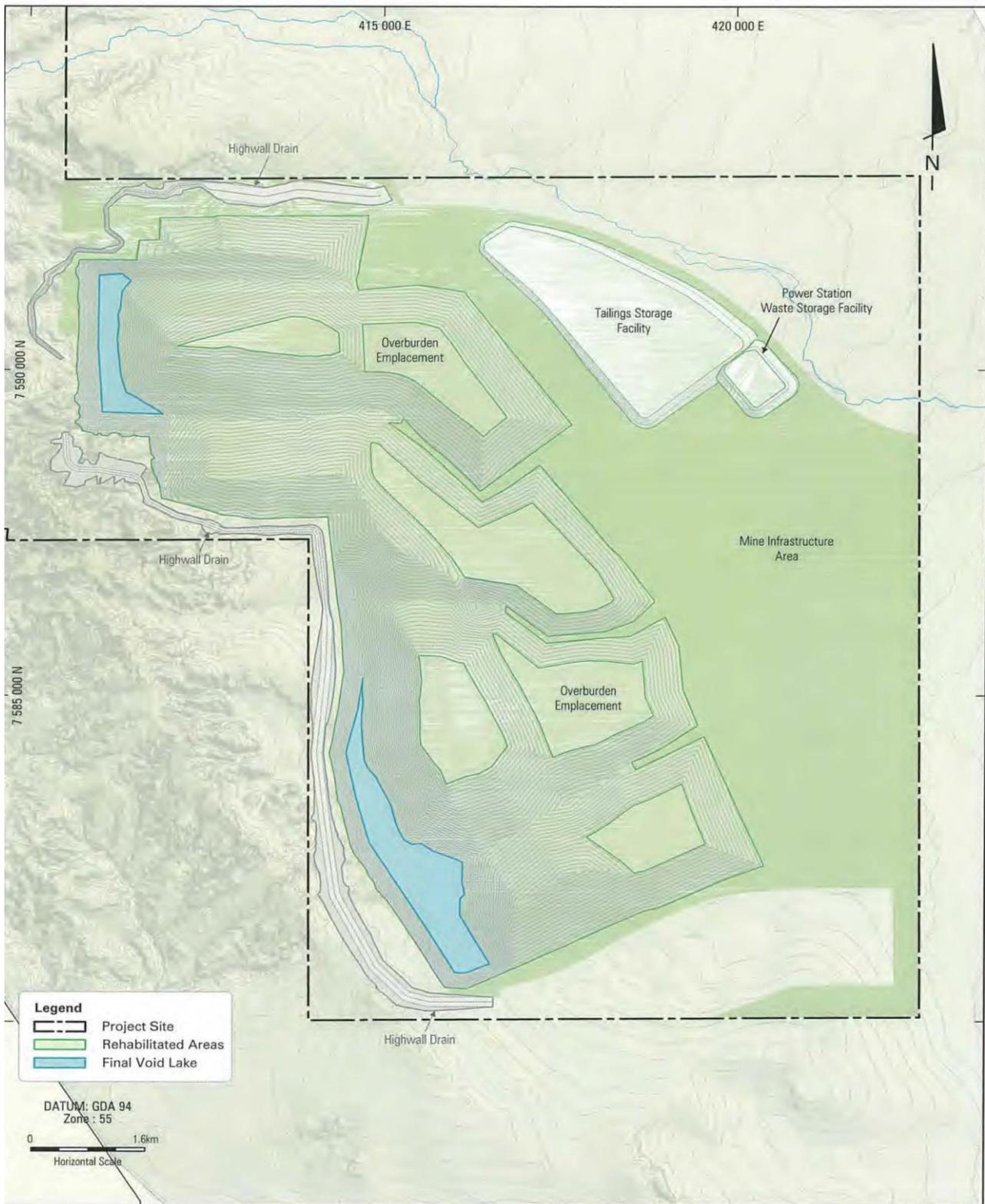
The model predicted that as the final mine pit gradually fills with water, the magnitude of drawdown surrounding the mined areas would reduce, but the zone of depressurisation would expand as water from surrounding groundwater systems flows into the mined areas. The water in the lakes would evaporate and lead to an ongoing loss of groundwater and a permanent reduction in the availability of groundwater to current and future users and GDEs.

Groundwater take is predicted to be approximately 5 ML/day (1,825 ML/year) following completion of mining as the lakes fill with water and the take is predicted to reach an equilibrium of 0.5 ML/day (183 ML/year) once the lakes are full and subject to ongoing evaporation. Post-mining groundwater take is predicted to affect up to 19 of the existing landowner bores after 200 years.

As noted, the independent peer review noted low confidence in the predictions of the regional extent and magnitude of depressurisation post-mining, therefore predicted impacts to landowner bores are uncertain.

Evaporation would also concentrate salts and other contaminants captured in the two lakes thereby increasing the water's salinity levels over time. The EIS concluded that increasing salinity would not impact the surrounding groundwater system post-mining because the lakes would remain groundwater sinks in perpetuity. Saline water would not leave the lakes meaning that groundwater quality of the surrounding groundwater regime would not be degraded.

The peer review noted concerns with the EIS conclusion that lake sinks do not pose a threat to groundwater quality. There is potential for these saline lakes to increase water density and cause density driven outflows to move away from the lakes, although this process could take hundreds of years.



PROJECT CHINA STONE



Open Cut Mine Layout - Final Landform

Figure 6.10 Open-cut mine layout – final landform

Proposed mitigation and monitoring measures

The EIS does not propose specific mitigation measures to limit the ongoing loss of groundwater due to the lakes or changes to groundwater quality due to increasing salinity levels in the lakes. However, proposed mitigation measures to limit other potential impacts from the open-cut mine pit are included in the EIS, including the contouring of the final landform and re-vegetating around the lakes, as discussed in section 5.1 and 6.3.3 of this report.

The peer review noted that significant reductions in impacts to groundwater could be achieved by backfilling the pit to the pre-mining groundwater level, which would minimise evaporation (and therefore ongoing loss of groundwater) and salinisation. The IESC and DES also had concerns about the impact of the final open-cut mine pit and recommended backfilling as an effective management option.

In order to prevent ongoing groundwater evaporation from the lakes it is necessary to backfill the pit to a level above the pre-mining water table so that groundwater would not flow in. The EIS states backfilling to a depth of approximately 300 m would be required to backfill above the pre-mining groundwater level.

The addendum to the AEIS states that there would be 3.7 billion cubic metres of out of pit material (including a 30% swell factor) that would need to be returned to the pits to backfill the open-cut mine pit to the extent necessary to prevent post-mining groundwater take. The proponent assumed that it would take 20 years after mining ceases to complete the backfill at a cost of \$10 billion (at today's money value) reducing profits and possibly making the project financially unviable to the proponent. Therefore, the proponent has not proposed to backfill the final open-cut mine pits.

I acknowledge there is a financial cost to backfill the pits. However, there are also economic benefits to the state and the community of backfilling. The land could be returned to cattle grazing or another land use, rather than a contaminates water body forming in a large open-cut mine pit that has no economic, social or environmental benefits and presents safety risks that require ongoing management and costs to the landholder or the state. The cost of backfilling the pits has not taken into account the savings associated with not having to maintain out-of-pit spoil dumps during the 20-year open-cut mine life and then stabilise and rehabilitate the out-of-pit spoil dumps after open-cut mining has been completed.

As the mine design is at a conceptual level at the EIS stage, I consider there is an opportunity for a mine redesign to find time and cost savings and enable backfilling and revegetation of the modelled open-cut mine pit after mining has been completed. For example, the overburden emplacement areas are located approximately 5 km from the mine pits and could be located closer to reduce the distance to truck the material back to the pits. It is noted that large Bowen Basin mines have a typical spoil haul distance of 1 km to 1.5 km from the pit floor to the overburden emplacement site. Further refinements to the mine plan, with progressing backfilling in mind from the outset of mining operations that minimise double-handling of spoil, could significantly reduce the cost of backfilling the pits.

Best practice mining recognises that rehabilitation, including backfilling, should be undertaken progressively. Therefore, more efficient mine planning would ensure that coal extraction and progressive backfilling and rehabilitation could occur together. Also, a comparison of the cost of backfilling with the profits over the life of the mine has not been provided to give context that the cost would make the project financially unviable to the proponent.

Given the impacts to landowner bores and uncertainties noted by the peer reviewer in terms of the extent of post-mining impacts, I have stated a condition (Appendix 2) for the draft EA to require partial backfilling of the final open-cut mine pit to a level above the pre-mining groundwater level.

As this would reduce the amount of groundwater take that was modelled for the EIS, the groundwater model would need to be revised to account for the backfilling in order to determine the predicted groundwater take post-mining.

The Final Landform Plan, Rehabilitation Management Plan and Mine Closure Plan to be prepared by the proponent would also need to account for backfilling of the pits.

I note that there is a possibility that a recess could still remain in the landform, as partial backfilling would not return the ground level to pre-mining levels. Therefore, I require an open-cut mine pit management plan to be prepared (Appendix 1) that would consider options for complete backfill and suitable post-mining land uses with an economic and environmental benefit. The GMMP also requires monitoring of the open-cut mine area final pit.

Coordinator-General's conclusion —groundwater impacts from the final open-cut mine pit

Given the potential for a permanent reduction in the availability of groundwater to current and future users and the environment, I have stated a condition for the draft EA to partially backfill the open-cut mine pit (also known as a final void) and imposed a condition for an open-cut mine pit management plan. I am satisfied these conditions would prevent the ongoing take of groundwater and address IESC and agency comments and public submissions regarding the open-cut mine pit.

Groundwater security for landowner bores

The primary land use surrounding the project area is cattle grazing. Cattle graziers rely on an adequate supply of groundwater to water their cattle. The EIS states that groundwater from landowner bores in the census area was used sporadically due to typically low yields but was primarily used for stock watering. Although groundwater use may be sporadic, bores are vital during drought periods when surface waters are dry. A reduction in availability of groundwater to bores could result in cattle stock losses and reduced business profitability.

A total of 52 landowner bores were identified during the bore census within a 20 km radius of the project, including three operational bores within the project area, as can be seen on Figure 6.3. The 20 km radius includes the maximum zone of predicted depressurisation during and post-mining, including sensitivity analyses as shown on

maps provided in the AEIS. Landowner bores outside the 20 km radius were not included in the assessment.

Impacts

Impacts of the project could include depressurisation in affected geological formations and drawdown of groundwater levels potentially leading to a reduction or loss of water supply to landholder bores.

As previously discussed, the EIS predicted a maximum drawdown of between 0.01 m and 0.54 m at 17 private bores located off the project area during mining operations, however the EIS states that this does not impact the operational water extraction from these bores. Post-mining groundwater drawdown impacts are predicted between 1.3 m and 7.2 m at 19 landholder bores located off the project area after a period of approximately 200 years (see Table 6, Appendix I of the EIS).

These predicted impacts may change once the model is revised as required by my imposed condition (Appendix 1), particularly to account for the required backfilling of the mine pits post-mining, which should significantly reduce post-mining impacts to landowner bores.

Three bores are also predicted to be impacted by the proposed CCM&RP at the same time as the project impacts are predicted to occur. Cumulative impacts are further discussed in section 6.3.4—Cumulative water impacts of this report.

Mitigation and monitoring measures

The EIS includes a commitment to mitigate the impacts to landowner bores within the project area through land access agreements with landowners and to comply with relevant requirements under the Water Act. Outside the project area, the proponent proposes to monitor bores during operations to identify any deviations from modelled predictions and to investigate any exceedances. However, I am not satisfied with this approach for bores outside the project area as make good agreements are required to be entered into prior to any predicted impact.

To ensure landowners are compensated for any mine dewatering impacts to bores, I have recommended that DNRME ensures that any AWL for the project contains 'make good obligations' that reflect the provisions in Chapter 3, Part 5 of the Water Act (Appendix 4). I note that Chapter 3, Part 5 of the Water Act does not apply to this project as the December 2016 transitional provisions of the MR Act apply. Therefore, the AWL would be required to contain the detailed make good obligations.

Make good obligations for bores are to include undertaking bore assessments on bores located in the affected area to establish whether the bore is likely to have an impaired capacity due to drawdown of groundwater or depressurisation caused by mine dewatering. Bore assessments must be undertaken by the resource tenure holder on all bores in the area predicted to be potentially affected prior to the take of associated water. I note the affected area of drawdown and depressurisation may change once the revised groundwater model is run, as per my imposed conditions, or updated with monitoring data once the project commences.

Following the bore assessments, the resource tenure holder would be required, as per the AWL, to enter into a make good agreement with the landowners of all bores likely to have an impaired capacity. A make good agreement is a legally binding agreement entered into by the resource tenure holder and a bore owner about the 'make good measures' to be undertaken by the resource tenure holder if the bore has an impaired capacity. Examples of possible make good measures include constructing a new bore or providing a supply of an equivalent amount of water of a suitable quality at no cost to the bore owner. Make good agreements bind the signatories to it and each of their successors and assigns, therefore the agreement stays with the land even if the landowner or resource tenure holder changes.

The make good obligations would also apply post-mining for any ongoing impacts of groundwater drawdown. The proponent would be required to prepare a report prior to mine closure to identify any bores that may become impacted post-mining and enter into make good agreements with any bore owners predicted to be affected by drawdown, that are not already party to a make good agreement.

To ensure all potential groundwater impacts are appropriately identified, mitigated and monitored, I have imposed a condition (Appendix 1) to require the preparation of a GMMP. The program must, amongst other objectives, include monitoring of landowner bores in the potentially affected area.

Coordinator-General's conclusion – groundwater security for landowner bores

Dewatering would result in drawdown impacts on groundwater bores affecting the availability of water for cattle or other stock watering. However, with the make good obligations that would be required by the AWL, based on Chapter 3 of the Water Act and my conditions requiring preparation of a GMMP and backfilling of the mine pits, I am satisfied impacts to current and future bore owners can be appropriately reduced and managed. I believe these recommendations and conditions would also address the IESC, public and agency concerns about impacts to landowner bores.

Groundwater quality

Existing groundwater quality at the project area was determined by sampling groundwater collected from each geological unit over two rounds of sampling from 21 monitoring bores between March 2013 and April 2014. Groundwater quality was reported as being highly variable with depth and location, ranging from fresh to brackish and generally suitable for stock watering, as described under the Geology and hydrogeology heading in this section of the report.

The EIS does not include a sufficiently detailed baseline assessment to accurately represent groundwater quality characteristics and variability and to identify future changes in groundwater quality caused by the project. In particular, the length of the baseline monitoring and the frequency of sampling were not sufficient. The EIS acknowledged this information gap and did not contain proposed groundwater quality limits for the draft EA. Two years of baseline monitoring is required to inform the groundwater quality limits which would be detailed in the draft EA.

Therefore, draft EA conditions for Schedule E – Groundwater to authorise limits of environmental harm to groundwater quality have not been included in Appendix 2, Part 1. I have imposed conditions (Appendix 1) requiring the proponent to provide a baseline groundwater monitoring program to DES along with proposed groundwater quality limits prior to notifying the application for an EA.

Mining activities that would impact on groundwater cannot commence until an EA for the project is issued by the administering authority that includes the required groundwater conditions, and all other relevant licenses, permits and approvals are granted by the Commonwealth and state agencies.

Impacts and mitigation measures

Degradation of groundwater quality from mining activities could reduce the groundwater's ecosystem values (flora, fauna, habitat) or human use values (for example drinking or stock watering). The key potential impacts to groundwater quality from the project include contamination from:

- leachate seepage from the TSF, PSWSF, land fill and raw coal stockpiles
- storage and handling of chemicals and hydrocarbons
- overburden emplacement areas and degraded water quality in lakes.

These potential impacts are discussed in more detail in the sections below.

Leachate seepage from the TSF, PSWSF, land fill and raw coal stockpiles

There is a risk that leachate could seep from the TSF, PSWSF, land fill and raw coal stockpile areas into the groundwater below these facilities and degrade groundwater quality so that it may no longer be viable for landowner use for stock watering and potentially cause harm to ecosystem values.

The TSF, PSWSF, land fill and raw coal stockpiles are underlain by Tertiary sediments. Geochemical testing indicated that any leachate from these facilities is likely to be of a similar quality to existing groundwater quality in the Tertiary sediments. Therefore, the EIS concluded that degradation of groundwater quality is unlikely to occur.

Furthermore, there was only one landholder bore (RN36400) in proximity to these facilities at the time of the bore census. This bore would be removed during construction of the TSF, so in the event of seepage reaching groundwater, there is minimal risk to the current groundwater users.

Proposed mitigation and monitoring measures - Leachate seepage

The EIS stated that the TSF, PSWSF, land fill and raw coal stockpile bases would be designed to prevent leachate seepage reaching groundwater, including installation of seepage collection systems to collect and contain any seepage. The EIS includes a commitment to monitor groundwater quality to identify any leachate seepage.

To ensure water resources are protected, I have stated a condition (Appendix 2) for the draft EA requiring a mineral waste management plan to be developed. The plan would include a program of progressive sampling and characterisation of mine waste to predict the quality of any potential seepage generated including salinity and acidity.

The plan would also need to demonstrate how potentially acid-forming waste rock, spoil and rejects would be selectively placed and/or contained to minimise the potential acidic liquids draining from the waste rock to groundwater and include sampling and monitoring plans.

I have also stated a condition (Appendix 2) for the draft EA requiring tailings disposal and management procedures to be set out within the plan of operations. The plan would need to include procedures for:

- containment of tailings
- the management of seepage and leachates both during and post operations
- a program of progressive sampling and characterisation to identify acid-producing potential and metal concentrations of tailings
- maintaining records of relative locations of other waste stored within tailings
- rehabilitation strategy
- monitoring of rehabilitation, research and/or trials to verify the requirements and methods for decommissioning and final rehabilitation of tailings.

My stated condition for the draft EA in Appendix 2 also requires a leachate collection system to collect leachate generated in the landfill.

Refer to section 5.5—Waste of this report for more information on mine waste.

The proposed groundwater monitoring network (refer Figure 6.2) includes bores near the proposed mine waste storage facilities and raw coal stockpiles. The IESC had concerns with the capacity of the proposed monitoring bores to monitor potential water quality issues associated with the mine waste facilities.

The operations phase GMMP that I require in imposed condition (Appendix 1) must include additional monitoring bores near these facilities for improved coverage, particularly in the south-east of the project area. This would monitor groundwater quality parameters for comparison with contaminant trigger values in underlying aquifers and identify potential seepage. If groundwater quality characteristics exceed any of the stated trigger limits, the proponent would need to investigate the potential for environmental harm in accordance with the EA.

Storage and handling of chemicals, hydrocarbons and other hazardous substances

The EIS outlines how chemicals, hydrocarbons and other hazardous substances would be transported, stored, handled and used on the project area to prevent health, safety and environmental risks, including contamination of groundwater.

Proposed mitigation and monitoring measures - Storage and handling of chemicals, hydrocarbons and other hazardous substances

The proponent has listed a range of commitments in the EIS to manage the storage and handling of chemicals, hydrocarbons and other hazardous substances in accordance with all relevant legislation, Australian standards and guidelines, which are designed to prevent environmental harm including contamination of groundwater.

To ensure this outcome, I have stated conditions for the draft EA (Appendix 2) requiring storage and handling of all chemicals and flammable or combustible liquids in accordance with current Australian standards. This includes storage in a suitable containment system and management procedures to prevent environmental harm, including preventing release of contaminants to groundwater.

Overburden emplacement areas and degraded water quality in final open-cut mine pits

The EIS stated there is a risk that leachate could seep through the out-of-pit overburden emplacement areas into the groundwater system. The proponent's geochemical testing indicated that any leachate from the overburden is likely to generate slightly alkaline, low-salinity leachate with low concentrations of soluble metals and major ions. The EIS concluded that the leachate is unlikely to be a significant risk to groundwater quality because the existing groundwater quality is slightly alkaline with low concentrations of soluble metals and major ions.

Overburden would initially be placed out-of-pit to the east of the open-cut area, and then progressively stored in-pit, beginning in approximately year 3 once the open-cut pits are developed. Water leaching through the overburden emplacement areas would migrate into the pits via groundwater.

As discussed in the 'Groundwater impacts from final open-cut mine pit' section, in the event the residual pits were not backfilled once the open-cut mining operations cease after year 30, the modelling indicated that water would flow into the pits, including from the final overburden emplacement areas. The residual pits and overburden emplacement areas can be seen on Figure 6.10.

The final level of the water within the pits would stabilise below the pre-mining water table. The modelling predicted the mine pit would act as a groundwater sink (that is water would remain in the pits and not migrate through the walls and back into the groundwater system). The EIS concluded and the peer review supported that water would continue to evaporate from the two proposed pit lakes and continue to draw in groundwater from the surrounding geological units. Evaporation would also concentrate salts and other contaminants in water captured in the two proposed pit lakes over time. The EIS concluded that increasing salinity would not impact the groundwater system post-mining because the pits would remain groundwater sinks in perpetuity.

Proposed mitigation and monitoring measures – overburden emplacement areas and degraded water quality in residual open-cut mine pits

While the EIS includes a commitment to undertake groundwater monitoring, no specific mitigation measures have been proposed by the proponent to manage groundwater quality in the two proposed pit lakes because the lakes were predicted to act as groundwater sinks. As discussed previously, I have stated a condition for the draft EA requiring the proponent to partially backfill to above the pre-mining groundwater level. This would prevent the ongoing loss of groundwater through the evaporative cycle and prevent the formation of a potentially highly saline body of water.

The GMMP required by my imposed condition (Appendix 1) includes a requirement that all potential groundwater quality impacts from overburden emplacement areas during mining are identified, mitigated and monitored.

Post-mining, the overburden would be moved back into the pit in order to partially backfill the mined space. Groundwater would gradually begin to flow into and through the overburden material. As discussed previously, the EIS concluded that the leachate from the overburden is unlikely to be a significant risk to groundwater quality because the existing groundwater quality has similar characteristics. However, I require monitoring of groundwater quality around the backfilled pits for a minimum period of 30 years post-mining or a shorter period if the site is proven to be geotechnically and geochemically stable and it can be demonstrated that any release of contaminants from the site will not result in environmental harm. This requirement is included in my GMMP condition.

Coordinator-General's conclusion - Groundwater quality

I am satisfied that risks to groundwater quality have been considered by the EIS with proposed leachate collection systems for waste facilities and handling of hazardous substances. Furthermore, the predicted leachate seepage has similar characteristics to existing groundwater quality in the Tertiary sediments, so if seepage were to occur, groundwater quality is unlikely to be impacted.

During mining, any exceedances of groundwater quality limits would be investigated in accordance with the EA. Post-mining groundwater quality impacts would be reduced due to my stated condition to backfill the final mine pit thereby preventing the formation of highly saline pit lakes.

However, the proponent has further baseline work to do before impacting on groundwater. Groundwater impacts would not be authorised in an EA until groundwater quality limits are identified following two years of monitoring (in addition to other matters identified in the report). My set of conditions aims to prevent impacts on groundwater quality and monitor for potential or actual impacts.

Groundwater dependent ecosystems

The potential for GDEs to occur in the study area was assessed for the draft EIS via a search of the Queensland Wetland Data Springs database, the Bureau of Meteorology's (BoM) GDE Atlas and targeted groundwater field investigations. The draft EIS stated that the DSC, 22 km south-west of the project area, and Lake Buchanan, 17 km west, are the only GDEs in proximity to the project area or within the predicted zone of depressurisation beyond the site. The modelling predicted that the project would not impact on the DSC or Lake Buchanan.

The IESC advice, government agency submissions, public submissions and the peer review raised concerns with the draft EIS findings, specifically:

- impacts to the DSC from the project and cumulative impacts with the CCM&RP have not been adequately assessed

- there is a lack of proposed monitoring to inform potential impacts to Lake Buchanan and Caukingburra Swamp (which lies to the north-east of Lake Buchanan)
- that the northern seasonal wetland could be a GDE, even though the proponent did not identify it as a GDE. Impacts to this wetland are uncertain. There may be interactions with the base of the wetland, the fault and underlying subsidence zone
- the possibility of other GDEs occurring within the project area and predicted zone of dewatering impacts has not been adequately assessed
- potential groundwater impacts (and other project impacts) to the Moray Downs West property need to be considered as the property is the approved offset site for protected flora and fauna species for the proposed CCM&RP.

Doongmabulla Springs Complex

My assessment of potential groundwater impacts to the DSC is located in section 6.4.1 of this report.

Lake Buchanan and Caukingburra Swamp

Lake Buchanan is located approximately 17 km from the western project area boundary and is listed on the Directory of Important Wetlands (refer Figure 6.8). The EIS refers to the lake as a groundwater discharge zone for the underlying Tertiary sediments, Clematis Sandstone and Moolayember Formation. Independent published studies and mapping provided in the AEIS confirm the lake is a regional discharge zone. The groundwater model included a hydraulic connection between the project area and the lake for impact prediction purposes.

Caukingburra Swamp is also listed in the Directory of Important Wetlands and is located within the same closed drainage depression as Lake Buchanan. The Queensland Government Wetland Mapping System reports the swamp is likely a closed alluvial system with fresh intermittent groundwater connectivity.

Impacts

The EIS concluded the project's predicted zone of depressurisation remains a minimum 6 km from Lake Buchanan and that lake levels are unlikely to be impacted by the project. The sensitivity analysis conducted for the AEIS reduced this distance to approximately 2.5 km during and post-mining, which is considered the worst-case scenario.

The peer review concluded that the groundwater numerical model is capable of adequately predicting impacts to Lake Buchanan during mining, however there is low confidence in the post-mining predictions, due to the modelling procedure. The peer review also questioned the assumption of a 5 m water level in the lake and recommended further sensitivity and uncertainty analyses.

The EIS did not assess potential impacts to Caukingburra Swamp because the groundwater model showed the zone of depressurisation would not reach Lake Buchanan and therefore would not reach Caukingburra Swamp.

Proposed mitigation and monitoring measures – Lake Buchanan and Caukingburra Swamp

The proposed monitoring bore network includes several bores located between the project area and Lake Buchanan and Caukingburra Swamp to detect any changes to the groundwater regime prior to these features being impacted.

To ensure the project does not impact on Lake Buchanan or Caukingburra Swamp, I have recommended a condition (Appendix 3) to the Commonwealth Minister for the Environment for any EPBC Act approval that the project must not result in direct or indirect impacts to Lake Buchanan or Caukingburra Swamp.

My imposed condition (Appendix 1) requires the GMMP to identify drawdown level thresholds for monitoring potential project impacts to Lake Buchanan and Caukingburra Swamp. This would ensure the GMMP would identify any unexpected departures from the draft EIS modelling predictions and act as an early warning system for potential impacts to the hydrogeology, fauna and flora of Lake Buchanan and Caukingburra Swamp. The ongoing model revisions that I have required (Appendix 1), based on actual project monitoring data once mining commences, would continue to refine and improve impact predictions, and adaptive management and monitoring strategies.

The model revision required by my imposed condition includes verification of the assumption of the 5 m water level in Lake Buchanan and additional sensitivity and uncertainty analysis to assess potential impacts to Lake Buchanan and Caukingburra Swamp. The updated groundwater assessment report, required by my imposed condition (Appendix 1), would confirm if there has been an under-prediction of impacts to these GDEs.

If it becomes evident, through the model revision or monitoring data, that the lake or the swamp may become impacted by the project the proponent would need to reconsider the mine plan to avoid impacts and adopt adaptive management measures.

My stated condition to partially backfill to a level above the pre-mining groundwater level would further reduce the uncertainty of post-mining impacts on Lake Buchanan and Caukingburra Swamp as the ongoing take of groundwater post-mining would be prevented.

Coordinator-General's conclusion - Lake Buchanan and Caukingburra Swamp

I am satisfied the sensitivity analysis has tested likelihood of potential impact on Lake Buchanan and Caukingburra Swamp, and that no impacts are predicted. I have developed a set of conditions to ensure this outcome is achieved.

Northern seasonal wetland

The northern seasonal wetland is located on Darkies Range within the northern underground mining area and is mapped as a wetland of high ecological significance on the Queensland wetlands database by DES. The EIS concludes that this wetland is not dependent on groundwater because groundwater is at depths of more than 100 m in this area.

The IESC suggested there is a possibility of perched groundwater below the wetland, however, the AEIS highlighted bore data that suggests the presence of perched groundwater is unlikely. Instead the AEIS concludes that the wetland is supported and filled by seasonal rainfall and surface run-off. Other government agencies agree with the AEIS finding that the wetland is unlikely to be dependent on groundwater for water supply. To confirm the AEIS finding, I have recommended a condition to the Commonwealth Minister for the Environment (Appendix 3) that monitoring of the northern seasonal wetland should occur prior to, during and post-mining.

The EIS predicted that the northern seasonal wetland would be impacted by subsidence from longwall mining associated with the northern underground mining area and therefore an offset for significant residual impacts (SRIs) may be necessary, however this is subject to detailed mine planning and the development of appropriate mitigation measures. If monitoring determines the northern seasonal wetland is groundwater dependent and affected by groundwater drawdown, predicted impacts from loss of groundwater recharge to the northern seasonal wetland would need to be taken into consideration when offsets are determined.

The peer review noted that the fault alignment passes near the northern seasonal wetland. However, as the groundwater model does not contain a feature to represent the northern seasonal wetland, the model cannot be used to investigate potential interaction effects between connective subsidence cracking, the fault and the northern seasonal wetland. It is possible that the subsidence impacts (for examples cracking the base of the wetland) may be made worse by the presence of the fault.

The peer review recommended that the revised modelling include further uncertainty scenarios to explore the potential for interactions between the northern seasonal wetland, the fault alignment and properties and the underlying subsidence zone (especially the effect of connective cracking to the surface). I have included this requirement in an imposed condition (Appendix 1).

Impacts to the northern seasonal wetland from subsidence and proposed mitigation and monitoring measures are also to be addressed in the subsidence management plan required by my stated conditions for the draft EA (Appendix 2). The northern seasonal wetland is further discussed in section 6.3.3—Surface water and section 5.2—MSES of this report.

Potential for shallow groundwater, surface water-groundwater interaction and other GDEs

Targeted groundwater drilling and stream geomorphology assessments were undertaken for the EIS to identify the potential for shallow groundwater in drainage features, which could indicate a surface water - groundwater interaction. Assessments were also undertaken in areas mapped as regional ecosystem (RE) 10.3.14 and 10.3.14(d). These REs contain *E. camaldulensis* (river red gum) as one of the dominant species. River red gum is typically groundwater dependent, at least part of the time, especially during dry periods. In addition to other terrestrial vegetation, potential GDEs that could exist on the site and within the predicted zone of depressurisation include smaller scale GDEs and aquifer cave ecosystems.

Quaternary and Tertiary alluvial sediments are the key strata relevant to the assessment of shallow groundwater and GDEs. The EIS determined that extensive, alluvial deposits and associated shallow groundwater, and surface water-groundwater interaction, that would support GDEs were absent from the project area and surrounding area. Only thin patches (less than 1 m thick) of Quaternary sediments (mud and gravel) were found on-site.

The EIS states that a water table forms within the Tertiary sediments at least 25 m below the surface within the south-east corner of the project area. While the Tertiary sediments would be impacted by groundwater drawdown, the EIS concluded there are no GDEs within the Tertiary sediments. Within the area of RE 10.3.14 where drilling occurred, the depth to groundwater is more than 50 m from the surface, suggesting RE 10.3.14 is not reliant on groundwater. The water table depth reduces further to the east of the site and, within the predicted extents of drawdown, is as shallow as 15 m deep.

The EIS found that drainage features on-site are ephemeral with short duration flows following rainfall events. Most drainage features were dry or contained only small, shallow ponds during the survey undertaken at the end of the dry season, suggesting there is no direct groundwater-surface water interconnection within the site.

The IESC advised and DNRME agreed that the potential for GDEs had not been adequately assessed and that government mapping indicates shallow groundwater and GDEs may be present. There are conflicts between the government mapping and conclusions provided in the EIS and other published mapping including the BoM GDE atlas, Queensland Government wetland mapping (which contains known and potential GDEs) and the Geological Survey of Queensland (GSQ), which has more detailed mapping of Quaternary sediments compared to the EIS maps. The GSQ maps show that there are more significant areas of Quaternary sediments on the project area, particularly in the north of the open-cut mining area.

Furthermore, areas of government mapped Quaternary and Tertiary sediments coincide with areas mapped as RE 10.3.14 with river red gum. Tertiary sediment groundwater levels on-site are close to potential root depth.

DNRME advised that the targeted groundwater drilling was not sufficient to demonstrate that alluvium, shallow groundwater and GDEs are absent from the site. Only two bores are located directly in the alluvium (Roo Bore and Camp Bore). Other bores are located near, but not within, the alluvium and these bores did not specifically target groundwater in the alluvium.

Impacts

The EIS concluded that the project would not have an impact on GDEs as there is no shallow groundwater to support GDEs on or near the project area. After consideration of the advice I have received from DNRME and IESC, I am not satisfied with the EIS conclusion and require further investigation of the presence of other GDEs before a determination on the level of impact can be made.

Whilst the proponent found only thin patches of Quaternary sediments, I consider there was insufficient survey work undertaken to confirm the broadscale absence of

Quaternary sediments across the project area. As there is the potential for impacts to the water content of these sediments from project related subsidence or groundwater drawdown, I consider their presence (or otherwise) and hydrology should be further investigated via surveys prior to the clearance of any vegetation.

Of specific concern within the project area is the northern part of the proposed open-cut mining area where intermittent streams form part of the upper reaches of Tomahawk Creek. Government GDE and geological mapping indicates potential for Quaternary alluvium to support groundwater and GDEs in this area. This part of the project area also coincides with areas mapped as high-value habitat for the black-throated finch (BTF), koala and squatter pigeon, which are MNES as described in section 6.4.1 of this report. Groundwater can contribute base flow to intermittent streams and maintain pools of water at the surface for longer periods. These pools could provide an important water source for fauna.

Proposed mitigation and monitoring measures

I require the proponent to undertake further surveys prior to clearing any vegetation to adequately investigate, identify, and satisfactorily provide to DES detailed supporting evidence for the presence or absence of shallow groundwater, surface water-groundwater interaction and GDEs on-site and within the extent of predicted depressurisation off-site.

Therefore, I have imposed a condition (Appendix 1) to achieve this outcome, amongst other matters. If GDEs are detected, I require a groundwater dependent ecosystem management plan (GDMP) to be prepared and implemented by the proponent. The GDMP should report on the pre-mining condition and values of GDEs, the effect of removing or dewatering the GDEs on-site and within the extent of predicted drawdown, and include appropriate avoidance and/or mitigation, management and monitoring measures.

Although the proponent has designed the mine footprint to avoid the north-eastern part of the southern underground mine area around the upper reaches of Tomahawk Creek, there may still be drawdown impacts on this area and any GDEs, because the zone of depressurisation extends well beyond the open-cut mine area (see Figure 6.8). Dewatering impacts to GDEs would be better understood once the groundwater model is revised (as required by my condition in Appendix 1) and once mining commences and monitoring data confirms impacts.

I also require the proponent to provide offsets if SRIs to GDEs are identified. Therefore, in the event offsets are required, the GDMP should also identify SRIs and potential offsets. An amendment to the EA would be required to account for any additional impacts and the offset would need to be made in accordance with the *Environmental Offsets Act 2014* and the *Queensland Environmental Offsets Policy*.

Coordinator-General's conclusion other GDEs

I am not satisfied with the EIS assessment of shallow groundwater and other potential GDEs. I require the proponent to undertake surveys prior to the clearance of vegetation

to investigate and confirm the absence or presence of shallow groundwater, groundwater-surface water interaction and GDEs.

Should the assessment identify GDEs that would be affected by the project, I am satisfied the preparation of a GDEMP would assist to avoid, minimise or mitigate and manage impacts. Where SRIs to GDEs are identified, I require the proponent to provide offsets. I have addressed the concerns of the IESC and DNRME about the GDE assessment through my conditioning approach.

Moray Downs offset area

The north-western part of the Adani Moray Downs offset site lies adjacent to the southern part of the project and northern part of the proposed CCM&RP. The site contains habitat for the BTF, yakka skink and squatter pigeon. If there is habitat for MNES on Moray Downs that is groundwater-dependent and becomes impacted by groundwater drawdown from either project or cumulatively from both projects, the viability of the impacted offset area may be jeopardised.

As discussed above, the EIS has identified that drawdown would affect the Tertiary sediments. Cumulative impacts to the Tertiary sediments from both the project and CCM&RP are also predicted. Wetlands or habitat for MNES within the Moray Downs West offset site may be dependent on groundwater in the Tertiary sediments. If the wetlands or habitat are impacted by groundwater drawdown from mining operations, the fauna dependent on the wetlands or vegetation may also be impacted.

To ensure the viability of the Moray Downs offset site is not jeopardised, I have recommended a condition (Appendix 3) to the Commonwealth Minister for the Environment that the project must not result in any direct or indirect impacts to the Moray Downs West offset site, either from groundwater drawdown or other physical disturbance during operations or post-mining. Groundwater levels are to be monitored by the proponent through an appropriate network of monitoring bores. Monitoring must be designed to identify groundwater dependency of vegetation and monitor drawdown impacts on vegetation.

I expect the proponent to work with the proponent for the CCM&RP to ensure groundwater drawdown does not impact habitat or wetlands on the offset site.

Coordinator-General's overall conclusion – impacts to GDEs

I am satisfied there would be no impacts to the DSC and Lake Buchanan from the project. My conditions and recommendations would ensure this outcome and also protect the Moray Downs offset site from potential project impacts. The model needs to be revised to further investigate impacts to the northern seasonal wetland and ensure the monitoring network includes this wetland. I require pre-clearance surveys to investigate and confirm the absence or presence of shallow groundwater and GDEs.

Should these investigations identify further impacts to the northern seasonal wetland or other GDEs, additional offsets would be required. I am satisfied the preparation of a GDEMP would assist to avoid, minimise or mitigate and manage impacts of the project on GDEs.

Mine dewatering impacts on stygofauna

The EIS states that one round of stygofauna sampling was undertaken, collecting groundwater samples from 15 monitoring bores within the project area. From this sampling, the EIS concluded that there was a limited potential for significant stygofauna assemblages to occur within the project area. The conclusion was further supported in the EIS by the findings that groundwater is disconnected from the ephemeral surface water drainage lines, that groundwater is located at significant depths not conducive to stygofauna and that alluvium, which is conducive to stygofauna, is not present in the project area.

The IESC and DNRME advised me that one round of sampling is inadequate and not in accordance with best practice guidelines (which require sampling in two rounds of sampling from different seasons) and that there is a potential for shallow groundwater to be present on the project area which is conducive to stygofauna, as discussed in the 'Potential for shallow groundwater and other GDEs' heading in this section of the report.

Of concern is the region underlying streambeds where ground and surface water potentially mix (hyporheic zone) which is an important environment for key ecological processes and can support stygofauna. The hyporheic zone can be shallow (less than one metre) and conditions can change significantly over small distances so even a small amount of groundwater drawdown can have a significant impact. Surveys need to be carefully designed to account for the variability of this zone. I consider the proponent has not completed appropriate surveys to identify this zone or its characteristics.

Stygofauna is further discussed in section 5.2—MSES of this report. I have imposed a condition (Appendix 1) requiring the proponent to undertake additional stygofauna sampling in any areas of alluvium prior to clearing of vegetation and report back to DES. If stygofauna are found on the project area, a Stygofauna Management Plan must be prepared by the proponent and submitted to DES.

Coordinator-General's overall conclusion – groundwater impacts

The key groundwater impact from the project would be drawdown and depressurisation resulting in impacts to bore owners, which are most significant in the post-mining phase. This impact would be addressed via make good agreements between the proponent and the bore owner in line with the requirements of Chapter 3 of the Water Act. I am satisfied that my condition to partially backfill the mine pit would prevent ongoing impacts to groundwater resources and bore owners after mine dewatering ceases.

The project is unlikely to have a significant impact on the GAB. No impacts are predicted to GDEs, including the nationally important DSC and Lake Buchanan. To ensure this outcome I have made a recommendation to the Commonwealth Minister for the Environment that the project must not result in impacts to the DSC or Lake Buchanan. I also require pre-clearance surveys to confirm whether there would be impacts to any other GDE, and if impacts are predicted, a GDEMP and potentially offsets for SRIs to GDEs would also be required.

The EIS groundwater assessment provides an adequate prediction of the potential project impacts. However, groundwater modelling is an iterative process which is improved by ongoing monitoring data. Prior to the public notification of the EA application, further refinements to the assessment methodology are required to improve prediction of groundwater impacts.

I acknowledge that the groundwater model revision, further baseline monitoring and other requirements of my conditions may result in additional, or changes to, the predicted impacts. Once the project commences monitoring data would further refine and confirm the impact predictions.

As a precautionary approach, until further information is available about the impacts of the project on groundwater resources from the model revision, baseline monitoring data and other requirements of my imposed conditions, I consider the EA application should not be notified for public comment. Therefore, my stated conditions in Appendix 2 for the draft EA do not contain groundwater conditions. No impact on groundwater resources would be authorised until an EA is issued complete with groundwater conditions and all other necessary groundwater impact approvals are issued.

Once mining commences, collection of monitoring data would improve the prediction of impacts via regular model updates. I am satisfied groundwater impacts would be appropriately managed by my imposed conditions and the conditions of the EA, any Commonwealth approval under the EPBC Act and the AWL. Appropriate adaptive management strategies, including modifying operations or mine plan redesign, would be required to address any new predicted impacts that were not predicted prior to mining commencing. Further offsets for SRIs to GDEs may also be required.

6.3.3 Surface Water

Existing environment

Regional catchment setting

The project is located within the Belyando Basin, a sub-basin of the Burdekin Basin which has a total catchment area to the coastline of approximately 135,000 km². The Belyando Basin forms part of the catchment of the largest dam in Queensland, the Burdekin Falls Dam, which is located approximately 255 km downstream of the project area. The dam is at the upstream end of a regulated water supply scheme involving a series of downstream weirs that are fed by the dam. The Burdekin Falls Dam discharges into the lower Burdekin Basin and the coastal marine waters of Upstart Bay (see Figure 6.11). Cattle grazing is the dominant land use in the Belyando Basin.



PROJECT CHINA STONE
Regional Catchment Setting



Figure 6.11 Regional catchment setting

Local catchment setting

The EIS states that most of the project area drains towards the east from Darkies Range by the headwaters of Tomahawk Creek and North Creek flowing to the south-east of the Belyando River downstream. The Belyando River is a regionally significant watercourse that enters the Suttor River upstream of the Burdekin Falls Dam. There are no major waterways, as defined by the Water Act, traversing the project area, however a number of unnamed features traverse the project area. The EIS states that there is no interaction between groundwater and surface water in the project area.

Minor portions of the project area drain to the Lake Buchanan catchment and Carmichael River catchment, located to the west and south-west of the project area respectively, via minor drainage lines (see Figure 6.12).

Drainage features on the project area transition from a steep network of gullies within the Darkies Range to wide, shallow overland flow paths in the flatter regions of the project area to the east, typically with no defined channels. Project area drainages are highly ephemeral drainage lines which flow only during, and shortly after, rainfall. These drainage lines contain many remnant pools that form after rainfall and dry out during the dry season. Two farm dams and two seasonal wetlands, referred to as the northern and southern seasonal wetlands, are located within these drainage lines, are fed by rainfall run-off and not groundwater-fed.

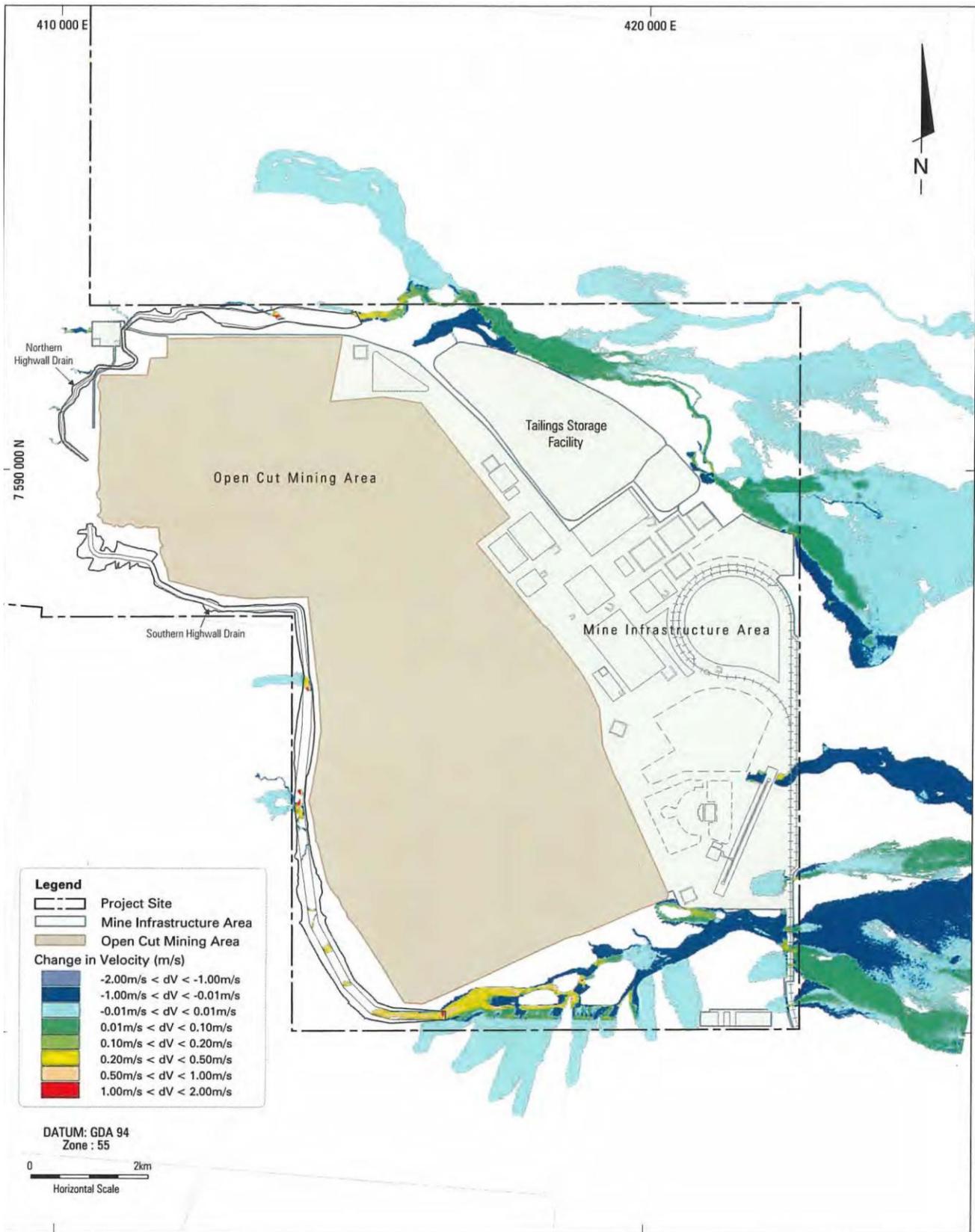
Lake Buchanan is a groundwater-fed shallow semi-arid lake located approximately 20 km west of the project area, as noted in section 6.3.2—Groundwater of this report.

The land uses in catchment areas downstream of the project area are predominantly grazing on natural pastures. Riparian and aquatic habitat in the project area and in the downstream catchment is degraded due to the effects of clearing and cattle grazing. Persistent water bodies are known to be turbid and aquatic ecology values are considered slightly to moderately disturbed.

Downstream water use and environmental features

The project area is not within a basin gazetted under Schedule 1 of the *Environmental Protection (Water) Policy 2009* (EPP Water), which means that a plan outlining environmental values and water quality objectives for the catchment has not been developed. Instead, the proponent has derived environmental values relevant to the project from local and downstream land use which is predominantly grazing on natural pastures. The EIS identifies that cattle grazing and land clearing has degraded the riparian and aquatic habitat in the project area and in the downstream catchment. Aquatic ecology values in the downstream catchment are also considered to have been slightly to moderately disturbed under the EPP Water classification.

The Burdekin Falls Dam, located approximately 255 km downstream of the project area, is a significant water supply for drinking water and irrigated agriculture.



PROJECT CHINA STONE



Hansen Bailey
ENVIRONMENTAL CONSULTANTS

Predicted Velocity Change for 1 in 2 AEP Flood Event

Figure 6.12 Local catchment setting

Surface water quality

Baseline surface water quality datasets provided by DNRME were supplemented in the EIS with local water quality sampling data collected for North Creek and the Belyando River upstream of where they converge. Samples were collected from two monitoring locations on five occasions between October 2012 and April 2013. The EIS states that regular sampling of surface water flows from the project area were hampered by the highly ephemeral, short-duration, surface water flows characteristic of the local catchments.

Surface water quality data indicates that nutrient concentrations were slightly elevated in the Belyando and Suttor Rivers, before decreasing at the Burdekin Falls Dam which acts to dilute natural sediment and nutrient loads prior to discharge into the lower Burdekin Basin. Suspended sediments, turbidity and sulphate also showed a similar trend. All other monitored values and toxicant concentrations including aluminium, copper and zinc were within applicable guidelines for cattle watering and irrigated agriculture.

Submissions

Submissions received on the draft EIS identified the following key issues related to surface water matters:

- sufficient water supply has not been secured for the project
- mine-affected run-off from the project could lead to downstream sedimentation and contamination of waterways and wetlands
- mining disturbance and mine site drainage would change catchment areas, potentially resulting in downstream catchment yield impacts
- the project's baseline surface water quality and quantity data is insufficient to establish the environmental management objectives of the project
- discharge flows for mine-affected water releases should be based on flow criteria for the proposed release point at North Creek and not for the Belyando River
- impacts to downstream aquatic ecosystems from mine-affected water releases at times of no or low flow are unknown
- insufficient baseline and time-series monitoring data has been provided from within and beyond the project area on surface water to adequately assess impacts and the effectiveness of mitigation or management strategies during and after mining
- potential impacts to the surface water flow regime include reductions in the catchment area of Tomahawk and North Creeks; subsidence impacts (surface cracking, ponding); changes in the inundation regime for floodplain habitat, ephemeral drainages and creeks downstream of the project area
- impacts from the proposed management of run-off coming off the top of the tailings TSF and PSWSF.

I have considered issues raised in submissions in my evaluation of the EIS, and how the information provided by the proponent addresses these issues.

EIS surface water impact assessment methodology

Flood modelling

The methodology for the surface water impact assessment for the EIS included hydrologic modelling of the drainage features across the project area to estimate water discharges. The CatchmentSim software package (CatchmentSIM, 2005) was used to show drainage paths and catchment boundaries.

The XP-RAFTS model (XP Software, 2009) was used to estimate water discharges for the 1 in 2, 1 in 50 and 1 in 1,000 annual exceedance probability (AEP) as well as the probable maximum flood (PMF) event. Models were developed for existing conditions, Year 5 and Year 30 of the operations phase, and post-mine closure, to assess the flood immunity of the proposed mine infrastructure and final mine pit as well as assess downstream flooding impacts.

The Two-Dimensional Unsteady Flow (TUFLOW) model (BMT WBM, 2010) was used to estimate the flooding behaviour (flood levels, depths, flow velocities, bed shear stress and stream power) along the drainage features within the study area.

Mine water management

Overview

The EIS states that management strategies for mine-affected water generated by the project are based on the quality of the water and are designed to prevent any adverse impacts on the receiving environment. The proposed mine water management system involves the use of mine-affected water as mine water supply, and an external raw water supply to meet high-quality water supply requirements and to make up any shortfall in the project's water balance.

The project would require the management of waters including pit water from underground and open-cut mining areas; return water from the TSF; run-off from areas disturbed and undisturbed by project activities and run-off from areas affected by mine subsidence.

The EIS states that water demand and losses for the project are typically variable over the life of the project and include use of water for underground mine supply; power station supply; water treatment plant supply; coal handling processing plant supply; vehicle wash-down and dust suppression.

The following mine water dams are proposed to be constructed in the project area to collect and contain mine-affected water:

- return water dam – used to store return water transferred from the TSF decant pond which needs to be maintained at a low water level to ensure there is no risk of overflow
- mine water dam – used to store pit water generated from the underground and open-cut mines (controlled discharges of mine-affected water would be required following extended rainfall periods when accumulated open-cut pit water volumes exceed the pit water storage capacity)

- industrial area dam and mine infrastructure area catch dams – the industrial area dam would be used to store water transferred from mine infrastructure area catch dams which collect run-off draining from contained infrastructure area catchments
- raw water dam – used as a buffer storage for an external water supply.

A preliminary consequence category assessment undertaken in the EIS indicates that the proposed mine water dams are considered 'low' consequence category structures and are not considered to be 'regulated structures' under the EP Act.

The EIS states that further detailed consequence category assessments would be conducted at the detailed design stage to confirm whether any of the mine water dams would be regulated dams under the EP Act. Notwithstanding, the EIS states that the design criteria for the overall mine water management system, including the mine water storages, has been based on the manual requirements for 'significant' hazard category dams to ensure the mine water management system complies with the regulated dam requirements in the event any of the storages are assessed as regulated structures. Accordingly, I have stated conditions (Appendix 2) for the draft EA relating to the design, construction and operating requirements for any storages assessed as regulated structures, to mitigate the consequences arising from potential failure or collapse of those structures.

The EIS includes a commitment to undertake quarterly monitoring of water levels and water quality in mine water storage dams including the return water dam, mine water dam and intermediate pit water dams, and the industrial area dam and associated infrastructure area catch dams. Parameters to be monitored include pH (a measure of hydrogen ion concentration) and electrical conductivity (EC), metals and metalloids. The EIS includes a commitment to monitor the site water balance including water transfers, consumption and dam storage volumes monthly in accordance with a Site Water Management Plan.

The EIS includes a commitment that controlled releases of mine-affected water, which would be necessary following extended wet periods, would be conducted in accordance with the DES's model mining conditions for an EA. The trigger levels for releases will be stated by DES as part of the surface water conditions within the future EA for the project.

Operational modelling method

The EIS states that an operational simulation model was used to assess the project water balance across a range of climatic conditions over the 50-year life of the project. The modelling was undertaken using GoldSim software, an operational simulation program used for modelling both natural and industrial water resource systems, and was used to assess the appropriate sizing of catch dams and water supply storage dams as well as assess the optimum utilisation of mine-affected water for mine water supply while minimising the volume of external raw water supply required for the project.

The modelling also assessed the frequency and volumes of controlled releases of mine-affected water to enable dewatering of open-cut pits following extended wet events (discussed further under 'Mine-affected water releases').

External water supply

The EIS states that an external water supply would be required to supply demands which require consistently high-quality water including supply to underground mines, the water treatment plant and the power station. Additional external water supply would also be required during dry periods when mine water stored on-site is insufficient to meet mine water demands.

The modelling results identified that median water supply demands are significantly greater than the amount of mine-affected water that would be generated by the project. The mine water management system is predicted to have a water deficit over the life of the mine ranging from approximately 903 to 12,300 MLpa. Accordingly, the proponent proposes to secure an annual external water supply of up to 12,500 MLpa to ensure continued operation over the 50-year life of the project.

The EIS considered options for sourcing external water supplies from several proponents currently developing water supply options for the Galilee Basin coal mines. The preferred water supply option would be to gain an allocation from a piped water supply from one of two schemes being proposed to harvest water from the Cape River or the Belyando/Suttor River system, the latter having the potential to be supplemented by a connection to the Burdekin Falls Dam.

Submissions on the draft EIS raised concerns that the harvesting of water from surrounding watercourses would have a significant impact on the availability and quality of water used by adjoining and surrounding property owners for cattle grazing and domestic purposes. Furthermore, schemes relying on off-stream storages are unlikely to provide a high level of reliability. The EIS documentation states that the approved large-scale coal mines within the Galilee Basin are yet to secure approved water supplies that meet the demands of each mine and that the EIS includes a commitment to securing a suitable water supply prior to commencement of production. The EIS recognises that securing a raw water supply would be subject to a separate environmental assessment and approval process and that if a suitable water supply cannot be procured, the project would be unable to proceed.

Mine-affected water releases

Modelling results within the EIS indicate that there would be sufficient storage capacity for contained mine-affected water during a range of historical climate conditions over the 50-year life of the mine without the need for uncontrolled discharges of mine water.

During extended wet periods however, significant run-off volumes would accumulate in the open-cut pit which would need to be discharged under controlled conditions to enable mine operations to continue. Accordingly, the proponent proposes to release stored pit water from the mine water dam to the Belyando River catchment and estimates an average annual discharge requirement of approximately 400MLpa, with a peak annual discharge requirement of 2,438 MLpa. Mine-affected water is proposed to

be discharged under controlled conditions in accordance with the DES model mining conditions. Surface water quality impacts resulting from the controlled releases of mine-affected water are discussed in further detail in this section.

Surface water management

Overview

The conceptual site drainage plan for the project presented in the EIS seeks to:

- divert clean run-off from undisturbed areas around areas disturbed by mining activities to allow it to drain from site
- control suspended sediment in site drainage water to reduce the potential for downstream sedimentation
- re-use mine-affected water as mine water supply
- release mine-affected water as per the DES model mining conditions
- provide flood protection for mine infrastructure and the open-cut pit
- establish a free-draining post-mining landform (except for the final mine pit).

Two highwall drains have been designed and located to minimise the catchment area draining into the open-cut mine pits during operations and into the remaining pits after mine closure. The highwall drains are permanent structures that would remain in place post-mining and have been designed with sufficient capacity to convey the peak flows from the PMF providing flood immunity to the open-cut pits during operations and the final mine pit after mine closure.

Drainage infrastructure including diversion drains, collection drains, sediment dams and sediment traps would be constructed progressively as the operations expand over the life of the mine. Remedial drains would be installed to re-establish free drainage of ponded surface water trapped in surface depressions due to underground mine subsidence, as required.

The EIS states that post-mining, the mine infrastructure area would be decommissioned and profiled with drainage to discharge to the downstream natural drainage lines. The final landform would include the rehabilitated overburden emplacement areas, TSF and PSWSF, final open-cut mine pits and rehabilitated mine infrastructure areas (see Figure 6.13).

The EIS states that in addition to the highwall drains, the northern and southern drainage corridors would also remain post-mining and would continue to convey any discharge from the highwall drains to the downstream natural drainage system. I have stated conditions (Appendix 2) for the draft EA relating to the design, construction and operation of the highwall water drain to ensure any permanent water drainage maintains the pre-existing hydrologic characteristics of surface water for the area. Fauna movement across the highwall water drain for access to food, water and foraging areas is addressed in section 5.2—MSES of this report.

The EIS states that the project area would be free-draining except for the final mine pit in which two lakes would form reaching an equilibrium level below the spill point. I am

not satisfied that this is an acceptable environmental outcome due to potential impacts on groundwater (as mentioned in section 6.3.2 of this report) and the loss of use of land for grazing purposes (as mentioned in section 5.1—Land use and rehabilitation of this report).

While I recognise there is a financial cost to backfilling the pit, there would be environmental, economic and social benefits by returning the land to its pre-mining land use, i.e. cattle grazing, or similar. Backfilling to above the pre-mining groundwater level would also limit the ongoing loss of groundwater as well as minimise evaporation. I have stated a condition (Appendix 2) for the draft EA requiring the open-cut pits to be backfilled to above the level of the pre-mining groundwater level to ensure they do not cause environmental harm to land, surface waters or any recognised groundwater aquifers and can be used for a post-mining land use.

I have also imposed a condition (Appendix 1) requiring the proponent to prepare an open-cut mine pit management plan to ensure any open-cut mine pits that remain within the project area are rehabilitated to a stable condition suitable for a post-mining land use with an economic, social and environmental benefit. The open-cut mine pit management plan must include an assessment of completely backfilling the open-cut mine pits, to be approved by DES prior to the public notification of the draft EA for the project.

Surface water run-off – Tailings Storage Facility and Power Station Waste Storage Facility

Impacts

During the EIS submission period a concern was raised regarding the TSF and PSWSF drainage management, specifically that insufficient information was provided in the EIS demonstrating how water shedding and run-off management from the TSF and PSWSF can be managed to prevent flow paths from developing that would cause erosion.

Proposed management and mitigation measures

The EIS includes a commitment to design an internal drain at the final surface of the TSF plateau with capacity to convey run-off to natural ground at the northern end of the TSF. The EIS also includes a commitment to revise the PSWSF landform so that it is integrated with the TSF final landform. In addition, to prevent the downslope movement of contaminated water, I have stated a condition (Appendix 2) for the draft EA requiring the installation of a surface water and seepage collection system along the downstream toe of the TSF embankment to intercept any surface expression of seepage or leachate.

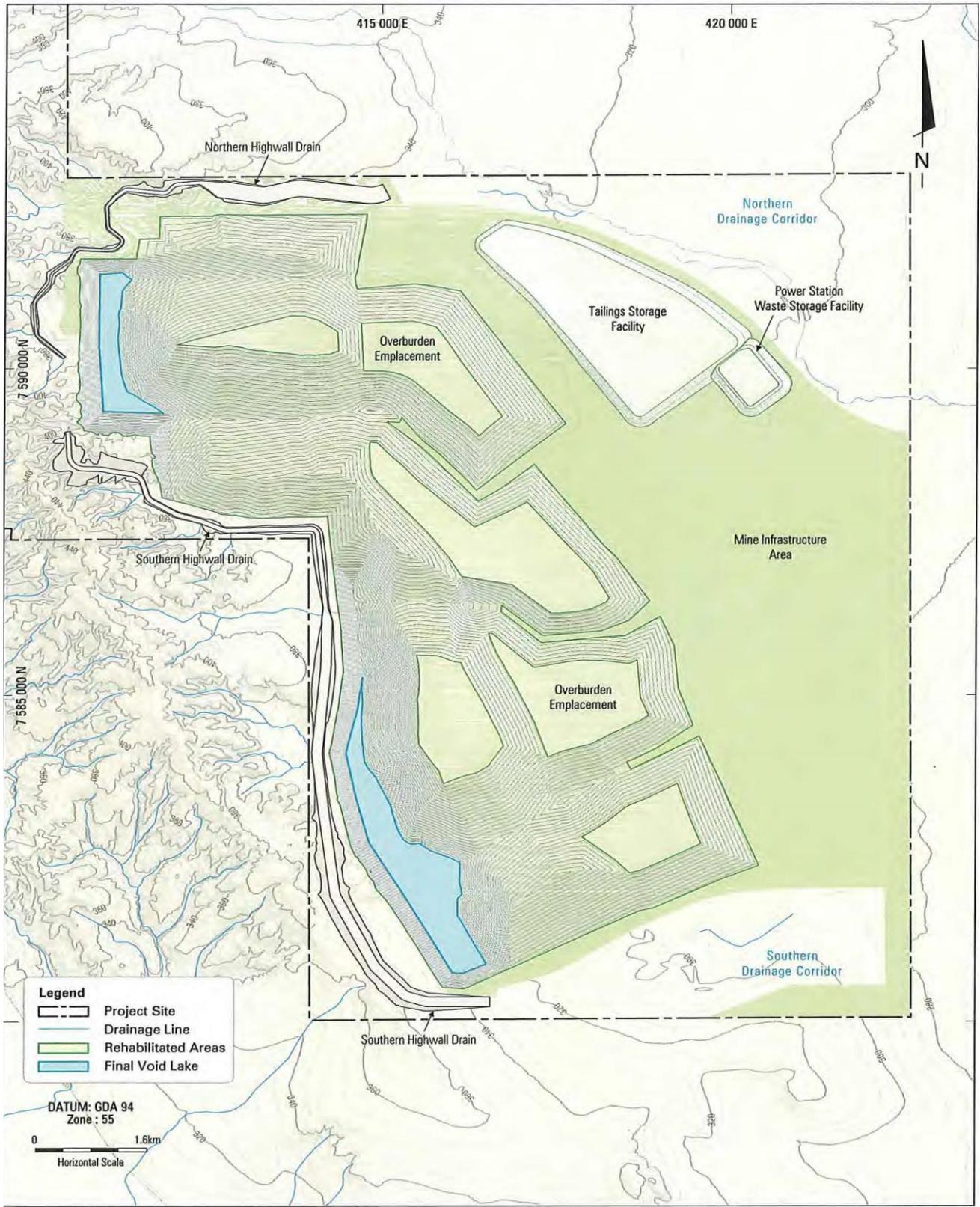


Figure 6.13 Conceptual site drainage – final landform

Coordinator-General's conclusion – TSF and PSWSF surface water management

I have stated conditions to ensure tailings are managed to prevent the downslope movement of contaminated water. I have also stated conditions requiring the preparation of a TSF rehabilitation and monitoring strategy to ensure the methods for decommissioning and final rehabilitation include the prevention and management of acid mine drainage, erosion minimisation and establishment of vegetation cover.

Surface water flow/geomorphology

Impacts

The key potential impacts of the project on surface water flow/geomorphology identified within the EIS would be:

- sedimentation of downstream waterways during construction and operations due to erosion from disturbed areas resulting in increased sediment loads in site drainage water
- potential impacts in downstream catchment yields due to mining disturbance and changes in mine site drainage altering catchment areas
- potential impacts to downstream drainage resulting in changes to flood behaviour and geomorphic impacts on watercourses and drainage lines
- impacts of the final landform and final mine pit on surface drainage.

Proposed management and mitigation measures

SEDIMENTATION OF DOWNSTREAM WATERWAYS

The EIS states that run-off from areas disturbed by construction and mining activities may contain elevated levels of suspended sediment. The EIS states potential impacts would be managed by installing collection drains to capture run-off from disturbed areas for control of suspended sediment prior to discharge from the project area. Sediment collected in sediment dams would be excavated at regular intervals and disposed of in the overburden emplacement areas.

Submissions raised concerns regarding potential sedimentation of downstream waterways due to erosion from disturbed areas during the construction and operation phases which could reduce the capacity of waterholes and dams to hold water. The EIS states that any drainage from the project area would be subject to sediment controls that would minimise impacts to the water supply of downstream catchments. The EIS includes a commitment to preparing an Erosion and Sediment Control Plan (ESCP) prior to the commencement of construction of the project to address erosion and the control of suspended sediments in drainage. The plan will need to be submitted to DES for approval prior to the commencement of construction of the project.

DOWNSTREAM CATCHMENT YIELD IMPACTS

The EIS states that during operations, run-off from contained catchments in the open-cut mine and mine infrastructure area would be captured and diverted. Post-mining,

run-off would be retained in the final pit which would result in a reduction in total catchment run-off from the project compared to pre-mining conditions.

The EIS states that, over the life of the project, the contained catchment area would correspond to a maximum reduction in catchment area of approximately 2 per cent for the Tomahawk Creek catchment and 7 per cent for the North Creek catchment. After mine closure, this is predicted to reduce to 2 per cent for both creek catchments corresponding to 0.09 per cent of the Belyando River catchment and 0.03 per cent of the Burdekin Falls Dam catchment.

Submissions raised concerns that the project would alter drainage catchment areas resulting in reduced catchment yields affecting downstream users. However, the EIS states that the contained catchments represent a negligible proportion of the overall receiving catchment and that downstream water users in the Tomahawk and North Creek catchments would not be significantly affected by the relatively minor reductions in catchment area concluding that changes in catchment yields at grazing properties downstream of the project area would therefore be negligible. I am satisfied that the downstream impacts on grazing properties would be minimal. Further, to ensure that open-cut mine pits on the area are progressively rehabilitated to a stable condition that ensures that impacts to downstream surface water users are minimised and mitigated, I have imposed a condition requiring the preparation of an open-cut mine pits management plan (Appendix 1).

DOWNSTREAM FLOODING/GEOMORPHIC IMPACTS

The EIS states that hydraulic modelling results for the mine drainage system were assessed for the 1 in 2 AEP and 1 in 50 AEP flood events to quantify surface water impacts on downstream properties and stream geomorphology. Flood levels are predicted to increase marginally in some drainage features downstream of the eastern project area boundary and at the northern boundary of the project area downstream of the northern highwall drain. The EIS states however, that changes in flood levels and distribution are not predicted to impact on any structures or property due to the wide shallow nature of the flow paths and that no significant flood impacts are predicted.

An assessment of geomorphological impacts on drainage features identified that while minor increases in flow velocities are predicted downstream of the eastern boundary of the project area, the project is not predicted to significantly impact these drainage features due to the minor predicted changes in velocities, flood depths, bed shear stresses and stream power. Accordingly, no management or mitigation measures are proposed. The EIS includes a commitment however, to construct a small earth bund at the northern end of the topsoil stockpile area to prevent erosion in this area during flooding, if needed.

A limited area along and downstream of the project area boundary downstream of the northern highwall drain, would be exposed to increased flood levels, flow velocities, bed shear stresses and stream power. The EIS states that this area could experience increased erosion in both channels and overbank areas and the EIS includes a commitment to incorporate erosion protection and energy dissipation measures for these drainage features during detailed design.

In the southern drainage corridor, downstream of the southern highwall drain, peak flow velocities are predicted to be limited to the subsided area above the southern underground mine and the EIS includes a commitment to install erosion control measures to manage potential erosion impacts, if necessary.

I also note that erosion impacts to the bed and banks of the receiving waters would be managed through the model mining conditions to be attached to a future EA which would require the release of water to be undertaken so as not to cause erosion of the bed and banks of the receiving waters, or a material build-up of sediment.

POST-MINING IMPACTS

The EIS states that post-mining, the highwall drains and northern and southern drainage corridors would continue to convey the PMF providing the final mine pit with flood immunity. The modelling of the final mine pit water storage indicates that the lakes would likely reach a quasi-equilibrium level in the long-term, approximately 200 years after mine closure, which would occur once the evaporative losses from the surface of the lakes match the groundwater inflows and surface run-off inputs. The average lake water level is predicted to be 50 m below the final mine pit spill point elevation of 305 m Australian Height Datum (AHD). The salinity of the final mine pit water storage would likely increase over time due to evaporative losses from the surface of the lake, however the EIS states that overflow to downstream drainage is extremely unlikely based on the modelling results. Refer section 6.3.2—Groundwater of this report for further discussion on potential groundwater impacts of the lakes forming in the open-cut mine pits.

Submissions raised concerns that the final landform and final mine pit would result in unacceptable surface drainage impacts. The EIS states that there would be no significant loss of water to downstream properties as the contained catchments represent a negligible proportion of the overall receiving catchment and the lake in the final mine pit is extremely unlikely to overflow. I do not consider this an acceptable outcome and I have stated a condition (Appendix 2) that pits be backfilled to above the pre-mining groundwater level, as a minimum. I have also imposed a condition (Appendix 1) requiring the proponent to prepare an open-cut mine pit management plan to ensure any open-cut mine pits that remain within the project area are rehabilitated to a stable condition suitable for a post-mining land use. The open-cut mine pit management plan must demonstrate that the ponding of water (either surface water or groundwater) can be prevented and that impacts to water resources are mitigated and managed in perpetuity.

Coordinator-General's conclusion - surface water flow/geomorphology

I am satisfied that my conditions and the commitments in the EIS will ensure the project's impacts on surface water flow are appropriately managed and mitigated. I require an ESCP to be submitted to DES for approval prior to the project commencing to control the potential sedimentation of downstream waterways during the construction and operation phases of the project.

I require the proponent to operate the mine to ensure a nil reduction in catchment yield and downstream flow. To ensure the final landform does not result in unacceptable surface drainage and groundwater impacts, I have stated a condition that pits be backfilled to above the pre-mining groundwater level, as a minimum, and I have imposed a condition requiring the proponent to prepare an open-cut mine pit management plan to ensure any open-cut mine pits that remain on the site are rehabilitated to a stable condition suitable for a post-mining land use.

Surface water quality

Impacts – Controlled discharges of mine-affected water

The EIS states that one of the key potential impacts of the project on surface water quality would be the impact of controlled discharges of mine-affected water on downstream environmental values and water users. During extended wet periods, significant volumes of rainfall run-off would be collected in the open-cut pit resulting in a net surplus of mine-affected water within the mine water management system. It would be necessary for the open-cut pits to be dewatered under controlled conditions to ensure that the open-cut mine can continue to operate.

The EIS states that the water management system had been designed to allow for the controlled release of stored pit water from the mine water dam into the Belyando River catchment and identifies that, on average, less than 25% of the mine water dam capacity, comprising 1,600 megalitres (ML), would need to be discharged under controlled conditions per year. The EIS states that any controlled discharges would be conducted in accordance with the DES model EA discharge conditions, which are designed to prevent any adverse impacts on downstream environmental values.

Submissions on the draft EIS raised the following concerns relating to surface water quality:

- Discharge flow should not be based on Belyando River flow criteria as there is a high risk of discharge not reaching the Belyando River, which is located 64 km downstream from the intended discharge point in North Creek. EA conditions for mine-affected water discharge should instead be based on least flow criteria in North Creek.
- There is a lack of water quality data available in the EIS to adequately assess the potential impacts of mine-affected water releases on the instream and downstream environmental values, including aquatic ecosystems, in North Creek. As North Creek is ephemeral, there would likely be limited opportunity to release mine-affected water during periods of adequate flow and that any releases of mine-affected water during periods of no flow in North Creek could present a high risk to environmental values.
- Insufficient information had been provided in the EIS to enable flow triggers and water quality release limits for North Creek to be calculated. Additional information on the ecological condition of North Creek should be provided to enable locally relevant water quality objectives to be developed in order to assess impacts to downstream environmental values.

In response to submitter concerns, the AEIS states that mine-affected water will be discharged using North Creek flow criteria instead of Belyando River. However, the receiving water quality and flow data information required to determine flow triggers and water quality release limits for North Creek was not provided within the EIS for my assessment. The EIS states that the project area is remote and experiences highly ephemeral, short duration, surface water flows, which limited the proponent's ability to undertake regular sampling of surface water flows from the project area. As a result, there is currently insufficient receiving water quality and flow data to enable the detailed calculation of flow triggers and water quality release limits required for the development of draft EA conditions for the controlled release of mine-affected water to North Creek.

Proposed management and mitigation measures

The AEIS proposes to implement a North Creek baseline water quality and flow monitoring program prior to the project commencing, in order to assess impacts on the North Creek receiving environment. Data collected from the North Creek baseline water quality and flow monitoring program would enable the calculation of water quality objectives for the receiving waters, including flow conditions and criteria for the release of mine-affected water and would be used by DES to prepare draft EA conditions that address the requirements of the model mining conditions.

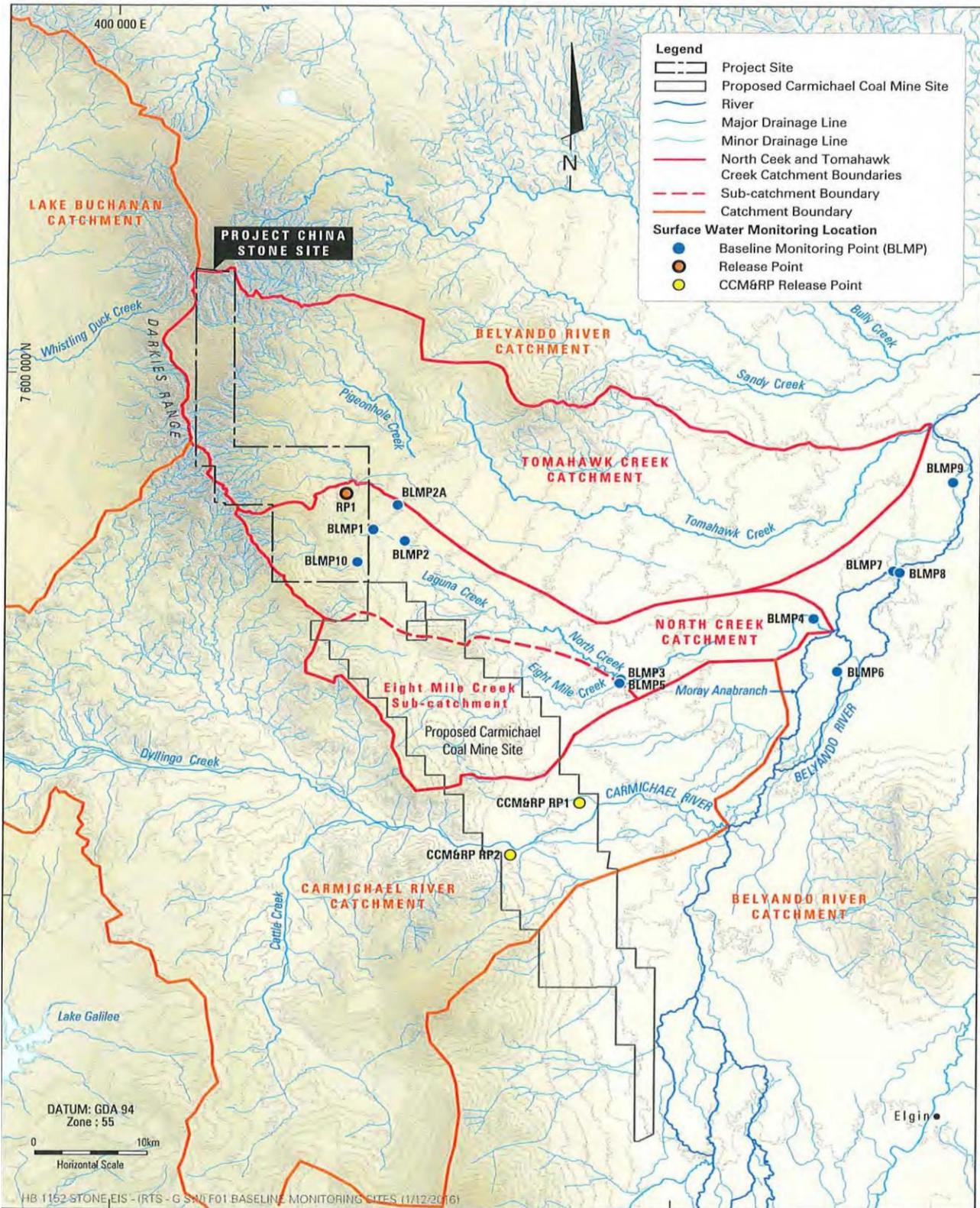
A North Creek baseline water quality and flow monitoring program would determine:

- water quality objectives for North Creek in accordance with the Queensland Water Quality Guidelines (or the guideline current at the time)
- flow conditions for the receiving waters
- flow criteria for discharge, maximum release rates, and release limits.

This information would also be used to inform the development of a Receiving Environment Monitoring Program (REMP) as well as complete the tables in the DES model mining conditions for mine-affected water releases, prior to the public notification of the EA application.

The AEIS included an amended mine water management system for the project to reflect that the controlled release of stored pit water from Release Point 1 (RP1) at the mine water dam to the North Creek catchment (see Figure 6.14), would be based on North Creek flow criteria rather than Belyando River flow criteria.

Accordingly, I have imposed a condition (Appendix 1) requiring the proponent to provide DES with baseline water quality and flow monitoring data for North Creek prior to public notification of the EA application to determine the adequacy of trigger levels for the controlled release of mine-affected water to North Creek. The North Creek baseline water quality and flow monitoring program is required to be undertaken prior to project commencement. The data will be used to calculate flow triggers and water quality release limits required for the assessment of the impact by DES to determine if the level of impact is acceptable. The information would be used by DES in the development of draft EA conditions to authorise controlled releases of mine-affected water.



PROJECT CHINA STONE



Baseline Monitoring Sites

Figure 6.14 Baseline monitoring sites

Impacts – Uncontrolled discharges of mine-affected water

Submitters raised concerns that uncontrolled run-off from open-cut pit catchments could occur during extended wet seasons and heavy storm activity causing downstream impacts. The EIS states that modelling undertaken for the project predicts that the mine water management system has adequate capacity to contain mine-affected water generated by the project for each of the modelled scenarios, concluding a very low probability of uncontrolled discharges of mine-affected water. I also note that the model mining conditions to be attached to a future EA for the project, would not permit the release of uncontrolled discharges of mine affected water.

Coordinator-General's conclusion - surface water quality

The draft EIS did not provide sufficient information to determine the full extent of surface water impacts on the downstream receiving environment resulting from controlled discharges of mine-affected water. The AEIS states that mine-affected water will be discharged using North Creek flow criteria and a North Creek baseline water quality and flow monitoring program will be undertaken, prior to the project commencing, to assess impacts on the North Creek receiving environment. Accordingly, I have imposed a condition (Appendix 1) requiring the proponent to provide DES with baseline water quality and flow monitoring data for North Creek to determine appropriate compliance and flow monitoring locations, release limits and contaminant trigger levels required for the development of draft EA conditions.

Subsidence impacts on surface water flow

Impacts

The project involves longwall operations in the northern and southern underground mining areas which would result in subsidence leading to the progressive development of shallow depressions on the surface above each extracted longwall panel. Subsidence predictions undertaken for the project identify that approximately 4,950 ha of land in the project area would experience subsidence which could give rise to localised surface cracking up to a maximum width of 0.2 m.

The key potential subsidence impacts on surface water flow would be surface drainage impacts including changes in drainage paths and gully bed elevations, ponding of water in shallow surface depressions and loss of catchment yield. Figure 6.15 depicts the modelled predicted subsidence that could occur because of the proposed underground operations.

Subsidence impacts are predicted to change the ponding characteristics of the seasonal wetlands which would dry out more rapidly and more frequently due to reduced water levels within the wetlands.

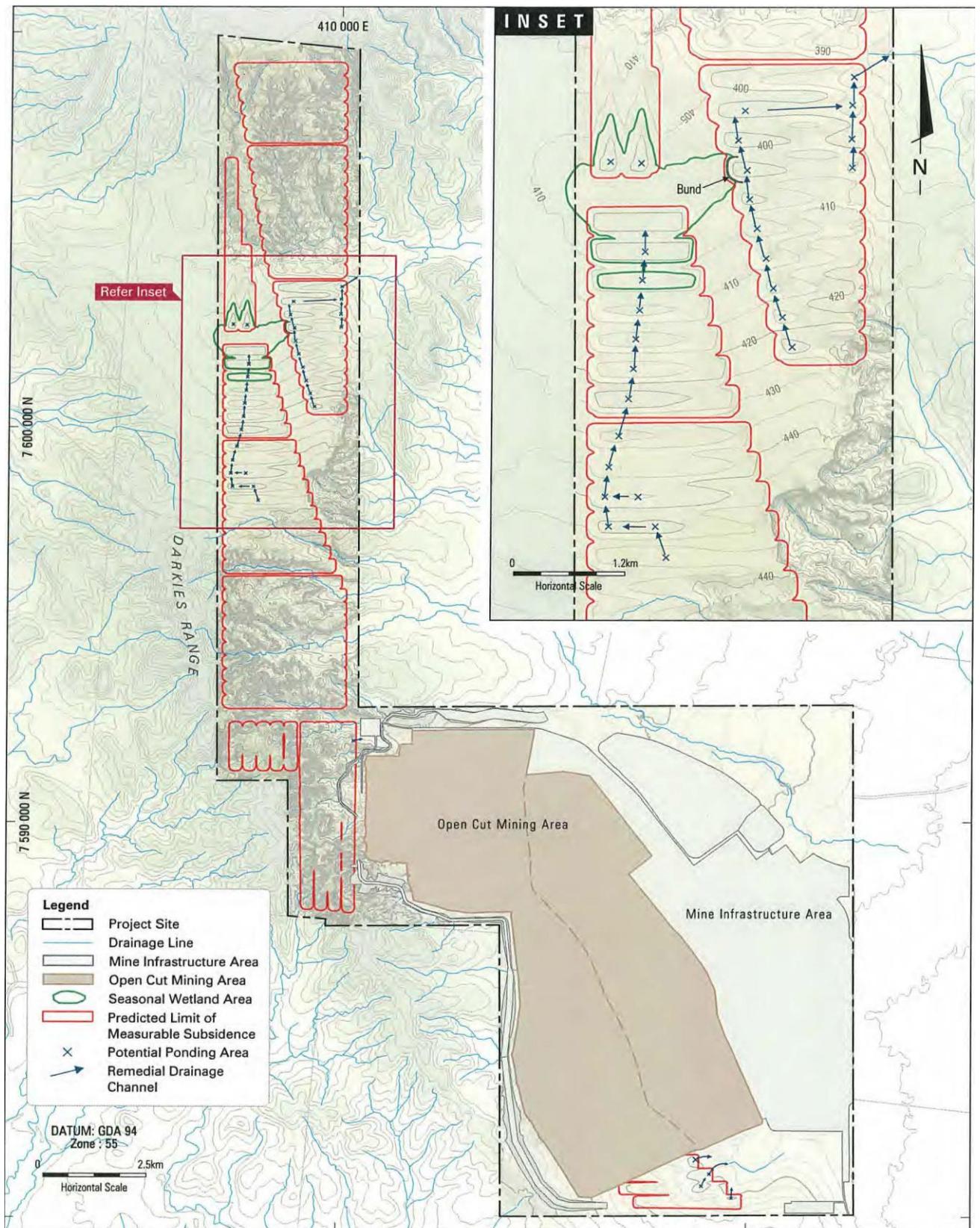


Figure 6.15 Place subsidence ponding and remedial drainage

Proposed management and mitigation measures

To mitigate impacts, a tension crack rehabilitation program has been developed for the project, which would involve monitoring areas potentially subject to tension cracking and repairing any cracks that develop to minimise disturbance on vegetation and prevent erosion and sedimentation.

Subsidence above the northern underground mine may result in localised changes to gully bed elevations which could result in flow velocity changes leading to erosion and subsidence-induced channel instability. The EIS predicts that these subsidence impacts are expected to be negligible as the gullies are rock controlled channels with limited bed sands. The EIS includes a commitment to monitor subsidence of drainage gullies to identify any geomorphic impacts in accordance with a Subsidence Management Plan (SMP) and ESCP and undertake remedial stabilisation where necessary.

The northern seasonal wetland ('the wetland') is located above the northern underground mine and would be subject to subsidence and cracking. The wetland is shown on the DES map of referable wetlands as being of high ecological value and is a MSES. Section 5.2.3—Wetlands and watercourses of this report addresses the impact of the project on the wetland.

Submissions raised concerns that changes to surface water flow resulting from subsidence of the ground surface and drainage features could result in downstream water quality impacts on environmental values and reduced catchment yields impacting downstream water users. The EIS includes a commitment to mitigate impacts by installing remedial drainage works as per the SMP to re-establish free drainage to minimise residual ponding in subsided longwall panels caused by mine subsidence and potential reductions in catchment yield. Subject to these mitigation measures, the EIS states that the project is not predicted to result in significant changes to the drainage and flooding characteristics of the existing drainage features.

In response to submissions, I have stated conditions for the draft EA (Appendix 2) for a SMP to be developed by the proponent and submitted to the administering authority for approval prior to commencement of the project. The SMP is to include detailed measures that provide for the proper and effective management of the actual and potential environmental impacts resulting from the mining activity as well as proposed options for mitigating any impacts associated with subsidence and how these mitigation methods will be implemented.

Coordinator-General's conclusion -subsidence impacts on surface water

The project's key subsidence impacts on surface water flow relate to ponding in the subsidence ground recess and subsequent impacts on the availability of downstream water resources.

To ensure surface water is drained from subsided panels, I have stated a condition for the draft EA that the SMP propose options for mitigating any impacts associated with the capture of overland flow by subsided longwall panels and the associated impacts on downstream users.

Coordinator-General's overall conclusion - surface water

The EIS does not provide sufficient information to determine the full extent of surface water impacts on the downstream environment resulting from controlled discharges of mine-affected water. Accordingly, I have imposed a condition (Appendix 1) requiring the proponent to provide DES with baseline water quality and flow monitoring data for the North Creek receiving environment to determine appropriate compliance and flow monitoring locations, release limits and contaminant trigger levels required for the development of draft EA conditions, prior to public notification of the draft EA.

I have stated conditions requiring the preparation of a TSF rehabilitation and monitoring strategy to ensure the methods for decommissioning and final rehabilitation include the prevention and management of acid mine drainage, erosion minimisation and establishment of vegetation cover.

To ensure surface water is drained from subsided panels, I have stated a condition for the draft EA that the SMP propose options for mitigating any impacts associated with the capture of overland flow by subsided longwall panels and the associated impacts on downstream users.

To ensure the final landform does not cause environmental harm to land, surface waters or any recognised groundwater aquifers, I have stated a condition that pits be backfilled to above the pre-mining groundwater level, as a minimum. I have also imposed a condition (Appendix 1) requiring the proponent to prepare an open-cut mine pit management plan to ensure any open-cut mine pits that remain within the project area are rehabilitated to a stable condition suitable for a post-mining land use with an economic, social and environmental benefit. The open-cut mine pit management plan must include an assessment of completely backfilling the open-cut mine pits and must also demonstrate that the ponding of water (either surface water or ground water) can be prevented and that impacts to water resources can be mitigated and managed in perpetuity. The open-cut mine pit management plan is to be approved by DES prior to the public notification of the draft EA for the project.

6.3.4 Cumulative groundwater and surface water impacts

The proposed CCM&RP is located immediately to the south-east of the project area. The CCM&RP is proposed to operate at the same time as the project. The proponent has undertaken an assessment of the cumulative impacts on groundwater and surface water arising from these two projects in the local and regional catchment.

The EIS did not consider the Hyde Park Coal Project, which is located to the north of the project area, in the cumulative assessment. The Hyde Park Coal Project is still in pre-feasibility planning and there is no publicly available data for the project. Therefore, it was not possible to include the Hyde Park Coal Project in the cumulative impact assessment. The Hyde Park Coal Project proponent would need to include the project, CCM&RP and any other relevant projects in its cumulative impact assessment when it prepares its environmental assessment.

There are four other proposed coal mine projects within the Galilee Basin with publicly available information that would enable inclusion of these projects within a cumulative

assessment. However, given the distance of approximately 125 km to 200 km to these projects, the proponent considered there was minimal potential for cumulative groundwater and surface water impacts and therefore did not include these projects in the assessment.

I do not agree that there is minimal potential of these other projects contributing to cumulative impacts of the project and the CCM&RP. The potential impacts of all projects need to be assessed. However, there are other regional impact assessment projects currently underway to assess the impacts of all proposed coal (and future coal seam gas) projects, and I have discussed these further in the 'Regional groundwater modelling, monitoring and assessment programs' section below. I am not satisfied the proponent has undertaken a sufficient cumulative assessment; however, a comprehensive regional cumulative assessment is currently being undertaken by Commonwealth and state government departments.

Cumulative groundwater impacts

Cumulative groundwater impact assessment methodology

The EIS used the method of superimposition to assess potential cumulative groundwater impacts with the CCM&RP. The superimposition method involved overlaying the drawdown contours of both projects, which show the predicted extents of depressurisation in all geological units, to identify overlapping zones. These overlapping zones represent the maximum potential extent of cumulative depressurisation. The one metre drawdown contour was used in defining the limit of impacts.

The IESC advised that the superimposition method was 'simplistic' and that appropriate calculations were not undertaken to estimate the extent of cumulative drawdown impacts. The peer review of the groundwater model noted that the superimposition method is a reasonable first estimate, and that a more detailed assessment of cumulative impact would require a regional model designed to investigate cumulative impacts and I have discussed this further below in the 'Regional groundwater modelling, monitoring and assessment programs' section.

The IESC also had concerns that the source of the external supply of water required for both projects (up to 12 GL/year each) has not been provided to enable an assessment of the impacts of taking the water. The EIS states that water will be sourced from either a managed water supply scheme or purchasing existing water allocations through water trading. The water supply schemes would be developed and operated by another proponent and subject to separate environmental assessment and approvals.

I consider that authorisation of water supply for the project is not required at this stage of the project assessment. Impacts of water take either by the proponent or another proponent, would be assessed in the authorisation process under the Water Act.

Impacts

Figures in the EIS show the predicted cumulative change in groundwater elevation and potentiometric surface and the extent of cumulative depressurisation from both the

project and CCM&RP. Figure 6.16 shows the maximum predicted extent of cumulative groundwater depressurisation. Cumulative impacts are predicted in the Tertiary sediments and the Betts Creek Beds, but not in other geological units.

However, based on the sensitivity analysis for the Clematis Sandstone conductivity and storage values, there is some potential for cumulative impacts with CCM&RP if the higher or lower values were adopted in the sensitivity analyses.

The groundwater model revision required by my imposed condition (Appendix 1) requires some changes to the values used in the base case model and subsequent sensitivity analysis. This could result in additional or different cumulative impacts being predicted, including potential impacts to the Clematis Sandstone, an increase in the number of bores impacted or GDE impacts. To address this, my condition requires that an updated cumulative assessment be prepared once all the required refinements to the model have been made. These refinements require revision of parameters, including that of hydraulic conductivity of the coal seams with depth, which could further affect drawdown predictions. The most up to date and publicly available groundwater modelling data and information from the CCM&RP must be incorporated into the cumulative assessment.

The model revision must be undertaken prior to notification of the EA application, so any additional cumulative impacts would be publicly notified. The updated groundwater assessment report, also required by my imposed condition (Appendix 1) must include updated measures to avoid, mitigate and monitor the cumulative groundwater impacts, where necessary.

Landowner bores

The most extensive area of impact is within Betts Creek Beds during and post mining. The Betts Creek Beds contain the A, C and D coal seams which are targeted by both projects.

There are three landowner bores shown on Figure 6.16 that are predicted to be subject to cumulative impacts:

- RN103875 (known as Roo Bore) located within the project area which targets groundwater from the Betts Creek Beds. Roo Bore would be removed during mining for the project
- RN132938 located within the CCM&RP area which targets the Betts Creek Beds
- Allens Bore located to the east of the project area which targets the Tertiary sediments.

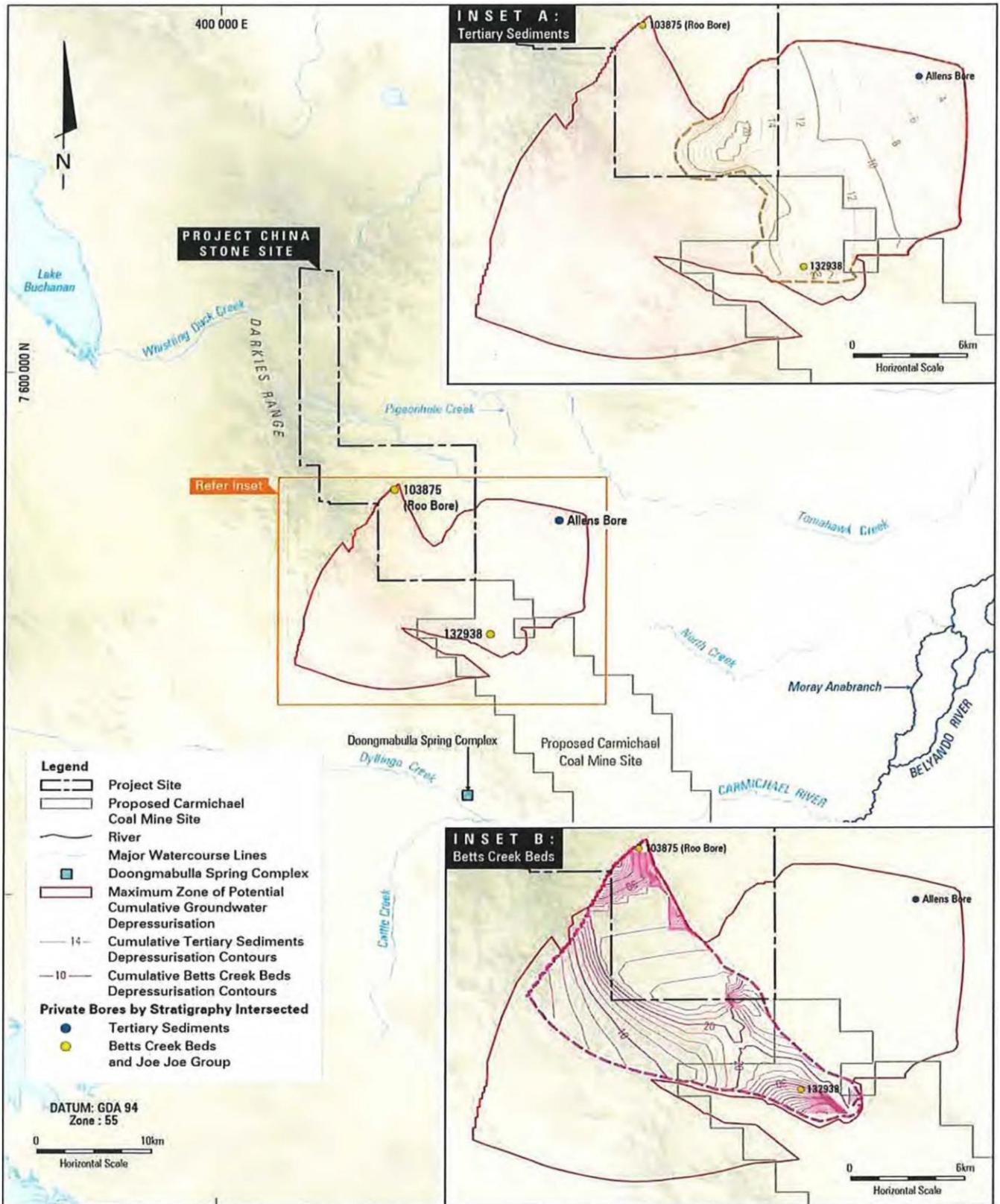


Figure 6.16 Maximum predicted extent of potential cumulative depressurisation

GDEs

The EIS predicted that cumulative impacts would be limited to bore owner impacts and that no GDEs would be subject to cumulative impacts. Cumulative impacts to the Clematis Sandstone, which is the likely source aquifer for the DSC, are not predicted, therefore cumulative impacts to the DSC are also not predicted. There are no other GDEs predicted to be subject to cumulative impacts.

As noted in the 'Impacts to other GDEs' section, further pre-clearance surveys are required by the proponent to confirm the presence or absence of shallow groundwater and other GDEs, particularly in the Tertiary sediments. This is important given the predicted drawdown in the Tertiary sediments due to cumulative impacts. My imposed condition (Appendix 1) outlines the additional surveys required.

Proposed mitigation and monitoring measures

Bores

Bore RN132938 is within the CCM&RP area and owned by Adani. While the bore may be removed or impacted by Adani, the project proponent may still be required to enter into a make good agreement with Adani, depending on the ultimate end use of the bore by Adani. This would be determined following the bore assessments to be undertaken by the project proponent, which would be a requirement of any future AWL for the project, as discussed in the 'Groundwater security for landowners' section.

For the Allens Bore, the proponent would be required by any future AWL to undertake a bore assessment and enter into a make good agreement with the landowner. The CCM&RP AWL (issued in March 2017 by DNRME) requires Adani to undertake a bore assessment on bores located within the predicted affected area and enter into make good agreements with any affected bore owner. This will apply to the Allens Bore.

The proponent has made a commitment to liaise with Adani to negotiate any make good agreements, proportionate to the predicted project contribution to the impacts. DES has published bore assessment guidelines that can be used to undertake the bore assessments. I expect the proponent to fulfil its commitment to work with Adani to negotiate make good agreements for bores subject to cumulative impacts.

The proponent has committed to undertake groundwater monitoring during the life of the project, including recording of groundwater levels and groundwater quality sampling. The proponent considers this monitoring would allow natural water level fluctuations to be distinguished from water level impacts due to mining activities and detect changes in groundwater quality.

However, I also require monitoring in the post-mining period and so to ensure this outcome I have imposed a condition (Appendix 1) for a GMMP to identify cumulative groundwater impacts during both the operations and post-mining periods, and identify groundwater impacts from the project, as opposed to impacts from the CCM&RP. This monitoring would also help to more specifically quantify the cumulative drawdown impacts of the projects.

GDEs

If pre-clearance surveys identify any GDEs that would be subject to cumulative impacts, my imposed condition (Appendix 1), requires the proponent to prepare a GDEMP that outlines management, mitigation and monitoring measures. Offsets may be required if SRIs are identified.

The Tertiary sediments on the north-western part of Adani's Moray Downs offset area would be subject to cumulative impacts from the project and the CCM&RP. As discussed in the 'Moray Downs' section of this report, I have recommended a condition (Appendix 3) to the Commonwealth Minister for the Environment to ensure the project must not result in any direct or indirect impacts to the Moray Downs offset area either from groundwater drawdown or other physical disturbance during operations or post-mining. I have also recommended that groundwater is monitored by the project through an appropriate network of monitoring bores. Assessment and monitoring are to be designed to identify groundwater dependency of vegetation and monitor drawdown impacts to vegetation. My recommendation requires the proponent to work with Adani to ensure predicted groundwater drawdown does not impact vegetation on the Moray Downs offset area.

Regional groundwater modelling, monitoring and assessment programs

In the Galilee, there is insufficient groundwater data publicly available about other projects to enable proponents to undertake a comprehensive cumulative assessment that would appropriately quantify impacts and complete a regional assessment. DNRME is better positioned to undertake a cumulative regional assessment in Queensland, using data requested from and provided by each proponent.

DNRME has commenced the development of a monitoring and assessment program for regional water impacts in the Galilee Basin. The Commonwealth Office of Water Science, Geoscience Australia and the BoM have also started development of a Galilee Basin Hydrogeological (water balance) model in collaboration with DNRME. The monitoring and assessment program and water balance model aim to consider the combined impacts of all currently proposed coal mines on groundwater and environmental assets in the Galilee Basin. As mines become operational and provide monitoring data, estimates of impacts would be refined and understanding of the risk to bore owners and regional impacts on GDEs would be improved. I have made a recommendation to DNRME (Appendix 4) that it continues to develop the regional model and monitoring and assessment programs.

I require the proponent to contribute data and funding for the regional water balance model and monitoring and assessment program and have imposed a condition (Appendix 1) to achieve this outcome. This is consistent with my conditions for other Galilee Basin coal mine proponents requiring the provision of the groundwater monitoring results to go to DNRME for input into the regional model.

Furthermore, my stated condition (Appendix 2) for the draft EA to partially backfill would reduce the potential regional cumulative groundwater impacts of the proposed lakes within the other proposed open-cut coal mine projects in the Galilee Basin.

Coordinator-General's conclusion - cumulative groundwater impacts

I am satisfied that the cumulative impacts to landowner bores would be appropriately mitigated through the make good obligations I have recommended for any future AWL. Potential impacts to GDEs would be more clearly understood following further survey work in the Tertiary sediments, which would be reported to DNRME, however my conditions require that in no circumstances are the DSC, Lake Buchanan or the Moray Downs offset area to be impacted by groundwater drawdown from the project. The cumulative assessment would be updated during the model revision and further enhanced by DNRME's continued development of the regional model, monitoring and assessment program. I consider that I have addressed the IESC's cumulative impact concerns through my conditioning approach.

Cumulative surface water impacts

Impacts

The potential for mine-affected water released from the project to impact downstream water users and environmental values in the Belyando River, Suttor River and Burdekin Falls Dam is a key potential cumulative surface water impact. The project may generate waters that contain elevated levels of suspended sediment or other contaminants that, if unmitigated, could affect downstream water quality in combination with other projects in the same catchments. The EIS states that significant adverse cumulative impacts are unlikely to occur due to mitigation measures to be put in place.

Proposed mitigation and monitoring measures

Mitigation measures include the controlled discharge of mine-affected water in accordance with DES model mining conditions. The EIS states that DES's model mining conditions, to be based on flows in North Creek, would also address potential cumulative impacts by considering the assimilative capacity of the Belyando River receiving environment. Surface water conditions are to be stated as part of a subsequent EA.

Coordinator-General's conclusion - cumulative surface water impacts

I am not satisfied that the EIS has provided sufficient information to determine the full extent of cumulative surface water impacts on the downstream environment resulting from controlled discharges of mine-affected water. Accordingly, I have imposed a condition (Appendix 1) requiring the proponent to provide DES with baseline water quality and flow monitoring data for North Creek to determine appropriate compliance and flow monitoring locations, release limits and contaminant trigger levels, required for the development of draft EA conditions, prior to public notification of the draft EA application.

6.4 Listed threatened species and communities

In deciding whether or not to approve the proposal for the purposes of a subsection of section 18, section 18A, and what conditions (if any) to attach to such an approval, the

Commonwealth Minister for the Environment must have regard to any approved recovery plan and conservation advice for the threatened species or ecological community that are likely to be or would be significantly impacted by the project.

6.4.1 Threatened ecological communities

The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin

An ecological community is a naturally occurring group of plants, animals and other organisms that are interacting in a unique habitat. Its structure, composition and distribution are determined by environmental factors such as soil type, position in the landscape, altitude, climate and water availability. An ecological community becomes threatened when it is at risk of extinction.

The EPBC referral decision stated that the proposed action is likely to have a 'significant impact on *the Community of native species dependent on natural discharge of groundwater from the Great Artesian Basin*' (GAB discharge spring wetlands). The GAB discharge spring wetlands are listed as 'endangered' under the EPBC Act. The community is defined by the abiotic (i.e. water) features of the springs rather than the composition of fauna and flora in the ecological community. To be part of the community, discharge spring wetlands must be fed by the discharge of GAB groundwater. The distribution of GAB discharge spring wetlands extends along the northern, western and southern margins of the GAB in Queensland, New South Wales and South Australia.

The GAB discharge spring wetlands are known to support a wide variety of plants, and aquatic and semi-aquatic animals including fish, frogs and aquatic invertebrates, many of which are considered endemic to the areas associated with the GAB discharge spring wetlands and/or are listed as threatened at a national and state level. The national recovery plan for the GAB spring wetlands¹³ considers the greatest threatening process for GAB discharge spring wetlands to be aquifer groundwater drawdown resulting from groundwater extraction for domestic and agricultural use and mining/coal seam gas extraction (Fensham et al., 2010). Mining of coal in aquifers can change the pressure of water reaching the springs and decrease the water available to flora and fauna dependent on springs.

Surveys did not find GAB discharge spring wetlands within the project area; however, the EIS identified the Doongmabulla Springs Complex (DSC) as the closest GAB discharge spring wetlands to the project area. The DSC is located approximately 20 km south of the southern mining lease boundary. The DSC forms an isolated cluster of wetlands that provide base flow to the Carmichael River and associated downstream ecosystems. The DSC contains a high number of endemic flora and fauna species,

¹³ Full citations for all recovery plans, threat abatement plans and conservation advices are in Appendix 6 of this report.

including threatened and near-threatened species (i.e. the salt pipewort (*Eriocaulon carsonii*), listed as endangered under the EPBC Act and the *Nature Conservation Act 1992* (NC Act) and the waxy cabbage palm (*Livistona lanuginosa*) listed as vulnerable under the EPBC Act and NC Act).

As discussed in section 6.3.2—Groundwater of this report, notwithstanding the GeoScience Australia assessment that the Clematis Sandstone is a non-GAB aquifer, and DNRME's support of the assessment, the Commonwealth Government's listing for the DSC under the EPBC Act as an endangered 'community of native species dependent on natural discharge of groundwater from the Great Artesian Basin' remains unchanged and sections 18 and 18A of the EPBC Act are still controlling provisions for the project.

Impacts and Mitigation

Impacts

The EPBC referral decision considered that a reduction in groundwater levels is likely to modify or destroy the abiotic factors necessary for the survival of the GAB discharge spring wetlands. The extent of the threat to the ecological community depends on the extent to which the spring flows will be affected by mining operations. Even a small reduction in the amount of groundwater pressure in the source aquifer(s) below the springs could potentially have a significant impact on the DSC. If the DSC were to dry up, the ecological community would be lost.

The EIS predicts that the reduction in groundwater pressure due to the project's mine dewatering would not extend as far south as the DSC and there would be no impacts to the DSC from the project. However, the IESC and other advisory agencies raised issues about the uncertainty of the source groundwater aquifer for the DSC, the adequacy and reliability of the project's groundwater modelling and cumulative impact assessment related to the DSC.

DSC source groundwater aquifer

The EIS states that the Clematis Sandstone is the source groundwater aquifer for the DSC (i.e. the DSC is reliant on groundwater flow from the Clematis Sandstone). The Clematis Sandstone occurs within the project area, however monitoring bores found the Clematis Sandstone largely unsaturated within the area. Open-cut mining and subsurface subsidence cracking above the southern underground mine would intersect a minor area of thin and unsaturated Clematis Sandstone. There would be a direct impact to the saturated Clematis Sandstone on the eastern side of the fault that runs through the Northern Underground Mine area, however this is an isolated piece of Clematis Sandstone, with limited connection to the main Clematis Sandstone aquifer due to the fault. There would also be an impact to the Clematis Sandstone aquifer post-mining due to the remaining open-cut mine pits filling with groundwater over time (see sub-section 'Final open-cut pit' of section 6.3.2—Groundwater of this report for further discussion).

The IESC advice for the project raised a concern that there is uncertainty about the source aquifer for the DSC, therefore investigating the project impacts based on the

Clematis Sandstone as the source aquifer may not be justified. The IESC advice referenced an alternative scenario (proposed by Webb et al 2015¹⁴) to suggest the source aquifer of the DSC could be the Permian sediments beneath the Rewan Formation, which generally has a low permeability. Under this scenario a fracture or fault would need to exist in the Rewan Formation and substantial potentiometric head (an imaginary surface that defines the level to which water in a confined aquifer would rise were it completely pierced with wells) would exist to allow groundwater to discharge through the Rewan Formation and Dunda Beds to the springs.

A 2017 report by the Queensland Herbarium, Department of Science, Information Technology and Innovation titled *Doongmabulla Galilee Springs Group: Hydrology and ecology*¹⁵, confirmed there is still uncertainty about the source aquifer due to an insufficient number of bores in proximity to the springs and limitations in available bore data (Queensland Herbarium 2017). DNRME consider that most available information points to the DSC being sourced from the Clematis Sandstone and that it is appropriate to investigate potential impacts from the project on that basis. I accept DNRME's advice on this matter, but acknowledge that uncertainty remains about the source aquifer(s) for the DSC.

Groundwater numerical modelling

The groundwater numerical model for the EIS shows a significant component of south-easterly groundwater flow direction in all geological formations toward the DSC and the Carmichael River. The groundwater numerical model predicts the maximum extent of depressurisation based on a 1 m drawdown contour. This zone of predicted groundwater drawdown in the Clematis Sandstone will extend 2 km south of the project area during operations and 11 km post-mining i.e. approximately 9 km away from the DSC. Groundwater drawdown in the other geological formations impacted by the project does not reach as far toward the DSC as it does in the Clematis Sandstone. Therefore, regardless of the source aquifer for the DSC, no impacts on the DSC are predicted. The EIS states this assessment is based on 'conservative' modelling and represents the best estimate predictions.

A sensitivity analysis was carried out for the EIS with the aim of assessing the response of the groundwater model to changing the input parameters (e.g. aquifer storage properties, rainfall recharge to groundwater). The sensitivity analysis assessed the changes to the zone of depressurisation in the Clematis Sandstone, the Tertiary sediments and Permian sediments (including the targeted coal seams that will be directly dewatered) during operations and post-mining.

¹⁴ Webb, J. (2015) Expert report on groundwater impacts to the Land court. Land Services of Coast and Country Inc. & Ors ats Adani Mining Pty Ltd. Land Court proceedings no. MRA428-14, EPA429-14, MRA430-14, EPA431-14, EPA433-14. Objection to Mining lease and Environmental Authority for Carmichael Coal Mine.

¹⁵ Queensland Herbarium. (2017), *Doongmabulla Galilee Springs Group: Hydrology and ecology*, Department of Science, Information Technology and Innovation, Brisbane

The resulting zone of predicted drawdown in the sensitivity analysis does not reach the DSC, although the drawdown comes within approximately 2 km of the DSC post-mining. The EIS considers the values adopted in the sensitivity analysis are unrealistic and extreme values, but these would represent the worst-case scenario. Despite the use of these values depressurisation shown in the sensitivity analysis does not extend to the DSC.

The sensitivity analysis shows that geological formations are most sensitive to changes in the model inputs for aquifer hydraulic conductivity (permeability) and aquifer storage values. The independent peer review of the groundwater model concluded the aquifer permeability values adopted in the model base case were too low in some model layers and aquifer storage values were too high in some layers and the combination would tend to under-estimate drawdown impacts.

The review recommended that the model should be updated and re-calibrated with revised base case parameters before re-running the composite and other sensitivity analyses and the predictions. The peer review also found the residual modelling procedure was not well executed and the predicted maximum zone of depressurisation post-mining is therefore not established conclusively (see 'Final open-cut pit' section of this report for further discussion).

The peer review also recommended refinement of the model features to provide the capability to assess any spring discharge impacts to ecological features that may arise due to any drawdown impacts (if predicted in future model updates).

Given the model may have underestimated impacts, there is uncertainty about the EIS conclusion that there would be no impact to DSC as a result of depressurising of aquifers caused by mining. There is a possibility that predicted impacts to DSC could be different once the model is re-run with revised base case parameters.

Cumulative impacts

The groundwater numerical model was used to undertake a cumulative groundwater impact assessment for the project with the adjacent CCM&RP. The CCM&RP groundwater modelling predicts a maximum drawdown from that project's mine dewatering of 0.19 m measured at the DSC. This maximum impact would not be reached until year 60 of the CCM&RP operations, which is the end of the mine life. The CCM&RP groundwater modelling also assumes the Clematis Sandstone is the source aquifer for the springs.

The method employed by the proponent for assessing cumulative impacts involved superimposing maximum predicted groundwater drawdown contours for the project and the CCM&RP on a map.

The project is not predicted to contribute to cumulative groundwater drawdown impacts on the DSC. However, there is a possibility that predicted impacts to the DSC could be different once the project groundwater model is re-run with revised base case parameters. The independent peer review of the project groundwater model also noted low confidence in the prediction of cumulative post-mining impacts, due to the residual modelling procedure undertaken for the EIS, as previously mentioned.

The IESC advice was concerned with this approach to assessing cumulative impacts instead of undertaking appropriate calculations. The peer review of the groundwater modelling advised that the principle of superposition is a reasonable method to provide a first estimate of cumulative impacts. A more detailed cumulative assessment of the project and CCM&RP impacts requires a regional model specifically designed to investigate cumulative impacts, with appropriate surface water interaction features, including the DSC. Further discussion on cumulative groundwater impacts is provided in the 'Regional groundwater modelling, monitoring and assessment programs' section.

Mitigation and management measures

The EIS did not propose mitigation measures for potential impacts to DSC because no impacts from the project are predicted. To ensure there would be no impacts to the DSC from the project, I have recommended a condition (Appendix 3) to the Commonwealth Minister for the Environment for the approval under the EPBC Act requiring that the project must not result in any direct or indirect impacts to the DSC, either from groundwater drawdown or other physical disturbance during operations and post-mining.

I have imposed a condition (Appendix 1) requiring the proponent to revise the groundwater numerical model incorporating the revised base case parameters recommended in the independent peer review report and re-run all sensitivity analysis and the cumulative impact assessment within three months of issuance of this evaluation report. The proponent must also submit an updated groundwater impact assessment report incorporating any changes to the predicted groundwater impacts of the project and updated proposed mitigation and management measures. If it becomes evident, through the model revision or monitoring data that the DSC may become impacted, the proponent must either revise their mine design plan or operations to avoid the impacts and adopt adaptive management measures.

To monitor for potential impacts and identify any unexpected departures from the EIS groundwater modelling predictions, I have also recommended a condition (Appendix 3) to the Commonwealth Minister for the Environment requiring the proponent to prepare a GMMP to ensure groundwater impacts to MNES are identified, managed, mitigated and monitored. The GMMP must include details of a groundwater monitoring network designed to provide early warning triggers if groundwater levels fluctuate more than level thresholds to be set at monitoring bores between the project and the DSC in all geological formations. The GMMP must also detail measures to be taken if thresholds are exceeded. Once operations commence any unexpected departures from predicted impacts would need to be investigated in accordance with the EA, which would include a report to the administering authority.

My conditions and recommendations also require regular reviews and updates of the GMMP and the groundwater numerical model once mining operations commence. These reviews will assess the adequacy of monitoring locations, frequencies and triggers, after incorporating updated operations phase groundwater monitoring data and measured mine dewatering volumes.

To reduce the ongoing take of groundwater post-mining through evaporation from the contaminated water in the open-cut mine pits, and further reduce any likelihood of impacts to DSC, I have stated a condition in the EA to backfill the residual pits (Appendix 2) to a level above the pre-mining groundwater level. The revision of the groundwater numerical model required by my imposed condition would need to account for the requirement to backfill the pits.

I acknowledge that the source aquifer(s) for the DSC is not certain and that additional data and information is required to provide sufficient evidence for this certainty. A GAB Springs Research Plan is required by a condition of the EPBC approval for the CCM&RP. One of the aims of the research plan is to identify the source aquifer for the DSC. Other conditions on the CCM&RP require the establishment of a comprehensive baseline dataset on the spring conditions to improve understanding of the DSC. Work has progressed by the CCM&RP proponent on the GAB Springs Research Plan.

Given research into the source aquifer for the DSC has commenced and the current modelling for the EIS does not predict impacts to the DSC (regardless of the source aquifer), I have not required the proponent to investigate the source aquifer. However, the results of the research undertaken by the CCM&RP proponent should be used to inform future updates of the China Stone groundwater numerical model and the GMMP, including any change to the source aquifer for the DSC.

To address cumulative impacts with CCM&RP and potential other mines in the Galilee Basin, I have recommended (Appendix 4) that the authority responsible for administering the Water Act must ensure the continued development and maintenance of a numerical regional water balance model for the Galilee Basin. I have also recommended (Appendix 4) the authority responsible for administering the Water Act continue the development of an ongoing regional groundwater and surface water monitoring and assessment program with reference to existing water users and the maintenance of environmental values. Furthermore, I have imposed a condition (Appendix 1) that the proponent is required to contribute data and funding to the development of the regional water balance model and the groundwater and surface water monitoring and assessment program and update the GMMP to account for requirements of the regional program.

Recovery plan, conservation advice and threat abatement plans

The overall objective of the recovery plan for the GAB discharge springs wetlands is to maintain or enhance groundwater supplies to the springs, maintain or increase habitat area and health, and increase all populations of endemic organisms.

Aquifer drawdown is the key threat identified in the recovery plan which is relevant to the project. The key objectives in the recovery plan relevant to the project are the enhancement of aquifer pressure and ensuring flows from springs do not decrease lower than natural variability. The recovery plan includes actions to eliminate, reduce and manage threats to the springs.

I have imposed and recommended conditions that will result in the implementation of actions that are consistent with the recovery plan, including recommending that there

be no impact to the DSC resulting from the project and ongoing monitoring to ensure this outcome.

There is no approved conservation advice for the GAB discharge springs wetlands.

There are two threat abatement plans for species that pose a threat to the GAB discharge springs wetlands:

1. *Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads* - 2011
2. *Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (Sus scrofa)* - 2017

I note the EIS includes a commitment to manage feral and pest animals within the project area and to prepare and implement a biodiversity management plan and a feral animal and weed management plan. While the GAB discharge springs wetlands are located 22 km from the project area, I consider that this commitment will help reduce the spread of these species and reduce threats on the GAB discharge springs wetlands.

Coordinator-General's conclusion – GAB discharge springs wetlands

The groundwater modelling for the EIS predicts no impacts to the DSC from the project because of groundwater drawdown, however there remains uncertainty with this conclusion. The threat of environmental damage to the DSC may become apparent in future modelling updates or data collected during the operations phase groundwater monitoring program.

Given the uncertainties and risk of threat, I conclude the precautionary principle should be applied and I have recommended to the Commonwealth Minister for the Environment that the project must avoid impacts on the DSC.

The other conditions I have imposed and recommended form part of an adaptive management approach which will monitor impacts, regularly review and report on the GMMP and investigate and action any exceedances of predicted impacts. I am satisfied this approach would avoid and manage the risk of threat to the ecological value of the GAB discharge springs wetland. With my requirement for backfilling of the open-cut pit to a level above the pre-mining groundwater level, the risk of drawdown impacts to DSC will be further reduced.

Considering the approach to conditions for the project, I conclude that the project would be consistent with the recovery plan for the GAB discharge spring wetlands.

This approach to conditioning and managing potential impacts on the GAB discharge spring wetlands also addresses the IESC's concerns with respect to the project impacts and cumulative impacts.

6.4.2 Threatened terrestrial flora

Surveys

Flora surveys were undertaken in the major regional ecosystems present in the project area, at representative locations established following desktop data assessments which included state and Commonwealth published regional ecosystem databases and vegetation mapping, the EPBC Act Protected Matters Search Tool, and Queensland Museum and HERBRECS databases.

Flora field surveys were undertaken during four periods:

- by helicopter on 1 and 3 May 2012
- ground surveys between 16 May and 24 May 2012
- ground surveys between 29 October 2012 and 9 November 2012
- ground surveys between 14 October and 20 October 2013.

A total of 77 secondary flora quadrats measuring 10 m x 50 m were surveyed, with validation and mapping of remnant vegetation undertaken at 676 quaternary sites (Figure 6.17).

Results

A search of the EPBC Act Protected Matters Search Tool database identified the following flora species listed under the EPBC Act as having a low potential to occur within the project area and 10 km of the boundary of the area:

- Endangered salt pipewort (*Eriocaulon carsonii*)
- Endangered blue devil (*Eryngium ovinum*)
- Vulnerable *Lawrenzia buchananensis*
- Vulnerable waxy cabbage palm (*Livistona lanuginosa*)

These species were not recorded during the field surveys.

Submissions

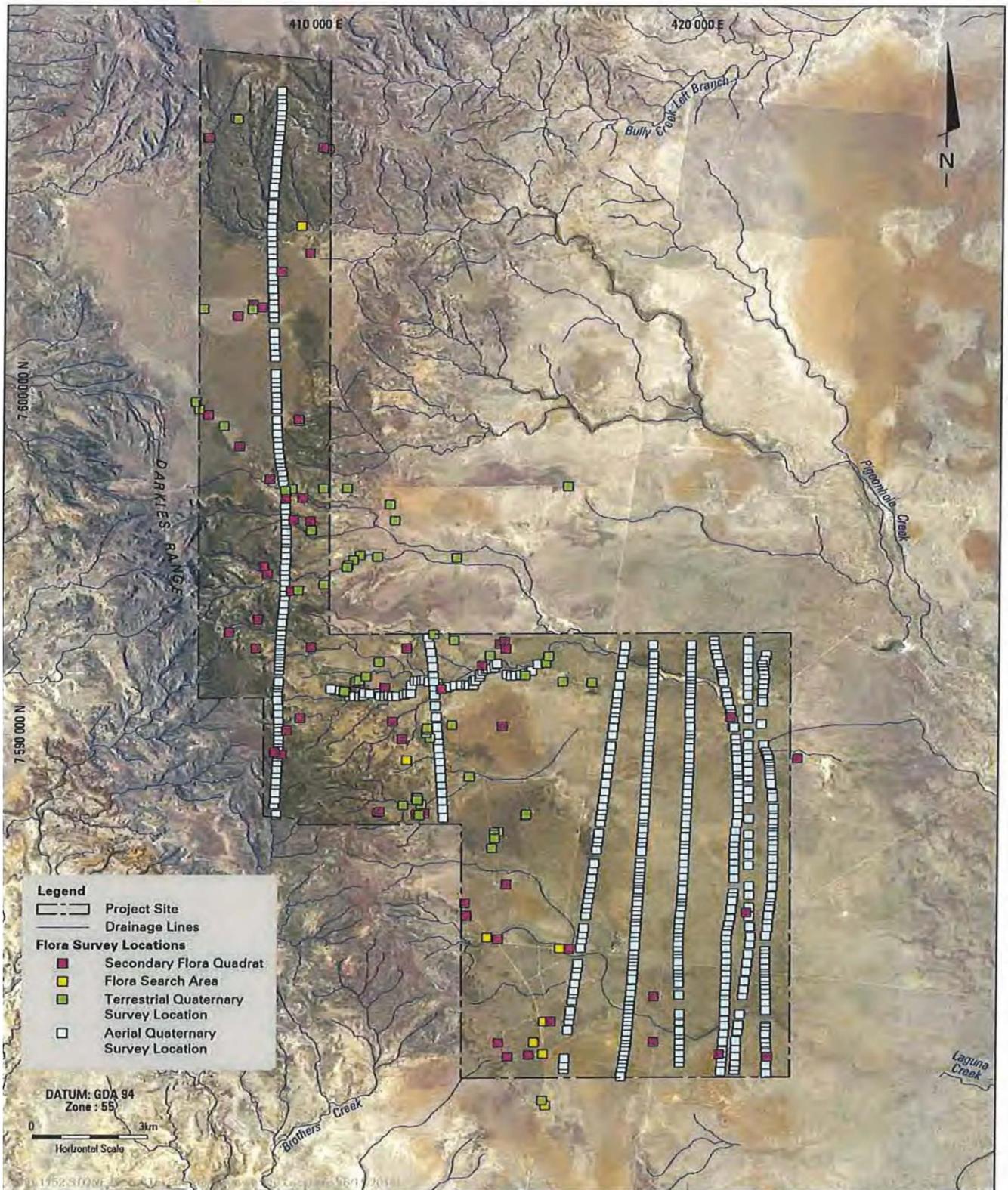
Submissions lodged in respect of species which are both MNES and MSES are addressed in section 5.2—MSES.

A submitter advised that the vulnerable species *Corymbia clandestina* is present within the project area and has not been described and assessed in the EIS.

Impacts and mitigation

Clearing of vegetation

The EIS indicated that the largest direct impact of clearing vegetation for the open-cut mine, mine infrastructure, remedial drains and the highwall drainage infrastructure channel would be the removal of 11,000 ha of woodland habitat, rock outcrops habitat, the southern seasonal wetland, the southern farm dam and ephemeral drainage lines.



PROJECT CHINA STONE



Hansen Bailey

Flora Survey Sites

Figure 6.17 Flora survey sites

No EPBC listed flora species were recorded during field surveys, however, the proponent has made commitments throughout the EIS that pre-clearance surveys to identify MNES would be undertaken prior to any works associated with the construction of the open-cut mine, the mine infrastructure areas and the highwall drainage infrastructure channel.

A submitter advised that the EPBC listed flora species *Corymbia clandestina* is present on the site. This species would be included in the identification of MNES during the pre-clearance surveys.

Section 5.2—MSES of this report addressed the potential for aquatic habitat above and below the surface area of the project area and identified the need for further survey work to be undertaken to identify this habitat. Pre-clearance surveys would address the identification of MNES within aquatic habitat found in the survey area.

The EIS also included environmental management commitments and environmental management plans which address rehabilitation and revegetation of areas at each stage of the mining process, the risk to flora from feral animals, subsidence, erosion and sediment management.

Bushfires

The EIS indicated that vegetated areas within the project area and adjoining lands are subject to bushfire risk. The proponent has made a commitment to undertake surveys to identify risks to vegetated areas from bushfires, the results of which would inform the preparation of a Bushfire Management Plan to minimise the risk of identified EPBC listed flora being destroyed by bushfire.

The proponent has made a commitment to prepare flora species management plans and intends to integrate all species management plans within a biodiversity management plan.

Coordinator-General's conclusions

I am satisfied that the EIS has undertaken surveys to identify EPBC listed threatened flora species in accordance with the guidelines issued pursuant to the EPBC Act.

The proponent has provided commitment to undertake pre-clearance surveys which would identify MNES flora not identified in the surveys undertaken in the EIS. I am satisfied there are approved government guidelines which provide for the survey methodology and reporting requirements to identify MNES flora and environmental values.

I have recommended a condition (Appendix 3) to the Commonwealth Minister for the Environment that, prior to the clearing of vegetation, the approval holder must undertake pre-clearance surveys within the project area to identify the presence and extent of MNES flora. A report on the findings of the surveys must be provided to DEE by the approval holder.

Where species are identified, any recovery plans, conservation advices and threat abatement plans in respect of those species must be included and considered as part

of the project's offset measures, environmental management plans, impact mitigation control measures and monitoring programs outlined in the EIS.

Habitat offset areas for threatened and endangered species including the BTF must be protected before any clearing of habitat.

Throughout the EIS, the proponent made commitments to prepare a Biodiversity Management Plan and other flora and fauna environmental management plans would address the management of adverse impacts on EPBC listed threatened species. I accept the proposed commitments outlined in Appendix 5 which are provided to manage and mitigate any adverse impacts caused by the project.

6.4.3 Threatened terrestrial fauna

Surveys

Terrestrial fauna field surveys were conducted in strategic locations during four survey periods:

- by helicopter on 1 and 3 May 2012
- ground surveys between 16 May and 24 May 2012
- ground surveys between 29 October 2012 and 9 November 2012
- ground surveys between 14 October and 20 October 2013.

The survey techniques and source data used on land and at remnant pools and water holes were based on the results of databases, aerial imagery, state and Commonwealth published regional ecosystem databases, wetland, essential habitat and vegetation mapping, EPBC Act Protected Matters Search Tool, threatened species databases, Queensland Museum and HERBRECS databases and other sources. The following methods were used to identify species:

- flora sampling of 77 secondary quadrats, with validation and mapping of remnant vegetation undertaken at 676 quaternary sites
- infrared camera traps, hair tubes, spotlighting, callback and active searching, and anabat survey sites on 15 generic sites having an area of 100 m x 100 m
- 2,040 trap nights, 116 infrared camera trap nights, 15 person hours of spotlighting, 15 person hours of call playback, 37 person hours of bird surveys, and 44 person hours of active searches for amphibians and reptiles
- 68 nights of ultrasonic bat recording.

Surveys were not undertaken during all four seasons in a year, and rainfall patterns over a number of years were not recorded.

The field surveys recorded 128 native bird species within the study area and the avian fauna was generally diverse and abundant during all three survey periods. Suitable foraging habitats and remnant pools were present for granivores, insectivores and nectarivores.

The search of the protected matters search tool database identified the following species listed under the EPBC Act as present, having a moderate potential to occur and having a low potential to occur within 10 km of the project area boundary.

Present

- black-throated finch (southern) (*Poephila cincta cincta*), endangered
- squatter pigeon (southern) (*Geophaps scripta scripta*), vulnerable
- koala (*Phascolarctos cinereus*), vulnerable

Moderate Potential to Occur

- Australian painted snipe (*Rostratula australis*), endangered

Low Potential to Occur

- yakka skink (*Egernia rugosa*), vulnerable

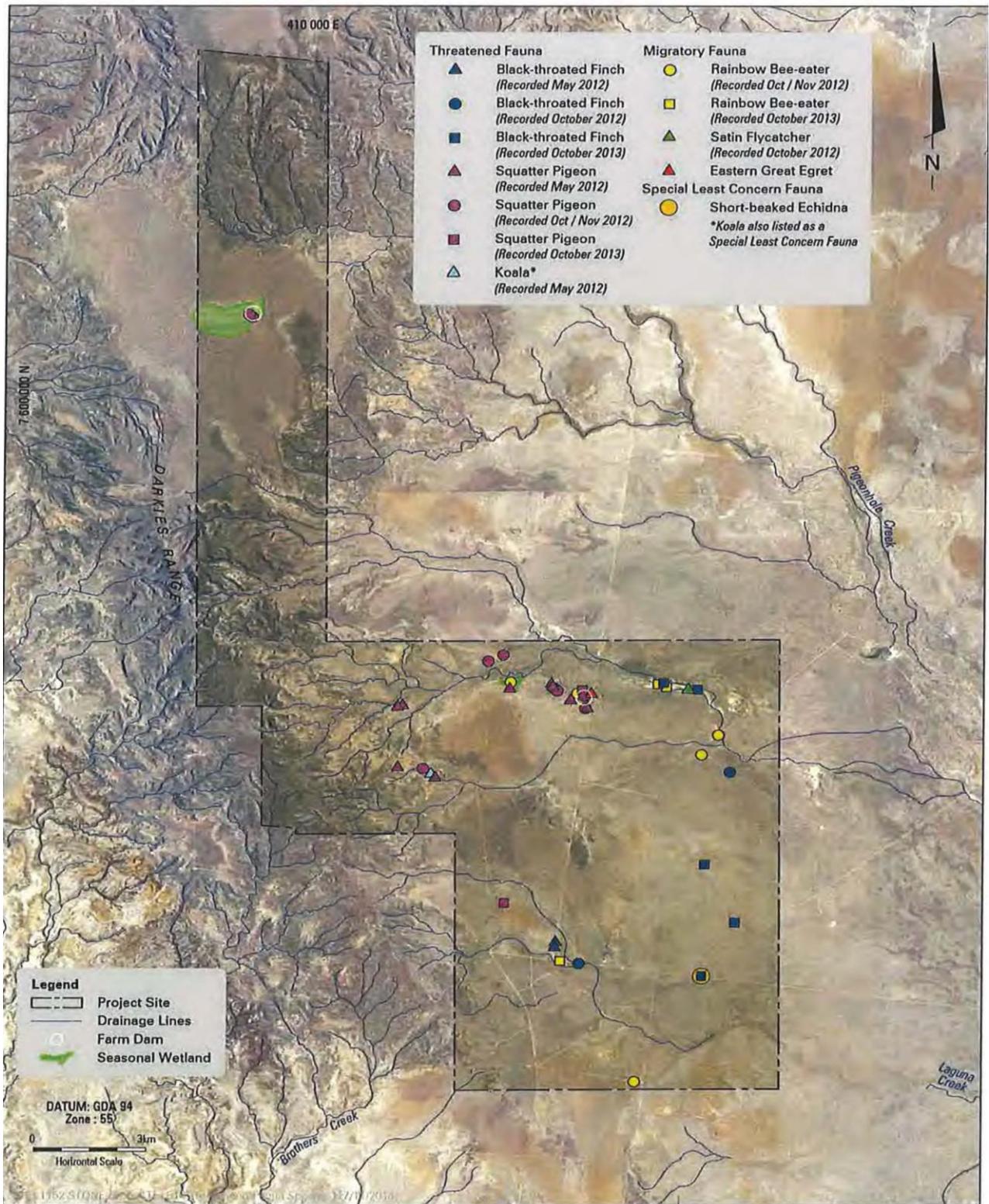
The black-throated finch (southern) (BTF), squatter pigeon and koala were recorded during the field surveys. The remainder of the species were not recorded during the field surveys.

Figure 6.18 identifies the locations where the species were recorded.

Submissions received

Submissions were lodged in respect of MNES threatened species. The following issues raised by the submitters relate to all species identified in the desktop and field survey work:

- the field surveys and desktop habitat assessments were inadequate and do not reflect the range of fauna species within the project area and in the adjoining lands.
- the EIS assessments of the species and their habitat are not adequate to determine the species' populations and their habitats, including water sources and the determination of any offsets required.
- the field survey programs did not include adequate spatial and seasonal conditions for the project area in order to assess representative examples of ecological values.
- the cumulative impacts of the approved Galilee Basin mine projects were not taken into account.
- the project will cause irreversible damage to fauna species.
- the content of the draft Biodiversity Offset Strategy was not included within the EIS.
- the quantity of offset required cannot be determined until the environmental values are known as a result of detailed field surveys.



PROJECT CHINA STONE



Threatened, Special Least Concern and Migratory Fauna Species Records

Figure 6.18 Threatened, special least concern and migratory fauna species records identifies the locations where the species were recorded.

Black-throated finch (southern) (*Poephila cincta cincta*)

The BTF is listed as endangered under the EPBC Act and the NC Act. The species is a ground-dwelling bird. It inhabits grassy woodland where there is access to seeding grasses and water for regular drinking during the day. It eats grass seeds and insects, nests in foliage of trees or tree hollows and roosts in trees at night. The species breeds throughout the year.

The DEE *Significant Impact Assessment Guidelines* provide that the BTF once extended from Inverell in north-east New South Wales, through eastern Queensland, to the Atherton Tablelands and west to central Queensland. In north Queensland (Atherton Tablelands, north to Cape York Peninsula and west to the Gulf of Carpentaria) the distribution of this subspecies overlaps with that of the northern subspecies. The BTF range has contracted by up to approximately 80 per cent of its former extent over the last 20 years and is now restricted to the northern part of its former range.

BTF monitoring programs on land adjoining the western and southern boundaries of the project area are currently underway. The data is being provided by the landholder, Adani, to the DES and DEE. These monitoring programs are part of the requirements of a Biodiversity Offset Strategy approved by the DEE and the CG in 2016 discussed in section 5.2.4 and will contribute to the recovery strategies outlined in the *National recovery plan for the Black-throated finch southern subspecies (Poephila cincta cincta)*

The six projects approved by the Commonwealth Minister for the Environment in the Galilee Basin include as a condition of approval, monitoring programs for the BTF and the requirement for monetary contributions towards government research programs aimed at conserving the species. In addition to these research programs, the DES is currently preparing a BTF bioregional plan to address the impacts of mining projects in the Galilee Basin region ('recovery plan for the BTF').

Results of surveys

The species was recorded in several locations in the southern central portion of the project area (Figure 6.18). A flock of approximately 12 individuals was recorded several times during May 2012. Several individuals and some small flocks were recorded at separate locations during October 2012 to November 2012 and October 2013 to November 2013. As described above, a BTF population is being monitored on adjoining land.

The EIS indicated that the BTF may occur as a single, contiguous population that extends into habitat surrounding the project area, however, surveys were not undertaken by the proponent to establish this possibility.

The recovery plan for the BTF provides that no widespread targeted surveys of the BTF have been conducted outside of the Townsville-Thuringowa region. It further provides that a survey results database is being prepared by the DES.

The EIS identified that 7,066 ha of high-value habitat for the BTF is present in the northern, southern and eastern portions of the project area where they have access to water. A total of 6,879 ha of low-value habitat for this species is present mostly in the

southern portion of the project area with a few small areas within the northern portion of the project area.

Revised habitat modelling undertaken as part of the AEIS identified 12,334 ha of high-value BTF habitat in the project area. Areas of high-value habitat anticipated to be disturbed by the project total 8,524 ha. Of this amount 8,499 ha is high-value habitat which would be cleared for open-cut mining and mine infrastructure, 15 ha would be disturbed due to subsidence crack rehabilitation and 10 ha would be cleared for the construction of remedial drains. Figure 6.19 identifies the results of the revised BTF habitat modelling.

Recovery Plan

There is an approved recovery plan for this species: *National recovery plan for Black-throated Finch southern subspecies (Poephila cincta cincta)*.

The recovery plan lists the key threats to the species as:

- clearing and fragmentation of woodland, riverside habitats and wattle shrubland
- degradation of habitat by domestic stock and rabbits, including alterations to fuel load, vegetation structure and wet season food availability
- invasion of habitat by exotic weed species, including exotic grasses
- illegal trapping of birds
- predation by introduced predators
- hybridisation with escapees of the northern subspecies.

Recovery objectives, performance criteria and actions are outlined in the plan. The recovery objectives are:

- Recovery Objective 1: Identify and quantify threats
- Recovery Objective 2: Quantify distribution and abundance
- Recovery Objective 3: Protect and enhance habitat
- Recovery Objective 4: Investigate the potential for captive birds contributing to a re-introduction project
- Recovery Objective 5: Increase public awareness.

The overall objective of the national recovery plan is to manage and protect BTF and its habitat and promote recovery of the subspecies. I consider that although the project will result in the clearing of habitat for this species, the proponent's environmental management measures such as the revegetation management plan and feral animal and pest management plans would contribute towards achieving the recovery plan's objectives.

The EIS addressed the edge effects from clearing of vegetation and the impact of the edge effects on all EPBC listed threatened species within these areas. To manage this impact the proponent has made a commitment to regenerate these areas with native species, which I accept as an appropriate management measure.



PROJECT CHINA STONE



Black-throated Finch Habitat
(Based on Revised Habitat Modelling)

Figure 6.19 Black-throated finch habitat based on revised habitat modelling)

The proponent has made a commitment to prepare a biodiversity management plan which will include measures to conserve and enhance the conservation value of areas of native vegetation that to be retained within the project area. The plan would also describe the alignment of the management measures with the national recovery plan for the BTF.

Conservation Advice

There is no conservation advice for the BTF.

Threat Abatement Plans

The approved threat abatement plans for the BTF relate to the impact of rabbits and listed grasses on the species:

- *Threat abatement plan to reduce the impacts on northern Australia's biodiversity by the five listed grasses - 2012*
- *Threat abatement plan for competition and land degradation by rabbits – 2016.*

Other possible threats include feral cats, feral pigs and the European red fox which are provided for in the following approved threat abatement plans:

- *Threat abatement plan for predation by feral cats – 2015*
- *Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*) – 2016*
- *Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads - 2011*
- *Threat abatement plan for predation by the European red fox – 2008.*

The five listed grasses are the introduced species: gamba grass (*Andropogon gayanus*), para grass (*Urochloa mutica*), olive hymenachne (*Hymenachne amplexicaulis*), perennial mission grass (*Cenchrus polystachios* syn. *Pennisetum polystachion*) and annual mission grass (*Cenchrus pedicellatus* syn. *Pennisetum pedicellatum*). These grasses are considered to be weeds and would be included as part of the weed management plan and its pest identification and control measures.

The rabbit and European red fox are Category 3, 4, 5 and 6 restricted matters and the feral cat is a Category 3, 4, and 6 restricted matter under the Queensland *Biosecurity Act 2014*. Under this Act, landowners have a 'general biosecurity obligation' to take all reasonable and practical steps to minimise the risks associated with invasive plants and animals on a person's land.

I note the proponent has made a commitment in the EIS to manage feral and pest animals and to prepare and implement a biodiversity management plan and a feral animal and weed management plan. The biodiversity management plan would include measures to enhance habitat values, management of grazing pressure within the project area, and a fire management plan. The feral animal and weed management plan would include pest identification, including rabbits, and control measures.

The impact of cattle on MNES (and MSES) species are not included in a specific threat abatement plan, however, the proponent has made a commitment to construct fencing

around water sources to protect the sources of water for the BTF and also to prevent trampling of food sources by cattle.

I consider that these actions would reduce the threats of predation on the BTF within the project area and protect its water and food sources.

Impacts and mitigation

The EIS indicated that an assessment of significance was conducted according to the EPBC Act *Significant Impact Guidelines*. The assessment identified that clearing of the high-value habitat for the BTF would give rise to a significant residual impact to the species of 8,524 ha.

The EIS indicated that severance of connectivity of the habitat for the BTF would not occur as connected habitat would remain between the retained vegetation to the north and south of the clearing footprint and with habitat adjoining the project area.

It also indicated that a revised Draft Biodiversity Offset Strategy to address the significant residual impacts and would include proposed offset areas, management strategies for the offset areas, monitoring and reporting arrangements and a description of the environmental gains to be achieved by the offset.

The proponent identified in the EIS the need to undertake further detailed field surveys prior to the commencement of construction to identify MNES not recorded in the field surveys undertaken for the EIS.

The EIS also provided for the following commitments:

- measures to enhance habitat values will include establishing fauna watering points which could be used by birds, mammals and reptiles. The construction of fencing around water sources to preserve water sources and prevent trampling of food sources by cattle is proposed as a protection measure for the BTF.
- clearing procedures would minimise unnecessary disturbance to native vegetation
- pre-clearing surveys to identify fauna, protect the species from injury and identify habitat features to be relocated
- a spotter catcher would be present to rescue any animals present during the clearing procedures
- areas of native vegetation within the project area, outside the footprint of the open-cut mining and the mine infrastructure area would be managed to conserve and enhance their conservation areas
- speed limits along internal roads, appropriate signage and careful driving policies will be put in place to increase the awareness of drivers and decrease the risk of vehicles striking fauna.

The proponent also made commitments to prepare species management plans, rehabilitate and revegetate mined areas after the completion of the relevant stage of the mine project and to prepare a range of environmental management plans relating to the re-establishment of vegetation, topsoil, management of subsidence, bushfire prevention, erosion and sediment control, and to prevent feral animal predation on fauna.

The EIS addressed the edge effects from clearing of vegetation and the impact of the edge effects on all EPBC listed threatened species evaluated in this report within these areas. To manage this impact the proponent has made a commitment to regenerate these areas with native species, which I accept as an appropriate management measure.

Coordinator-General's conclusions

I am satisfied that the proponent's commitments to prepare environmental management plans which would include the feral and pest animals identified in the threat abatement plans and to provide fencing to protect the BTF water and food sources would manage the potential impacts of the project on the BTF.

The EIS indicated that a total of 8,524 ha would be disturbed as a result of the project. I have stated a condition (Appendix 2) of the draft EA that no more than 8,524 ha of BTF habitat can be disturbed by the project. I have recommended a condition to the Commonwealth Minister for the Environment that this area is also the maximum habitat disturbance limit for the approval under the EPBC Act (Appendix 3).

The proponent has provided a commitment to undertake pre-clearance surveys which would identify MNES fauna not identified in the surveys undertaken for the EIS. I am satisfied there are approved government guidelines which provide for the survey methodology and reporting requirements to identify the BTF and MNES environmental values.

Having regard to these matters and to manage any possible adverse impacts of the project on the BTF not identified in the EIS, I have recommended a condition to the Commonwealth Minister for the Environment that, prior to the clearing of vegetation, the approval holder must undertake pre-clearance surveys in the disturbed areas to identify the presence and extent of any BTF and its habitat (Appendix 3). A report on the findings of the surveys must be submitted to the DEE by the approval holder.

Where species are identified, any recovery plans, conservation advices and threat abatement plans in respect of those species must be included and considered as part of the project's offsets measures, environmental management plans, impact mitigation control measures and monitoring programs outlined in the EIS.

I have recommended a condition to the Commonwealth Minister for the Environment that MNES management plans must be prepared for the BTF (Appendix 3). I have also stated a condition (Appendix 2) of the draft EA that the proponent must submit a draft BTF Species Management Plan to the DES and that the plan must align with the EPBC Act requirements, recovery plans, conservation advices and relevant threat abatement plans.

I have also recommended a condition to the Commonwealth Minister for the Environment that the approval holder prepare a Biodiversity Offset Strategy which addresses the residual impacts of the project on the BTF (Appendix 3). Consistent with the National Recovery Plan for the BTF, residual impacts caused by the project must be offset by protecting and enhancing habitat for the BTF within that Strategy.

Squatter pigeon (southern) (*Geophaps scripta scripta*)

The squatter pigeon (southern) ('squatter pigeon') is listed as 'vulnerable' under the EPBC Act and the NC Act. The species is a ground-dwelling, granivorous bird, which nests on the ground, forages for seeds among grass and roosts in trees at night.

Results of surveys

The species was recorded during field surveys and in the Queensland Wildlife Online database search. It was commonly observed along the tracks whilst the field survey personnel were driving and adjacent to the artificial farm dams or ephemeral drainage lines. The EIS indicated that the species is tolerant of disturbance, has been recorded in a wide range of habitats, is widespread in the project area and is locally abundant. It also recognised that there is no recovery plan for the species, and that there is an approved conservation advice for the species.

The EIS identified that 3,440 ha of high-value habitat for the squatter pigeon is present in the northern portion of the project area, along remnant pools and in the eastern portions of the study area. Habitat modelling also identified 16,647 ha of low-value habitat for this species within the remainder of the project area.

Revised habitat modelling undertaken as part of the AEIS identified 3,520.7 ha of high-value squatter pigeon habitat in the project area. Of this amount 3,476 ha would be cleared for open-cut mining and mine infrastructure, 39 ha would be disturbed due to subsidence crack rehabilitation and 5.7 ha would be cleared for the construction of remedial drains.

Recovery Plan

There is no recovery plan for this species.

Conservation Advice

There is an approved conservation advice for this species: *Approved Conservation Advice for (Geophaps scripta scripta) squatter pigeon (southern)*.

The overall objective of the conservation advice is to protect the species and provide measures to contribute to its survival.

The conservation advice lists the key threats to the species as:

- clearing of habitat
- grazing of habitat by livestock and feral herbivores
- land degradation by rabbits
- predation by feral animals.

The primary conservation and management actions to protect the species include:

- identification of species populations
- protection and rehabilitation habitat which supports the species
- implement stock management plans
- control and eradication of feral herbivores.

The overall objective of the conservation advice is to manage and protect the squatter pigeon and its habitat and promote the conservation of the species. I consider that although the project will result in the clearing of habitat for this species, the proponent's environmental management measures such as the revegetation management plan, feral animal and pest management plans, would contribute towards achieving the conservation advice conservation and management actions outlined in the conservation advice.

The proponent has made a commitment to prepare a biodiversity management plan which will include measures to conserve and enhance the conservation value of areas to be retained within the project area. The plan would also describe the alignment of the management measures with the conservation advice for this species.

The approved threat abatement plans for the BTF relate to the impact of rabbits and listed grasses on the species:

- *Threat abatement plan to reduce the impacts on northern Australia's biodiversity by the five listed grasses - 2012*
- *Threat abatement plan for competition and land degradation by rabbits – 2016.*

Threat abatement plans

The approved threat abatement plans for the squatter pigeon relate to the impact of feral cats, rabbits and the European Fox:

- *Threat abatement plan for predation by feral cats – 2015*
- *Threat abatement plan for competition and land degradation by rabbits – 2016*
- *Threat abatement plan for predation by the European red fox – 2008*

Other possible threats to the squatter pigeon are outlined in the following threat abatement plans:

- *Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*) – 2016*
- *Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads - 2011*
- The European red fox and the rabbit are Category 3, 4, 5 and 6 restricted matters and the feral cat is a Category 3, 4, and 6 restricted matter under the Queensland *Biosecurity Act 2014*. Under this Act, landowners have a 'general biosecurity obligation' to take all reasonable and practical steps to minimise the risks associated with invasive plants and animals on a person's land.
- *Threat abatement plan to reduce the impacts on northern Australia's biodiversity by the five listed grasses - 2012*

I note the proponent has made a commitment in the EIS to manage feral and pest animals and to prepare and implement a biodiversity management plan and a feral animal and weed management plan. The biodiversity management plan would include measures to enhance habitat values, management of grazing pressure within the project area and a fire management plan. The feral animal and weed management plan would include pest identification and control measures.

The five listed grasses are the introduced species: gamba grass (*Andropogon gayanus*), para grass (*Urochloa mutica*), olive hymenachne (*Hymenachne amplexicaulis*), perennial mission grass (*Cenchrus polystachios* syn. *Pennisetum polystachion*) and annual mission grass (*Cenchrus pedicellatus* syn. *Pennisetum pedicellatum*). These grasses are considered to be weeds and would be included as part of the weed management plan management and its pest identification and control measures.

Livestock are not included in a specific threat abatement plan; however, the proponent has made a commitment to construct fencing around water sources to protect the sources of water for the squatter pigeon and also to prevent the trampling of food sources and the species by cattle.

I consider that these actions would be expected to reduce the threats of predation on the squatter pigeon within the project area and protect its water and food sources.

Impacts and mitigation

The EIS indicated that an assessment of significance was conducted according to the EPBC Act *Significant Impact Guidelines*, the assessment identified that clearing of the high-value habitat for the squatter pigeon would give rise to a significant residual impact of 3,520.7 ha.

The EIS indicated that foraging habitat would not be fragmented as the connectivity of habitat would remain between retained vegetation to the north and south of the clearing footprint and with habitat adjoining the project area.

It also indicated that a revised Draft Biodiversity Offset Strategy would be prepared to address the significant residual impacts and would include proposed offset areas, management strategies for the offset areas, monitoring and reporting arrangements and a description of the environmental gains to be achieved by the offset.

The proponent identified in the EIS the need to undertake further detailed field surveys prior to the commencement of construction to identify MNES not recorded in the field surveys undertaken for the EIS.

The EIS also provided a commitment that measures to enhance habitat values would include establishing fauna watering points which could be used by birds, mammals and reptiles. The construction of fencing around water sources to preserve water sources and prevent trampling of food sources by cattle is proposed as a protection measure for the squatter pigeon.

The proponent also made commitments to prepare species management plans, rehabilitate and revegetate mined areas after the completion of the relevant stage of the mine project and to prepare a range of environmental management plans relating to the re-establishment of vegetation, topsoil, management of subsidence, bushfire prevention, erosion and sediment control, and to prevent feral animal predation on fauna.

Coordinator-General's conclusion

I am satisfied with the proponent's commitments to prepare environmental management plans which would include the feral animals identified in the threat abatement plans and to provide fencing to protect the squatter pigeon's water and food sources would management the potential impacts on the squatter pigeon.

The EIS indicated that a total of 3,520.7 ha would be disturbed as a result of the project activities. I have stated a condition (Appendix 2) of the draft EA that no more than 3,520.7 ha of squatter pigeon habitat can be disturbed by the project. I have also recommended a condition to the Commonwealth Minister for the Environment that this area is also the maximum habitat disturbance limit for the squatter pigeon under the EPBC Act (Appendix 3).

The proponent has provided a commitment to undertake pre-clearance surveys which would identify MNES fauna not identified in the surveys undertaken for the EIS. I am satisfied that there are approved government guidelines which provide for the survey methodology and reporting requirements to identify the squatter pigeon and MNES environmental values.

Having regard to these matters and to manage any possible adverse impacts of the project on the squatter pigeon not identified in the EIS, I have recommended a condition to the Commonwealth Minister for the Environment that, prior to the clearing of vegetation, the approval holder must undertake pre-clearance surveys in the disturbed areas to identify the presence and extent of any squatter pigeon and its habitat (Appendix 3). A report on the findings of the surveys is required to be submitted to the DEE by the approval holder.

Where species are identified, any recovery plans, conservation advices and threat abatement plans in respect of those species would be included and considered as part of the project's offsets measures, environmental management plans, impact mitigation control measures and monitoring programs outlined in the EIS.

I have recommended a condition to the Commonwealth Minister for the Environment that MNES that a management plan must be prepared for the squatter pigeon (Appendix 3).

I have also recommended a condition to the Commonwealth Minister for the Environment that the approval holder prepare a Biodiversity Offset Strategy which addresses the residual impacts of the project on the squatter pigeon (Appendix 3). Consistent with the conservation advice for the squatter pigeon, the project's disturbed areas must be offset by protecting and enhancing habitat for the squatter pigeon within that Strategy.

Australian painted snipe (*Rostratula australis*)

The Australian painted snipe is listed as 'endangered' under the EPBC Act and the NC Act. It has been recorded at wetlands in all states of Australia and is most common in eastern Australia. The species occurs in shallow freshwater, wetlands, both ephemeral and permanent, and dams, and feeds on aquatic insects, grasshoppers, crickets, earthworms and some plant seeds.

Results of Surveys

The species was not recorded within the project area; however, it has a moderate potential to occur based on habitat modelling undertaken in the EIS.

The EIS identified that 123.2 ha of high-value habitat for this species is present at the northern and southern seasonal wetlands in the project area.

It also indicated that Lake Buchanan, located approximately 17 km west of the project area, and Lake Galilee located approximately 45 km south-west of the project area, are suitable habitat and is available for the Australian painted snipe should the species be found within the project area during pre-clearance surveys or during construction and operation activities.

Revised habitat modelling for this species was not required by the DES and DEE.

Recovery Plan

There is no recovery plan for this species.

Conservation Advice

There is an approved conservation advice for this species: *Approved Conservation Advice for (Rostratula australis) Australian painted snipe.*

The overall objective of the conservation advice is to protect the species and provide measures to contribute to its survival.

The conservation advice lists the key threats to the species as:

- loss and degradation of wetlands, through drainage and the diversion of water for agriculture and reservoirs
- clearing of habitat
- grazing of habitat by livestock and feral herbivores
- predation by feral animals.

The primary conservation and management actions to protect the species include:

- identification of species populations
- preparation of management plans to prevent habitat loss, disturbance and modification
- implement stock management plans
- protect and rehabilitate habitat which support the species
- implement stock management plans
- control and eradication of feral herbivores.

The overall objective of the conservation advice is to manage and protect the Australian painted snipe and its habitat and promote the conservation of the species. I consider that although the project will result in the clearing of habitat for this species, the proponent's environmental management measures such as the revegetation management plan, feral animal and pest management plans, would contribute towards achieving the conservation advice conservation and management actions.

The EIS addressed the edge effects from clearing of vegetation and the impact of the edge effects on all EPBC listed threatened species within these areas. To manage this impact the proponent has made a commitment to regenerate these areas with native species, which I accept as an appropriate management measure.

The proponent has made a commitment to prepare a biodiversity management plan which will include measures to conserve and enhance the conservation value of areas to be retained within the project area. The plan would also describe the alignment of the management measures with the conservation advice for this species.

Threat abatement plans

There are no approved threat abatement plans for the Australian painted snipe, however, it may be adversely affected by the species outlined in the following threat abatement plans:

- *Threat abatement plan for predation by feral cats – 2015*
- *Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*) – 2016*
- *Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads - 2011*
- *Threat abatement plan for predation by the European red fox – 2008.*

The European red fox is a Category 3, 4, 5 and 6 restricted matter and the feral cat is a Category 3, 4, and 6 restricted matter under the Queensland *Biosecurity Act 2014*. Under this Act, landowners have a 'general biosecurity obligation' to take all reasonable and practical steps to minimise the risks associated with invasive plants and animals on a person's land.

I note the proponent has made a commitment in the EIS to manage feral and pest animals and to prepare and implement a biodiversity management plan and a feral animal and weed management plan. The biodiversity management plan would include measures to enhance habitat values, management of grazing pressure on the project area and a fire management plan. The feral animal and weed management plan would include pest identification and control measures.

Livestock are not included in a specific threat abatement plan; however, the proponent has made a commitment to construct fencing around water sources to protect the sources of water for the squatter pigeon and also to prevent the trampling of food sources and the species by cattle.

I consider that these actions would be expected to reduce the threats of predation on the Australian painted snipe within the project area and protect its water and food sources.

Impacts and mitigation

The northern seasonal wetland will not be cleared for mining and mining infrastructure areas.

Subsidence modelling undertaken for the EIS indicated that the northern seasonal wetland will be subject to subsidence and potential impacts include surface cracking and changes in drainage patterns. It found that the ponding area of the wetland before mining is 127 ha and after mining would increase to 199 ha as a result of subsidence, and that the catchment area would change from 2,711 ha pre-underground mining to 2,399 ha post-underground mining, resulting in a 12 per cent reduction in the catchment area.

The EIS indicated the reduction in catchment area would cause the wetland to dry out more rapidly and more frequently, leading to a predicted significant residual impact of 15.03 ha for wildlife habitat.

The southern seasonal wetland is 12 ha in area. The southern farm dam adjoining the wetland is an artificially created dam, approximately 2 ha in area and 2 m deep at its deepest point. Field surveys found that in the wet season the dam overflows and generates a wetland until the dry season. Both the wetland and dam would be cleared for open-cut mining and mine infrastructure areas.

The EIS indicated that an assessment of significance was conducted for the species according to the EPBC *Significant Impact Guidelines*. The EIS found that due to the small area of impact being 15.03 ha, and the availability of wetlands at Lake Buchanan and Lake Galilee, no significant impact is likely to occur to the species due to subsidence and cracking. The EIS did not address the need for monitoring the integrity of the ecological significance of the northern seasonal wetland over the life of the project, and did not address the significance of this water source for all species of state and national environmental significance. Section 5.2—MSES of this report addresses the impacts of the project on the MSES northern seasonal wetland and addresses the requirement for an offset for the significant residual impact of 15.03 ha wildlife habitat as a stated condition in the draft EA (Appendix 2).

The impacts of the project on the significance of this water source to MNES flora and fauna are addressed in this section. The EIS also provided a commitment that measures to enhance habitat values would include establishing fauna watering points which could be used by birds, mammals and reptiles.

The proponent has made a commitment to prepare a biodiversity management plan which will include measures to conserve and enhance the conservation value of areas to be retained within the project area. The plan will also describe the alignment of the management measures with the conservation advice for this species.

The EIS indicated that a revised Draft Biodiversity Offset Strategy would be prepared and would include proposed offset areas, management strategies for the offset areas, monitoring and reporting arrangements and a description of the environmental gains to be achieved by the offset.

I note that the proponent has made a commitment in the EIS to manage feral animal pests and to prepare and implement a biodiversity management plan and a feral animal and weed management plan. The biodiversity management plan is intended to include monitoring measures for threatened species to evaluate the effectiveness of management measures and fire management strategies. The feral animal and weed

management plan would include identification and control measures. These actions would be expected to reduce the risk of pest predation on the Australian painted snipe in the project area.

The EIS also provided a commitment to management measures that will enhance habitat values and include establishing fauna watering points which could be used by birds, mammals and reptiles.

The proponent also made commitments to prepare species management plans, rehabilitate and revegetate mined areas after the completion of the relevant stage of the mine project and to prepare a range of environmental management plans relating to the re-establishment of vegetation, topsoil, management of subsidence, bushfire prevention, erosion and sediment control, and to prevent feral animal predation on fauna.

Coordinator-General's conclusions

I am satisfied with the proponent's commitments to prepare environmental management plans which would address the threats associated with the feral animals identified in the threat abatement plans. The management plans will include measures such as fencing to protect the Australian painted snipe's water and food sources. I am satisfied these measures would manage the potential impacts of the project on the Australian painted snipe.

I consider that although the project will result in the clearing of habitat for this species, the proponent's environmental management measures such as the revegetation management plan, feral animal and pest management plans, would contribute to achieving the conservation advice conservation and management actions.

I do not agree with the view in the EIS that the clearing of 15.03 ha of MSES wildlife habitat is not a SRI. I have stated a condition (Appendix 2) of the draft EA that no more than 15.03 ha wildlife habitat for the Australian painted snipe can be disturbed by the project. I have also recommended a condition to the Commonwealth Minister for the Environment that this area is also the maximum habitat disturbance limit for this species for the approval under the EPBC Act (Appendix 3).

The proponent has provided a commitment to undertake pre-clearance surveys which would identify MNES fauna not identified in the surveys undertaken for the EIS. I am satisfied there are approved government guidelines which provide for the survey methodology and reporting requirements to identify the Australian painted snipe and MNES environmental values.

The EIS addressed matters of subsidence and cracking and the availability of other water sources for the Australian painted snipe, however it did not address the significance of the northern seasonal wetland to all species of state and national environmental significance. Having regard to this matter and to protect the environmental values of the northern seasonal wetland, I have recommended a condition to the Commonwealth Minister for the Environment that surveys be undertaken to identify the northern seasonal wetlands habitat environmental values including hydrological characteristics and drainage patterns (Appendix 3).

I have also provided in this recommended condition that a program for the monitoring and review of the wetland's environmental values be undertaken for the life of the project which includes prior to the commencement of any works associated with underground mining. These recommended conditions are in addition to the draft stated conditions in the environmental authority relating to the subsidence management plan (Appendix 2), imposed conditions relating to groundwater modelling (Appendix 1), and the maximum residual impact on Australian painted snipe habitat identified in Appendix 2. I have also recommended a condition to the Commonwealth Minister for the Environment that this area is also the maximum habitat disturbance limit (Appendix 3).

Having regard to these matters and to manage any possible adverse impacts of the project on the Australian painted snipe not identified in the EIS, I have recommended a condition to the Commonwealth Minister for the Environment that, prior to the clearing of vegetation, the approval holder must undertake pre-clearance surveys in the impact areas to identify the presence and extent of any Australian painted snipe and its habitat (Appendix 3). A report on the findings of the surveys would be required to be submitted to the DEE.

Where species are identified, any recovery plans, conservation advices and threat abatement plans in respect of those species would be included and considered as part of the project's offsets measures, environmental management plans, impact mitigation control measures and monitoring programs outlined in the EIS.

I have recommended a condition to the Commonwealth Minister for the Environment that an MNES management plan must be prepared for the Australian painted snipe (Appendix 3).

I have also recommended a condition to the Commonwealth Minister for the Environment that the approval holder prepare a Biodiversity Offset Strategy which addresses the residual impacts of the project on the Australian painted snipe (Appendix 3). Consistent with the conservation advice, residual impacts caused by the project must be offset by protecting and enhancing habitat for the Australian painted snipe.

Koala (*Phascolarctos cinereus*)

The koala is listed as vulnerable under the EPBC Act and as special least concern under the NC Act. The EPBC Act referral guidelines for the koala provide that the project area is comprised of 'Critical Habitat' for the koala and is dominated by eucalyptus woodlands. The koala feeds on eucalyptus leaves, on average 500 g per day, feeds at night and can jump 2 m from tree to tree for a food source. The eucalyptus leaves provide the major source of water for the koala, and the eucalyptus trees provide for shelter and breeding places.

Results of surveys

The species was recorded in the project area and on the Queensland Wildlife Online database.

Habitat modelling revealed that 6,878 ha of high-value habitat is present in the project area, primary habitat is located along the ephemeral drainage lines and riparian areas.

Only one animal was recorded during the field surveys. The EIS indicated that, based upon published literature figures for the species, and an assumed density of 0.005 animals per hectare in the Desert Uplands bioregion, it is possible that 60 animals could be present within the study area.

Recovery plan

There is no recovery plan for this species.

Conservation Advice

There is an approved conservation advice for this species: *Approved Conservation Advice for Phascolarctos cinereus (combined populations of Queensland, New South Wales and the Australian Capital Territory) (koala Northern Designatable Unit)*.

The overall objective of the conservation advice is to protect the species and provide measures to contribute to its survival.

The conservation lists the key threats to the species as:

- Loss and fragmentation of habitat
- Vehicle strike
- Disease
- Predation by dogs
- Drought and incidences of extreme heat are known to cause very significant mortality.

The primary conservation and management actions to protect the species include:

- Identification of populations of high conservation priority
- Development and implementation of a development planning protocol to be used in areas of koala populations to prevent loss of important habitat, koala populations or connectivity options
- Management of any other known, potential or emerging threats such as Bell Miner Associated Dieback or *eucalyptus* rust
- Development and implementation of options of vegetation recovery and re-connection in regions containing fragmented populations, including inland regions in which koala populations were diminished by drought
- Development and implementation of a management plan to control the adverse impacts of predation on koalas by dogs.

The overall objective of the conservation advice is to manage and protect the Koala and its habitat and promote the conservation of the species. I consider that although the project will result in the clearing of habitat for this species, the proponent's environmental management measures such as the revegetation management plan, feral animal and pest management plans, would contribute towards achieving the conservation advice conservation and management actions.

Threat abatement plans

The threat abatement plans for feral cats, feral pigs, cane toads and the European red fox identified in this section do not specifically mention the koala. This section has identified the general biosecurity obligation of landowners to take all reasonable and practical steps to minimise the risks associated with invasive plants and animals on a person's land.

I note the proponent has made a commitment in the EIS to manage feral and pest animals and to prepare a biodiversity management plan and feral animal and weed management plan. The biodiversity management plan would include measures to enhance habitat values, management of grazing pressure in the project area and a fire management plan. The feral animal and weed management plan would include pest identification and control measures.

I consider these actions would be expected to reduce the threats of predation on the koala within the project area.

Management plans

There are two management plans which protect the koala: *National Koala Conservation and Management Strategy* and the *Queensland Nature Conservation (Koala Conservation) Plan and Management Program*.

The management strategy and management program identify the following key threats to the species:

- loss, fragmentation and degradation of habitat
- over-browsing by high densities of koala
- natural disaster
- disease
- predation by dogs
- vehicle collisions with the species
- the impact of climate change on food sources.

The primary conservation and management actions in the management plan and management program to mitigate against key threats include:

- management plans to identify and protect habitat
- translocation of individuals from over-browsed habitat
- guidelines for road design within koala habitat.

Impacts and mitigation

The EIS indicated that an assessment of significance was conducted according to the EPBC Act *Significant Impact Guidelines*, the assessment identified that clearing of high-value habitat for the koala would give rise to a significant residual impact of 3,267.4 ha.

The EIS indicated that severance of connectivity of the habitat for the koala would not occur as connected habitat would remain between the retained vegetation to the north and south of the clearing footprint and with habitat adjoining the project area.

The proponent indicated that a revised Draft Biodiversity Offset Strategy to address the significant residual impacts would include proposed offset areas, management strategies for the offset areas, monitoring and reporting arrangements and a description of the environmental gains to be achieved by the offset.

The proponent identified in the EIS the need to undertake further detailed field surveys prior to the commencement of construction to identify MNES not recorded in the field surveys undertaken for the EIS.

The EIS also provided for the following commitments:

- clearing procedures would minimise unnecessary disturbance to native vegetation
- pre-clearing surveys to identify fauna, protect the species from injury and identify habitat features to be relocated
- a spotter catcher would be present to rescue any animals present during the clearing procedures
- areas of native vegetation within the project area, outside the footprint of the open-cut mining and mine infrastructure area would be managed to conserve and enhance their conservation areas
- speed limits along internal roads, appropriate signage and careful driving policies would be put in place to increase the awareness of drivers and decrease the risk of vehicles striking fauna.

The proponent also made commitments to prepare species management plans, rehabilitate and revegetate mined areas after the completion of the relevant stage of the mine project and to prepare a range of environmental management plans relating to the re-establishment of vegetation, topsoil, management of subsidence, bushfire prevention, erosion and sediment control, and to prevent feral animal predation of fauna.

Coordinator-General's conclusion

I am satisfied with the proponent's commitments to prepare environmental management plans and species management plans would manage the potential impacts of the project on the koala.

The EIS indicated that a total of 3,267.4 ha would be disturbed as a result of the project. I have stated a condition (Appendix 2) of the draft EA that no more than 3,267.4 ha of koala habitat can be disturbed by the project. I have also recommended a condition to the Commonwealth Minister for the Environment that this area is also the maximum habitat disturbance limit for koala habitat (Appendix 3).

The proponent has provided a commitment to undertake pre-clearance surveys which would identify MNES fauna not identified in the surveys undertaken for the EIS. I am satisfied there are approved government guidelines which provide for the survey methodology and reporting requirements to identify koalas and their habitat.

Having regard to these matters and to manage any possible adverse impacts of the project on the koala not identified in the EIS, I have recommended a condition to the Commonwealth Minister for the Environment that, prior to the clearing of vegetation, the approval holder must undertake pre-clearance surveys in the impact areas to identify the presence and extent of any koala and its habitat (Appendix 3). A report on the findings of the surveys would be required to be submitted to the DEE.

Where species are identified, any management plans, management programs, recovery plans, conservation advices and threat abatement plans in respect of those species would be included and considered as part of the project's offsets measures, environmental management plans, impact mitigation control measures and monitoring programs outlined in the EIS.

I have recommended a condition to the Commonwealth Minister for the Environment that MNES management plans also be required to be prepared for the koala (Appendix 3).

I have also recommended a condition to the Minister for the Environment that a condition to the EPBC Act approval of the project be attached that requires the approval holder to prepare a Biodiversity Offset Strategy which addresses the residual impacts of the project on the koala (Appendix 3). Consistent with any management plans, management programs, recovery plans, conservation advices and threat abatement plans, residual impacts caused by the project must be offset by protecting and enhancing habitat for the koala within that strategy.

Yakka skink (*Egernia rugosa*)

The yakka skink is listed as vulnerable under the EPBC Act and the NC Act. It is endemic to Queensland, found in open dry sclerophyll forest or woodland, will take refuge in dense ground vegetation, large hollow logs, cavities in soil-bound root systems and beneath rocks. It is approximately the same size as a blue-tongued lizard and its presence is often indicated by a shared site where they deposit their droppings. The yakka skink will retreat to its shelter at the first sign of disturbance by noise or vibration. It is omnivorous, and its diet includes beetles, grasshoppers and spiders.

Results of surveys

The yakka skink was not recorded during field surveys undertaken in 2012 and 2013. The EIS indicated that the habitat modelling identified the project area as having no core habitat for the species. The DES and the DEE lodged a submission requesting that revised habitat modelling be undertaken.

Revised habitat modelling undertaken as part of the AEIS identified 20,057 ha of high-value habitat for the yakka skink within the project area. Of this amount, 10,997 ha would be cleared for open-cut mining and mine infrastructure, 103 ha would be disturbed due to subsidence crack rehabilitation and 12 ha would be cleared for the construction of remedial drains.

Conservation advice

There is an approved conservation advice for this species: *Approved Conservation Advice for Ergemina rugosa (Yakka Skink)*.

The overall objective of the conservation advice is to protect the species and provide measures to contribute to its survival.

The conservation advice lists the key threats to the species as:

- clearing of habitat and habitat degradation
- removal of wood debris and rock microhabitat features
- ripping of rabbit warrens
- predation by feral animals.

The primary conservation and management actions to protect the species include:

- Identification of species populations
- Protection and rehabilitation of habitat which supports the species
- Control and eradication of feral herbivores.

The overall objective of the conservation advice is to manage and protect the yakka skink and its habitat and promote the conservation of the species. I consider that although the project will result in the clearing of habitat for this species, the proponent's environmental measures such as the revegetation management plan, the protection of microhabitat features, feral animal and pest management plans would contribute towards achieving the conservation advice conservation and management actions.

The EIS addressed the edge effects from clearing of vegetation and the impact of the edge effects on all EPBC listed threatened species within these areas. To manage this impact the proponent has made a commitment to regenerate these areas with native species, which I accept as an appropriate management measure which will support the rehabilitation requirements required as a stated condition in the draft environmental authority (Appendix 2).

The proponent has made a commitment to prepare a biodiversity management plan which will include measures to conserve and enhance the conservation value of areas to be retained within the project area. The plan would also describe the alignment of the management measures with the conservation advice for this species.

Threat abatement plans

There are no approved threat abatement plans for the yakka skink; however, it may be adversely affected by the species outlined in the following threat abatement plans:

- *Threat abatement plan for predation by feral cats – 2015*
- *Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (Sus scrofa) – 2016*
- *Threat abatement plan for predation by the European red fox – 2008.*

The European red fox and the rabbit are Category 3, 4, 5 and 6 restricted matters and the feral cat is a Category 3, 4, and 6 restricted matter under the Queensland

Biosecurity Act 2014. Under this Act, landowners have a 'general biosecurity obligation' to take all reasonable and practical steps to minimise the risks associated with invasive plants and animals on a person's land.

I note the proponent has made a commitment in the AEIS to undertake field surveys to identify microhabitat for the yakka skink and identify the microhabitat features used by the yakka skink such as ground cover, rock crevices and fallen logs as part of pre-clearance vegetation surveys undertaken prior to the commencement of mining activities.

I also note that the proponent has made a commitment in the EIS to manage feral and pest animals and to prepare and implement a biodiversity management plan and a feral animal and weed management plan. The biodiversity management plan would include measures to enhance habitat values, management of grazing pressure in the project area and a fire management plan. The feral animal and weed management plan would include pest identification and control measures.

I consider that these actions will be expected to reduce the threats of predation of the yakka skink within the project area and protect its microhabitat.

Impacts and mitigation

The EIS indicated that an assessment of significance was conducted according to the EPBC Act *Significant Impact Guidelines*, the assessment identified that clearing of the high-value habitat would give rise to a significant residual impact for a total disturbance area of 11,112 ha for the yakka skink.

The EIS indicated that the disturbance area estimate would require refinement during field surveys proposed to be undertaken prior to the commencement of construction and noted that the availability of habitat is dependent on microhabitat features such as ground cover, rock crevices, fallen logs. The EIS also indicated the disturbance area estimate would be included as part of the work required for the preparation of the Biodiversity Offset Strategy and the preparation of offset area management plans.

The proponent indicated that a revised Draft Biodiversity Offset Strategy will include proposed offset areas, management strategies for the offset areas, monitoring and reporting arrangements and a description of the environmental gains to be achieved by the offset.

The proponent indicated in the EIS the need to undertake further detailed field surveys prior to the commencement of construction to identify MNES not recorded in the field surveys. The EIS also provided a commitment that measures to enhance habitat values will include establishing fauna watering points which could be used by birds, mammals and reptiles.

The proponent has made a commitment in the EIS to manage feral animal pests and to prepare and implement a Biodiversity Management Plan and a Feral Animal and Weed Management Plan which will complement each other. The Biodiversity Management Plan is intended to include monitoring measures for threatened species to evaluate the effectiveness of management measures and fire management strategies. The Feral Animal and Weed Management Plan will include pest identification and control

measures. These actions would be expected to reduce the risk of predation on the yakka skink in the project area.

The proponent has also made commitments to prepare species management plans, identify microhabitat areas and features and rehabilitate and revegetate mined areas after the completion of the relevant stage of the mine project. The proponent also committed to the preparation of a range of environmental management plans relating to the re-establishment of vegetation, topsoil, management of subsidence, bushfire prevention, erosion and sediment control, and to prevent feral animal predation of fauna.

Coordinator-General's conclusion

I am satisfied with the proponent's commitments to prepare environmental management plans which would include the feral animals identified in the threat abatement plans and to identify microhabitat and microhabitat features would manage the potential impacts of the project on the yakka skink.

The AEIS indicated that a total of 11,112 ha would be disturbed as a result of the project. I have stated a condition (Appendix 2) for the draft EA that no more than 11,112 ha of yakka skink habitat can be disturbed by the project. I have also recommended a condition to the Commonwealth Minister for the Environment that this area is also the maximum habitat disturbance limit for the yakka skink habitat (Appendix 3).

The proponent has provided a commitment to undertake pre-clearance surveys which would identify MNES fauna not identified in the surveys undertaken for the EIS and AEIS. The surveys would also identify microhabitat and microhabitat features required for the survival of the yakka skink. I am satisfied there are approved government guidelines which provide for the survey methodology and reporting requirements to identify MNES environmental values.

Having regard to these matters and to manage any possible adverse impacts of the project on the yakka skink not identified in the EIS, I have recommended a condition to the Commonwealth Minister for the Environment that, prior to the clearing of vegetation, the approval holder must undertake pre-clearance surveys in the impact areas to identify the presence and extent of any yakka skink and its microhabitat. A report on the findings of the surveys would be required to be submitted to the DEE.

Where species are identified, any recovery plans, conservation advices and threat abatement plans in respect of those species would be included and considered as part of the project's offsets measures, environmental management plans, impact mitigation control measures and monitoring programs outlined in the EIS.

I have recommended a condition to the Commonwealth Minister for the Environment that MNES management plans also be required to be prepared for the yakka skink.

I have also recommended a condition to the Minister for the Environment that the approval holder prepare a Biodiversity Offset Strategy which addresses the residual impacts of the project on the yakka skink (Appendix 3). The project's disturbed areas must be offset by protecting and enhancing habitat for the yakka skink.

Galilee Basin project approvals for listed threatened fauna

Current approvals under the EPBC Act for six projects within the Galilee Basin have conditioned the following maximum disturbance areas and offset areas for each of the EPBC listed threatened fauna species evaluated in this Report.

Table 6.1 Galilee Basin projects' approved maximum disturbance areas and offset areas

Project	BTF	Squatter pigeon	Australian painted snipe	Koala	Yakka skink
Alpha Coal Mine and Rail <i>Max. disturbance area</i>	7,932 ha	6,348 ha	536 ha	nil	8,964 ha
Galilee Coal & Rail <i>Max. disturbance area</i>	3,628 ha	4,751 ha	nil	nil	5,335 ha
Kevin's Corner <i>Max. disturbance area</i>	1,000 ha	1,158 ha	nil	nil	1,415 ha
South Galilee Coal <i>Max. disturbance area</i>	<i>Assessment to be undertaken prior to construction</i>	1,673 ha	nil	nil	1,880 ha
North Galilee Basin Rail <i>Max. disturbance area</i>	1,836.2 ha	1,361.8 ha	45.6 ha	2,047.6 ha	nil
Carmichael Coal Mine & Rail <i>Offset Areas</i>	30,999.99 ha	2,500 ha	nil	nil	5,600 ha

These projects are located within the central Queensland Desert Uplands bioregion identified by the state and Commonwealth governments as providing regional ecosystems and habitat for many threatened species of flora, mammals, birds, reptiles and fish. Figure 6.20 identifies the location of the project area within this bioregion.

At the time of the approvals' decisions, comprehensive knowledge about the extent and density of the species and communities had not been researched and documented. Accordingly, the approvals provided for conditions requiring the approval holder to provide a monetary contribution towards the development and implementation of research programs to manage the impacts of projects in the Galilee Basin on EPBC listed species and communities.

The approvals' decisions also provided conditions that the programs would take into consideration relevant recovery plans, conservation advices, threat abatement plans and any state regional strategies and management plans which support a regional approach to the protection and long-term conservation of EPBC listed species and MSES species.

As the project is located within the Galilee Basin and the Desert Uplands bioregion this approach is supported, and I have made a recommendation to the Minister for the Environment to include a condition that the proponent for the project contribute \$100,000 per annum for 10 years (GST exclusive and subject to the CPI) to the development and implementation of these research programs (Appendix 3).

Bioregional Management Plan for the Galilee Basin and Desert Uplands bioregion

The *Carmichael Coal and Rail Project Coordinator-General Evaluation Report 2014* provided a recommendation that a Bioregional Management Plan for the Galilee Basin and Desert Uplands bioregion ('the Plan') be prepared for the BTF to address the impacts of mining projects in the Galilee Basin region and to maximise the ongoing conservation and long-term protection of the BTF. The recommendation included a governance arrangement which provided the administering authority for the NC Act (DES) prepare the Plan in consultation with the BTF National Recovery Team and proponents for the Galilee Basin mine projects likely to significantly impact upon BTF habitat. The preparation of this Plan is well advanced.

I have included a recommendation in this report (Appendix 4) and further discussed in section 5.2—MSES of this report, which recommends continuation of the proposed Plan to address the impacts of the project on the BTF. The preparation of such a plan is within the jurisdiction of the Queensland DES. I have also imposed a condition (Appendix 1), that requires the proponent to prepare a BTF monitoring program, undertake baseline surveys, and contribute to the delivery and operation of the Plan, including pro-rata funding.



PROJECT CHINA STONE



Bioregion Setting

Figure 6.20 Bioregion setting

Existing biodiversity offset area adjoining the project area

The project is not situated within an approved offset area. However, the southern and western parts of the project area include part of and adjoins with, the 116,528 ha pastoral holding 'Moray Downs' described as Lot 662 on PH 1491. The holding was purchased by Adani in 2011 as part of its project approvals and biodiversity offset commitments to the Commonwealth and state governments for the CCM&RP and the North Galilee Basin Rail project.

Part of the project area overlays a section of the Moray Downs property which provides habitat for MNES species BTF, squatter pigeon and yakka skink, and which were the subject of an EIS assessment for the CCM&RP.

A Biodiversity Offset Strategy for the CCM&RP was approved by the Commonwealth Minister for the Environment on 7 October 2016 and by the Coordinator-General on 25 October 2016. The strategy provides for the protection of the endangered black-throated finch, the vulnerable squatter pigeon and the vulnerable yakka skink.

The preparation of management plans and research programs for these species are well advanced and have been considered by the Commonwealth and state governments. The proponent for that project is currently making revisions to the management plans and research programs required by these governments. A decision on the implementation of these plans and programs is anticipated in late 2018. The operation of these plans and programs will directly impact on the project activities.

The EIS indicated that areas cleared for the project will be progressively revegetated which would contribute to the reduction of impacts on EPBC listed threatened species on the project area, however, these measures would not apply to adjoining land which is subject to the proposed offset area management plans and research programs.

As both the Commonwealth and state governments are well advanced in the consideration of offset area management plans and research programs to protect the BTF, the squatter pigeon and the yakka skink, I have recommended a condition to the Commonwealth Minister for the Environment that the project activities are not to detrimentally impact upon these plans and programs (Appendix 3).

6.4.4 Biodiversity offsets

The EIS indicated that an assessment of significance was conducted according to the EPBC Act *Significant Impact Guidelines* to determine the areas which will be disturbed by the project.

The EIS concluded that the following maximum areas would be disturbed by the project:

- a maximum disturbance area of 8,524 ha for BTF habitat
- a maximum disturbance area of 3,520.7 ha for squatter pigeon habitat
- a maximum disturbance area of 15.03 ha for Australian painted snipe habitat
- a maximum disturbance area of 3,267.4 ha for koala habitat
- a maximum disturbance area of 11,112 ha for yakka skink habitat.

The EIS included a draft Biodiversity Offset Strategy which was revised in the AEIS to take into account the results of additional habitat modelling required by DES and DEE.

The revised draft Biodiversity Offset Strategy includes the identification of MNES threatened fauna species habitat within a potential offset property which may meet some of the requirements of the DEE in respect of the EPBC listed threatened species under evaluation in this report:

- BTF habitat – 68,280 ha
- squatter pigeon habitat – 68,280 ha
- yakka skink habitat – 72,610 ha
- koala habitat – 26,300 ha.

The proponent recognised in the EIS and in the AEIS that ground truthing field surveys would be required to confirm these potential disturbed areas. The proponent also made commitments to identify other potential properties which would provide suitable offsets.

The EIS recognised that the number of hectares identified for each disturbed area would be refined after ground truthing field surveys had been undertaken, and that the actual offsets required for the disturbed areas would be determined in accordance with the EPBC Act *Environmental Offsets Policy 2012*.

The EIS provided that compensatory measures to manage residual impacts would include direct and indirect offsets and that the proponent would comply with the EPBC Act offset policies and conditions attached to a decision by the Commonwealth Minister for the Environment.

The requirement for offset area management plans as part of a biodiversity offset strategy was discussed in the EIS and the proponent made commitments to include management measures commensurate with the findings of the ground truthing field surveys. Commitments were also provided which address the content of the offset area management plans. These include management measures for the protection of species and their habitat, monitoring and reporting arrangements, timelines for actions to achieve the management measures and performance criteria to evaluate the management measures.

Coordinator-General's conclusion

I accept the amount of disturbance areas outlined above and the commitments to prepare a biodiversity offset strategy, offset area management plans and actions to identify potential offset areas other than those described in the EIS and AEIS.

I have recommended a condition to the Commonwealth Minister for the Environment to include a requirement which requires biodiversity offsets for the disturbance areas identified above and detailed in Appendix 3, and biodiversity offset strategy and offset area management plans for EPBC Act listed threatened species (Appendix 3). I am satisfied the revised draft biodiversity offset strategy has identified potential offset areas for consideration by the DEE as part of its assessment of the impacts of the project on MNES.

I have stated a condition for the draft EA (Appendix 2) which identifies the maximum disturbance areas permitted as a result of project activities on the BTF, squatter pigeon, Australian painted snipe, koala and yakka skink and the MSES short-beaked echidna. The extent of the areas to be disturbed are also outlined in spatial form in figures which form part of the draft EA. Any area disturbed by the project above the maximum areas identified in either the recommendation or the draft EA is not authorised.

It should be noted that these disturbance areas are the maximum areas which can be impacted by the project. These areas do not include any additional EPBC Act listed threatened species or habitat areas identified during the proposed surveys to be undertaken prior to the commencement of construction.

I accept the proponent's commitment to undertake surveys to identify MNES not identified during the EIS process. I have recommended a condition to the Commonwealth Minister for the Environment that, prior to the clearing of vegetation, the approval holder must undertake pre-clearance surveys in the disturbed areas to identify the presence and extent of any EPBC Act listed threatened species and their habitat (Appendix 3). A report on the findings of the surveys would be required to be submitted to the DEE.

Habitat offset areas for threatened and endangered species including the BTF, must be protected before any clearing of habitat for BTF or other protected species could occur.

Where species are identified, any recovery plans, conservation advices and threat abatement plans in respect of those species would be included and considered as part of the project's offsets measures, environmental management plans, impact mitigation control measures and monitoring programs outlined in the EIS. MNES management plans would also be required to be prepared for the species identified during the surveys.

The amount of offsets required would be determined by the DEE having regard to the pre-clearance survey results, EPBC *Environment Offsets Policy and Guidelines* and the conditions included in the EPBC decision made in respect of this project.

Where additional MNES threatened species and associated disturbance areas are identified during the pre-clearance surveys, these MNES and disturbance areas do not form part of this report, or a decision made on this project by the Commonwealth Minister for the Environment.

6.5 Listed migratory species

In deciding whether or not to approve the proposal for purposes of section 20 or 20A of the EPBC Act, and the conditions to attach to such approval, the Commonwealth Minister for the Environment must not act inconsistently with Australia's obligations under the following conventions and agreements:

- Convention on Biological Diversity

- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)
- Convention on Wetlands (Ramsar Convention)
- China Australia Migratory Bird Agreement
- Republic of Korea Australia Migratory Bird Agreement
- East Asian – Australasian Flyway Partnership
- Japan Australia Migratory Bird Agreement.

A search of the EPBC Act protected matters search tool database identified the following listed migratory species as being recorded in the project area:

Table 6.2 Listed migratory species

Species	Status
Common sandpiper (<i>Actitis hypoleucos</i>)	Migratory, marine
Sharp-tailed sandpiper (<i>Calidris acuminata</i>)	Migratory, marine
Caspian tern (<i>Hydroprogne caspia</i>)	Migratory, marine
Rainbow bee-eater (<i>Merops ornatus</i>)	Marine
Glossy ibis (<i>Plegadis falcinellus</i>)	Migratory, marine
Common greenshank (<i>Tringa nebularia</i>)	Migratory, marine
Marsh sandpiper (<i>Tringa stagnatilis</i>)	Migratory, marine
Satin flycatcher (<i>Myiagra cyanoleuca</i>)	Migratory, marine
Eastern great egret (<i>Ardea alba modesta</i>)	Marine
Cattle egret (<i>Bubulcus ibis</i>)	Marine
Fork tailed swift (<i>Apus pacificus</i>)	Migratory, marine
Latham's snipe (<i>Gallinago hardwickii</i>)	Migratory, marine
White-bellied sea-eagle (<i>Haliaeetus leucogaster</i>)	Marine
Australian painted snipe (<i>Rostratula australis</i>)	Endangered, marine

Terrestrial fauna field surveys were conducted in strategic locations during four survey periods:

- by helicopter on 1 and 3 May 2012
- ground surveys between 16 May and 24 May 2012
- ground surveys between 29 October 2012 and 9 November 2012
- ground surveys between 14 October and 20 October 2013.

The EIS stated the only migratory species recorded during the field surveys was the Satin flycatcher (*Myiagra cyanoleuca*).

Satin flycatcher

The satin flycatcher is an insectivore that occurs in eucalyptus woodlands and forests which it inhabits when it is breeding. They are common in tall wet sclerophyll forest, often in gullies or along water courses. In woodlands they prefer open, grassy woodland types of vegetation. During migration, habitat preferences expand and the species has been recorded in wooded areas except rainforests. Wintering birds in northern Queensland will use rainforest – gallery forests interfaces, and birds have been recorded wintering in mangroves and paperbark swamps.

Results

The satin flycatcher was recorded from a single location adjacent to an ephemeral drainage line located in the north-east of the southern section of the study area. It was foraging in trees near a remnant pool in the ephemeral drainage line.

The *Referral Guideline for 14 birds listed as migratory species under the EPBC Act* ('the Guideline') provides a map which indicates the modelled distribution of five breeding flycatchers which includes the satin flycatcher. The project area appears to be in a 'vagrant non-breeding range' which means that it has strayed outside its normal breeding, migrating and wintering range.

Recovery plans, conservation advices, threat abatement plans

There are no approved recovery plans, conservation advices or threat abatement plans for this species.

Impacts and mitigation

The EIS indicated the project area does not provide suitable habitat for the bird and it is unlikely to breed in the project area. The habitat requirements for the satin flycatcher outlined in the Guideline support this indication.

The EIS also indicated that given the distance of the project area from the normal satin flycatcher habitat range outlined in the Guideline, the project is not expected to have a direct impact on the satin flycatcher.

Coordinator-General's conclusion

I have considered and accepted the assessments and indications in the EIS that any migratory species would have access to nearby lakes and accept these assessments and indications.

I am satisfied that there would be no unacceptable impact on the satin flycatcher caused by the project.

6.6 Ecologically sustainable development

As defined in Part 1, section 3A of the EPBC Act, the principles of ecologically sustainable development are:

- the integration principle: decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations.
- the precautionary principle: if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation
- the intergenerational principle: the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations
- the biodiversity principle: the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making
- the valuation principle: improved valuation, pricing and incentive mechanisms should be promoted.

I have considered the above principles in the evaluation of project impacts.

This report is the culmination of an environmental impact assessment process addressing economic, environmental, social and equitable considerations which included a public consultation process and the consideration of submissions lodged by the public and government agencies.

All long and short-term MNES impacts for the mine would be managed through my condition set and the future EA administered by DES. I have adopted a precautionary approach and support for the biodiversity principle by including a condition requiring offsets for MNES which will supplement the proponent's management and impact mitigation measures.

A public comment period enabled the submitters to raise issues about the project in a fair and equitable manner. I have considered these issues in my evaluation of the project to ensure the interests of all stakeholders were considered and the intergenerational principle was applied.

I consider that my comprehensive condition set for the mine will allow for the project to be constructed, operated, rehabilitated and decommissioned in a sustainable manner, having regard to potential environmental risks to protect MNES and the environment generally for future generations.

I am satisfied that potential impacts of the project would be suitably compensated through the provision of offset areas in respect of areas disturbed by the project and the valuation principle was applied.

6.7 Coordinator-General's overall conclusion

Groundwater

The key groundwater impact from the project would be drawdown and depressurisation resulting in impacts to bore owners, which are most significant in the post-mining phase. This impact would be addressed via make good agreements between the proponent and the bore owner in line with the requirements of Chapter 3 of the Water Act. I am satisfied that my condition to partially backfill would prevent ongoing impacts to groundwater resources and bore owners after mine dewatering ceases.

The project is unlikely to have a significant impact on the GAB. No impacts are predicted to GDEs, including the nationally important DSC and Lake Buchanan. To ensure this outcome I have made a recommendation to the Commonwealth Minister for the Environment that the project must not result in impacts to the DSC or Lake Buchanan. I also require pre-clearance surveys to confirm whether there would be impacts to any other GDE, and if impacts are predicted, a GDEMP and potentially offsets for SRIs to GDEs, would also be required.

The EIS groundwater assessment provides an adequate prediction of the potential project impacts. However, groundwater modelling is an iterative process which is improved by ongoing monitoring data. Prior to the public notification of the EA application, further refinements to the assessment methodology are required to improve prediction of groundwater impacts.

I acknowledge that the groundwater model revision, further baseline monitoring and other requirements of my conditions may result in additional, or changes to, the predicted impacts. Once the project commences monitoring data would further refine and confirm the impact predictions.

As a precautionary approach, until further information is available about the impacts of the project on groundwater resources from the model revision, baseline monitoring data and other requirements of my imposed conditions, I consider the EA application should not be notified for public comment. Therefore, my stated conditions in Appendix 2 for the draft EA do not contain groundwater conditions. No impact on groundwater resources would be authorised until an EA is issued complete with groundwater conditions and all other necessary groundwater impact approvals are issued.

Once mining commences, collection of monitoring data would improve the prediction of impacts via regular model updates. I am satisfied groundwater impacts would be appropriately managed by my imposed conditions and the conditions of the EA, any Commonwealth approval under the EPBC Act and the AWL. Appropriate adaptive management strategies, including modifying operations or mine plan redesign, would be required to address any new predicted impacts that were not predicted prior to mining commencing. Further offsets for SRIs to GDEs may also be required.

Surface water

The proponent has not provided sufficient information to determine the full extent of surface water impacts on the downstream environment resulting from controlled

discharges of mine-affected water. Accordingly, I have imposed a condition (Appendix 1) requiring the proponent to provide DES with additional baseline water quality and flow monitoring data for the North Creek receiving environment to determine appropriate compliance and flow monitoring locations, release limits and contaminant trigger levels required for the development of draft EA conditions, prior to public notification of the EA application.

I have stated conditions requiring the preparation of a TSF rehabilitation and monitoring strategy to ensure the methods for decommissioning and final rehabilitation include the prevention and management of acid mine drainage, erosion minimisation and establishment of vegetation cover.

To ensure surface water is drained from subsided panels, I have stated a condition for the draft EA that the SMP propose options for mitigating any impacts associated with the capture of overland flow by subsided longwall panels and the associated impacts on downstream users.

To ensure the final landform does not cause environmental harm to land, surface waters or any recognised groundwater aquifers, I have stated a condition (Appendix 2) that pits be backfilled to above the pre-mining groundwater level, as a minimum. I have also imposed a condition (Appendix 1) requiring the proponent to prepare an open-cut mine pit management plan to ensure any open-cut mine pits that remain within the project area are rehabilitated to a stable condition suitable for a post-mining land use with an economic, social and environmental benefit.

The open-cut mine pit management plan must include an assessment of completely backfilling the open-cut mine pits and must also demonstrate that the ponding of water (either surface water or ground water) can be prevented and that impacts to water resources can be mitigated and managed in perpetuity. The open-cut mine pit management plan is to be approved by DES prior to the public notification of the EA application for the project.

Listed threatened communities

The current groundwater modelling for the EIS predicts no impacts to the DSC from the project because of groundwater drawdown. Future modelling updates and data collected during the operations phase groundwater monitoring program will monitor this prediction. Given the uncertainties and risk of threat to the DSC I have applied the precautionary principle and recommended a strict condition to the Commonwealth Minister for the Environment that the project must not impact on DSC.

With my requirement for backfilling of the residual pits to a level above the pre-mining groundwater level, the risk of drawdown impacts to DSC will be further reduced.

Listed threatened species

I am satisfied the EIS has identified the potential impacts the project could have on EPBC Act listed threatened flora and fauna species.

I note that the proposed commitments, proposed environmental management plans, impact mitigation control measures, monitoring programs. The proposed biodiversity management plan and the feral animal and weed management plan would contribute

towards the protection of EPBC listed threatened species. I also require compliance with the relevant recovery plans, conservation advices and threat abatement plans.

I note the proponent's commitment to prepare a Biodiversity Offset Strategy in accordance with Commonwealth and state government legislation, guidelines and policies and provide for offset areas in respect of the areas proposed to be disturbed by the project.

I am satisfied that the pre-clearance surveys, environmental management plans, proponent commitments and species management plans are an appropriate response to the identification and protection of EPBC listed threatened species not identified in the field surveys undertaken in 2012 and 2013.

There is a requirement for the contribution by the proponent of funding towards the better protection and long-term conservation of MNES threatened species.

The implementation of the management and recovery measures in recovery plans, conservation advices and threat abatement plans to mitigate and manage the impacts of the project, would contribute towards satisfying the principles of ecologically sustainable development.

Listed migratory species

I am satisfied the EIS has assessed and identified the potential impacts of the project could have on EPBC listed migratory species.

I have considered and accepted the assessments and indications in the EIS that any migratory species would have access to nearby lakes and accept these assessments and indications.

Power station

While the EIS considered impacts associated with all aspects of the proposed project, I do not have sufficient information to fully assess and provide conditions for the approval required from the Queensland Government to construct and operate the proposed power station. Accordingly, I have not stated conditions for that approval.

However, for the purpose of MNES, I consider the EIS has addressed the potential impacts of the proposed power station (including PSWSF) on groundwater and surface water, listed threatened species and communities and listed migratory species under the EPBC Act. I am satisfied that potential impacts on these matters from the proposed power station and PSWSF have been appropriately described and assessed in the EIS and that my imposed, stated and recommended conditions are sufficient to ensure that significant residual impacts are identified, managed or offset as appropriate.

7. Conclusion

In undertaking my evaluation of the China Stone Coal project EIS, I have considered the following:

- the EIS and supplementary material prepared for the project
- submissions on the EIS, including agency advice and IESC advice
- the independent peer review on groundwater modelling
- supplementary submissions received following the EIS.

I am satisfied that the requirements of the SDPWO Act have been complied with and that sufficient information has been provided to enable the necessary evaluation of potential impacts, and to inform the development of mitigation strategies and conditions of approval.

The environmental assessment commenced with the declaration of this project as a coordinated project on 31 October 2012 and has involved a comprehensive body of work by the proponent. More specific work will occur in the detailed design phase of the mine.

I have assessed and considered the potential impacts identified in the EIS documentation and all submissions. I consider that the mitigation measures and commitments proposed by the proponent together with the conditions and recommendations stated in this report would result in overall acceptable outcomes.

Based on the information provided by the proponent and outlined in this evaluation report, I conclude that the project would promote economic growth by providing regional employment opportunities and benefits to the economy of central Queensland and the State.

Accordingly, I approve that the China Stone Coal project proceed, subject to the conditions in Appendix 1 and Appendix 2, the recommended conditions in Appendix 3 and the recommendations in Appendix 4. In addition, I require the proponent's commitments to be fully implemented as presented in the EIS documentation and summarised in Appendix 5 of this report.

To proceed further, the proponent will be required to obtain the following key approvals prior to project commencement:

- EPBC Act approval
- an EA with relevant ERAs under the EP Act
- a mining lease under the MR Act
- a plan of operations under the EP Act
- agreement and lodgement of financial assurance under the EP Act.

Subsequent approvals will be required for project construction and operation including environmental offsets under the *Environmental Offsets Act 2014* and biodiversity offsets under the EPBC Act.

If there are any inconsistencies between the project (as described in the EIS documentation) and the conditions in this report, the conditions shall prevail. The proponent must implement all the conditions of this report.

Section 6—MNES of this report describes the extent to which the material supplied by the proponent addresses the actual or likely impacts on MNES for each controlled action for the project.

Copies of this report will be issued to:

- DEE
- DES
- DNRME
- DAF

A copy of this report will also be available on the DSDMIP website at **www.statedevelopment.qld.gov.au/chinastone**

This report will lapse 4 years after the day this report is publicly notified.

Appendix 1. Imposed conditions

This appendix includes conditions imposed by the Coordinator-General under section 54B of the *State Development and Public Works Organisation Act 1971* (SDPWO Act). All of the conditions imposed in this appendix take effect from the date of this Coordinator-General's Evaluation Report (this report), unless otherwise stated.

These conditions do not relieve the proponent of the obligation to obtain all approvals and licences from all relevant authorities required under any other Act.

In accordance with section 54B(3) of the SDPWO Act, several entities have been nominated to have jurisdiction for the conditions in this appendix.

In accordance with section 54D of the SDPWO Act, the conditions in this appendix apply to anyone who undertakes the project, such as the proponent and an agent, contractor, subcontractor or licensee of the proponent.

Schedule 1. Land use and rehabilitation

The entity with jurisdiction for the condition in this schedule is the Department of Environment and Science.

Condition 1. Open-cut mine pits management plan

The outcome sought by this condition is to ensure that any open-cut mine pits on the site are rehabilitated to a stable condition that is suitable for a post-mining land use with an economic, social and environmental benefit.

- (a) The proponent must prepare and implement an open-cut mine pits management plan which:
 - (i) as a minimum, details backfilling all open-cut mine pits to above the pre-mining groundwater level
 - (ii) includes an assessment of backfilling to ground level having regard to the economic, social and environmental impacts and benefits
 - (iii) ensures that any area of open-cut mine pits that remain on the site, including the final topography and vegetation cover and composition, are suitable for cattle grazing or another post-mining land use that has an economic, social and environmental benefit agreed to by the administering authority for the *Environmental Protection Act 1994* (EP Act)
 - (iv) identifies areas which were previously black-throated finch habitat and details areas to be rehabilitated to support BTF populations
 - (v) ensures that any area of open-cut mine pits that remain on the site are protected from flooding and overland flow
 - (vi) demonstrates that adverse impacts to surface water and groundwater resources are minimised and mitigated
 - (vii) demonstrates that the post-mining land use would require little to no ongoing maintenance by the proponent and would be self-sustaining in perpetuity.
- (b) The open-cut mine pits management plan must be prepared by an appropriately qualified and experienced person and submitted to the administering authority for the EP Act for approval prior to the public notification of the environmental authority for the project.

The approved open-cut mine pits management plan would inform the rehabilitation management plan, required by stated Condition H5, Schedule H, Appendix 2 of this report, which conditions rehabilitation for mining activities for the whole project site.

Definitions

'appropriately qualified person' is a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authorities assessment, advice and analysis to performance relative to the subject matter using the relevant protocols, standards, methods or literature.

'land use' means the selected post-mining use of the land, which is planned to occur after the cessation of mining operations.

'minimise' is to reduce to the smallest possible amount or degree.

'open-cut mine pit' is the removal of minerals found over a large area, close to the surface. The mine is dug downward in benches or steps which slope towards the centre of the pit.

'rehabilitation' the process of reshaping and revegetating land to restore it to a stable landform.

Schedule 2. Matters of state environmental significance

The entity with jurisdiction for conditions in this schedule is nominated below each condition.

Condition 1. Proponent contribution to Black-throated Finch (southern) Bioregional Management Plan

The outcomes sought by this condition are to address the contribution of the regional impacts of the China Stone Coal project on the black-throated finch (BTF) southern subspecies (*Peophila cincta cincta*) and its habitat in the Galilee Basin and Desert Uplands bioregion, and maximise the ongoing protection and long-term conservation of the BTF and its habitat in this bioregion.

- (a) The proponent must, prior to the commencement of mining activities, provide to the administering authority of the *Nature Conservation Act 1992* (NC Act) for approval:
 - (i) an ongoing BTF monitoring program that takes into account the requirements of the BTF Bioregional Management Plan required by Recommendation 1, Schedule 1, Appendix 4 of this report and the outputs of baseline research undertaken for the Carmichael Coal Mine and Rail Project (CCM&RP) pursuant to Imposed Condition 1, 'Black-throated Finch (southern) baseline research for the Carmichael project', Section 3, Appendix 1 of the CGER¹⁶ for the CCM&RP
- (b) When requested by the administering authority of the NC Act, provide baseline and other survey results in the format and at intervals specified for the coordination of the bioregional survey data, to the administering authority for the BTF Bioregional Management Plan
- (c) When requested by the administering authority, contribute to the operation of the BTF Bioregional Management Plan, including pro-rata funding.

Note: All surveys required by this condition are to be undertaken in accordance with the state, Commonwealth and best practice regulatory frameworks, guidelines, plans, policies and

¹⁶ Page 463, Coordinator-General Evaluation Report, 7 May 2014. Carmichael Coal Mine and Rail project. Appendix 1 Mine conditions, Section 3 Imposed conditions, Condition 1 Black-throated Finch (southern) baseline research for the Carmichael project.

government geospatial data current at the time the surveys are undertaken. Surveys are to be revised for currency prior to the submission of the results of the surveys to the relevant agency.

The entity with jurisdiction for this condition is the Department of Environment and Science.

Definitions

'**commencement of mining activities**' is the first instance of any mining activity. Commencement of mining activity includes any physical disturbance including clearing of vegetation, earthworks, new road works, new rail works, construction of camp, development of mining associated infrastructure and mining operations. Commencement does not include:

- (a) erection of signage or fencing
- (b) minor physical disturbance necessary to undertake pre-clearance surveys or establish monitoring programs or associated with the mobilisation of plant, equipment, materials, machinery and personnel prior to the start of railway and road development or construction; or
- (c) activities that are critical to commencement that are associated with mobilisation of plant and equipment, materials, machinery and personnel prior to the start of railway or road development or construction only if such activities will have no adverse impact on MSES, and only if the environmental authority holder has notified the administering authority in writing before an activity is undertaken.

'**mining activity**' as defined in section 110 of the EP Act.

Condition 2. Apportionment of pro-rata contributions – Black-throated Finch Bioregional Management Plan

The outcome sought by this condition is to ensure pro-rata funding for the Black-throated Finch (BTF) Bioregional Management Plan is apportioned fairly in consultation with relevant project proponents and administering authorities.

- (a) The apportionment of pro-rata contributions pursuant to Condition 1, Schedule 2, Appendix 1 of this report will be determined by the Coordinator-General in consultation with:
 - (i) Galilee Basin proponents of projects that have been declared Coordinated Projects under the *State Development and Public Works Organisation Act 1971*
 - (ii) Galilee Basin proponents that have made an application for and/or have been granted a mining or petroleum lease, but not included in (a)(i)
 - (iii) the administering authority for the *Environmental Protection Act 1999*
 - (iv) the Commonwealth Department of the Environment and Energy.

The entity with jurisdiction for this condition is the Coordinator-General.

Condition 3. Fauna crossing and habitat connectivity – highwall drainage infrastructure channel

The outcome of this condition is to enable fauna movement protection measures are in place across the highwall drainage channel during the construction, operation, decommissioning and post-mining phases of the project.

- (a) The proponent is to provide, during the construction of the highwall drainage infrastructure channel and maintain in place during operations, decommissioning and post-mining, best practice fauna crossing and fauna habitat connectivity measures across the highwall drainage infrastructure channel.

- (b) The design of the fauna crossings and habitat connectivity measures must allow for effective fauna passage and no fauna losses. The design must be approved by the Department of Environment and Science (DES) prior to the commencement of construction of the highwall drainage infrastructure channel. The design must be undertaken with input from a qualified and experienced ecologist in consultation with DES.
- (c) The proponent is to include fauna crossing and habitat connectivity monitoring programs within the highwall drainage infrastructure channel and environmental management plans during the construction and operation of the project.

The entity with jurisdiction for this condition is DES.

Definitions

'Construction' - physical construction, including significant and continuous site preparation work such as major clearing or excavation for foundations or the placement, assembly or installation of facilities or equipment at any site related to the highwall drainage infrastructure channel.

'highwall drainage infrastructure' – permanent water drainage constructed along the final highwall of the open-cut pit providing flood protection for the operating pits during operations.

Condition 4. Pre-clearance surveys

The outcome sought by this condition is to identify impacts of the project on matter of state environmental significance (MSES) and, in respect of fauna, their habitat; groundwater dependent ecosystems (GDEs) within areas of Alluvium and Tertiary sediments; and stygofauna within areas of Alluvium and Tertiary sediments.

MSES

- (a) Prior to the clearing of vegetation, the proponent must undertake pre-clearance surveys within the project area to identify the presence and extent of any MSES and their habitat.
- (b) The pre-clearance surveys required by this condition must:
 - (i) be undertaken generally in accordance with the Queensland Government survey guidelines in effect at the time of the survey
 - (ii) be undertaken by an appropriately qualified person/s
 - (iii) identify measures to minimise the impact of the clearance on MSES and their habitat
 - (iv) identify measures to protect the MSES and their habitat, and adjacent to the areas to be cleared.
- (c) The proponent must provide to the administering authority of the *Environmental Protection Act 1999* (EP Act), within thirty (30) days of completing the pre-clearance surveys, for approval, a MSES pre-clearance survey report and mitigation and management plan:
 - (i) details of survey methods, locations and timing
 - (ii) detailed description of the areas of habitat directly or indirectly impacted by the clearing
 - (iii) survey/s results detailing any changes to impacts on MSES
 - (iv) details of the proposed mitigation and management measures.
- (d) Clearing of vegetation cannot commence until DES has approved the MSES pre-clearance survey report and mitigation and management plan.
- (e) Any additional MSES areas to be impacted must be included in an application to amend the environmental authority (EA).
- (f) The maximum extent of significant residual impacts on MSES and their habitat must be included as an environmental offset in the environmental authority under the EP Act.

Note: All surveys required by this condition are to be undertaken in accordance with the state, Commonwealth and best practice regulatory frameworks, guidelines, plans, policies and government geospatial data current at the time the surveys are undertaken. Surveys are to be revised for currency prior to the submission of the results of the surveys to the DES.

Groundwater dependent ecosystems

- (a) Prior to the clearing of vegetation, the proponent must undertake pre-clearance surveys within the Alluvium and Tertiary sediments in the area of predicted groundwater depressurisation to identify the presence and extent of any GDEs.
- (b) The surveys must be undertaken by an appropriately qualified person/s.
- (c) The proponent must provide to the administering authority of the environmental authority under the EP Act within thirty (30) days of the completion of the survey/s, for approval:
 - (i) a GDE pre-clearance survey report identifying the survey methods, locations and timing, location of any GDEs identified during the surveys, whether or not the GDEs are MSES and the values of the GDEs that are directly or indirectly impacted by the project, including cumulative impacts with other projects
 - (ii) a GDE management plan including proposed mitigation, monitoring and management measures for GDEs for approval by DES.
- (d) Clearing of vegetation cannot commence until DES has approved the GDE pre-clearance survey report and GDE management plan.
- (e) Any additional impact to GDEs that are MSES must be included in an application to amend the EA.
- (f) The maximum extent of significant residual impacts on GDEs that are MSES must be included as an environmental offset under the environmental authority under the EP Act.

Stygofauna

- (a) Prior to the clearing of vegetation, the proponent must ensure stygofauna sampling is undertaken within the Alluvium and Tertiary sediments in the area of predicted groundwater depressurisation to identify the presence of any stygofauna:
 - (i) information identifying the location of the stygofauna, whether or not the stygofauna are MSES
 - (ii) details of the proposed mitigation and management measures for stygofauna.
- (b) The sampling must:
 - (i) be undertaken by an appropriately qualified person/s
 - (ii) be undertaken in accordance with the government guidelines for sampling and include at least forty (40) samples from at least ten (10) sample sites where water is found in areas of alluvium
 - (iii) include a sample mix of bores in Tertiary sediments and any other bores identified during consultation with the administering authority under the EP Act prior to the commencement of the sampling.
- (c) The proponent must provide to the administering authority of the environmental authority under the EP Act within thirty (30) days of the completion of the sampling, for approval:
 - (i) a sampling report which must include details of survey methods, the timing and location of the sampling bores
 - (ii) for any stygofauna identified during the surveys, a stygofauna management and monitoring plan.

- (d) Clearing of vegetation cannot commence until DES has approved the stygofauna survey report and stygofauna management plan.

The entity with jurisdiction for this condition is DES.

Definitions

'Alluvium' is sediment deposited by a flowing stream, consisting of unconsolidated materials including gravel, clay, silt and sand.

'appropriately qualified person/s' is a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authorities assessment, advice and analysis to performance relative to the subject matter using the relevant protocols, standards, methods or literature.

'environmental offset' has the meaning in section 7 of the *Environmental Offsets Act 2014*.

'minimise' is to reduce to the smallest possible amount or degree.

'significant residual impact' has the meaning in section 8 Environmental Offsets Act 2014.

'Tertiary sediments' is a geological unit, consisting of weakly consolidated siltstone and fine sandstone.

Condition 5. Fish habitat

The outcome sought by this condition is to address the impacts of the project on fish habitat identified in waterways within the project area.

- (a) All waterway barrier works that have the potential to limit fish passage in green, amber, or red waterways, as indicated on the State Assessment Referral Agency development application mapping for Queensland waterways for waterway barrier works, must be designed, constructed and maintained in accordance with:
- (i) the Department of Agriculture and Fisheries (DAF) '*Accepted development requirements for operational works that is constructing or raising waterway barrier works*'
 - (ii) the performance outcomes of the *State Development Assessment Provisions State Code 18: Constructing or raising waterway barrier works in fish habitats*, as revised from time to time
- (b) The design of the waterway barrier works must be approved by DAF prior to the commencement of construction of the waterway barrier works. The design must be undertaken in consultation with DAF
- (c) The proponent must advise the Coordinator-General in writing that construction of the waterway barrier works have commenced within 7 days of commencement of the works.
- (d) The proponent is to implement a fish monitoring program within the waterway barrier works during the construction and operation of the project and make monitoring results publicly available upon request of DAF.

Note: Any fish or habitat surveys required to implement the requirements of this condition are to be undertaken in accordance with the state, Commonwealth and best practice regulatory frameworks, guidelines, plans, policies and government geospatial data current at the time the surveys are undertaken.

The entity with jurisdiction for this condition is DAF.

Definitions

'construction' - physical construction, including significant and continuous site preparation work such as major clearing or excavation for foundations or the placement, assembly or installation of facilities or equipment at any site related to the waterway barrier works.

'waterway' under the *Fisheries Act 1994*, includes a river, creek, stream, watercourse or inlet of the sea.

'waterway barrier works' under the *Fisheries Act 1994*, means a dam, weir or other barrier across a waterway if the barrier limits fish stock access and movement along a waterway.

Schedule 3. Sewage management

The entity with jurisdiction for the condition in this schedule is the Department of Environment and Science (DES).

Condition 1. Sewage management system

The outcome sought by this condition is to ensure that sewage is treated and managed appropriately on-site.

- (a) The proponent must provide the administering authority of the *Environmental Protection Act 1999* (EP Act) with the information requested in this condition prior to public notification of the environmental authority (EA) application to inform the administering authority's assessment and potential conditions of approval.
- (b) The proponent must provide:
 - (i) the "daily peak design capacities" for the various proposed sewage treatment works for the facility based on the methodology outlined in the Environmental Protection Regulation 2008, Part 13, Water Treatment Services 63, Sewage Treatment
 - (ii) information on the activity to demonstrate how the proposed sewage treatment works would be operated to protect the environmental values of air, waters, wetlands, groundwater and any associated surface ecological systems, the acoustic environment and land including soils, subsoils, landforms and associated flora and fauna as outlined in the Environmental Protection Regulation 2008, Schedule 5, Part 3 Environmental objectives and performance outcomes, Table 1, Operational assessment.

Sewage - maps

- (c) The proponent must provide a scale site plan in A4 size and in electronic format, which shows:
 - (i) location of all sewage treatment infrastructure, including, but not limited to, tanks, sewage pump stations, sewerage collection system(s) and pipe work, sewage treatment plant/s, wet weather storage(s), effluent irrigation/disposal areas, and their relation to other on-site structures (e.g. buildings, recreational areas, etc)
 - (ii) distance (in metres) of the sewage treatment infrastructure to site boundaries
 - (iii) distance (in metres) from each side of the proposed sewage treatment works, sewage pump station(s) and disposal area/s to potentially impacted waters, including rivers, creeks, dams, channels, gullies, stormwater drains, etc
 - (iv) wet weather/effluent irrigation storage structure/s
 - (v) sensitive features within 250 m of the proposed sewage treatment works
 - (vi) soil monitoring locations
 - (vii) groundwater bore locations
 - (viii) stormwater collection/drainage system/s
 - (ix) site contours
 - (x) Q10 and Q100 flood lines.

Sewage Treatment Activity – Specific Information

- (d) The proponent must provide a description of the proposed sewage treatment works, including:
- (i) the composition of sewage that will be treated by the proposed sewage treatment works, how the volume(s) of influent was/were arrived at and how influent quality will be controlled (e.g. grease-traps if wastewater from kitchens, etc, are to be treated in the proposed sewage treatment works)
 - (ii) the treatment units that will comprise the treatment train associated with the proposed sewage treatment works, including any irrigation system and infrastructure, such as wet weather storage/s
 - (iii) the method of disposal of “regulated wastes” associated with the sewage treatment works, such as screenings, grits, sludges, biosolids
 - (iv) the sewage treatment works disinfection method/s that will be used to disinfect treated wastewater
 - (v) the suitability of the location for the proposed sewage treatment works and wet weather storage(s) and irrigation site/s
 - (vi) the alarm systems for both plant operations and any sewage pump stations necessary to indicate any plant malfunctions and overflows or unplanned wastewater releases
 - (vii) the proposed water sampling devices that will be installed to monitor wastewater generation
 - (viii) all sewage pump stations, their locations, overflow storage capabilities, release locations, including alarms and telemetry
 - (ix) any emergency backup power available to the pumps and the sewage treatment works in the event of power outages
 - (x) all chemicals used in the sewage treatment processes, including material safety data sheets
 - (xi) the storage of all chemicals on-site associated with operating the sewage treatment works and treated wastewater disposal/re-use (types and volumes) and method of storage and containment
 - (xii) waste re-use/disposal methods for all chemicals, fuels, etc associated with the proposed sewage treatment works
 - (xiii) security measures to prevent unauthorised public access to the sewage treatment works, sewage pumping stations, treated wastewater/wet weather storage(s) and minimise risks to public health
 - (xiv) how the proposed sewage treatment works and infrastructure will be maintained.

Sewage - Bypassing

- (e) The proponent must provide the following information:
- (i) proposed design details of bypassing infrastructure at the proposed sewage treatment works
 - (ii) expected volume of bypassed wastewater at the proposed sewage treatment works
 - (iii) whether all bypassed wastewater will be contained on-site for treatment at a future time and how and where this bypassed wastewater will be contained on-site

- (iv) type of wastewater treatment bypassed wastewater will receive, such as screening, degritting, disinfection etc.
- (v) how the discharge of bypassed wastewater to the environment and surface waters will be managed such as not to cause environmental harm to surface waters and the environment
- (vi) method of disposal of bypassed wastewater (outfall pipe, diffuser etc).

Sewage - Treated Wastewater Wet Weather Storage

- (f) The proponent must provide details on treated wastewater storage facilities associated with the proposed sewage treatment works and their management such that environmental harm and risks to public health are prevented. Matters to be addressed should include, but not be limited to, the following:
 - (i) design details (including maximum capacity) of the wet weather storage(s) and how the design(s) was/were selected
 - (ii) vector management
 - (iii) odour control
 - (iv) measures to prevent potential overflows from wet weather storage(s) to waters
 - (v) measures to prevent stratification of waters within the wet weather storage(s)
 - (vi) weed management
 - (vii) measures and strategies for protection of groundwater from dam storages, such as installing an impermeable lining
 - (viii) predicted overtopping and environmental impact of any such losses to the environment
 - (ix) algae management (including toxic algal management), including measures to reduce water quality degradation in the storage by measures such as aeration and destratification.

Sewage - Treated Wastewater Quality

- (g) the proponent must provide information on the expected treated wastewater quality for the following parameters (minimum, median, maximum where appropriate):
 - (i) five (5) day Biochemical Oxygen Demand (BOD) in mg/L
 - (ii) Total Suspended Solids (TSS) in mg/L
 - (iii) pH
 - (iv) *Escheria coli* (in terms of colony forming units (cfu) per 100mL)
 - (v) Total Dissolved Solids (mg/L)
 - (vi) Dissolved oxygen (mg/L, % saturation)
 - (vii) Total nitrogen as nitrogen in terms of mg/L
 - (viii) Ammonia nitrogen as nitrogen in mg/L
 - (ix) Total phosphorus as phosphorus in terms of mg/L
 - (x) faecal coliforms (in terms of colony forming units per 100mL)
 - (xi) Sodium Absorption Ratio (SAR)
 - (xii) electrical conductivity
 - (xiii) any other expected contaminants including heavy metals, pharmaceuticals, toxins, pathogens etc.

- (h) The proponent must compare the above information with monitoring results from operational sewage treatment works of the same type and capacity at similar-sized facilities to demonstrate that the proposed sewage treatment works will produce treated wastewater as described above.

Sewage - Treated Wastewater Irrigation

- (i) The proponent must provide details on proposed treated wastewater irrigation and the land(s) to be irrigated including:
- (i) a suitably-scaled map/s and GPS coordinates identifying the location of proposed irrigation area(s) and how the area was selected
 - (ii) determination of the suitability of the proposed irrigation area/s for receiving treated wastewater in terms of the following:
 - (A) existing vegetation cover including plant species and any vegetation to be grown in the irrigation area/s
 - (B) topography (slope (%))
 - (C) stormwater flow paths
 - (D) proximity to drainage lines/watercourses or other sensitive environments
 - (E) existing land use
 - (F) flood potential
 - (G) relevant soil and characteristics including:
 - (1) erodibility
 - (2) soil profile including texture, structure, impermeable layers and details of the watertable including levels over time and evidence of rising watertable
 - (3) hydraulic properties including moisture content at field capacity, permanent wilting point and saturation and saturated hydraulic conductivity
 - (4) chemical properties including nitrogen content (especially organic nitrogen), phosphorus content, phosphorus sorption capacity, exchange sodium percentage, background concentration of any relevant contaminants
 - (H) the presence, depth and quality of groundwater, including available quality and water level monitoring data, and the current and future uses of the groundwater
 - (I) mathematical modelling (preferably the 'Model for Effluent Disposal Using Land Irrigation' (MEDLI) version 2) that assesses the suitability of the irrigation system for land disposal of treated wastewater. The modelling must assess the hydraulic load applied to the irrigation area/s and the fate of nitrogen, phosphorous and salts based on soil permeability and vegetation cover. The assessment must be carried out for both the average and maximum predicted effluent disposal rates under climatic conditions and soil quality parameters relevant to the site's location. The assessment must include the input data used (including all raw files), metadata details/quality assurance of data used, model defaults, expert estimates and details of outputs and interpretation. The assessment must be used to determine:

- (1) the minimum area (hectares) of the irrigation area/s required to ensure the protection of groundwater and vegetation being irrigated and to prevent run-off beyond the boundary of the irrigation areas
- (2) soil water and nutrient balances
- (3) the required wet weather storage volume/s and frequency of overtopping events
- (4) how the wet weather storage/s would be operated and maintained to ensure acceptable water quality
- (5) the schedule and management of irrigation rates to ensure that they do not result in an exceedance of the water holding capacity of the soil or the crop uptake capacity to prevent surface run-off
- (6) the salinity of the treated wastewater applied and the capacity of the vegetation and soils in the irrigation area/s to assimilate the salt loadings on a sustainable basis (e.g. maintaining acceptable soil salinity and structural stability and preventing deep drainage)
- (7) the preferred method/s of treated wastewater application (surface or sub-surface irrigation) and irrigation rates
- (8) potential for, and management of, human exposure to irrigated treated wastewater and aerosols
- (9) how the irrigation system would be operated and maintained in a sustainable manner
- (10) a suitable monitoring program and performance evaluation and correction system.

Sewage - Air quality

- (j) the proponent must provide a list of all potential odour sources associated with the proposed sewage treatment works and related infrastructure, and outline measures that will be taken to control odour impacts from sewage treatment activities and irrigation practices so as not to cause environmental nuisance at a sensitive place, or commercial place, existing and future.

Sewage - Waste management

- (k) The proponent must provide information regarding waste-related issues associated with operating the proposed sewage works that includes, but is not limited to, the following matters:
 - (i) details of waste generated (such as treated wastewater, recycled water, grit, screenings, biosolids, etc.) by type and proposed quantity/volume
 - (ii) storage method/s
 - (iii) odour generation and controls
 - (iv) avoidance, re-use, recycling, energy recovery, treatment or disposal method/s¹⁷

¹⁷ Refer to the Queensland Waste Avoidance and Resource Productivity Strategy (2014-2024)

- (v) details of how waste is managed with reference to the waste management hierarchy and 'cleaner production'
- (vi) procedures for improving waste management practices.

Note—refer to sections 10 and 19 of the *Environmental Protection (Waste Management) Policy 2000*.

Sewage - Noise management

- (l) the proponent must provide information regarding noise-related issues associated with the operation of the proposed sewage works that includes, but is not limited to, the following matters:
 - (i) assessment of noise impacts from equipment and machinery
 - (ii) proximity of sensitive receptors
 - (iii) operating times of the activities
 - (iv) outline of measures that will be taken to control noise impacts from equipment and machinery.

Definitions

'commercial place' means a place used as a workplace, an office or for business or commercial purposes and includes a place within the curtilage of such a place reasonably used by persons at that place.

'effluent' is treated waste water discharged/released from sewage treatment plants.

'environmental nuisance' as defined under Chapter 1 of the *Environmental Protection Act 1994*

'minimise' is to reduce to the smallest possible amount or degree.

'sensitive place' includes the following and includes a place within the curtilage of such a place reasonable used by persons at that place:

1. a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises; or
2. a motel, hotel or hostel; or
3. a kindergarten, school, university or other educational institution; or
4. a medical centre or hospital; or
5. a protected area under the *Nature Conservation Act 1992*, the *Marine Parks Act 1992* or a World Heritage Area; or
6. a public thoroughfare, park or gardens; or
7. for noise, a place defined as a sensitive receptor for the purposes of the *Environmental Protection (Noise) Policy 2008*.

'sensitive receptor' as defined under Schedule 1 Acoustic quality objectives of the *Environmental Protection (Noise) Policy 2008*.

Schedule 4. Social impacts

The entity with jurisdiction for conditions in this schedule is the Coordinator-General.

Condition 1. Community and stakeholder engagement

The outcome sought by this condition is to develop and implement a plan to manage community and stakeholder engagement to ensure that community and stakeholder issues associated with potential social impacts of the project are clearly identified and effectively managed.

- (a) The proponent must advise the Coordinator-General in writing that mining activities have commenced within 7 days of commencement of the first mining activity.

- (b) The proponent must submit, six months prior to commencement of mining activities, a community and stakeholder engagement plan (CSEP) to the Coordinator-General for approval.
- (c) The CSEP is to provide details of:
 - (i) the components of the stakeholder consultation strategy outlined in Attachment H – Additional Information on SIA for the China Stone Coal project EIS:
 - (A) stakeholder engagement plans
 - (B) complaints and grievances systems
 - (C) evaluation and reporting procedures
 - (ii) the landholder engagement protocol described in Attachment H – Additional Information on SIA for the China Stone Coal project, including strategies for engagement with potentially affected landholders
 - (iii) culturally appropriate strategies for engaging with Aboriginal and Torres Strait Islander peoples about potential cultural, social and economic impacts resulting from the project
 - (iv) strategies for providing timely notification to local industry service providers and job seekers regarding potential project opportunities, and for ensuring that they are aware of the relevant registration and application processes.
- (d) The CSEP must also include the following:
 - (i) a summary profile of the local communities, focusing on potentially affected stakeholder groups
 - (ii) an analysis of key stakeholders and stakeholder issues
 - (iii) engagement schedules and programs
 - (iv) communication activities and tools
 - (v) roles and responsibilities for engagement
 - (vi) an appropriately scaled complaints management process
 - (vii) objectives and key performance indicators
 - (viii) timeframes for implementation
 - (ix) monitoring and reporting requirements
 - (x) processes for incorporating stakeholder feedback into the further development of project specific management strategies and the social impact management plan
 - (xi) a report on the outcomes of engagement undertaken with directly affected and potentially affected landholders.
- (e) The proponent must implement the CSEP once approved by the Coordinator-General.
- (f) Publish the CSEP on the website of the proponent for the China Stone Coal project within one month of the Coordinator-General’s approval under Condition 1(a) of this schedule.

Definitions

‘**commencement of mining activities**’ is the first instance of any mining activity. Commencement of mining activity includes any physical disturbance including clearing of vegetation, earthworks, new road works, new rail works, construction of camp, development of mining associated infrastructure and mining operations. Commencement does not include:

- (a) erection of signage or fencing
- (b) minor physical disturbance necessary to undertake pre-clearance surveys or establish monitoring programs or associated with the mobilisation of plant, equipment, materials, machinery and personnel prior to the start of railway and road development or construction; or

- (c) activities that are critical to commencement that are associated with mobilisation of plant and equipment, materials, machinery and personnel prior to the start of railway or road development or construction only if such activities will have no adverse impact on MSES, and only if the environmental authority holder has notified the administering authority in writing before an activity is undertaken.

'mining activity' as defined in section 110 of the EP Act.

Condition 2. Updated social impact assessment

The outcome sought by this condition is to ensure that the social impact assessment (SIA) report is updated to capture the social conditions and trends in the SIA study areas, and the potential social impacts and management measures at the commencement of mining activities. The updated SIA will inform preparation of the social impact management plans.

- (a) The proponent must submit an updated SIA report to the Coordinator-General, 12 months prior to commencement of mining activities, on commencement of mining activities and annually thereafter for the duration of the construction and for the first five (5) years of operation.
- (b) The updated SIA report is to include:
 - (i) the updated social baseline
 - (ii) the findings of an updated labour study
 - (iii) up-to-date population and workforce information
 - (iv) updated identification of potential impacts and their significance
 - (v) measures to address the updated potential social impacts.

Definitions

'commencement of mining activities' is the first instance of any mining activity. Commencement of mining activity includes any physical disturbance including clearing of vegetation, earthworks, new road works, new rail works, construction of camp, development of mining associated infrastructure and mining operations. Commencement does not include:

- (a) erection of signage or fencing
- (b) minor physical disturbance necessary to undertake pre-clearance surveys or establish monitoring programs or associated with the mobilisation of plant, equipment, materials, machinery and personnel prior to the start of railway and road development or construction;
- (c) activities that are critical to commencement that are associated with mobilisation of plant and equipment, materials, machinery and personnel prior to the start of railway or road development or construction only if such activities will have no adverse impact on MSES, and only if the environmental authority holder has notified the administering authority in writing before an activity is undertaken.

'mining activity' as defined in section 110 of the EP Act.

Condition 3. Social impact management plan

The outcome sought by this condition is to develop and implement a plan to manage the potential social impacts of the project identified in the updated social impact assessment (SIA).

- (a) The proponent must submit a social impact management plan (SIMP) to the Coordinator-General for approval 12 months prior to commencement of mining activities and an updated SIMP on commencement of mining activities and annually thereafter for the duration of construction and for the first five (5) years of operation.
- (b) The SIMP must include details of the management measures identified in the updated SIA required under Condition 2 of this schedule and the matters outlined in the management plans in Attachment H – Additional Information on SIA for the China Stone Coal project EIS:

- (i) workforce management plan
 - (ii) housing and accommodation management plan
 - (iii) local business and industry content plan
 - (iv) health and community wellbeing management plan
 - (v) cumulative social impact management plan.
- (c) The SIMP must include the details of management measures specific to potential cultural, social and economic impacts on Aboriginal and Torres Strait Islander peoples, identified in the updated SIA required under Condition 2 of this schedule.
- (d) The SIMP must include measures to manage potential project impacts to emergency services during both construction and operation of the project.
- (e) The SIMP is to include detail on the following in each of the management plans listed in (b) and (c) of this schedule:
- (i) the potential impacts
 - (ii) the proposed management measures
 - (iii) timeframes for implementation
 - (iv) roles and responsibilities
 - (v) stakeholders
 - (vi) potential partnerships
 - (vii) processes to monitor the effectiveness of management measures and amend ineffective measures (monitoring program).
- (f) The proponent must implement the SIMP once approved by the Coordinator-General.
- (g) Publish the SIMP on the proponent's website within one month of the Coordinator-General's approval under condition 3(a) of this schedule.

Definitions

'**commencement of mining activities**' is the first instance of any mining activity. Commencement of mining activity includes any physical disturbance including clearing of vegetation, earthworks, new road works, new rail works, construction of camp, development of mining associated infrastructure and mining operations. Commencement does not include:

- (a) erection of signage or fencing
- (b) minor physical disturbance necessary to undertake pre-clearance surveys or establish monitoring programs or associated with the mobilisation of plant, equipment, materials, machinery and personnel prior to the start of railway and road development or construction; or
- (c) activities that are critical to commencement that are associated with mobilisation of plant and equipment, materials, machinery and personnel prior to the start of railway or road development or construction only if such activities will have no adverse impact on MSES, and only if the environmental authority holder has notified the administering authority in writing before an activity is undertaken.

'**mining activity**' as defined in section 110 of the EP Act.

Condition 4. Reporting on the implementation of social impact management measures

The outcome sought by this condition is to report on the implementation and effectiveness of measures to manage social impacts during construction and the first five (5) years of operation of the project.

- (a) The proponent must submit a social impact management report (SIMR) to the Coordinator-General for approval twelve (12) months from the commencement of mining

activities and annually thereafter for the duration of construction and for the first five (5) years of operation.

- (b) The proponent must advise the Coordinator-General in writing that construction of the project has commenced within 7 days of commencement of construction.
- (c) The proponent must advise the Coordinator-General in writing that operation of the project has commenced within 7 days of commencement of operation.
- (d) Using the monitoring program described in the social impact management plan (SIMP) (Condition 3(e)(vii) of this schedule), the annual SIMR must detail:
 - (i) an assessment of the actual social impacts against the potential social impacts identified in the updated SIA (Condition 2 of this schedule) and SIMP (Condition 3 of this schedule)
 - (ii) the progress and effectiveness of the social impact management measures detailed in the SIMP
 - (iii) actions to adapt social impact management measures where monitoring indicates they are not effective
 - (iv) the implementation of commitments relating to social impacts made by the proponent listed in Appendix 5 in the Coordinator-General's evaluation report for the China Stone Coal project
 - (v) outcomes of engagement programs described in the community and stakeholder engagement plan (CSEP) under Condition 1 Condition 1(iii) of this schedule, including outcomes of the complaints management process.
- (e) Each SIMR is to be made publicly available on the proponent's website within one month of the Coordinator-General's approval under (a) of this condition, during each year of the reporting period.

Definitions

'commencement of mining activities' is the first instance of any mining activity. Commencement of mining activity includes any physical disturbance including clearing of vegetation, earthworks, new road works, new rail works, construction of camp, development of mining associated infrastructure and mining operations. Commencement does not include:

- (a) erection of signage or fencing
- (b) minor physical disturbance necessary to undertake pre-clearance surveys or establish monitoring programs or associated with the mobilisation of plant, equipment, materials, machinery and personnel prior to the start of railway and road development or construction; or
- (c) activities that are critical to commencement that are associated with mobilisation of plant and equipment, materials, machinery and personnel prior to the start of railway or road development or construction only if such activities will have no adverse impact on MSES, and only if the environmental authority holder has notified the administering authority in writing before an activity is undertaken.

'mining activity' as defined in section 110 of the EP Act.

Schedule 5. Power supply

The entity with jurisdiction for the condition in this schedule is nominated below each condition.

Condition 1. Power supply options assessment

The outcome sought by this condition is to ensure that the administering authority for the *Environmental Protection Act 1999* (EP Act) is provided with sufficient information to undertake a comprehensive assessment of power supply options for the China Stone Coal project.

- (a) The proponent must submit a comprehensive power supply options assessment report to the entity with jurisdiction for this condition, prior to public notification of the environmental authority (EA) application, including environmentally relevant activity (ERA) 14 – Electricity generation under the EP Act. The following information is required in the report:
- (i) description of power supply alternatives, including conceptual, technological and locality alternatives to the coal-fired power station proposed in the China Stone Coal project EIS and the consequences of not proceeding with a power station (including any impacts that would be avoided). Include a comparison of environmentally sustainable design principles and operational practices
 - (ii) evidence of investigations into cost and viability of alternative project power supply options, including but not limited to:
 - (A) implementing renewable energy technologies including, but not limited to wind, solar and hybrid technologies, for all or part of the project's power demands
 - (B) consideration of alternative fuel sources
 - (C) sourcing electricity from an off-lease source, such as the electricity grid or the proposed Moray Power Project
 - (D) small power station generating units and different types of units, including supercritical generating units for power stations.
 - (iii) details of the criteria used to determine the viability of alternatives and provide sufficient information to convey why certain options or courses of action are preferred and why others are rejected
 - (iv) a comparison of the avoidance, minimisation, recycling, handling, storage, treatment, and/or disposal of solid, liquid and gaseous waste streams and potential emissions associated with each option including:
 - (A) emissions to the atmosphere (e.g. SO_x, NO_x, VOC, CO, CO₂, particulates, PM₁₀, PM_{2.5}, and toxic, persistent or hazardous substances)
 - (B) an inventory of projected future annual emissions for each greenhouse gas and total emissions expressed as total mass per annum and as mass per megawatt hour for individual gases (including fugitive methane), and combined annual emissions in CO₂ equivalent terms
 - (C) emissions/discharges to surface water, groundwater and land.
 - (v) a discussion of the potential hazards and risks to people and property of each alternative. Discuss any other environmental and human health impacts (including noise and vibration levels at nearby sensitive receptors) as a result of each alternative and associated activities (e.g. transport of materials)
 - (vi) a description of the annual water demand, source and quality of water, on-site water storage infrastructure, water treatment (if required), estimated water reliability, security and risk of failure of water supply for each alternative
 - (vii) In relation to the preferred power supply option, include the following:
 - (A) evidence of the need for intended scale of the power supply option, including an outline of the energy needs of the project on an annual basis for the life of the mine
 - (B) proposed staging of construction and commissioning of the preferred power supply option to suit the staged power needs of the mine

- (C) a description of how redundancy will be built into the proposed power supply for the project and operational triggers for bringing additional generation capacity on line
- (D) approach to storing or using surplus power produced by any on-site power generation facility.

The entity with jurisdiction for the condition is the Department of Environment and Science.

Definitions

'PM₁₀' is a particular matter with an aerodynamic diameter of 10 micrometres or less.

'CO₂' - carbon dioxide, a colourless, odourless gas present in the atmosphere.

'CO' – carbon monoxide, a colourless, odourless, and tasteless gas.

Schedule 6. Power station assessment

The entity with jurisdiction for the condition in this schedule is nominated below each condition.

Condition 1. Updated power station emissions profile and impact assessment

The outcome sought by this condition is to ensure that the administering authority for the *Environmental Protection Act 1999* (EP Act) is provided with sufficient information to enable a comprehensive assessment of the power station emissions profile.

- (a) The proponent must submit to the administering authority for the EP Act, an updated emissions profile and impact assessment for the proposed power station prior to public notification of the environmental authority (EA) application, including environmentally relevant activity (ERA) 14 – Electricity generation under the EP Act. The following information is required:
 - (i) a detailed inventory of all air emissions, including greenhouse gas (GHG) emissions during construction and the operational life of the proposed power station (including source, nature and levels of emissions)
 - (ii) 'best practice' emissions that would be expected from the power station based on the nameplate (actual) performance of the plant, quality of the input coal supply during operation and the implementation of best practice industry standards
 - (iii) ground level predictions for any site identified as an environmental value or sensitive receptor in the *Environmental Protection (Air) Policy 2008* (EPP (Air)), including any sites that could be sensitive to the effects of predicted emissions
 - (iv) 'best practice' mitigation measures together with proactive and predictive operational and maintenance strategies that could be used to prevent and mitigate impacts
 - (v) an evaluation of potential air quality impacts from emissions, with reference to the *National Environmental Protection (Ambient Air Quality) Measure 2003* (Commonwealth) and the EPP (Air). If an emission is not addressed in these legislative instruments, discuss the emission with reference to its risk to human health and appropriate health-based guidelines/standards.

The entity with jurisdiction for the condition is the Department of Environment and Science.

Condition 2. Air quality and greenhouse gas emissions cumulative impact assessment

The outcome sought by this condition is to ensure that the administering authority for the *Environmental Protection Act 1999* (EP Act) is provided with sufficient information to enable a

comprehensive assessment of air quality and greenhouse gas (GHG) emission cumulative impacts associated with the proposed power station.

- (a) The proponent must submit a cumulative impact assessment, which considers both the Moray Power Project and the China Stone Coal project proposed on-site power station, prior to publicly notifying the environmental authority (EA) application including environmentally relevant activity (ERA) 14 – Electricity generation under the EP Act. The following information is required:
- (i) revised estimates of predicted cumulative PM₁₀ and SO₂ concentrations based on the actual performance of the on-site power generation units as presented in the updated emissions profile required by Condition 1 in this Schedule
 - (ii) an assessment of the potential impacts of predicted cumulative concentrations at sensitive receptors with reference to the *Environmental Protection (Air) Policy 2008*
 - (iii) an assessment of GHG emission cumulative impacts on climate change, including potential impacts on livestock, and terrestrial and aquatic habitat
 - (iv) an updated discussion of proposed mitigation measures relevant to predicted cumulative impacts
 - (v) a description of any assumptions or limitations to the modelling which underpins the cumulative impact assessment.

The entity with jurisdiction for the condition is the Department of Environment and Science.

Definitions

‘PM₁₀’ is a particular matter with an aerodynamic diameter of 10 micrometres or less.

‘SO₂’ is a colourless, water-soluble gas that forms when sulfur burns.

Condition 3. Power station waste

The outcome sought by this condition is to ensure that if a power station is constructed within the China Stone Coal project mining lease that power station waste is processed efficiently.

This condition will take effect in the event the administering authority for the *Environmental Protection Act 1999* (EP Act) grants environmentally relevant activity (ERA) 14 – Electricity generation to construct and operate a power station on the granted mining lease.

- (a) At least three (3) months prior to commencement of construction of the power station and power station waste storage facility (PSWSF), a detailed radionuclide assessment of coal ash waste, including radium isotopes and lead-210, must be undertaken by an appropriately qualified person. The proponent must submit a radionuclide assessment report, including proposed mitigation, management and monitoring measures to the administering authority of the EP Act for approval.
- (b) If the appropriately qualified person considers that radioactivity is too high for safe short and/or long-term storage, the radionuclide assessment report must detail how the coal ash waste would be contained. The containment plan is to be approved by the administering authority for the EP Act prior to construction of the power station and the PSWSF.

The entity with jurisdiction for the condition is the Department of Environment and Science.

Definitions

‘appropriately qualified person’ is a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authorities assessment, advice and analysis to performance relative to the subject matter using the relevant protocols, standards, methods or literature.

'construction' - physical construction, including significant and continuous site preparation work such as major clearing or excavation for foundations or the placement, assembly or installation of facilities or equipment at any site related to the power station.

Condition 4. Power station greenhouse gas emissions reduction and management plan

The outcome sought by this condition is to ensure that if a power station is constructed on the China Stone Coal project mining lease:

- the greenhouse gas (GHG) emissions of the power station are minimised, monitored and managed to contribute to the Australian Government's emissions reduction targets, as revised from time to time
- the GHG emission impacts from the power station on human health, livestock, terrestrial and aquatic habitat and cumulative impacts are minimised.

This condition will take effect in the event the administering authority for the *Environmental Protection Act 1999* (EP Act) grants environmentally relevant activity (ERA) 14 – Electricity generation to proponent to construct and operate a power station on the granted mining lease.

- (a) The proponent must prepare a power station GHG emissions reduction and management plan (the 'plan') for scope 1 emissions from the power station.
- (b) The plan must be submitted to the Coordinator-General within three (3) months of the administering authority for the EP Act granting ERA 14 – Electricity generation for a power station on the mining lease. Written approval of the plan must be granted to the proponent by the Coordinator-General prior to commencement of the construction of the power station or power station waste storage facility.
- (c) The plan must:
 - (i) demonstrate that best practice, maximising energy efficiency, opportunities for future energy recovery, and minimising GHG emissions have been given priority in the design, operation and maintenance of the power station including but not limited to:
 - (A) coal-fired base load generation plant designed to achieve best practice thermal efficiency
 - (B) use of economisers and feed water heaters to reduce fuel consumption
 - (C) consideration of new and emerging coal-fired technologies
 - (ii) identify opportunities to offset GHG emissions through indirect means, including sequestration and carbon trading
 - (iii) provide evidence of how the greenhouse gas intensity (i.e. quantity of CO₂-e produced per MWh of electricity produced) is equivalent to, or better than benchmarked best practice for the electricity industry at the time of the report
 - (iv) demonstrate how continuous improvement in greenhouse gas intensity could be achieved, through an annual review and adoption of applicable advances in technology and process management
 - (v) outline how the power station has or has not been designed and constructed to be carbon capture and storage (CCS) ready and implement CCS technology, and store gas in accordance with *GHG Storage Act 2009*
 - (vi) detail how emissions from the power station would be monitored and reported.
- (d) The plan is to be reviewed and updated at least annually for the construction and operations phases of the power station. The approved and most current updated plans are to be made publicly available upon request.

The entity with jurisdiction for the condition is the Coordinator-General.

Definitions

'**appropriately qualified person**' is a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authorities assessment, advice and analysis to performance relative to the subject matter using the relevant protocols, standards, methods or literature.

'**minimise**' is to reduce to the smallest possible amount or degree.

Schedule 7. Groundwater

The entity with jurisdiction for the conditions in this schedule is nominated following each condition.

Condition 1. Groundwater numerical model review and groundwater assessment report

The outcome sought by this condition is to ensure the project's groundwater numerical model is suitable to provide an adequate prediction of the potential impacts of the project on groundwater resources.

- (a) The groundwater numerical model referred to in the 'Project China Stone Groundwater Report' prepared by Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) must be reviewed and revised by the proponent to incorporate the recommendations from the China Stone Coal project Groundwater Model Targeted Peer Review (peer review report) prepared by Hydrogeologic Pty Ltd dated 25 September 2017. A revised groundwater numerical model must be produced by the proponent which includes:
- (i) review of the hydrogeological conceptualisation used in the previous model
 - (ii) application of a revised coal seam Kh-depth (horizontal permeability) relationship (based on the sensitivity regressions shown in Figure C8 of the 'Additional Information on Groundwater' report August 2017, prepared by AGE) to the base-case model parameters
 - (iii) refinement to the interburden base-case model parameters based on the peer review report recommendations
 - (iv) decreased specific storage (Ss):
 - (A) Ss not higher than $2 \cdot 10^{-6} \text{ m}^{-1}$ for the Rewan Group, Joe Joe Group and intervening interburden units
 - (B) Ss in the range $5 \cdot 10^{-6} \text{ m}^{-1}$ to $1 \cdot 10^{-5} \text{ m}^{-1}$ for the coal seams
 - (C) Ss not higher than $2 \cdot 10^{-5} \text{ m}^{-1}$ for other geological units
 - (v) a revised recharge distribution based on the peer review report recommendations
 - (vi) revision of the southern boundary of the model to align with the Carmichael River
 - (vii) the properties of the northern fault in the composite sensitivity analysis
 - (viii) refinements to river and evapotranspiration features to represent discharge from the Doongmabulla Springs Complex as recommended in the peer review report
 - (ix) as per the peer review report recommendations, a specific feature in the model for the northern seasonal wetland
 - (x) results from on-site testing of the Clematis Sandstone saturation on either side of the fault in the northern underground mining area

- (xi) uncertainty scenarios to identify any interactions between the northern seasonal wetland and:
 - (A) the northern fault alignment and properties
 - (B) the underlying fracture/subsidence zone associated with the northern underground mine area, particularly the effect of connective cracking to the surface and recharge variability
 - (xii) recalibration of the model after the base-case parameter amendments have been applied
 - (xiii) re-running all sensitivity analyses, including the composite sensitivity analysis
 - (xiv) verification of a 5 m water level in Lake Buchanan, and additional sensitivity and uncertainty analysis for potential impacts to Lake Buchanan and the Caukingburra Swamp
 - (xv) for the post-mining groundwater impact assessment, backfilling of the void to above the pre-mining groundwater level
 - (xvi) an updated cumulative groundwater impact assessment for the mining and post-mining scenarios that consider all of the refinements to the model required by this condition. The most up to date and publicly available groundwater modelling data and information from the CCM&RP and any other relevant project must also be incorporated into the cumulative assessment.
- (b) The proponent is required to prepare a groundwater assessment report, based on the groundwater numerical model review under Condition 1(a) of this schedule which must:
- (i) be completed by an appropriately qualified person and
 - (ii) be submitted to the administering authority for the *Water Act 2000* (Water Act) and the *Environmental Protection Act 1994* (EP Act) for approval. It is to be submitted to the administering authority at least four months prior to the proponent notifying its environmental authority (EA) and mining lease applications.
 - (iii) be decided on by the administering authorities for the Water Act and the EP Act prior to the proponent publicly notifying its EA and mining lease applications.
 - (iv) have an independent peer review of this report and groundwater numerical model review is to be undertaken by an appropriately qualified person and submitted to the administering authorities with the groundwater assessment report.
- (c) The groundwater assessment report must include:
- (i) an analysis of the results from the groundwater numerical model revision including the predicted groundwater impacts of the project
 - (ii) evidence from on-site testing of the Clematis Sandstone saturation on either side of the fault in the northern underground mining area
 - (iii) quantification and interpretation of any changes in outflows (i.e. changes to boundary flows) to the west of the project area under the prediction scenarios to assess potential impacts on aquifers to the west
 - (iv) any recommendations to avoid, mitigate or manage the predicted groundwater impacts of the project
 - (v) a discussion about how all recommendations of the independent peer review undertaken as part of fulfilling this condition have been incorporated
 - (vi) details about predicted groundwater take volumes from all affected aquifers over the life of the mine to enable a determination of the offset for groundwater take required by Condition 11, Appendix 3

- (vii) a detailed discussion about any additional offset requirements, if there are additional predicted significant residual impacts to matters of national environmental significance (MNES) or matters of state environmental significance (MSES) as a result of the groundwater numerical model revision.
- (d) The recommendations to avoid, mitigate or monitor the predicted groundwater impacts in the approved groundwater assessment report must be implemented and incorporated into the groundwater management and monitoring program required under Imposed Condition 5, Schedule 7, Appendix 1 of this report.

A copy of the approved report is to be provided to the Commonwealth Department of the Environment and Energy by the proponent within one (1) month of approval by the administering authorities.

The entity with jurisdiction for this condition is the Department of Natural Resources, Mines and Energy.

Definitions

‘appropriately qualified person’ is a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authorities assessment, advice and analysis to performance relative to the subject matter using the relevant protocols, standards, methods or literature.

‘significant residual impact’ has the meaning in section 8 of the *Environmental Offsets Act 2014*.

‘void’ means an area of land excavated in the carrying out of a mining activity.

Condition 2. Ongoing groundwater numerical model reviews

The outcome sought by this condition is to ensure that the project’s groundwater numerical model remains suitable during the life of mining operations to provide an adequate prediction of the potential impacts of the project on groundwater resources.

- (a) The approved revised groundwater numerical model referred to in Condition 1, Schedule 7, Appendix 1 of this report must be reviewed by an appropriately qualified person within two (2) years from the issuing of the project’s environmental authority (EA) and mining lease and at least every five (5) years thereafter, or at other intervals specified in writing by the administering authority for the *Water Act 2000* if the observed groundwater levels are not consistent with those predicted by the latest version of the groundwater numerical model.
- (b) Each review must provide a revised groundwater numerical model that includes:
 - (i) review of the hydrogeological conceptualisation used in the previous model
 - (ii) groundwater and subsidence monitoring data and measured mine dewatering volumes from the groundwater management and monitoring program (required by Imposed Condition 5, Schedule 7, Appendix 1 of this report)
 - (iii) a review of assumptions used in the previous model
 - (iv) an update of the predicted impacts
 - (v) a revised water balance model
 - (vi) updated sensitivity and uncertainty analysis
 - (vii) a transient calibration.
- (c) A groundwater numerical model review report outlining the findings and any recommendations from the first review must be completed by an appropriately qualified person and submitted to the administering authority for the *Water Act 2000* for approval no later than three (3) months (or an alternative timeframe agreed with the administering

authority in writing) after the commencement of the review. The subsequent five (5) yearly review reports (or at other intervals specified) must be kept for the duration of mining activities and made available to the administering authority upon request for approval. Each report must include:

- (i) the outcomes of each of the matters reviewed in Imposed Condition 2(b), Schedule 7, Appendix 1 of this report.
 - (ii) information about any changes made to the model since the previous model, including data changes
 - (iii) detailed justification for the refined model
 - (iv) an evaluation of the accuracy of the predicted changes in groundwater levels
 - (v) recommended actions to improve the accuracy of model predictions.
- (d) The recommendations in the most current report must be implemented.

A copy of the first approved groundwater numerical model review report and any subsequent reports requested by the administering authority as per Condition 2(c), Schedule 7, Appendix 1 of this report is to be provided to the Commonwealth Department of Environment and Energy by the proponent within one month of approval

The entity with jurisdiction for this condition is the Department of Natural Resources, Mines and Energy.

Definitions

‘appropriately qualified person’ is a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authorities assessment, advice and analysis to performance relative to the subject matter using the relevant protocols, standards, methods or literature.

‘mine dewatering’ is pumping out groundwater that has seeped into the open-cut pit or underground longwall mine.

Condition 3. Baseline groundwater monitoring program

The outcome sought by this condition is to ensure that adequate baseline data is collected about existing pre-mining groundwater quality, flow directions and groundwater levels in order to adequately monitor and identify changes to groundwater resources resulting from mining activities.

- (a) A baseline groundwater monitoring program must be developed and certified by an appropriately qualified person and submitted no later than one-hundred and twenty (120) days after the date of this Coordinator-General’s evaluation report for approval to the administering authority for the *Environmental Protection Act 1994*. Following approval, the monitoring program must be implemented. The baseline groundwater monitoring program must be developed to produce a groundwater dataset that:
- (i) contains representative groundwater quality samples from the Quaternary alluvium, Tertiary sediments, Clematis Sandstone, Moolayember Formation, Rewan Formation, and Betts Creek Beds.
 - (ii) includes additional groundwater monitoring bores in the Betts Creek Beds to the north, south and west of the proposed mining lease, with locations to be determined in consultation with Department of Natural Resources Mines and Energy
 - (iii) includes at least twelve (12) sampling events that are no more than two (2) months apart over a two (2) year period, so as to determine background groundwater quality and propose groundwater quality limits

- (iv) identifies background groundwater quality from hydraulically isolated background bores
 - (v) allows for the identification of natural groundwater level trends, groundwater flow directions and groundwater contaminant trigger levels
 - (vi) monitors for potential interaction between surface water and groundwater.
- (b) Proposed monitoring bore details (e.g. construction, access, formations targeted) must be provided in the baseline groundwater monitoring program to confirm appropriateness of proposed monitoring bores.
- (c) The results of the baseline groundwater monitoring program must be incorporated into the groundwater management and monitoring program required by Imposed Condition 5, Schedule 7, Appendix 1 of this report.

The entity with jurisdiction for this condition is the Department of Environment and Science.

Definitions

'Alluvium' is sediment deposited by a flowing stream, consisting of unconsolidated materials including gravel, clay, silt and sand.

'appropriately qualified person' is a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authorities assessment, advice and analysis to performance relative to the subject matter using the relevant protocols, standards, methods or literature.

'certified', with respect to watercourse diversions, means assessed and approved by a suitably qualified and experienced person. In relation to 'as constructed' drawings and specifications, the certification must be by the suitably qualified person who supervised the construction of the watercourse diversion, or re-establishment of the watercourse.

'mining activity' as defined in section 110 of the EP Act.

'Rewan Formation' is a geological unit, regionally recognised aquitard, marker bed for the base of the Great Artesian Basin. Consists of fine grained, grey-green lithic sandstone, siltstone and claystone.

'Tertiary sediments' is a geological unit, consisting of weakly consolidated siltstone and fine sandstone.

Condition 4. Groundwater quality limits

The outcome sought by this condition is to ensure appropriate groundwater quality limits are included in the project's groundwater management and monitoring program and environmental authority (EA) application.

- (a) Prior to publicly notifying its EA application, the proponent must include groundwater quality limits in its EA application, based on two (2) years of baseline groundwater monitoring data obtained by Imposed Condition 3, Schedule 7, Appendix 1 and include the groundwater quality limits in the groundwater management and monitoring program required by Imposed Condition 5, Schedule 7, Appendix 1.

The entity with jurisdiction for this condition is the Department of Environment and Science.

Condition 5. Groundwater management and monitoring program

The outcome sought by this condition is to ensure that the impacts of mining activities on groundwater resources are identified and adequately managed, mitigated and monitored.

- (a) A groundwater management and monitoring program (GMMP) must be developed and certified by an appropriately qualified person.
- (b) The GMMP must be implemented prior to commencement of mining activities and maintained:
 - (i) during all phases of the mining operation

- (ii) for a minimum of thirty (30) years post-closure or a shorter period if the site is proven to be geotechnically and geochemically stable and it can be demonstrated to the satisfaction of the administering authority for the *Environmental Protection Act 1994* any release of contaminants from the site will not result in environmental harm.
- (c) The GMMP must be submitted and approved by the administering authority for the *Water Act 2000* and the administering authority for the *Environmental Protection Act 1994* prior to the proponent publicly notifying its environmental authority (EA) and mining lease applications.
- (d) The GMMP must be developed to meet the following objectives:
 - (i) all potential impacts to matters of national environmental significance (MNES), matters of state environmental significance (MSES) and groundwater users from mine dewatering, subsidence and mine water and waste storage facilities are identified, mitigated and monitored, including monitoring of radioactivity near the proposed deposit location of coal ash waste
 - (ii) groundwater level and quality monitoring occurs in all identified geological units across and adjacent to the mine site to monitor project impacts
 - (iii) drawdown level thresholds are identified for monitoring potential project impacts to Doongmabulla Springs Complex, Lake Buchanan, Caukingburra Swamp, the Carmichael River and any other relevant groundwater dependent ecosystems
 - (iv) monitoring data validates the groundwater numerical model and allows for a transient calibration of the groundwater numerical model to refine and confirm accuracy of groundwater impacts predicted
 - (v) monitoring measures mine dewatering volumes and provides an estimate of any surface water ingress to groundwater
 - (vi) compliance and reference groundwater monitoring bores are nominated and information is provided, including the geological unit each bore will monitor and frequency of monitoring, to demonstrate:
 - (A) the location of each compliance bore is appropriate for the geological unit it is intended to monitor
 - (B) the location of each reference bore is upstream of any potential mining related impacts
 - (C) that each bore is appropriately constructed for monitoring purposes
 - (D) landholder approval has been obtained to access private bores and/or construct new bores on privately owned land.
 - (vii) the approved baseline monitoring program under Imposed Condition 3, Schedule 7, Appendix 1 of this report is maintained and monitoring bores that will be replaced due to mining activities are identified and details of replacement bores (including location, construction, aquifers targeted) provided
 - (viii) any identified source aquifers for alternative water supplies, relevant to any approval issued under the *Water Act 2000* for the project are monitored
 - (ix) monitoring of cumulative groundwater impacts with other existing or proposed activities or projects that may impact on the same groundwater resources as the project occurs, and groundwater impacts from the project are identified, as opposed to groundwater impacts from the other activities or projects
 - (x) monitoring accounts for the requirements of any regional groundwater and surface water monitoring and assessment program developed in accordance with

Recommendation 8, Schedule 3, Appendix 4 (Regional Groundwater and Surface Water Monitoring and Assessment Program) of this report

- (xi) bore levels are measured on a quarterly basis during mining operations. Frequency of bore level measurements can be reduced to an annual basis post- mining. Monitoring data reviews must assess the ongoing suitability of the monitoring network
- (xii) where monitoring identifies any impacts have occurred that were not predicted by the groundwater model, or approved by the administering authority for the *Water Act 2000* and the administering authority for the *Environmental Protection Act 1994*, the GMMP must outline the investigation measures and actions to be undertaken to prevent the impact from continuing, and any measures to repair the impact already undertaken.

A copy of the approved GMMP is to be provided to the Commonwealth Department of the Environment and Energy within one (1) month of approval.

The entity with jurisdiction for this condition is the Department of Natural Resources, Mines and Energy.

Definitions

'appropriately qualified person' is a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authorities assessment, advice and analysis to performance relative to the subject matter using the relevant protocols, standards, methods or literature.

'certified', with respect to watercourse diversions, means assessed and approved by a suitably qualified and experienced person. In relation to 'as constructed' drawings and specifications, the certification must be by the suitably qualified person who supervised the construction of the watercourse diversion, or re-establishment of the watercourse.

'commencement of mining activities' is the first instance of any mining activity. Commencement of mining activity includes any physical disturbance including clearing of vegetation, earthworks, new road works, new rail works, construction of camp, development of mining associated infrastructure and mining operations. Commencement does not include:

- (a) erection of signage or fencing
- (b) minor physical disturbance necessary to undertake pre-clearance surveys or establish monitoring programs or associated with the mobilisation of plant, equipment, materials, machinery and personnel prior to the start of railway and road development or construction; or
- (c) activities that are critical to commencement that are associated with mobilisation of plant and equipment, materials, machinery and personnel prior to the start of railway or road development or construction only if such activities will have no adverse impact on MSES, and only if the environmental authority holder has notified the administering authority in writing before an activity is undertaken.

'mining activity' as defined in section 110 of the EP Act.

'mine dewatering' is pumping out groundwater that has seeped into the open-cut pit or underground longwall mine.

Condition 6. Ongoing groundwater management and monitoring program reviews

The outcome sought by this condition is to ensure the project's groundwater management and monitoring program remains suitable during the life of mining operations and post-mining to identify and adequately manage, mitigate and monitor the project's impacts on groundwater resources.

- (a) The groundwater management and monitoring program referred to in Condition 5, Schedule 7, Appendix 1 of this report must be:
 - (i) reviewed within two (2) years from the issuing of the project's environmental authority (EA) and mining lease and produce a groundwater management and monitoring program review report and submit the report for approval to the administering authority for the *Water Act 2000* no later than three (3) months (or an alternative timeframe agreed with the administering authority in writing) after the commencement of the review.
 - (ii) subsequently reviewed no later than three (3) months after 1 July every five (5) years, including for a period of thirty (30) years post-closure and produce a groundwater management and monitoring program review report which must be kept for the duration of mining activities and made available to the administering authority upon request for approval
- (b) The groundwater management and monitoring program reviews must be undertaken by an appropriately qualified person and be undertaken in conjunction with the groundwater numerical model reviews required by Imposed Condition 2, Schedule 7, Appendix 1 of this report.
- (c) The review report must include:
 - (i) a review of the adequacy of the monitoring locations, frequencies and groundwater quality triggers specified in the project's EA
 - (ii) an assessment of the outcomes of the groundwater management and monitoring program against the objectives in Imposed Condition 5, Schedule 7, Appendix 1 of this report
 - (iii) a review of the adequacy of the groundwater management and monitoring program to support the requirements outlined in Imposed Condition 2, Schedule 7, Appendix 1 of this report
 - (iv) updates based on data received during baseline monitoring required in Imposed Condition 3
 - (v) updates based on the outcomes of the Rewan Formation Connectivity Research Plan required by Recommended Condition 11, Appendix 3 of this report
 - (vi) recommendations to improve the groundwater management and monitoring program, including provision for adaptive management measures where required.
- (d) The groundwater management and monitoring program must be updated to include the recommendations from the most recently approved groundwater management and monitoring program review report, and must be implemented.

A copy of the first approved groundwater management and monitoring program review report and any subsequent reports requested by the administering authority is to be provided to the Commonwealth Department of Environment and Energy by the proponent within one (1) month of approval.

The entity with jurisdiction for this condition is the Department of Natural Resources, Mines and Energy.

Definitions

'appropriately qualified person' is a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authorities assessment, advice and analysis to performance relative to the subject matter using the relevant protocols, standards, methods or literature.

'mining activity' as defined in section 110 of the EP Act.

'Rewan Formation' is a geological unit, regionally recognised aquitard, marker bed for the base of the Great Artesian Basin. Consists of fine grained, grey-green lithic sandstone, siltstone and claystone.

Condition 7. Proponent contribution to regional water balance modelling, monitoring and assessment programs

The outcome sought by this condition is to identify and address potential cumulative impacts on water resources in the Belyando-Suttor sub-catchment and groundwater aquifers of the eastern part of the Galilee Basin.

- (a) To identify and address potential cumulative impacts on water resources in the Belyando-Suttor sub-catchment and groundwater aquifers of the eastern part of the Galilee Basin, the proponent must, when requested by the administering authority for the *Water Act 2000*:
- (i) provide groundwater and surface water monitoring results, in the format and at intervals specified in the protocol (available from the department of Natural Resources, Mines and Energy (DNRME)) for coordination of regional groundwater and surface water monitoring data, to the lead agency for the regional groundwater and surface water monitoring and assessment program in Recommendation 8, Schedule 3, Appendix 4 (Regional Groundwater and Surface Water Monitoring and Assessment Program) of this report
 - (ii) contribute to the ongoing operation of the regional groundwater and surface water monitoring and assessment program in Recommendation 8, Schedule 3, Appendix 4 (Regional Groundwater and Surface Water Monitoring and Assessment Program) of this report, including pro-rata funding as per Imposed Condition 8, Schedule 7, Appendix 1 of this report in this schedule.

The entity with jurisdiction for this condition is DNRME.

Condition 8. Apportionment of pro-rata funding—regional water balance modelling, monitoring and assessment programs

The outcome sought by this condition is to ensure pro-rata funding for the regional water balance modelling, monitoring and assessment programs is apportioned fairly in consultation with relevant project proponents and administering authorities.

- (a) The apportionment of pro-rata funding pursuant to (ii), Schedule 7, Appendix 1 of this report of this schedule will be determined by the Coordinator-General in consultation with:
- (i) proponents of projects in the Galilee Basin that have been declared Coordinated Projects under the *State Development and Public Works Organisation Act 1971*
 - (ii) proponents of projects in the Galilee Basin that have made an application for and/or have been granted a mining lease or petroleum lease
 - (iii) the administering authority for the *Water Act 2000*
 - (iv) the administering authority for the *Environmental Protection Act 1999*.

The entity with jurisdiction for this condition is the Coordinator-General.

Condition 9. Provision of monitoring bore data

The outcome sought by this condition is to ensure that existing groundwater level data collected from all monitoring bores is included in Queensland's monitoring bore database.

- (a) The proponent must provide the administering authority for the *Water Act 2000* with groundwater level data that has been collected from all monitoring bore sites to date for the project in electronic (excel) format including:

- (i) bore number
 - (ii) date
 - (iii) water level below top of casing in metres
 - (iv) elevation to top of casing in AHD.
- (b) The monitoring bore data must be provided to the administering authority for the *Water Act 2000* within sixty (60) days after the date of this Coordinator-General's evaluation report.

The entity with jurisdiction for this condition is the Department of Natural Resources, Mines and Energy.

Schedule 8. Surface water

The entity with jurisdiction for the conditions in this schedule is the Department of Environment and Science.

Condition 1. Baseline monitoring program for North Creek

The outcome sought by this condition is to ensure adequate baseline water quality and flow monitoring data for North Creek is obtained to determine trigger levels for the controlled release of mine affected water from the project to North Creek.

- (a) The proponent must develop and implement a monitoring program for North Creek using the methods outlined in *The Monitoring and Sampling Manual Draft May 2017*, that includes:
 - (i) monitoring of baseline water and sediment quality, stream flow and macroinvertebrates and fish
 - (ii) greater than eighteen (18) samples collected at two (2) or more control sites across a minimum of twelve (12) to twenty-four (24) months (to account for seasonal variation), or within an alternative timeframe determined by agreement between the proponent and the Department of Environment and Science (DES)
 - (iii) the monitoring of stream flow volumes every ten (10) to fifteen (15) minutes whenever flow is occurring during the twelve (12) to twenty-four (24) month water monitoring program, or alternative timeframe determined by agreement between the proponent and DES
 - (iv) the monitoring of sediment for metal concentrations according to the methods described in Batley and Simpson (2016).
- (b) The proponent must use the baseline data to:
 - (i) assess the downstream extent and potential impacts of controlled releases on the environmental values of North Creek
 - (ii) describe mitigation and management strategies that would be applied.
- (c) The baseline data assessment is to be based on predicted mine affected water quality and flows under varying discharge volumes and low, moderate and high background flow conditions.
- (d) The proponent must use the baseline results to develop a controlled mine affected water release strategy including proposed end-of-pipe limits and discharge triggers for low, moderate and high stages of stream flow.
- (e) The proponent must nominate water quality triggers that apply in the receiving environment based on water quality objectives protective of environmental values.

- (f) The baseline water quality and flow monitoring data for North Creek must be submitted to DES prior to public notification of the environmental authority (EA) application documents under the *Environmental Protection Act 1994*.
- (g) The proponent must collect water quality data for the following parameters, as a minimum:
 - (i) electrical conductivity (EC); sulfate; pH; a full suite of metals and polycyclic aromatic hydrocarbons (PAHs)
 - (ii) data for EC should be collected during periods of baseflows and high flows to develop EC limits and/or flow triggers for low, moderate and high flows.
- (h) For the purpose of monitoring water quality downstream of any controlled releases of mine-affected water, the proponent must propose downstream monitoring locations that are:
 - (i) downstream and in close proximity (e.g. <1km) of the proposed mine-affected water release location(s) on North Creek and/or in close proximity to the edge of any proposed mixing zone
 - (ii) upstream and in proximity (e.g. within 2km) of the confluence of North Creek and the Belyando River.
- (i) The proponent must co-locate flow gauging stations with the water quality monitoring locations to measure stream flow.
- (j) The proponent must submit to DES the minimum background flow conditions for releasing mine affected water with consideration of any likely cumulative impacts of predicted releases from the Carmichael Coal Mine and Rail Project (CCM&RP) approximately 30 km upstream.

Definitions

'macroinvertebrates' means invertebrates that are big enough to be seen with the naked eye.

'mining activity' as defined in section 110 of the EP Act.

'mine-affected water' means the following types of water:

- (a) pit water, tailings dam water, processing plant water
- (b) water contaminated by a mining activity which would have been an environmentally relevant activity under Schedule 2 of the Environmental Protection Regulation 2008 if it had not formed part of the mining activity
- (c) rainfall run-off which has been in contact with any areas disturbed by mining activities which have not yet been rehabilitated, excluding rainfall run-off discharging through release points associated with erosion and sediment control structures that have been installed in accordance with the standards and requirements of an Erosion and Sediment Control Plan to manage such run-off, provided that this water has not been mixed with pit water, tailings dam water, processing plant water or workshop water
- (d) groundwater which has been in contact with any areas disturbed by mining activities which have not yet been rehabilitated
- (e) groundwater from the mine's dewatering activities
- (f) a mix of mine affected water (under any of paragraphs i)-v) and other water.

Does not include surface water run-off which, to the extent that it has been in contact with areas disturbed by mining activities that have not yet been completely rehabilitated, has only been in contact with:

- (a) land that has been rehabilitated to a stable landform and either capped or revegetated in accordance with the acceptance criteria set out in the environmental authority but only still awaiting maintenance and monitoring of the rehabilitation over a specified period of time to demonstrate rehabilitation success, or

- (b) land that has partially been rehabilitated and monitoring demonstrates the relevant part of the landform with which the water has been in contact does not cause environmental harm to waters or groundwater, for example:
- (c) areas that have been capped and have monitoring data demonstrating hazardous material adequately contained with the site
- (d) evidence provided through monitoring that the relevant surface water would have met the water quality parameters for mine affected water release limits in this environmental authority, if those parameters had been applicable to the surface water run-off, or
- (e) both.

'mine dewatering' is pumping out groundwater that has seeped into the open-cut pit or underground longwall mine.

Condition 2. Receiving environment monitoring program

The outcome sought by this condition is to ensure the receiving environment is monitored for potential impacts from releases of water by the project.

- (a) The proponent must submit a receiving environment monitoring program (REMP) Design Document, developed in accordance with the *Receiving Environment Monitoring Program Guideline* (the former Department of Environment and Heritage Protection, 2014), to the administering authority for the *Environmental Protection Act 1999* (EP Act), for approval prior to commencement of the REMP. The REMP Design Document must describe the aims, objectives and methodology of the REMP and identify:
 - (i) Environmental values for receiving waters
 - (ii) Contaminants of concern and monitoring indicators that assess their risk
 - (iii) Measurable indicators and associated water quality objectives for each of the environmental values
 - (iv) Surface water quality, flow volume, sediment quality and macroinvertebrates and fish monitoring sites within the downstream receiving waters
 - (v) Control sites unaffected by mine water discharges and representative of background conditions
 - (vi) A monitoring program and assessment methodology for determining potential impacts of controlled releases on downstream environmental values based on the water quality objectives and representative control site data
 - (vii) A process for program review and modification
 - (viii) A quality control/quality assurance method to be adopted for the REMP.
- (b) The proponent must prepare a report annually (starting twelve months from the date of issue of the environmental authority (EA)) outlining the findings of the REMP which:
 - (i) is in accordance with the Department of Environment and Science (DES) Model Mining Conditions, including all monitoring results and interpretations
 - (ii) includes an assessment of background water quality, the condition of downstream water quality compared against water quality objectives, and the suitability of approved EA release limits to protect downstream environmental values
 - (iii) is made publicly available upon request of the administering authority.

Definitions

'macroinvertebrates' means invertebrates that are big enough to be seen with the naked eye.

Appendix 2. Coordinator-General's stated conditions

This appendix includes the Coordinator-General's stated conditions, stated under section 39, 45, 47C, 49, 49B, 49E and 49G of the *State Development and Public Works Organisation Act 1971* (SDPWO Act).

Part 1 Stated conditions for the environmental authority

This section includes the Coordinator-General's stated conditions for the proposed environmental authority (EA) (mining lease) under the *Environmental Protection Act 1994* (EP Act) for the China Stone Coal project (the project). These conditions are stated pursuant to section 47C of the SDPWO Act.

These conditions do not form a complete draft EA for the project. The administering authority may develop additional conditions for issues not covered by the stated conditions. The additional conditions must be consistent with the stated conditions.

The entity with jurisdiction for conditions in this Appendix is the Department of Environment and Science.

Schedule A—General

- A1** This environmental authority authorises environmental harm referred to in the conditions. Where there is no condition or this environmental authority is silent on a matter, the lack of a condition or silence does not authorise environmental harm.
- A2 Scope of activity**
The Environmental Authority holder is approved for a coal extraction rate of up to 55 million tonnes per annum (Mtpa) run of mine (ROM) coal.
- A3** In carrying out the mining activity, the holder of this environmental authority must not exceed the maximum disturbance area for each domain, as detailed in Table A1 – Authorised disturbance extent and Figure A1 – Authorised disturbance extent

Table A1 – Authorised disturbance extent

Mine Domain	Description	Location	Maximum Disturbance Area (hectares (ha)) *
Underground mining and subsidence area	Underground longwall panels, not including drift		7,769 ha
Open-cut area			5,648 ha
Industrial area and infrastructure	Inclusive of water storage facility, airstrip, accommodation village, topsoil stockpiles, coal handling and processing plant (CHPP), northern underground MIA, southern underground MIA, open-cut MIA, water storage dams, train loadout and rail loop	Refer to Figure A1 – Authorised disturbance extent	2,931 ha
Tailings storage facility			682.9 ha

Highwall drainage * as digitised by DES	484.5 ha
Total Disturbance	16,132.2 ha

* Maximum disturbance area has been estimated by DES from maps in the EIS and includes the total area of subsidence and open-cut. Total Disturbance is exclusive of the area of overlap of open-cut and underground. However, the estimated disturbance area does not include the footprint of the proposed coal fired power station nor the power station waste storage facility.

A4 The holder of this environmental authority must:

- a) install all measures, plant and equipment necessary to ensure compliance with the conditions of this environmental authority
- b) maintain such measures, plant and equipment in a proper and efficient condition
- c) operate such measures, plant and equipment in a proper and efficient manner
- d) ensure all instruments and devices used for the measurement or monitoring of any parameter under any condition of this environmental authority are properly calibrated.

A5 Monitoring

Except where specified otherwise in another condition of this environmental authority, all monitoring records or reports required by this environmental authority must be kept for the duration of the mining activities and made available to the administering authority upon request.

A6 Financial assurance

The activity must not be carried out until the environmental authority holder has given financial assurance to the administering authority as security for compliance with this environmental authority and any costs or expenses, or likely costs or expenses, mentioned in section 298 of the Act.

A7 The amount of financial assurance must be reviewed by the holder of this environmental authority when a plan of operations is amended or replaced or the authority is amended.

A8 Risk management

The holder of this environmental authority must develop and implement a risk management system for mining activities which mirrors the content requirement of the *ISO31000:2009 Standard for Risk Management*, or the latest edition of an Australian standard for risk management, to the extent relevant to environmental management, prior to the commencement of the mining activity. This risk management system must be reviewed by a third party.

A9 Notification of emergencies, incidents and exceptions

The holder of this environmental authority must notify the administering authority by written notification within 24 hours after becoming aware of any emergency or incident that results in the release of contaminants not in accordance, or reasonably expected to be not in accordance with, the conditions of this environmental authority. The environmental authority holder must take action in accordance with A11.

A10 The holder of this environmental authority must notify the administering authority within 30 days of commencement of mining activities of the actual date of commencement.

A11 Within five business days following the initial notification of an emergency or incident, or receipt of monitoring results, whichever is the latter, further written advice must be provided to the administering authority, including the following:

- a) results and interpretation of any samples taken and analysed
- b) outcomes of actions taken at the time to prevent or minimise unlawful environmental harm
- c) proposed actions to prevent a recurrence of the emergency or incident.

A12 Complaints

The holder of this environmental authority must record all environmental complaints received about the mining activities including:

- a) name, address and contact number for of the complainant
- b) time and date of complaint
- c) reasons for the complaint
- d) investigations undertaken
- e) conclusions formed
- f) actions taken to resolve the complaint
- g) any abatement measures implemented
- h) person responsible for resolving the complaint.

A13 The holder of this environmental authority must, when requested by the administering authority, undertake relevant specified monitoring within a reasonable timeframe nominated or agreed to by the administering authority to investigate any complaint of environmental harm and/or nuisance. The results of the investigation (including an analysis and interpretation of the monitoring results) and abatement measures, where implemented, must be provided to the administering authority within 10 business days of completion of the investigation, or no later than 10 business days after the end of the timeframe nominated by the administering authority to undertake the investigation.

A14 Third-party reporting

The holder of this environmental authority must:

- a) within six (6) months of the commencement of the mining activities, obtain from an appropriately qualified person a report on compliance with the conditions of this environmental authority;
- b) obtain further such reports at regular intervals, not exceeding three (3) years, from the completion of the report referred to above in a); and
- c) provide each report to the administering authority within 90 days of its completion.

A15 Where a condition of this environmental authority requires compliance with a standard, policy or guideline published externally to this environmental authority and the standard is amended or changed subsequent to the issue of this environmental authority, the holder of this environmental authority must:

- a) comply with the amended or changed standard, policy or guideline within one (1) year of the amendment or change being made, unless a different period is specified in the amended standard or relevant legislation, or where the amendment or change relates specifically to regulated structures referred to in conditions within Schedule K, the time specified in that condition
- b) until compliance with the amended or changed standard, policy or guideline is achieved; continue to remain in compliance with the corresponding provision that was current immediately prior to the relevant amendment or change.

A16 Chemicals and flammable or combustible liquids

All explosives, hazardous chemicals, corrosive substances, toxic substances, gases and dangerous goods must be stored and handled in accordance with the current Australian standard where such is applicable.

A17 Flammable and combustible liquids, including petroleum products, must be stored and handled in accordance with the latest edition of *AS1940—The storage and handling of flammable and combustible liquids*.

A18 The holder of this environmental authority must minimise the potential for contamination of land and waters by diverting stormwater around contaminated areas and facilities used for the storage of chemicals and flammable or combustible liquids.

A19 Monitoring

Upon request from the administering authority, copies of monitoring records and/or reports should be made available and provided to the administering authority within 5 business days, or an alternative timeframe agreed between the administering authority and the holder.

Any management or monitoring plans, systems or programs required to be developed and implemented by a condition of this environmental authority must be reviewed for effectiveness in minimising the likelihood of environmental harm on an annual basis, and amended promptly if required, unless a particular review date and amendment program is specified in the plan, system or program.

A20 Meteorological monitoring

The holder of this environmental authority must establish and maintain automatic weather stations to measure and record wind speed, wind direction, temperature, humidity, temperature inversion and rainfall intensity to aid in the compliance with this environmental authority and capture climate variation across the site.

Schedule B—Air

Note: This air schedule does not include emissions from the proposed power station.

- B1** An Air Quality Management Plan (AQMP) must be developed by an appropriately qualified and experienced person and submitted to the administering authority for approval at least three (3) months prior to the commencement of mining activities. Once approved by the administering authority, the AQMP must be implemented.
- B2** The Air Quality Management Plan required by condition B1 must, at a minimum:
- a) provide for the effective management of actual and potential environmental impacts to air resulting from the mining activity;
 - b) be developed by an appropriately qualified and experienced person;
 - c) identify all major sources of air emissions (including dust) that may occur as a result of the mining activity;
 - d) identify all potential sensitive and commercial locations that may be affected by air quality impacts from the mining activity;
 - e) detail a GHG management program and reporting;
 - f) detail the collection of air quality and meteorological data in accordance with the *Australian Standards Methods for Pollutant Monitoring* as specified in Schedule 3 of the *National Environment Protection (Ambient Air Quality) Measures* and in consultation with the administering authority;
 - g) identify the adverse meteorological conditions likely to produce elevated levels of PM₁₀ at a sensitive or commercial place due to mining activities;
 - h) detail the protocols for regular maintenance of plant and equipment to minimise the potential for fugitive dust emissions;
 - i) describe the procedures to be undertaken if any non-compliance is detected;
 - j) detail the period of regular review to determine the effectiveness of the plan;
 - k) describe the procedures that will be used to manage dust emissions. Procedures must include the following measures committed to in the EIS, and measures that achieve the ambient air quality levels specified in this environmental authority for dust and particulate matter deposition:
 1. haul road will be watered to minimise dust emissions;
 2. progressive rehabilitation will be conducted on the open-cut mine overburden emplacement areas;
 3. inactive disturbed areas will be rehabilitated as soon as possible; and

4. compliance with the relevant requirement of the Aurizon¹⁸ Coal Dust Management Plan at the train loading facility including the use of coal wagon veneering systems.

B3 The proponent must ensure that all reasonable and feasible avoidance and mitigation measures are employed so that the dust and particulate matter emissions generated by the mining activities do not cause exceedances of the following levels when measured at any sensitive or commercial place:

- a) Dust deposition of 120 milligrams per square metre per day, averaged over one month, when monitored in accordance with the most recent version of *Australian Standard AS3580.10.1 Methods for sampling and analysis of ambient air—Determination of particulate matter—Deposited matter – Gravimetric method*.
- b) A concentration of particulate matter with an aerodynamic diameter of less than 10 micrometres (PM₁₀) suspended in the atmosphere of 25 micrograms per cubic metre over a one (1) year averaging time (calendar year average), when monitored in accordance with the most recent version of Australian Standards; either:
 1. *Australian Standard AS3580.9.6 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—PM₁₀ high volume sampler with size-selective inlet – Gravimetric method*, or
 2. *Australian Standard AS3580.9.9 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—PM₁₀ low volume sampler—Gravimetric method*.
- c) A concentration of particulate matter with an aerodynamic diameter of less than 10 micrometres (PM₁₀) suspended in the atmosphere of 50 micrograms per cubic metre over a 24-hour averaging time¹⁹, when monitored in accordance with the most recent version of Australian Standards.
- d) A concentration of particulate matter with an aerodynamic diameter of less than 2.5 micrometres (PM_{2.5}) suspended in the atmosphere of 7 micrograms per cubic metre over a one (1) year averaging time (calendar year average), when monitored in accordance with the most recent version of Australian Standards.
- e) A concentration of particulate matter with an aerodynamic diameter of less than 2.5 micrometres (PM_{2.5}) suspended in the atmosphere of 20 micrograms per cubic metre over a 24-hour averaging time (calendar year average), when monitored in accordance with the most recent version of Australian Standards.
- f) A concentration of particulate matter suspended in the atmosphere of 90 micrograms per cubic metre over a one (1) year averaging time, when monitored in accordance with the most recent version of *AS/NZS3580.9.3:2003 Methods for sampling and analysis of ambient air—determination of suspended particulate matter—total suspended particulate matter (TSP)—high volume sampler gravimetric method*.

B4 An Odour Monitoring Program must be developed and implemented. The Odour Monitoring Program must be submitted to the administering authority for approval at least three (3) months prior to the commencement of mining activities, and include the following:

- a) identification of sensitive and commercial places;

¹⁸ Aurizon (2010). Coal Dust Management Plan, Aurizon Holdings Limited.

<https://www.aurizon.com.au/~media/aurizon/files/sustainability/central%20queensland%20coal%20network.pdf?la=en>

¹⁹ The exceedances of PM₁₀ above 50 micrograms per cubic metre over a 24-hour averaging time as a result of bushfires, dust storms and fuel reduction burning for fire management purposes are not considered a breach of Condition B3 (c).

- b) proposed monitoring locations to monitor impacts to sensitive and commercial places;
 - c) parameters that are to be monitored to determine odour nuisance;
 - d) limits for the parameters identified in determining odour nuisance; and
 - e) a description of how the program will demonstrate compliance with condition B5.
- Any significant revisions of the Odour Monitoring Program must be submitted to the administering authority for approval.

B5 Spontaneous combustion

A Spontaneous Combustion Management Plan must be developed and implemented by the holder of this environmental authority. The Spontaneous Combustion Management Plan must be submitted to the administering authority for approval three (3) months prior to the commencement of mining activities, and must:

- a) identify potential and actual spontaneous combustion heating areas
- b) involve inspections of spontaneous combustion heating areas
- c) include a risk assessment that will guide and prioritise management actions
- d) include remedial actions where a high risk has been identified.
- e) describe a program for the review of the effectiveness of the Spontaneous Combustion Management Plan.

Schedule C—Waste

C1 General waste must only be disposed of into the landfill on ML70515, identified in Figure C1 – Location of notifiable activities.

C2 Unless otherwise permitted by the conditions of this environmental authority or with prior approval from the administering authority and in accordance with a relevant standard operating procedure, waste and vegetation must not be burnt.

C3 A leachate collection system must be designed by an appropriately qualified person and installed and maintained to:

- a) collect leachate generated in the landfill unit;
- b) convey the collected leachate out of the landfill unit to an appropriate leachate storage facility; and
- c) restrict the height of the leachate above the liner system to a maximum level of 300 mm.

Leachate and stormwater run-off which has been in contact with waste material in the landfill unit, must be collected in the leachate storage facility and be:

- a) treated in the leachate treatment plant and discharged to land in accordance with the requirements of the relevant water utility;
- b) recirculated through waste disposal in the landfill unit; or
- c) treated by alternative technologies agreed by the administering authority for off-site disposal, discharge, or on-site re-use; or
- d) disposed of at a facility that approved to receive such waste.

C4 Tailings disposal *

Tailings must be managed in accordance with procedures contained within the current plan of operations. These procedures must include provisions for:

- a) containment of tailings;
- b) the tailings storage facility (TSF) will be constructed to be geotechnically stable landforms with a low permeability foundation;
- c) the management of seepage and leachates both during operation and the foreseeable future;
- d) surface run-off and any seepage from the TSF will be monitored to confirm run-off and leachate water quality. Water samples will be taken on a quarterly basis from the Return Water Dam, TSF decant pond, and the TSF seepage collection sumps;

- e) a seepage collection system must be installed along the downstream toe of the TSF embankment to intercept any surface expression of seepage or leachate, and to prevent the downslope movement of contaminated water. The seepage must be drained to a sump or pond for return to the TSF;
- f) the control of fugitive emissions to air;
- g) a program of progressive sampling and characterisation to identify acid-producing potential metal concentrations of tailings;
- h) monitoring of the TSF for key environmental and design performance indicators. Regular reviews of the design and operating plans must occur;
- i) maintaining records of the relative locations of any other waste stored within the tailings;
- j) rehabilitation strategy must include a progressive rehabilitation schedule for the completion of rehabilitation of the TSF and involve the construction of the landform, provision of benign capping, topsoil layers and seeding with the establishment of a self-sustaining native ecosystem; and
- k) monitoring of rehabilitation, research and/or trials to verify the requirements and methods for decommissioning and final rehabilitation of tailings, including the prevention and management of acid mine drainage, erosion minimisation and establishment of vegetation cover.

* Condition C4 does not authorise the disposal of ash waste from the coal fired power station.

C5 Mineral Waste Management Plan*

A Mineral Waste Management Plan (MWMP) must be developed prior to the commencement of mining activities and implemented. The Mineral Waste Management Plan must be available to the administering authority on request. The MWMP must be have a third-party audit with the audit provided to the administering authority once undertaken. The MWMP must, at a minimum, include the following items:

- a) a program of progressive sampling and effective characterisation of all mining waste/s to predict, under the proposed placement and disposal strategy, the quality of run-off and seepage generated including salinity, acidity, alkalinity and dissolved metals, metalloids and non-metallic inorganic substances;
- b) mineral waste field and laboratory testing procedure for validation of the acid-forming and potential erodibility characterisations of each phase;
- c) classifying waste rock zones (on the basis of acid forming potential, salinity and sodicity), placement and use of waste rock materials and appropriate disposal of PAF waste or waste designated as not suitable for use on final surfaces;
- d) ex-situ spoil dump design criteria, including preferred selective placement of each waste domain, dump heights, dump profiles, conceptual final landform design;
- e) monitoring and management of erosion, groundwater and surface water (including run-off and seepage) at ex-situ waste landforms; and
- f) progressive rehabilitation strategies.
- g) a program of continual review to determine the effectiveness of the Mineral Waste Management Plan.

* The above plan relates to the management of mine overburden, interburden and coarse rejects.

Schedule D—Noise

- D1** Noise generated by the activities must not cause the criteria in Table D1 – Noise limits to be exceeded at a sensitive place or commercial place.

Table D1 – Noise limits

Sensitive place or commercial place			
Noise level dB(A) measured as:	Monday to Sunday		
	7am to 6pm	6pm to 10pm	10pm to 7am
L _{Aeq} , adj, 15 mins	35	35	30
L _{A1} , adj, 15 mins	40	40	35

D2 Blasting must not cause the limits for peak particle velocity and air blast overpressure in Table D2 – Blasting noise limits to be exceeded at a sensitive place or commercial place.

Table D2 – Blasting noise limits

Blasting noise limits	Sensitive blasting noise limits place limits	
	7am to 6pm	6pm to 7am
Airblast overpressure	115 dB (Linear) Peak for 9 out of 10 consecutive blasts initiated and not greater than 120 dB (Linear) Peak at any time	no blasting
Ground vibration peak particle velocity	5 mm/second peak particle velocity for 9 out of 10 consecutive blasts and not greater than 10 mm/second peak particle velocity at any time	no blasting

D3 Monitoring and reporting

Noise monitoring and recording must include the following descriptor characteristics and matters:

- L_{AN,T} (where N equals the statistical levels of 1, 10 and 90 and T = 15 mins)
- background noise L_{A90}
- the level and frequency of occurrence of impulsive or tonal noise and any adjustment and penalties to statistical levels
- atmospheric conditions including temperature, relative humidity and wind speed and directions
- effects due to any extraneous factors such as traffic noise
- location, date and time of monitoring
- if required by the administering authority, low frequency noise, Max L_{pLIN,T} and one third octave band measurements in dB(LIN) for centre frequencies in the 10 – 200 Hz range.

D4 The holder of this environmental authority must develop and implement a blast monitoring program to ensure compliance with Table D2 – Blasting noise limits for:

- all blasts undertaken on this site in each month at the nearest sensitive place or commercial place
- all blasts conducted during any time period specified by the administering authority at the nearest sensitive place or commercial place.

D5 Blasting is authorised to be undertaken between 7 am to 6 pm Monday to Sunday. Blasting is not authorised outside of these hours or on public holidays.

D6 Notwithstanding D1, emission of any low frequency noise must not exceed either D6 (a) and D6 (b), or D6 (c) and D6 (d) in the event of a valid complaint about low-frequency noise being made to the administering authority:

- 60 dB(C) measured outside the sensitive receptor; and

- b) the difference between the external A-weighted and C-weighted noise levels is no greater than 20 dB; or
- c) 50 dB(Z) measured inside the sensitive receptor; and
- d) the difference between the internal A-weighted and Z-weighted (Max $L_{pZ, 15 \text{ min}}$) noise levels is no greater than 15 dB.

Schedule H—Land and rehabilitation

- H1.** All areas disturbed by mining activities must be rehabilitated to a stable landform with a self-sustaining vegetation cover.
- H2.** The rehabilitation completion criteria for all domains must be provided to the administering authority for approval prior to the commencement of mining activities.
- H3.** Upon approval of the completion criteria as per Condition H2, the completion criteria must be included in the environmental authority via an amendment by agreement with the administering authority.
- H4.** Rehabilitation must be carried out in accordance with Table H1 – Rehabilitation Schedule for Project China Stone and the approved completion criteria required by **H2**.

Table H1 - Rehabilitation Schedule for Project China Stone

Reporting Period	Total Cumulative Established Rehabilitation Area
Years 1 to 5 (inclusive)	184 ha
Years 6 to 15 (inclusive)	881 ha
Years 15 to 30 (inclusive)	2,330 ha
Years 31 to 50 (inclusive)	9,930 ha

- H5.** A Rehabilitation Management Plan must be developed by an appropriately qualified and experienced person and submitted to the administering authority for approval six (6) months prior to the commencement of the project. The approved Rehabilitation Management Plan must be implemented from the commencement of mining activities.
- H6.** The Rehabilitation Management Plan required by Condition H5, must address all relevant requirements within this environmental authority, and at a minimum include the following items:
 - a) How all land disturbed by the mining activities will be rehabilitated to ensure that it is:
 - i. safe for humans and wildlife;
 - ii. non-polluting;
 - iii. stable; and
 - iv. able to sustain an agreed post-mining land use;
 - b) Final completion criteria for all disturbance domains;
 - c) Final landform design for all areas impacted by mining activities;
 - d) Detail the progressive rehabilitation strategy to be implemented, which aligns with Table H1 – Rehabilitation Schedule for China Stone Project and Figures H1 to H4 in this environmental authority;
 - e) Identify appropriate reference sites to be used to develop rehabilitation acceptance criteria for self-sustaining vegetation communities for all disturbance domains;
 - f) Identify specific rehabilitation acceptance criteria for each disturbance domain;
 - g) A process to adequately strip, stockpile, and maintain topsoil to ensure its volume, physical and chemical characteristics are maintained in a way that will not constrain the achievement of the defined rehabilitation completion criteria;
 - h) Detail a program for monitoring and review of the effectiveness of the Rehabilitation Management Plan;

- i) Detail areas to be rehabilitated to woodland community that supports Black-throated finch populations, and maintains connectivity to undisturbed BTF habitat within the mining lease and the Carmichael BTF offset areas.

H7. The environmental authority holder must submit an annual report (for the previous calendar year) by September 30 each year that details the performance of the Rehabilitation Management Plan and include at a minimum:

- a) How the rehabilitation objectives were achieved in the period;
- b) How the rehabilitation objectives will be achieved in the coming years;
- c) Report on the rehabilitation success; and
- d) Detail any proposed changes to rehabilitation methods.

H8. Rehabilitation Monitoring Program

A Rehabilitation Monitoring Program must be developed and certified by an appropriately qualified person and implemented within <12 months after EA issue date>.

The Monitoring Program must contain a schedule for gathering baseline data from agreed reference sites and conducting rehabilitation trials to support the rehabilitation outcomes detailed in the conditions of this environmental authority. Baseline monitoring and rehabilitation trials under this plan must be undertaken at a suitable frequency to ensure that the holder of this Environmental Authority has a representative dataset to enable:

- a) Progressive certification of rehabilitation under chapter 5A of the *Environmental Protection Act 1994*.
- b) Surrender of the Environmental Authority under chapter 5 of the *Environmental Protection Act 1994*.

A copy of the Rehabilitation Monitoring Program must be made available to the administering authority for approval.

H9. Voids on a floodplain must be backfilled to the level of the pre-mining ground surface.

H10. Voids not on a floodplain must be backfilled to above the pre-mining groundwater level.

H11. Voids must not cause any serious environmental harm to land, surface waters or any recognised groundwater aquifer, other than the environmental harm constituted by the existence of the void itself and subject to any other conditions in this environmental authority.

H12. Topsoil management plan

A topsoil management plan must be developed by an appropriately qualified person and implemented.

H13. A topsoil inventory that identifies the topsoil requirements for the project and the availability of suitable topsoil on-site must be presented in the Plan of Operations.

H14. Mining Waste and Rejects Management

The Mining Waste and Rejects Management plan must be audited by a third party with the audit report provided to administering authority once completed. A waste rock, spoil and rejects disposal plan must be developed and include, where relevant, at least:

- a) effective characterisation of the waste rock, spoil and rejects to predict under the proposed placement and disposal strategy the quality of run-off and seepage generated concerning potentially environmentally significant effects including salinity, acidity, alkalinity and dissolved metals, metalloids and non-metallic inorganic substances;
- b) a program of progressive sampling and characterisation to identify dispersive and non-dispersive spoil and the salinity, acid and alkali producing potential and metal concentrations of waste rock, spoil and rejects;
- c) a materials balance and disposal plan demonstrating how potentially acid forming and acid forming waste rock, spoil and rejects will be selectively placed and/or encapsulated to minimise the potential generation of acid mine drainage;

- d) where relevant, a sampling program to verify encapsulation and/or placement of potentially acid-forming and acid-forming waste rock, spoil and rejects;
- e) how often the performance of the plan will be assessed;
- f) the indicators or other criteria on which the performance of the plan will be assessed;
- g) progressive rehabilitation strategy; and
- h) monitoring or rehabilitation, research and/or trials to verify the requirements and methods for decommissioning and final rehabilitation of the placed materials, including the prevention and management of acid mine drainage, erosion minimisation and establishment of vegetation cover.

H15. Contaminated Land

Before applying for surrender of this environmental authority or progressive rehabilitation certification of an area, the holder of this environmental authority must (if applicable) provide to the administering authority a site investigation report under the Act, in relation to any part of the mining lease or rehabilitated area which has been used for notifiable activities or which the holder is aware is likely to be contaminated land, and also carry out any further work that is required as a result of that report to ensure that the land is suitable for its final land use.

H16. Subsidence Management Plan

A Subsidence Management Plan must be developed by an appropriately qualified and experienced person(s) and submitted to the administering authority for approval prior to the commencement of mining activities. The approved Subsidence Management Plan must be implemented.

H17. The Subsidence Management Plan, required by condition H16 must include:

- a) detailed measures that provide for the proper and effective management of the actual and potential environmental impacts resulting from the mining activity and to ensure compliance with the conditions of this environmental authority;
- b) the proposed impacts of subsidence on any land, watercourse and floodplain, including but not limited to:
 - a. physical condition of surface drainage, including:
 - i. erosion;
 - ii. areas susceptible to higher levels of erosion such as watercourse confluences;
 - iii. incision processes;
 - iv. stream widening;
 - v. tension cracking;
 - vi. lowering of bed and banks;
 - vii. creation of instream waterholes;
 - viii. changes to local drainage patterns;
 - b. overland flow:
 - i. capture of overland flow by subsided longwall panels;
 - ii. increased overbank flows due to lowering of high bank of watercourses;
 - iii. the portion of local and large-scale catchments likely to be captured by subsided longwall panels and the associated impacts on downstream users;
 - c. water quality:

- i. surface water;
 - ii. groundwater;
 - iii. overland flow water detained in subsided longwall panels;
 - d. land condition: current land condition to be impacted by subsidence;
 - e. infrastructure: detail of existing infrastructure (pipelines, railway, powerlines and haul roads) should be identified where there is a potential impact from effects of land subsidence;
 - c) proposed options for mitigating any impacts associated with subsidence and how these mitigation methods will be implemented;
 - d) cumulative impacts on watercourses or catchments;
 - e) impacts on groundwater;
 - f) contingency procedures for emergencies; and
 - g) a program for monitoring and review of the effectiveness of the Subsidence Management Plan.
- H18.** The Subsidence Management Plan as required by condition H16, must be reviewed each calendar year and a report prepared by an appropriately qualified person. The report must:
- a) assess the plan against the requirements under condition H2;
 - b) include recommended actions to ensure actual and potential environmental impacts resulting from the subsidence activities are effectively managed for the coming year; and
 - c) identify any amendments made to the Subsidence Management Plan following the review.
- H19.** The holder of this environmental authority must attach to the review report required by condition H18, a written response to the report and recommended actions, detailing the actions taken, or to be taken on stated dates:
- a) to ensure compliance with this environmental authority; and
 - b) to prevent a recurrence of any non-compliance issues identified.
- H20.** The review report required by condition H18 and the written response to the review report required by condition H19 must be submitted to the administering authority with the subsequent annual return under the signature of the appointed signatory for the annual return.
- H21.** A Closure Management Plan for the site must be developed and submitted to the administering authority approved prior to the commencement of mining activities and implemented for a nominal period of:
- a) at least thirty (30) years following the finalisation of coal mining on-site; or
 - b) a shorter period if the site is proven to be geotechnically and geochemically stable and it can be demonstrated to the satisfaction of the administering authority that no release of contaminants from the site will result in environmental harm.

Schedule I—Offsets and biodiversity

Impacts to Prescribed Environmental Matters

- I1.** No reduction to any habitat value (e.g. extent and habitat quality) of a prescribed environmental matter is to occur in mining lease areas other than by mining activities authorised under this EA.
- I2.** Significant residual impacts to prescribed environmental matters are not authorised under this environmental authority or the *Environmental Offsets Act 2014* unless the impact(s) is specified in Table I1 – Significant residual impacts to prescribed environmental matters and as per Figures I1 to I8.

13. An environmental offset made in accordance with the *Environmental Offsets Act 2014* and *Queensland Environmental Offsets Policy*, as amended from time to time, must be undertaken for the maximum extent of impact to each prescribed environmental matter authorised in Table I1 – Significant residual impacts to prescribed environmental matters.
14. The significant residual impacts to a prescribed environmental matter authorised in Condition I1 for which an environmental offset is required by Condition I2 may be carried out in stages. An environmental offset can be delivered for each stage of the impacts to prescribed environmental matters.
15. Prior to the commencement of each stage, a report completed by an appropriately qualified person, that includes an analysis of the following must be provided to the administering authority:
 - a) for the forthcoming stage—the estimated significant residual impacts to each prescribed environmental matter; and
 - b) for the previous stage, if applicable—the actual significant residual impacts to each prescribed environmental matter, to date.
16. The report, required by I5, must be approved by the administering authority before a notice of election for the forthcoming stage, if applicable, is given to the administering authority.
17. A notice of election for the staged environmental offset referred to in I6, if applicable, must be provided to the administering authority no less than three (3) months before the proposed commencement of that stage, unless a lesser timeframe has been agreed to by the administering authority.
18. Within six (6) months from the completion of the final stage of the project, a report completed by an appropriately qualified person, that includes the following matters must be provided to the administering authority:
 - a) an analysis of the actual impacts on prescribed environmental matters resulting from the final stage; and
 - b) if applicable, a notice of election to address any outstanding offset debits for the authorised impacts.
19. The holder of this environmental authority must submit a black-throated finch (BTF) Species Management Plan (SMP) prepared and certified by an appropriately qualified person to the administering authority for approval prior to commencement of mining activities. The holder must publish the BTF SMP on its website within 10 business days of receiving the administering authority's approval. The approved BTF SMP must be implemented. The holder must align the SMP with the Bioregional BTF Management Plan and relevant documentation requirements under the *Environment Protection and Biodiversity Conservation Act 1999* including the BTF Recovery Plan, conservation advice and relevant threat abatement plans.

The BTF SMP must include:

- a) details of proposed impacts to BTF habitat from the project including impacts from clearing, construction, mining operation, subsidence, ecological function changes, hydrological changes and weed and pest infestation changes
- b) mitigation measures to be undertaken to avoid, mitigate and manage the impacts on BTF populations and habitat resulting from the project, including rehabilitation of habitat
- c) details of seasonal (both in the wet season and dry season) monitoring of BTF population and habitat within the project area (impacted areas and non-impacted areas), offset areas and areas adjacent to the impacted areas for the duration of the project
- d) details of surveys and research to accurately describe the BTF home range and describe the BTF resource usage patterns between seasons and years (for up to ten (10) years) and to allow for robust management actions to be developed for the

- maintenance of a viable local BTF population in the non-impacted areas of the mining lease and within the offset areas
- e) details of surveys and research to accurately describe the BTF breeding requirements with consideration to spatial and temporal seasonal variation of resources for up to ten (10) years
 - f) include details of water maintenance and/or provision of additional waters to ensure the maintenance of the BTF local populations within non-impacted habitat within the mining lease and within the offset areas
 - g) details of any management requirements and monitoring of these management requirements to ensure that BTF populations and habitat are maintained within the non-impacted areas of the mining lease and offset areas.
- I10.** The BTF SMP required under condition I8 must be reviewed by an appropriately qualified person annually and a report prepared and provided to the administering authority. The report must:
- a) assess the plan against the requirements under condition I9;
 - b) include recommended actions to ensure the actual and potential environmental impacts are effectively managed for the coming year;
 - c) identify any amendment to be made to the BTF SMP following the review; and
 - d) any revisions must be independently peer reviewed.
- I11.** The holder of this environmental authority must maintain water sources for BTF within non-impacted BTF habitat within the mining leases and offset areas. Should these waters be impacted by mining alternative watering sources must be provided.

Table I1 – Significant residual impacts to prescribed environmental matters

Prescribed environmental matter	Location of impact	Maximum extent of impact
Regulated vegetation		
Of concern regional ecosystem (not within an urban area) – 10.10.3	as per Figure I1	26 ha
Regional ecosystems (not within an urban area) within the defined distance from the defining banks of a relevant watercourse on the vegetation management watercourse map – 10.3.6	as per Figure I2	63.2 ha
Regional ecosystems (not within an urban area) within the defined distance from the defining banks of a relevant watercourse on the vegetation management watercourse map – 10.3.14	as per Figure I2	14.1 ha
Regional ecosystems (not within an urban area) within the defined distance from the defining banks of a relevant watercourse on the vegetation management watercourse map – 10.3.16	as per Figure I2	27.2 ha
Regional ecosystems (not within an urban area) within the defined distance from the defining banks of a relevant watercourse on the vegetation management watercourse map – 10.3.28	as per Figure I2	63.4 ha
Regional ecosystems (not within an urban area) within the defined distance from the defining banks of a relevant watercourse on the vegetation management watercourse map – 10.5.1	as per Figure I2	16.8 ha

Prescribed environmental matter	Location of impact	Maximum extent of impact
Regional ecosystems (not within an urban area) within the defined distance from the defining banks of a relevant watercourse on the vegetation management watercourse map – 10.5.4	as per Figure I2	2.4 ha
Regional ecosystems (not within an urban area) within the defined distance from the defining banks of a relevant watercourse on the vegetation management watercourse map – 10.5.5	as per Figure I2	65 ha
Regional ecosystems (not within an urban area) within the defined distance from the defining banks of a relevant watercourse on the vegetation management watercourse map – 10.5.10	as per Figure I2	14.5 ha
Regional ecosystems (not within an urban area) within the defined distance from the defining banks of a relevant watercourse on the vegetation management watercourse map – 10.7.2	as per Figure I2	4.9 ha
Regional ecosystems (not within an urban area) within the defined distance from the defining banks of a relevant watercourse on the vegetation management watercourse map – 10.7.3	as per Figure I2	41.4 ha
Regional ecosystems (not within an urban area) within the defined distance from the defining banks of a relevant watercourse on the vegetation management watercourse map – 10.7.4	as per Figure I2	0.3 ha
Regional ecosystems (not within an urban area) within the defined distance from the defining banks of a relevant watercourse on the vegetation management watercourse map – 10.7.5	as per Figure I2	0.01 ha
Regional ecosystems (not within an urban area) within the defined distance from the defining banks of a relevant watercourse on the vegetation management watercourse map – 10.7.12	as per Figure I2	17.2 ha
Regional ecosystems (not within an urban area) within the defined distance from the defining banks of a relevant watercourse on the vegetation management watercourse map – 10.10.1	as per Figure I2	8.1 ha
Regional ecosystems (not within an urban area) within the defined distance from the defining banks of a relevant watercourse on the vegetation management watercourse map – 10.10.3	as per Figure I2	2 ha
Regional ecosystems (not within an urban area) within the defined distance from the defining banks of a relevant watercourse on the vegetation management watercourse map – 10.10.4	as per Figure I2	18.5 ha
Protected wildlife habitat		
Habitat for an animal that is endangered wildlife – black-throated finch – <i>Poephila cincta cincta</i> *	as per Figure I3	8,524 ha

Prescribed environmental matter	Location of impact	Maximum extent of impact
Habitat for an animal that is vulnerable wildlife – squatter pigeon – <i>Geophaps scripta scripta</i> *	as per Figure 14	3,520.7 ha
Habitat for an animal that is vulnerable wildlife – Australian painted snipe – <i>Rostratula australis</i> *	as per Figure 15	15.03 ha
Habitat for an animal that is vulnerable wildlife – koala – <i>Phascolarctos cinereus</i> *	as per Figure 16	3,267.4 ha
Habitat for an animal that is vulnerable wildlife – yakka skink – <i>Egernia rugosa</i> *	as per Figure 17	11,112 ha
Habitat for an animal that is special least concern wildlife – short-beaked echidna – <i>Tachyglossus aculeatus</i>	as per Figure 18	10,916 ha
*offsets for these values are to be determined by EPBC approval conditions		

Schedule J—Highwall water drainage²⁰

J1. Permanent water drainage

Permanent water drainage must be designed and constructed to:

- incorporate natural features (including geomorphic and vegetation) present at the location of the drainage
- maintain the pre-existing hydrologic characteristics of surface water and groundwater systems for the area in which the highwall water drainage is located
- maintain the hydraulic characteristics of the permanent highwall water drainage that are equivalent to other local watercourses and are suitable for the area in which the drainage is located without using artificial structures that require ongoing maintenance
- maintain sediment transport and water quality regimes that allow the highwall water drainage to be self-sustaining, while minimising any impacts to upstream and downstream water quality, geomorphology or vegetation
- maintain equilibrium and functionality in all substrate conditions at the location of the highwall water drainage
- allow for fauna movement across the highwall water drainage system.

J2. Design plan – Drainage

A certified design plan that achieves condition J1 for permanent highwall water drainage must be submitted to the administering authority at least 10 business days before commencing construction of the drainage.

- J3.** The certified design plan for any permanent highwall water drainage must be consistent with the functional design/s that formed a part of the application documents for this authority.

J4. Construction and operation – Highwall water drainage

A certified set of ‘as constructed’ drawings and specifications must be submitted to the administering authority within 60 business days from the completion of construction of the permanent highwall water drainage. These drawings and specifications must state:

²⁰ As described in the EIS – Figure 13.5 Chapter 13 Surface Water.

- a) that the 'as constructed' drawings and specifications meet the original intent of the design plan for the highwall water drainage
- b) construction of the highwall water drainage is in accordance with the design plan.

J5. Register – Highwall water drainage

The details of highwall water drainage must be accurately recorded on the Register of Watercourse Diversions kept by the holder of the authority. An electronic copy must be provided to the administering authority on request.

Schedule K—Regulated Structures

K1. The consequence category of any structure must be assessed by a suitably qualified and experienced person in accordance with the *Manual for assessing consequence categories and hydraulic performance of structures (ESR/2016/1933)* at the following times:

- a) prior to the design and construction of the structure, if it is not an existing structure; or
- b) prior to any change in its purpose or the nature of its stored contents.

K2. A consequence assessment report and certification must be prepared for each structure assessed and the report may include a consequence assessment for more than one structure.

K3. Certification must be provided by the suitably qualified and experienced person who undertook the assessment, in the form set out in the *Manual for assessing consequence categories and hydraulic performance of structures (ESR/2016/1933)*.

K4. Design and construction²¹ of a regulated structure

All regulated structures must be designed by, and constructed²² under the supervision of, a suitably qualified and experienced person in accordance with the requirements of the *Manual for assessing consequence categories and hydraulic performance of structures (ESR/2016/1933)*.

K5. Construction of a regulated structure is prohibited unless:

- a) the holder has submitted a consequence category assessment report and certification to the administering authority; and
- b) certification for the design, design plan and the associated operating procedures has been certified by a suitably qualified and experienced person in compliance with the relevant condition of this authority.

K6. Certification must be provided by the suitably qualified and experienced person who oversees the preparation of the design plan in the form set out in the *Manual for assessing consequence categories and hydraulic performance of structures (ESR/2016/1933)*, and must be recorded in the Register of Regulated Structures.

K7. Regulated structures must:

- a) be designed and constructed in compliance with the *Manual for assessing consequence categories and hydraulic performance of structures (ESR/2016/1933)*
- b) be designed and constructed with due consideration given to ensuring that the design integrity would not be compromised on account of:

²¹ Construction of a dam includes modification of an existing dam – refer to the definitions section of this EA.

²² Certification of design and construction may be undertaken by different persons.

- i. floodwaters from entering the regulated dam from any watercourse or drainage line; and
 - ii. wall failure due to erosion by floodwaters arising from any watercourse or drainage line.
 - c) have the floor and sides of the dam designed and constructed to prevent or minimise the passage of the wetting front and any entrained contaminants through either the floor or sides of the dam during the operational life of the dam and for any period of decommissioning and rehabilitation of the dam.
- K8.** Certification by the suitably qualified and experienced person who supervises the construction must be submitted to the administering authority on the completion of construction of the regulated structure, and state that:
- a) the 'as constructed' drawings and specifications meet the original intent of the design plan for that regulated structure
 - b) construction of the regulated structure is in accordance with the design plan.
- K9. Notification of affected persons**
- All affected persons must be provided with a copy of the emergency action plan in place for each regulated structure
- a) for existing structures that are regulated structures, within 10 business days of this condition taking effect;
 - b) prior to the operation of the new regulated structure; and
 - c) if the emergency action plan is amended, within 5 business days of it being amended.
- K10. Operation of a regulated structure**
- Operation of a regulated structure, except for an existing structure, is prohibited unless the holder has submitted to the administering authority in respect of regulated structure, all of the following:
- a) one paper copy and one electronic copy of the design plan and certification of the 'design plan' in accordance with K5;
 - b) a set of 'as constructed' drawings and specifications;
 - c) certification of the 'as constructed drawings and specifications' in accordance with K8;
 - d) where the regulated structure is to be managed as part of an integrated containment system for the purpose of sharing the Design Storage Allowance (DSA) volume across the system, a copy of the certified system design plan;
 - e) the requirements of this authority relating to the construction of the regulated structure have been met;
 - f) the holder has entered the details required under this authority, into a Register of Regulated Structures; and
 - g) there is a current operational plan for the regulated structure.
- K11. Mandatory reporting level**
- Conditions K12 to K13 inclusive only apply to Regulated Structures which have not been certified as low consequence category for 'failure to contain – overtopping'.
- K12.** The Mandatory Reporting Level (the MRL) must be marked on a regulated dam in such a way that during routine inspections of that dam, it is clearly observable.
- K13.** The holder must, as soon as practicable but within forty-eight (48) hours of becoming aware, notify the administering authority when the level of the contents of a regulated dam reaches the MRL.
- K14.** The holder must, immediately on becoming aware that the MRL has been reached, act to prevent the occurrence of any unauthorised discharge from the regulated dam.
- K15.** The holder must record any changes to the MRL in the Register of Regulated Structures.

K16. Design storage allowance

The holder must assess the performance of each regulated dam or linked containment system over the preceding November to May period based on actual observations of the available storage in each regulated dam or linked containment system taken prior to 1 July of each year.

K17. By 1 November of each year, storage capacity must be available in each regulated dam (or network of linked containment systems with a shared DSA volume), to meet the DSA volume for the dam (or network of linked containment systems).

K18. The holder must, as soon as practicable but within forty-eight (48) hours of becoming aware that the regulated dam (or network of linked containment systems) will not have the available storage to meet the DSA volume on 1 November of any year, notify the administering authority.

K19. The holder must, immediately on becoming aware that a regulated dam (or network of linked containment systems) will not have the available storage to meet the DSA volume on 1 November of any year, act to prevent the occurrence of any unauthorised discharge from the regulated dam or linked containment systems.

K20. Annual inspection report

Each regulated structure must be inspected each calendar year by a suitably qualified and experienced person.

K21. At each annual inspection, the condition and adequacy of all components of the regulated structure must be assessed, and a suitably qualified and experienced person must prepare an annual inspection report containing details of the assessment and include a recommendations section, with any recommended actions to ensure the integrity of the regulated structure or a positive statement that no recommendations are required.

K22. The suitably qualified and experienced person who prepared the annual inspection report must certify the report in accordance with the *Manual for assessing consequence categories and hydraulic performance of structures (ESR/2016/1933)*.

K23. The holder must within 20 business days of receipt of the annual inspection report, provide to the administering authority:

- a) the recommendations section of the annual inspection report; and
- b) if applicable, any actions being taken in response to those recommendations; and
- c) if, following receipt of the recommendations and (if applicable) recommended actions, the administering authority requests a copy of the annual inspection report from the holder, provide this to the administering authority within 10 business days of receipt of the request.

K24. Register of Regulated Structures

A Register of Regulated Structures must be established and maintained by the holder for each regulated structure.

K25. The holder must provisionally enter the required information in the Register of Regulated Structures when a design plan for a regulated dam is submitted to the administering authority.

K26. The holder must make a final entry of the required information in the Register of Regulated Structures once compliance with condition K10 has been achieved.

K27. The holder must ensure that the information contained in the Register of Regulated Structures is current and complete on any given day.

K28. All entries in the Register of Regulated Structures must be approved by the chief executive officer for the holder of this authority, or their delegate, as being accurate and correct.

K29. The holder must, at the same time as providing the annual return, supply to the administering authority a copy of the records contained in the Register of Regulated Structures, in the electronic format required by the administering authority.

Definitions

Words and phrases used throughout this environmental authority are defined below. Where a definition for a term used in this environmental authority is not provided within this environmental authority, but is provided in the EP Act or subordinate legislation, the definition in the EP Act or subordinate legislation must be used.

'administering authority' is the agency that administers the environmental authority provisions under the EP Act.

'airblast overpressure' means energy transmitted from the blast site within the atmosphere in the form of pressure waves. The maximum excess pressure in this wave, above ambient pressure is the peak airblast overpressure measured in decibels linear (dBL).

'appropriately qualified person' means a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis on performance relating to the subject matter using the relevant protocols, standards, methods or literature.

'background', with reference to the water schedule means the average of samples taken prior to the commencement of mining from the same waterway that the current sample has been taken.

'blasting' means the use of explosive materials to fracture:

- (a) rock, coal and other minerals for later recovery, or
- (b) structural components or other items to facilitate removal from a site or for re-use.

'box cut' refers to the initial excavation of overburden to start the mined pit, and includes any blasting associated with its creation.

'certified', with respect to watercourse diversions, means assessed and approved by a suitably qualified and experienced person. In relation to 'as constructed' drawings and specifications, the certification must be by the suitably qualified person who supervised the construction of the watercourse diversion, or re-establishment of the watercourse.

'certification', **'certifying'** or **'certified'** by an appropriately qualified and experienced person in relation to a design plan or an annual report regarding dams/structures, means that a statutory declaration has been made by that person and, when taken together with any attached or appended documents referenced in that declaration, all of the following aspects are addressed and are sufficient to allow an independent audit at any time:

- (a) exactly what is being certified and the precise nature of that certification
- (b) the relevant legislative, regulatory and technical criteria on which the certification has been based
- (c) the relevant data and facts on which the certification has been based, the source of that material, and the efforts made to obtain all relevant data and facts
- (d) the reasoning on which the certification has been based using the relevant data and facts, and the relevant criteria.

'chemical' means:

- (a) an agricultural chemical product or veterinary chemical product within the meaning of the *Agricultural and Veterinary Chemicals Code Act 1994* (Commonwealth), or

- (b) a dangerous good under the *Australian Code for the Transport of Dangerous Goods by Road and Rail* approved by the Australian Transport Council, or
- (c) a lead hazardous substance within the meaning of the Workplace Health and Safety Regulation 1997, or
- (d) a drug or poison in the Standard for the Uniform Scheduling of Drugs and Poisons prepared by the Australian Health Ministers' Advisory Council and published by the Commonwealth, or
- (e) any substance used as, or intended for use as:
 - (i) a pesticide, insecticide, fungicide, herbicide, rodenticide, nematocide, miticide, fumigant or related product, or
 - (ii) a surface active agent, including, for example, soap or related detergent, or
 - (iii) a paint solvent, pigment, dye, printing ink, industrial polish, adhesive, sealant, food additive, bleach, sanitiser, disinfectant, or biocide, or
 - (iv) a fertiliser for agricultural, horticultural or garden use, or
 - (v) a substance used for, or intended for use for mineral processing or treatment of metal, pulp and paper, textile, timber, water or wastewater, or
 - (vi) manufacture of plastic or synthetic rubber.

'commencement of mining activities' is the first instance of any mining activity.

Commencement of mining activity includes any physical disturbance including clearing of vegetation, earthworks, new road works, new rail works, construction of camp, development of mining associated infrastructure and mining operations. Commencement does not include:

- (a) erection of signage or fencing
- (b) minor physical disturbance necessary to undertake pre-clearance surveys or establish monitoring programs or associated with the mobilisation of plant, equipment, materials, machinery and personnel prior to the start of railway and road development or construction; or
- (c) activities that are critical to commencement that are associated with mobilisation of plant and equipment, materials, machinery and personnel prior to the start of railway or road development or construction only if such activities will have no adverse impact on MSES, and only if the environmental authority holder has notified the administering authority in writing before an activity is undertaken.

'commercial place' means a workplace used as an office or for business or commercial purposes, which is not part of the mining activity and does not include employees' accommodation or public roads.

'construction' or **'constructed'** in relation to a regulated structure includes building a new regulated structure and lifting or otherwise modifying an existing regulated structure, but does not include investigations and testing necessary for the purpose of preparing a design plan.

'construction' or **'constructed'**, in relation to watercourse diversions, is the process of building, or modifying an existing diversion, but does not include investigations and testing necessary for the purpose of preparing a design plan.

'design plan' is a document that contains the design, operation, monitoring and revegetation criteria of a watercourse diversion that addresses the outcomes stated in conditions on the environmental authority relating to the diversion. The document should include, but not be limited to:

- (a) required information under a functional design

- (b) the location, function and description of geomorphic and riparian vegetation features within the proposed watercourse diversion
- (c) results from hydrologic, hydraulic and sediment transportation modelling used in the design of the diversion
- (d) a revegetation and vegetation management plan (a revegetation plan) for the diversion
- (e) engineering drawings depicting the physical attributes and dimensions of the diversion
- (f) (if relevant) the staged development of a permanent watercourse diversion including the proposed use of temporary watercourse diversions with identified lifespans
- (g) all investigation and other reports relied on by the design
- (h) plans and specifications sufficient to complete construction and revegetation in accordance with the design.

'disturbance' of land includes:

- (a) compacting, removing, covering, exposing or stockpiling of earth
- (b) removal or destruction of vegetation or topsoil or both to an extent where the land has been made susceptible to erosion
- (c) carrying out mining within a watercourse, waterway, wetland or lake
- (d) the submersion of areas by tailings or hazardous contaminant storage and dam/structure walls
- (e) temporary infrastructure, including any infrastructure (roads, tracks, bridges, culverts, dam/structures, bores, buildings, fixed machinery, hardstand areas, airstrips, helipads etc) which is to be removed after the mining activity has ceased
- (f) releasing of contaminants into the soil, or underlying geological strata.

However, the following areas are not included when calculating areas of 'disturbance':

- (a) areas off-lease (e.g. roads or tracks which provide access to the mining lease)
- (b) areas previously disturbed which have achieved the rehabilitation outcomes
- (c) by agreement with the administering authority, areas previously disturbed which have not achieved the rehabilitation objective(s) due to circumstances beyond the control of the mine operator (such as climatic conditions)
- (d) areas under permanent infrastructure. Permanent infrastructure includes any infrastructure (roads, tracks, bridges, culverts, dam/structures, bores, buildings, fixed machinery, hardstand areas, airstrips, helipads etc) which is to be left by agreement with the landowner
- (e) disturbance that pre-existed the grant of the tenure.

'environmental offset' has the meaning in section 7 of the *Environmental Offsets Act 2014*.

'equilibrium': A state where 'balance' is achieved despite changing variables.

'established rehabilitation area' means rehabilitated areas that meet the approved rehabilitation completion criteria (condition H2).

'functional design' is a document that contains 'conceptual' information about the design, operation and revegetation criteria of a watercourse diversion that addresses the outcomes stated in the conditions on the environmental authority relating to the diversion. The document should include, but not be limited to:

- (a) geomorphic and vegetation assessment of the existing watercourse
- (b) hydrologic conditions of the existing watercourse

- (c) the proposed watercourse diversion route
- (d) results from hydrologic, hydraulic and sediment transportation modelling used in the design of the diversion.

'functionality': the purpose that something is designed or expected to fulfil.

'hazard category' means a category, either low, significant or high, into which a dam is assessed as a result of the application of tables and other criteria in *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams*.

'holder', for a mining tenement, means a holder of the tenement under the *Mineral Resources Act 1989*, and the holder of the associated environmental authority under the *Environmental Protection Act 1994*.

'infrastructure' means water storage dams, levees, roads and tracks, buildings and other structures built for the purpose of the mining activity.

'L_{Aeq, adj, 15 mins}' means the equivalent continuous noise level over a 15-minute period, including any relevant adjustments for tonality or other defined characteristics.

'land' in the 'land schedule' of this environmental authority means land excluding waters and the atmosphere, that is, the term has a different meaning from the term as defined in the *Environmental Protection Act 1994*. For the purposes of the *Acts Interpretation Act 1954*, it is expressly noted that the term 'land' in this environmental authority relates to physical land and not to interests in land.

'land use' means the selected post-mining use of the land, which is planned to occur after the cessation of mining operations.

'leachate' means a liquid that has passed through or emerged from, or is likely to have passed through or emerged from, a material stored, processed or disposed of at the operational land which contains soluble, suspended or miscible contaminants likely to have been derived from the said material.

'm' means metres.

'maximum extent of impact' means the total, cumulative, residual extent and duration of impact to a prescribed environmental matter that will occur over a project's life after all reasonable avoidance and reasonable on-site mitigation measures have been, or will be, undertaken.

'measures' includes any measures to prevent or minimise environmental impacts of the mining activity such as bunds, silt fences, diversion drains, capping, and containment systems.

'minimise' is to reduce to the smallest possible amount or degree.

'notice of election' has the meaning in section 18(2) *Environmental Offsets Act 2014*.

'peak particle velocity (ppv)' means a measure of ground vibration magnitude which is the maximum rate of change of ground displacement with time, usually measured in millimetres/second (mm/s).

'permanent watercourse diversion' is a man-made structure that incorporates the geomorphologic, hydraulic, hydrologic and ecological components of a local watercourse and is designed, constructed, operated and maintained according to an engineering standard that ultimately achieves a self-sustaining watercourse able to function without features or characteristics that rely on ongoing maintenance or that impose a financial or other burden on the proponent, government or the community.

'pre-existing watercourse' is the section of watercourse from which the flow of water will be diverted as a result of the construction and operation of a watercourse diversion.

'prescribed environmental matters' has the meaning in section 10 of the *Environmental Offsets Act 2014*, limited to the matters of state environmental significance listed in schedule 2 of the Environmental Offsets Regulation 2014.

'rehabilitation' the process of reshaping and revegetating land to restore it to a stable landform.

'representative' means a sample set which covers the variance in monitoring or other data either due to natural changes or operational phases of the mining activities.

'revegetation' is the re-establishment of vegetation of a species and density of cover similar to surrounding undisturbed areas or the landform that existed before mining activities on soil surfaces associated with the construction or rehabilitation of a watercourse diversion.

'self-sustaining' means not requiring on-going intervention and maintenance to maintain functional riverine processes and characteristics.

'sensitive place' means:

- (a) a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises, or
- (b) a motel, hotel or hostel, or
- (c) an educational institution, or
- (d) a medical centre or hospital, or
- (e) a protected area under the *Nature Conservation Act 1992*, or a World Heritage Area, or
- (f) a public park or gardens.

Note: The definition of 'sensitive place' and 'commercial place' is based on Schedule 1 of EPP Noise. That is, a sensitive place is inside or outside on a dwelling, library and educational institution, childcare or kindergarten, school or playground, hospital, surgery or other medical institution, commercial and retail activity, protected area or an area identified under a conservation plan under the *Nature Conservation Act 1992* as a critical habitat or an area of major interest, marine park under the *Marine Parks Act 2004*, park or garden that is outside of the mining lease and open to the public for the use other than for sport or organised entertainment. A commercial place is inside or outside a commercial or retail activity.

A mining camp (i.e., accommodation and ancillary facilities for mine employees or contractors or both, associated with the mine the subject of the environmental authority) is not a sensitive place for that mine or mining project, whether or not the mining camp is located within a mining tenement that is part of the mining project the subject of the environmental authority. For example, the mining camp might be located on neighbouring land owned or leased by the same company as one of the holders of the environmental authority for the mining project, or a related company. Accommodation for mine employees or contractors is a sensitive place if the land is held by a mining company or related company, and if occupation is restricted to the employees, contractors and their families for the particular mine or mines which are held by the same company or a related company.

For example, a township (occupied by the mine employees, contractors and their families for multiple mines that are held by different companies) would be a sensitive place, even if part or all of the township is constructed on land owned by one or more of the companies.

'significant residual impact' has the meaning in section 8 *Environmental Offsets Act 2014*.

'suitably qualified and experienced person' means a person who is a Registered Professional Engineer of Queensland under the provisions of the *Professional Engineers Act 2002*, who has an appropriate level of expertise in the structures, geomechanics, hydrology, hydraulics and environmental impact of watercourse diversions.

An appropriate level of expertise includes:

- (a) demonstrable competency, experience and expertise in:
 - (i) investigation, design or construction of watercourses diversions
 - (ii) operation and maintenance of watercourse diversions
 - (iii) geomechanics with particular emphasis on channel equilibrium, geology and geochemistry
 - (iv) hydrology with particular reference to flooding, estimation of extreme storms, water management or meteorology
 - (v) hydraulics with particular reference to sediment transport and deposition and erosion control
 - (vi) hydrogeology with particular reference to seepage and groundwater
 - (vii) solute transport processes and monitoring thereof, or
- (b) sufficient knowledge and experience to certify that where the suitably qualified and experienced person has relied on advice and information provided by other persons with relevant expertise*:
 - (i) they consider it reasonable to rely on that advice and information
 - (ii) the expert providing the advice and information has knowledge, competency, suitable experience and demonstrated expertise in the matters related to watercourse diversions.

* Persons with relevant expertise include:

- (a) Geomorphologist: person who has demonstrated competency and relevant experience in stream geomorphology and watercourse diversions.
- (b) Geotechnical Expert: person who has demonstrated competency and relevant experience in geotechnical assessment of soil characteristics suitable for watercourse diversions.
- (c) Vegetation Expert: person who has demonstrated competency and relevant experience in the identification, role and function of vegetation with watercourses and adjoining floodplains, and has demonstrated competency and relevant experience in revegetation of watercourse diversions and adjoining floodplains.
- (d) Groundwater Expert: person who has demonstrated competency and relevant experience in groundwater systems.
- (e) Surface Water Expert: person who has demonstrated competency and relevant experience in hydrology.
- (f) Engineer: person who is a Registered Professional Engineer of Queensland (RPEQ) under the provisions of the *Professional Persons Act 2002* or has similar qualifications under a respected professional registration association, and has demonstrated competency and relevant experience in design and construction of watercourse diversions.
- (g) Soils Expert: person who has demonstrated competency and relevant experience in soil classification including the physical, chemical and hydrologic analysis of soil.

'temporary watercourse diversion' is a man-made structure that may incorporate geomorphologic, hydraulic, hydrologic and ecological components of a local watercourse and is designed, constructed, operated and maintained to an engineering standard that ensures the diversion does not compromise the equilibrium and performance of the diversion and adjoining watercourses. A temporary diversion is replaced by a permanent diversion, or the re-establishment of the pre-existing watercourse, within the timeframe specified in the design plan.

'the Act' means the *Environmental Protection Act 1994*.

'void' means an area of land excavated in the carrying out of a mining activity.

'water' is defined under Schedule 4 of the *Water Act 2000*.

'watercourse' has the same meaning given in the *Water Act 2000*.

'water quality' means the chemical, physical and biological condition of water.

'waters' includes river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, unconfined natural or artificial watercourse, bed and bank of any waters, dams, non-tidal or tidal waters (including the sea), storm water channel, storm water drain, and groundwater and any part thereof.

Figures

Figure A1 – Authorised disturbance extent

Figure C1 – Location of notifiable activities

Figure H1 – Rehabilitation by end of Year 5 of mining

Figure H2 – Rehabilitation by end of 15 years of mining

Figure H3 – Rehabilitation by end of 30 years of mining

Figure H4 – Rehabilitation by end of 40 years of mining.

Figure I1 – Maximum disturbance of 'of concern' regional ecosystems

Figure I2 – Maximum disturbance to regulated vegetation – regional ecosystems within a defined distance from defining banks of a relevant watercourse on the vegetation management watercourse map

Figure I3 – Maximum disturbance of black-throated finch habitat

Figure I4 – Maximum disturbance to squatter pigeon habitat

Figure I5 – Maximum disturbance to Australian Painted snipe habitat

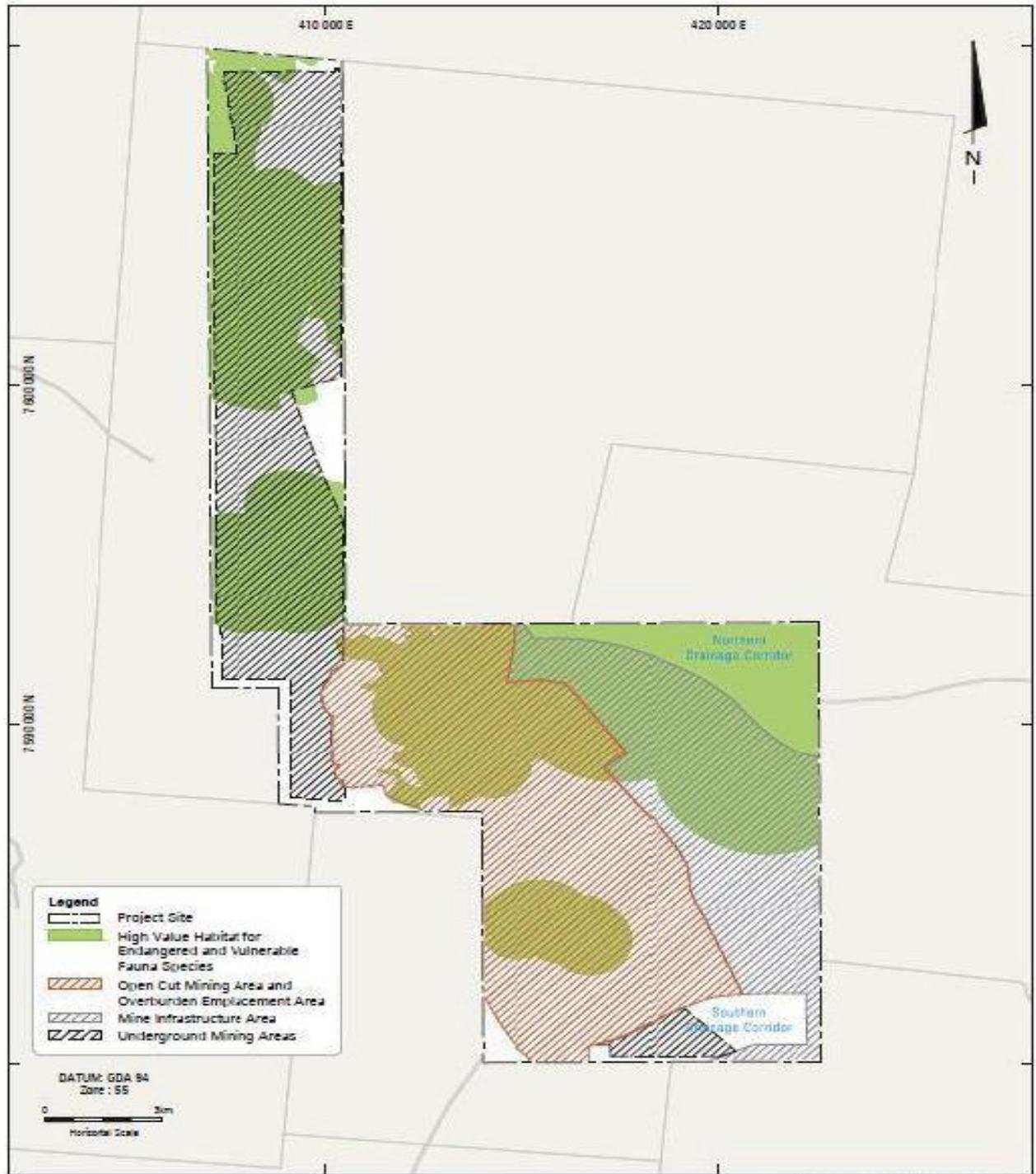
Figure I6 – Maximum disturbance to koala habitat

Figure I7 – Maximum disturbance to yakka skink habitat

Figure I8 – Maximum disturbance to short-beaked echidna habitat

Schedule K: Figures

Figure A1 – Authorised disturbance extent



PROJECT CHINA STONE



Habitat Disturbance

China Stone Coal Project

Figure C1 – Location of notifiable activities

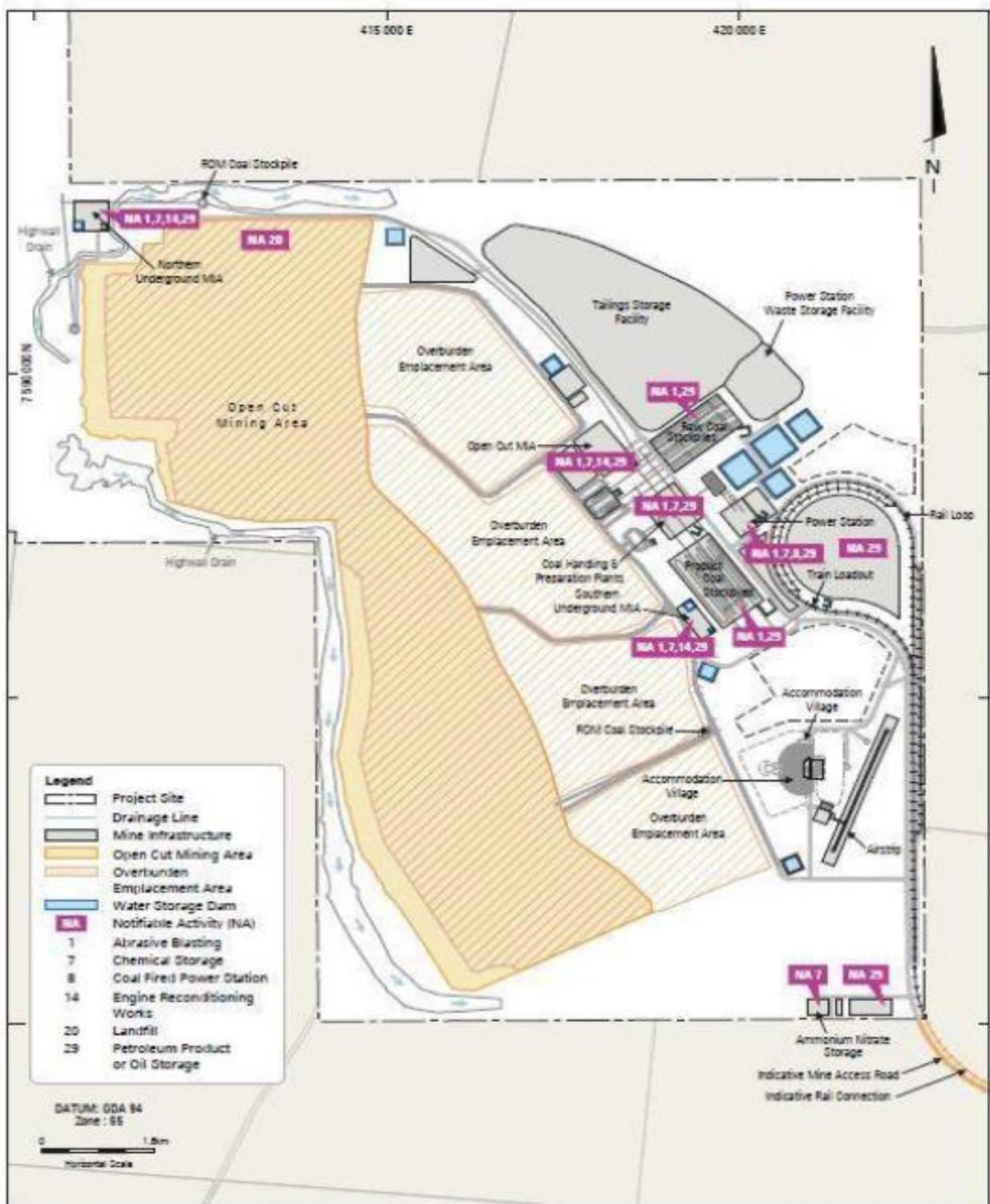
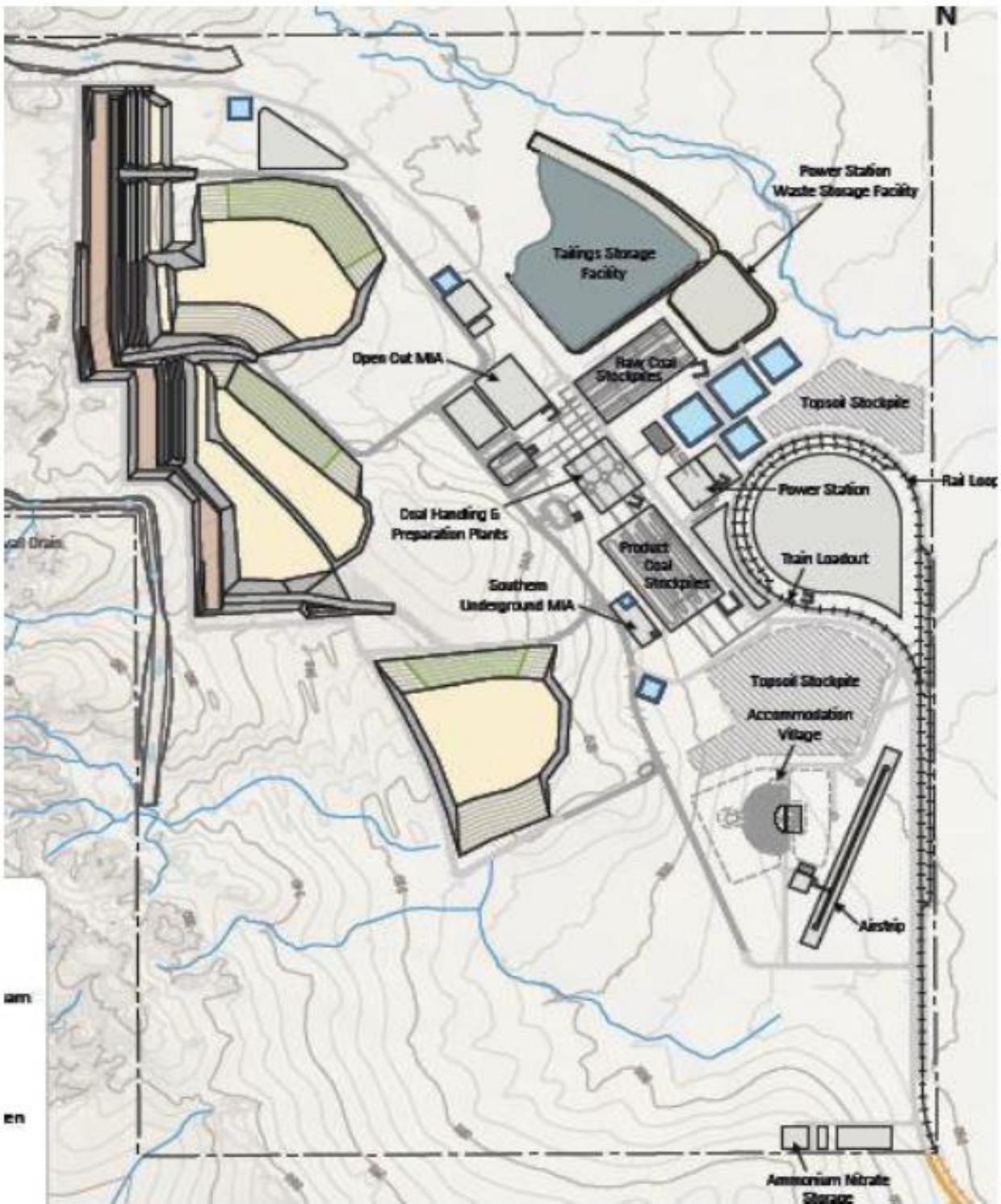
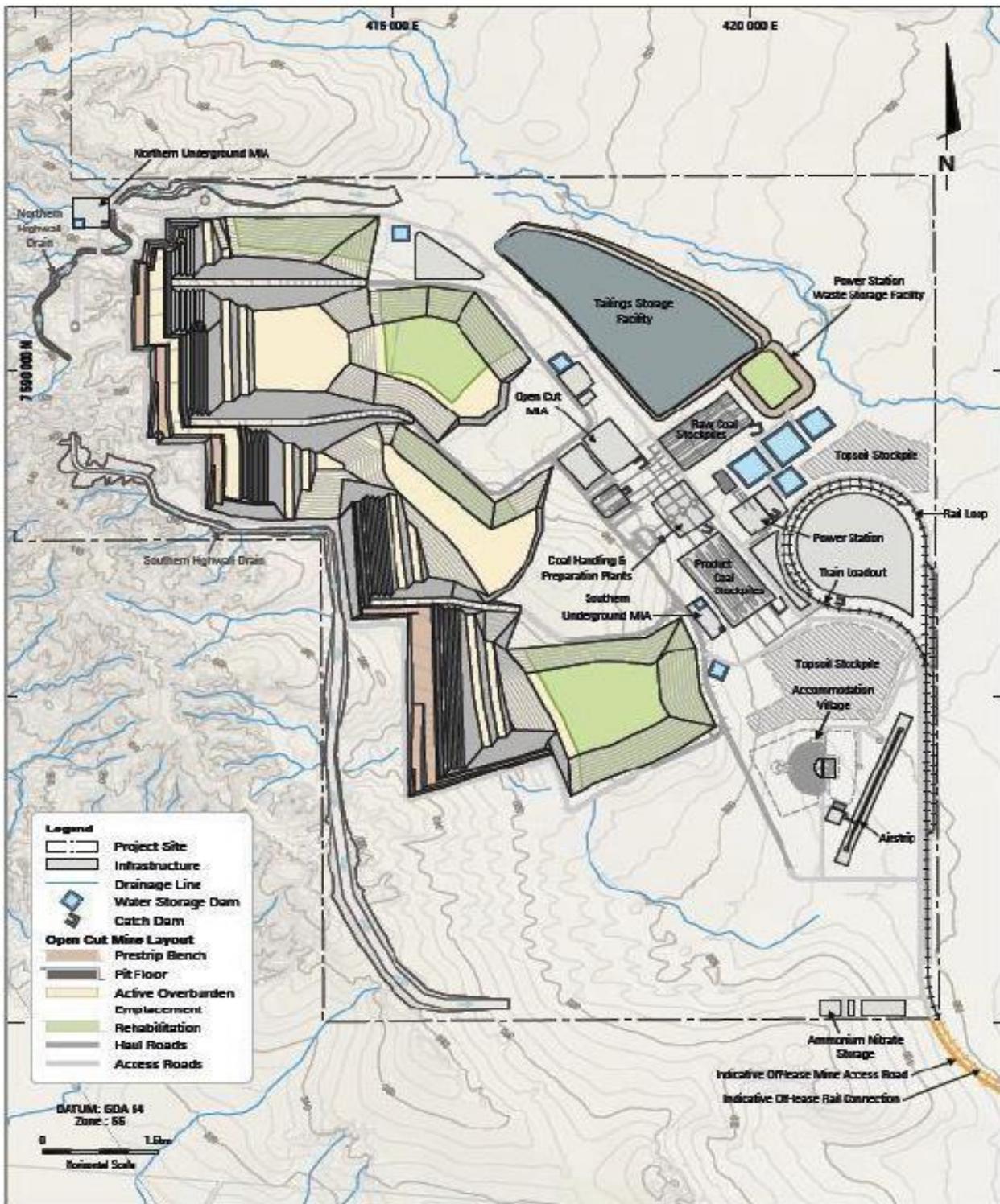


Figure H1 – Rehabilitation by end of Year 5 of mining



China Stone Coal Project

Figure H2 – Rehabilitation by end of 15 years of mining



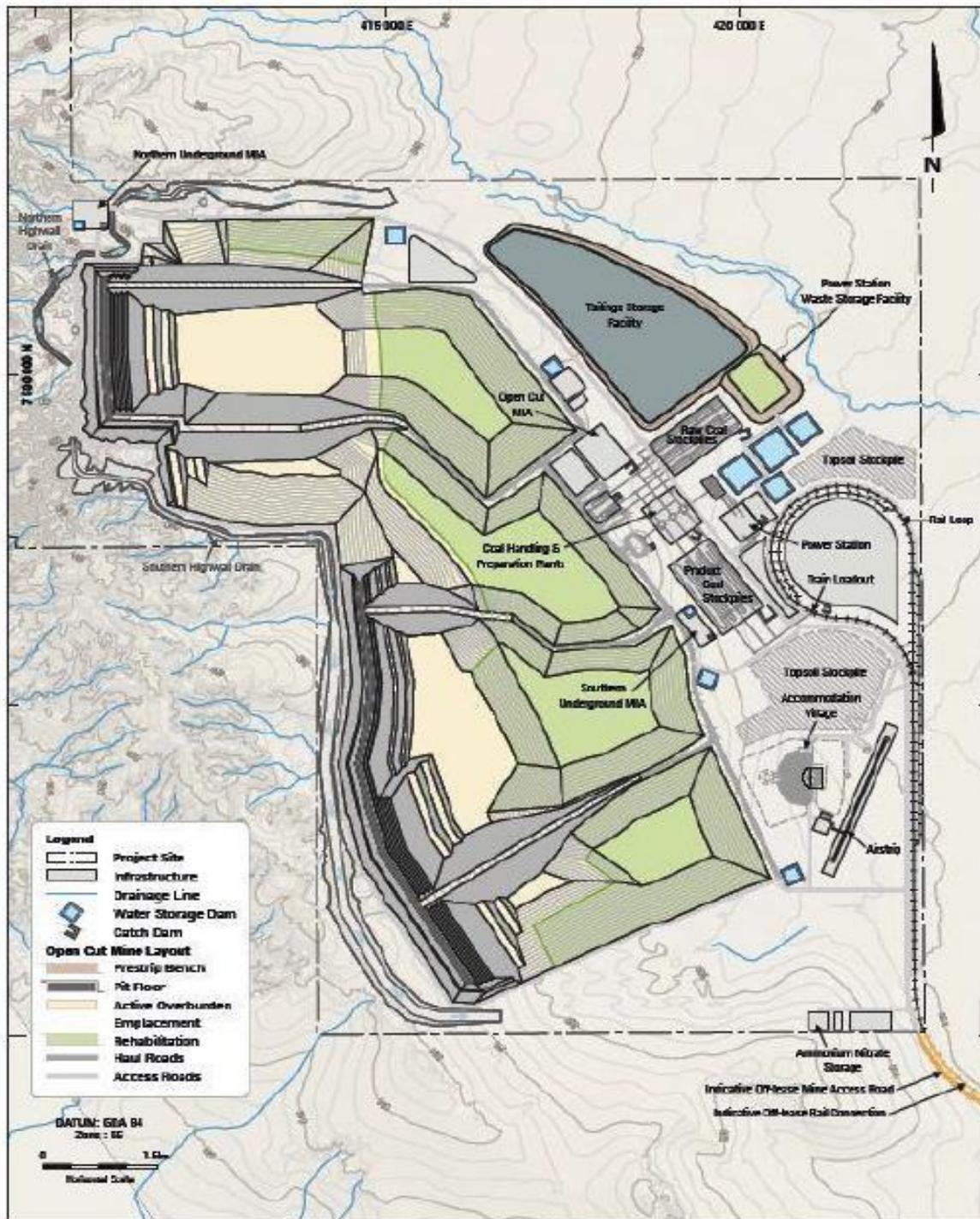
PROJECT CHINA STONE

Open Cut Mine Layout - Year 15



China Stone Coal Project

Figure H3 – Rehabilitation by end of 30 years of mining



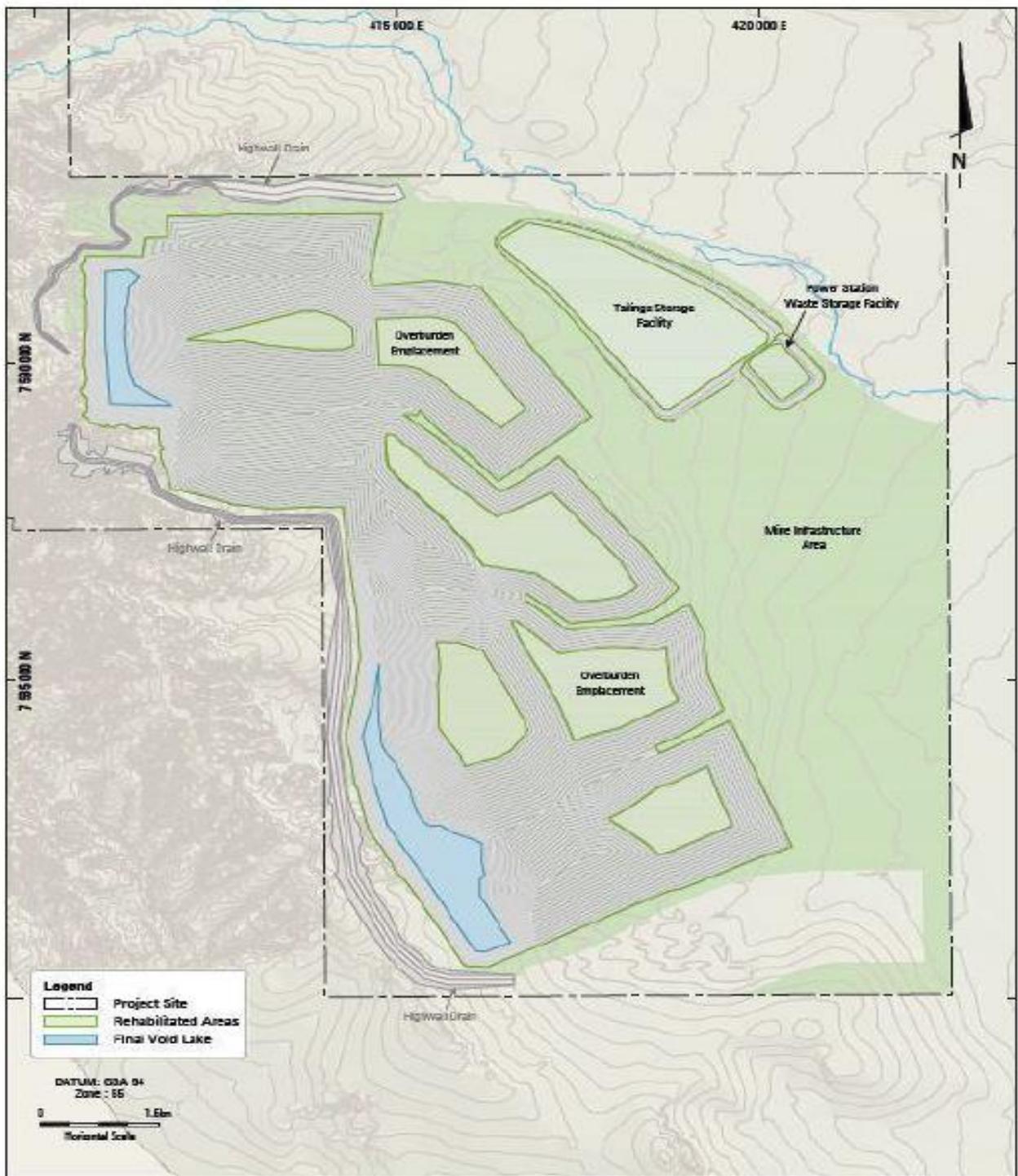
PROJECT CHINA STONE

Open Cut Mine Layout - Year 30



China Stone Coal Project

Figure H4 – Rehabilitation by end of 40 years of mining

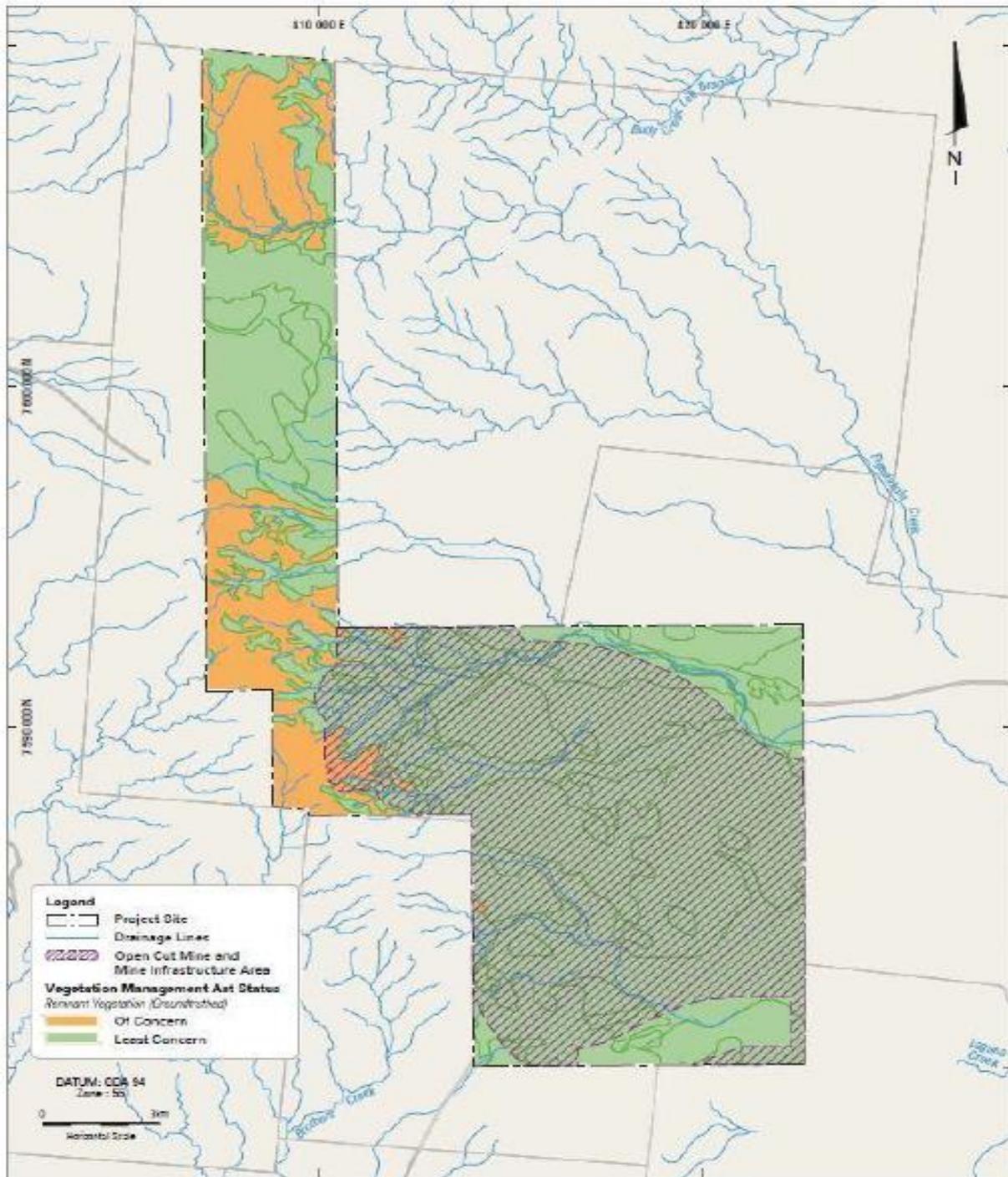


PROJECT CHINA STONE



Conceptual Decommissioning Plan

Figure 11 – Maximum disturbance of of concern Regional ecosystems



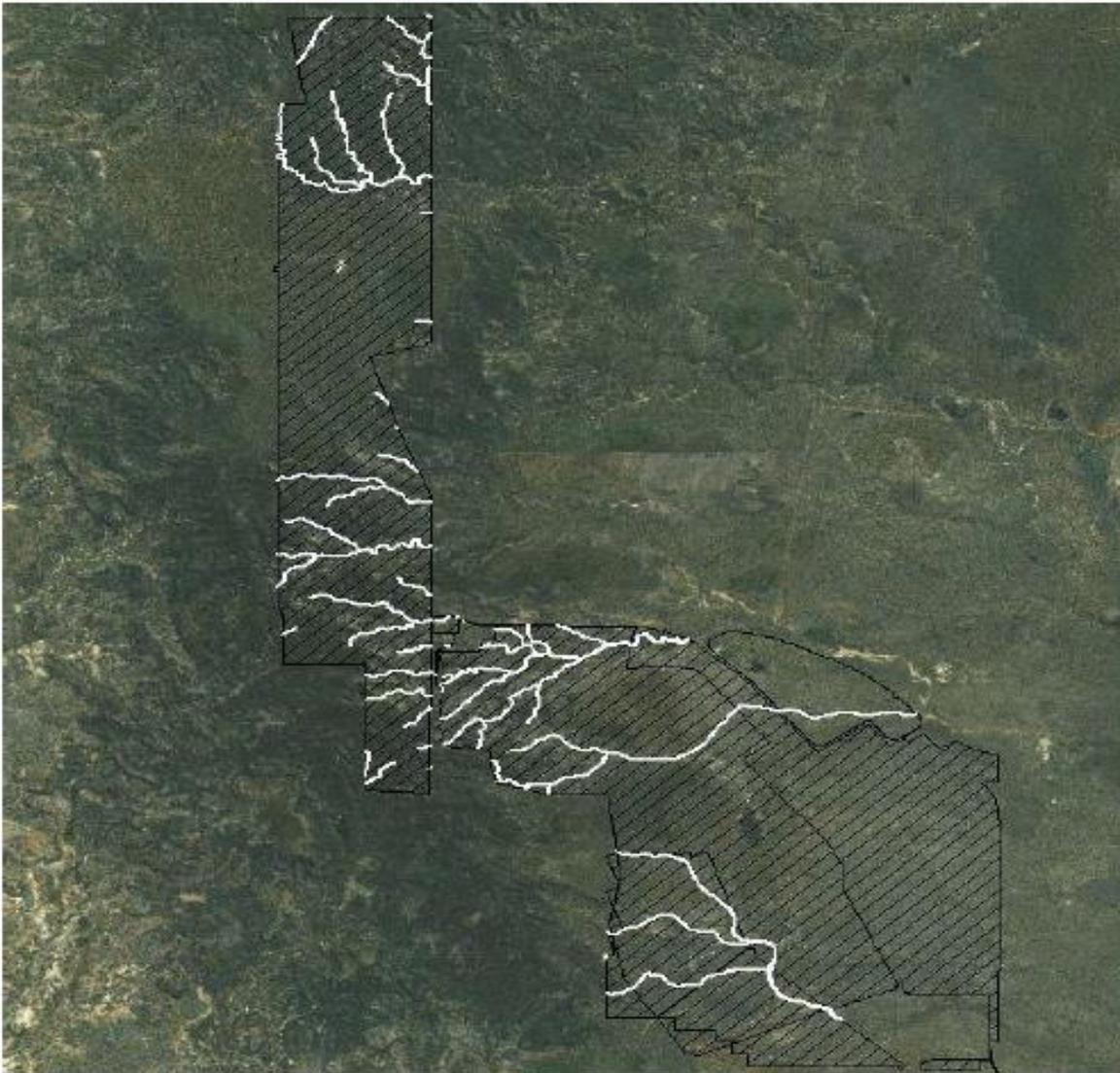
PROJECT CHINA STONE



Open Cut Mine and Mine Infrastructure Area Footprint

China Stone Coal Project

Figure 12 – Location of regional ecosystems and watercourses within the project site



Environmental Authority document reference:
Schedule I Offsets and Biodiversity, Table I1 - Significant residual impacts to prescribed environmental matters

Legend:
Regional ecosystems identified by black diagonal lines on the map
Watercourses identified in white on the map

Source: Queensland Spatial Catalogue 2017

Figure I3 – Maximum disturbance of Black-throated Finch habitat



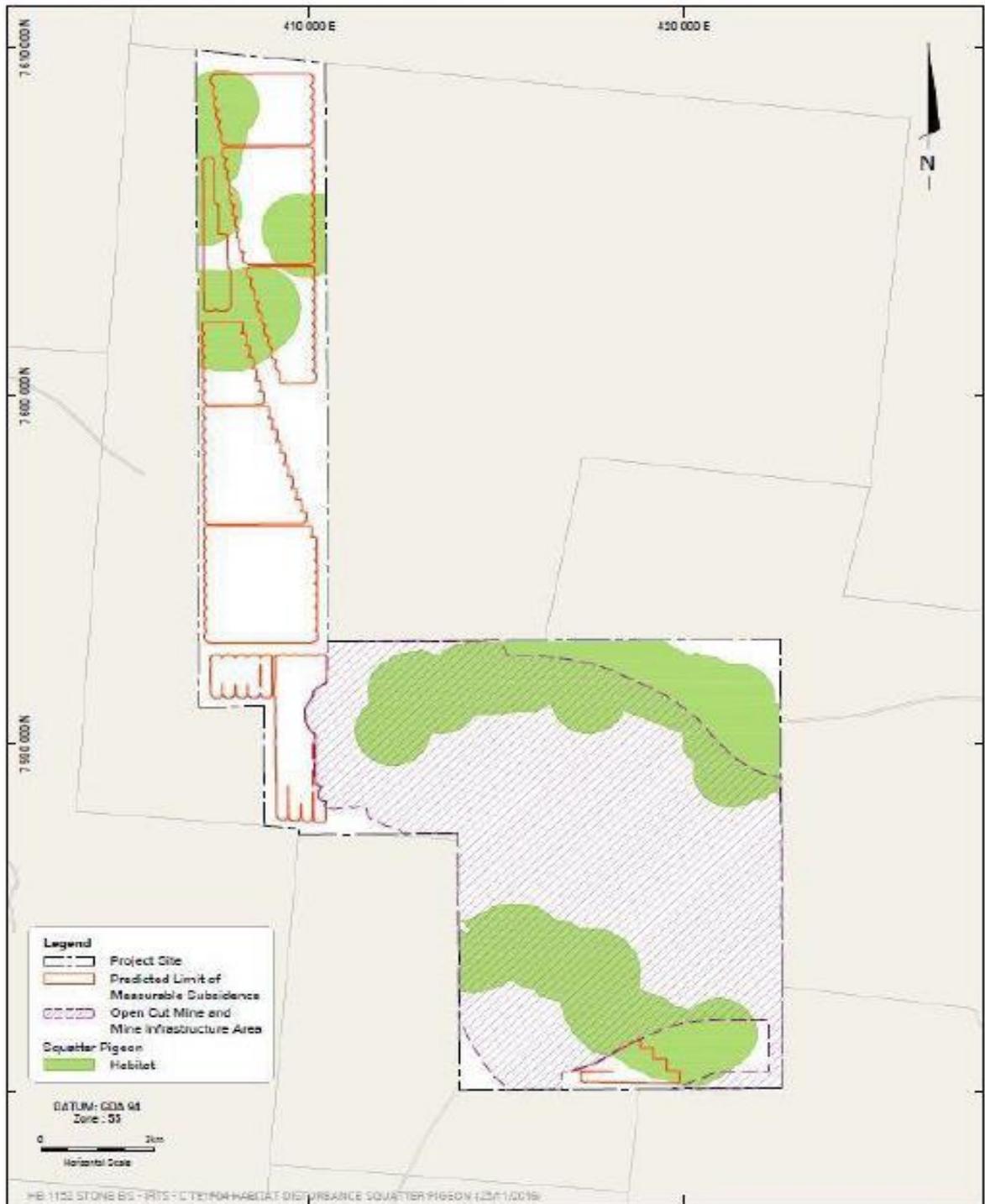
PROJECT CHINA STONE



Black-throated Finch Habitat Disturbance
(Based on Revised Habitat Modelling)

China Stone Coal Project

Figure I4 – Maximum disturbance to Squatter pigeon habitat



PROJECT CHINA STONE

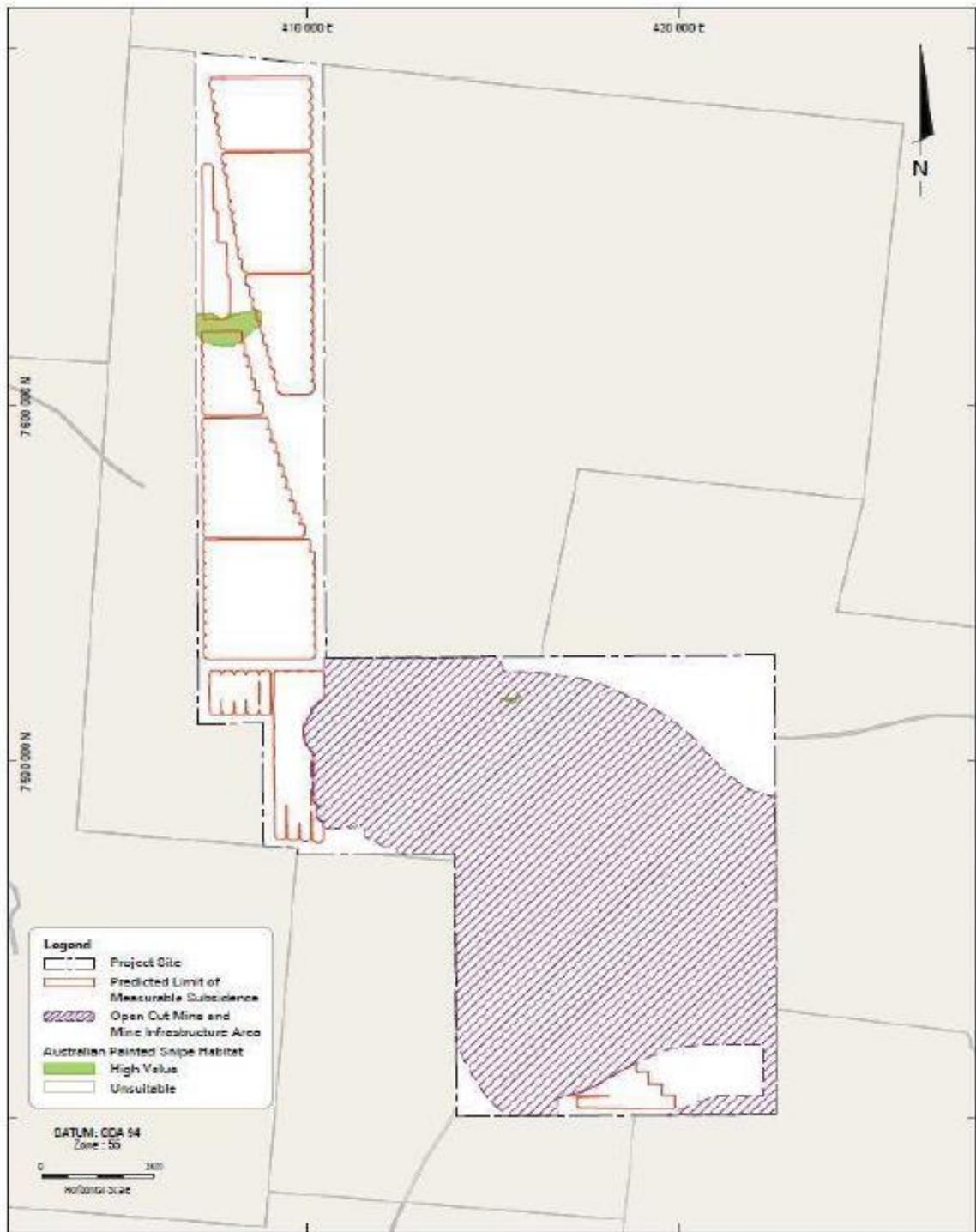


Squatter Pigeon Habitat Disturbance
(Based on Revised Habitat Modelling)

China Stone Coal Project

Appendix 2. Coordinator-General's stated conditions
China Stone Coal project

Figure 15 – Maximum disturbance to Australian Painted Snipe habitat



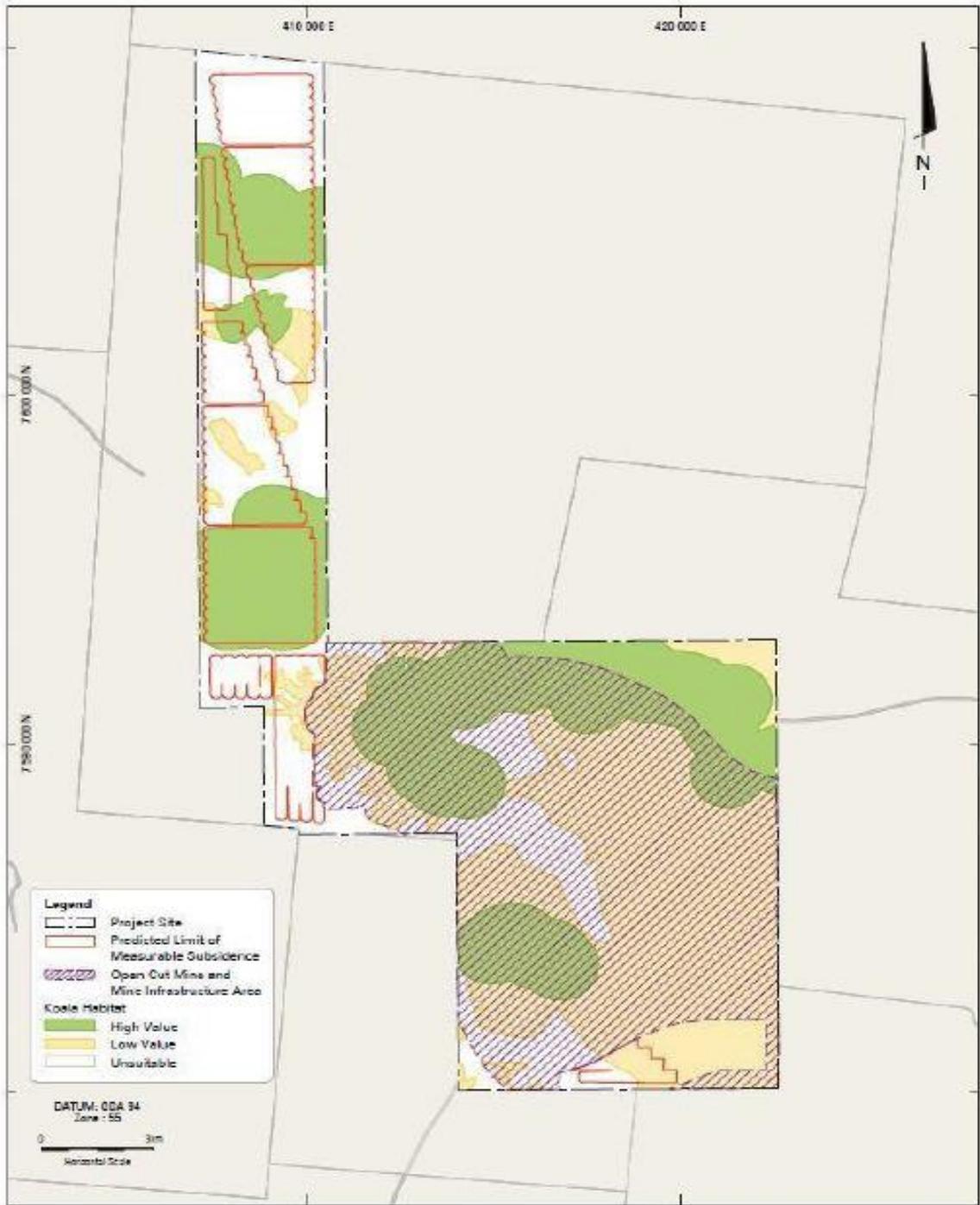
PROJECT CHINA STONE



Australian Painted Snipe Potential Habitat

China Stone Coal Project

Figure 16 – Maximum disturbance to Koala habitat



PROJECT CHINA STONE



Koala Habitat

China Stone Coal Project

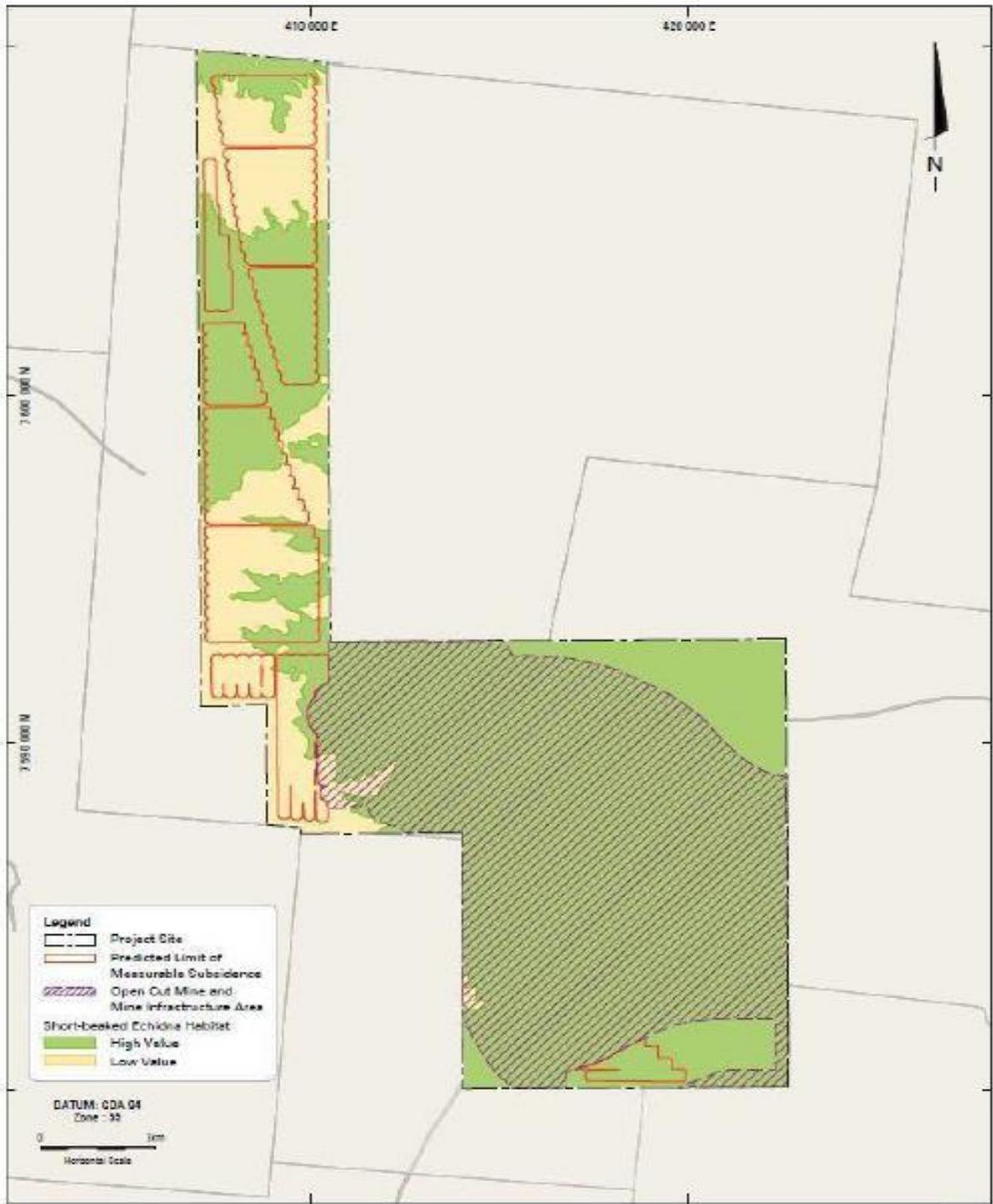
Figure 17 – Maximum disturbance to Yakka Skink habitat



PROJECT CHINA STONE
Yakka Skink Habitat Disturbance
(Based on Preliminary Mapping)

China Stone Coal Project

Figure 18 – Maximum disturbance to Short-beaked Echidna habitat



PROJECT CHINA STONE



Short-beaked Echidna Habitat

Appendix 3. Recommended conditions for the Commonwealth Minister for the Environment

In accordance with section 87 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), this appendix recommends conditions for consideration by the Commonwealth Minister for the Environment in making an approval decision on the proposed action under of the EPBC Act.

Condition 1. Matters of national environmental significance habitat disturbance limits

The outcome sought by this condition is to ensure the approval holder does not directly or indirectly disturb areas of matters of national environmental significance (MNES) habitat greater than the approved disturbance limits for each species.

- (a) The approval holder must not directly or indirectly disturb areas of MNES habitat greater than the disturbance limits defined as:
 - (i) Black-throated finch (southern subspecies) (*Poephila cincta cincta*) – residual impact 8,524 ha
 - (ii) squatter pigeon (*Geophaps scripta scripta*) – residual impact 3,520.7 ha
 - (iii) Australian painted snipe (*Rostratula benghalensis australis*) – residual impact 15.03 ha
 - (iv) Koala (*Phascolarctos cinereus*) – residual impact 3,267.4 ha
 - (v) yakka skink (*Egernia rugosa*). – residual impact 11,112 ha.

Condition 2. Pre-clearance surveys

The outcome sought by this condition is to identify the presence and extent of impacts from the project to any *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed threatened species and their habitat; and ecological communities.

- (a) Prior to clearing of vegetation, the approval holder must undertake pre-clearance surveys in the impact areas to identify the actual presence and extent of any EPBC Act listed threatened species and their habitat; and ecological communities.
- (b) Pre-clearance surveys must inform the Biodiversity Offset Strategy required by Recommended Condition 5, Appendix 3 of this report
- (c) Pre-clearance surveys must:
 - (i) be undertaken generally in accordance with the Department of the Environment and Energy's (DEE) survey guidelines in effect at the time of the survey
 - (ii) be undertaken by a suitably qualified person/s
 - (iii) identify measures to minimise the impact of the action on EPBC Act listed species and communities
 - (iv) identify measures to protect EPBC Act listed threatened species and ecological communities' habitat located adjacent to the areas to be cleared.
- (d) For any EPBC Act listed threatened species and ecological communities identified during these surveys, provide to DEE:
 - (i) precise data on the areas of habitat or ecological community directly and indirectly impacted by the action

- (ii) details of proposed mitigation and management measures
 - (iii) an Offset Strategy for any residual significant impacts.
- (e) The approval holder must provide a survey report to the Commonwealth Minister for the Environment for approval within thirty (30) days of the completion of the surveys.
- (f) The survey report must include details of survey methods, timing and information and management proposals.

Condition 3. Northern seasonal wetland

The outcome sought by this condition is to identify the environmental values of the northern seasonal wetland, monitor the integrity of those values and provide mitigation measures should the project impact upon those values at any time prior to, during and after the commencement and completion of underground mining.

- (a) To identify the environmental values of the northern seasonal wetland, at least six (6) months prior to the commence of underground mining the approval holder must undertake:
- (i) a baseline survey of the northern seasonal wetland to identify the habitat values for all matters of national environmental significance (MNES) and matters of state environmental significance (MSES) species
 - (ii) a hydrological survey of the northern seasonal wetland's hydrological environmental values which includes the geographical area, its catchment area and seasonal water variations
 - (iii) a survey of the drainage patterns which contribute to the environmental values of the northern seasonal wetland
 - (iv) a program for the monitoring and review of the existing environmental values prior to commencement of underground mining which include the habitat and hydrological environmental values of the northern seasonal wetland
 - (v) a program for monitoring any loss of the northern seasonal wetland environmental values and implement mitigation measures to manage any impact upon the environmental values of the northern seasonal wetland caused by any of the project's activities.
- (b) The results of the surveys, monitoring program and mitigation measures must be provided to the Department of Environment and Science (DES) and Department of the Environment and Energy (DEE) in the form of a report and must inform the MNES Management Plans and Offset Plans required by the conditions in this appendix.
- (c) The report must include the results of the surveys, management plans and monitoring programs required by the Queensland state government for subsidence, groundwater, surface water, biodiversity and drainage.
- (d) The report must be submitted to DES and DEE for approval at least three (3) months prior to the commencement of underground mining.
- (e) The proponent must not commence underground mining until the report has been approved by DES and DEE in writing.
- (f) The approved report must be implemented.
- (g) Where an environmental value is impacted upon by the project's activities the approval holder is required to provide an offset to compensate for a residual impact and apply to the DEE to amend the Biodiversity Offset Plan to include this residual impact. The provisions of Condition 5, Appendix 3 of this report will apply to any northern seasonal wetland residual impact identified as part of the report submitted to the DES and DEE.

Condition 4. MNES Management Plans

The outcome sought by this condition is the protection of the species and communities identified in Table [insert number].

- (a) To mitigate impacts to *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed threatened species and communities arising from the project, the approval holder must submit a matter of national environmental significance (MNES) Management Plan (MMP) for the management of the species and communities listed in Table 1 [insert number] to the Commonwealth Minister for the Environment for approval at least three (3) months prior to the commencement of the clearing of habitat.
- (b) The MMP must be consistent with the relevant recovery plans, threat abatement plans, conservation advices and any plan required under another condition of this approval and must include:
 - (i) details of how the MMP will be updated to incorporate and address outcomes from research undertaken for EPBC listed species and communities under this approval
 - (ii) a monitoring program to determine the success of mitigation and management measures. The monitoring must:
 - (A) clearly set out trigger levels or criteria for assessing the success of management measures
 - (B) measure the success of the management measures against trigger levels
 - (C) outline how milestones and compliance will be reported on.
 - (iii) corrective measures to be implemented if trigger levels are exceeded.
- (c) The approval holder cannot commence the action until the MMP has been approved by the Commonwealth Minister for the Environment in writing.
- (d) The approval holder must publish the MMP on their website within ten (10) business days from the day of receiving the Commonwealth Minister for the Environment's approval of the MMP in writing.
- (e) The approved plan must be implemented.

Note: Where EPBC listed species share similar habitat and management requirements, such as migratory species, the requirements of these EPBC listed species may be addressed together as a component of the MMP.

The MMP does not need to include but must be consistent with management plans required for EPBC listed species and communities for which a management plan is required under another condition of this approval.

Note: Management plans may also be required under state approvals. Whenever possible a combined document should be prepared to address both state government and EPBC Act approval conditions.

Condition 5. Biodiversity offsets for threatened species and ecological communities

The outcome sought by this condition is to provide offsets and offset area management plans for *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed threatened species and ecological communities, for which a residual significant impact remains after avoidance and mitigation strategies are implemented.

- (a) At least three (3) months prior to the commencement of Stage 1, the approval holder must submit, for the Minister's written approval, a Biodiversity Offset Strategy (BOS) for the residual impacts to the following MNES:
 - (i) black-throated finch (southern subspecies) (*Poephila cincta cincta*)
 - (ii) squatter pigeon (*Geophaps scripta scripta*)

- (iii) Australian painted snipe (*Rostratula australis*)
 - (iv) koala (*Phascolarctos cinereus*)
 - (v) yakka skink (*Egernia rugosa*).
- (b) The offset required for each matters of national environment significance (MNES) must be informed by results of the pre-clearance surveys required at Condition 2, Appendix 3 of this report. If pre-clearance surveys do not refine the actual impacts, offsets for the whole disturbance limit, described in Condition 2, Appendix 3 of this report, must be provided.
- (c) The BOS and any offset area management plans provided as part of the BOS, must be consistent with the Galilee Basin Offset Strategy, relevant recovery plans, threat abatement plans, conservation advices and project species management plans, including any Black-throated Finch Management Plans and provisions of Schedule I, Appendix 2 of the draft environmental authority included in the Coordinator-General's evaluation report.
- (d) The approval holder must provide offsets for the following impacts:
- (i) loss of the area of habitat for the MNES identified in (a) of this condition
 - (ii) the quantum determined as a residual significant impact for any further species and ecological communities.
- (e) The BOS must include:
- (i) details of the offset areas (including maps in electronic Geographic Information System format), site descriptions, environmental values relevant to MNES, amounts of primary habitat for each EPBC listed species, connectivity with other habitat and biodiversity corridors, a rehabilitation program, and conservation and management measures for long-term protection
 - (ii) a detailed survey and description of the offset areas prior to any management activities, including existing EPBC listed species and communities which has the potential to be restored or improved (the baseline condition)
 - (iii) details of how the offsets have been or will be legally secured
 - (iv) a description of the potential risks to the successful implementation of the BOS and the offset area management plans, and include details of the contingency measures that will be implemented to mitigate against these risks
 - (v) management measures for EPBC listed species and communities and EPBC listed species habitat
 - (vi) a monitoring program for the offset areas. The monitoring program must:
 - (A) clearly set out performance indicators
 - (B) measure the success of the management measures against stated performance criteria
 - (C) include monitoring parameters, frequencies, triggers, corrective actions, timing and scope for the duration of the project approval
 - (vii) details of how the plan will be updated to incorporate and address outcomes from research undertaken for EPBC listed threatened species and communities
 - (viii) an outline of how milestones and compliance will be reported
 - (ix) details of who will be undertaking monitoring, review, and implementation of the offset area management plan (if this person is not the approval holder).
- (f) The offset area management plan must include, in writing, commitments from the approval that demonstrate that the offset areas required in Table 1 [*insert number*] will be met.

- (g) The offset area management plan must be approved by the Commonwealth Minister for the Environment in writing prior to the commencement of the action.
- (h) Offsets detailed in the offset area management plan must be legally secured within two (2) years of commencement of the action or as required under relevant Queensland legislation, whichever is the earlier.
- (i) The approved offset area management plan must be implemented.

Note: Management plans may also be required under state approvals. Whenever possible a combined document should be prepared to address both state government and EPBC Act offset area requirements.

Condition 6. Biodiversity funding

The outcome sought by this condition is to contribute to the protection and long-term conservation of *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed threatened species identified in Table 1 and the fulfillment of research priorities and actions provided for in recovery plans and conservation advices.

- (a) The approval holder must establish and/or contribute to a pool of funds established for the better protection and long-term conservation of EPBC listed threatened species listed in Table 1.
- (b) The mechanism to establish and/or contribute to a pool of funds, including terms of reference to support a regional approach, funding mechanisms and an initial work plan, must be provided to the Commonwealth Minister for the Environment for approval three (3) months prior to commencement of mining activities. The mechanism may be in the form of a trust fund, or other mechanism/s as agreed by the Commonwealth Minister for the Environment in writing.
- (c) The approval holder must contribute \$100,000 (GST exclusive and subject to the CPI) per annum for ten (10) consecutive years to the pool of funds beginning from commencement of mining activities. The approval holder must provide notice of the establishment of and/or contribution to the pool of funds to the Department in writing prior to commencement of mining activities. Documentary evidence must be provided to the Department showing that the annual financial contributions to the pool of funds have been provided within thirty (30) calendar days of each payment.
- (d) These funds must facilitate the development and implementation of research programs consistent with priorities to manage development impacts of EPBC Act listed threatened species listed in Table 1 which are consistent with, and take into account any relevant recovery plans, threat abatement plans, conservation advices and the proposed Queensland Government's Black-throated Finch Bioregional Management Plan for the Galilee Basin and bioregion. Research programs should identify measures to mitigate and manage the impacts on EPBC Act listed threatened species listed in Table 1 and should address where relevant:
 - (i) Methodologies for a baseline survey that will report on each species' life history, movement patterns, habitat requirements and population dynamics. Survey methodologies must be in accordance with the Department's survey guidelines or alternative best practice methodologies that are agreed to in writing by the Commonwealth Minister for the Environment prior to commencement and endorsed by a suitably qualified independent expert. The baseline survey must begin with the first year of the date of this approval.

- (ii) An ongoing monitoring program (developed from the baseline monitoring) for each species, to continue for the duration of the research programs, with annual reporting to the Department.
 - (iii) Commitments, including financial commitments and associated timeframes, that will be implemented by the approval holder to support the undertaking of research.
 - (iv) The time frames for undertaking each research component.
 - (v) Timing and methods of reporting research outcomes to the Minister, the scientific community and the public.
 - (vi) Outcomes of consultation with the Department on how the proposed research programs align with other studies for EPBC Act listed threatened species listed in Table 1, the Queensland Government's proposed Black-throated Finch Bioregional Management Plan and any approved offset area management plans and research programs relevant to the BTF. Identification of priority actions for funding must be decided in consultation with the Queensland Department of Environment and Science and members of relevant Recovery Teams.
- (e) A review of funding must be undertaken five (5) years after the establishment of the pool of funds and/or the commencement of the action or as otherwise agreed by the Commonwealth Minister for the Environment in writing. This review must take into account progress of the research programs and any subsequent on ground actions, as well as the involvement of other holders of approvals under the EPBC Act in funding and administrative arrangements. The review must be provided to the Department within six (6) months after the five (5) year period.

Definitions

'commencement of mining activities' is the first instance of any mining activity. Commencement of mining activity includes any physical disturbance including clearing of vegetation, earthworks, new road works, new rail works, construction of camp, development of mining associated infrastructure and mining operations. Commencement does not include:

- (a) erection of signage or fencing
- (b) minor physical disturbance necessary to undertake pre-clearance surveys or establish monitoring programs or associated with the mobilisation of plant, equipment, materials, machinery and personnel prior to the start of railway and road development or construction; or
- (c) activities that are critical to commencement that are associated with mobilisation of plant and equipment, materials, machinery and personnel prior to the start of railway or road development or construction only if such activities will have no adverse impact on MSES, and only if the environmental authority holder has notified the administering authority in writing before an activity is undertaken.

'mining activity' as defined in section 110 of the EP Act.

Condition 7. Moray Downs offset area plans and programs

The outcome sought by this condition is to protect any offset area management plans and research programs approved by the Commonwealth and state governments on the pastoral holding 'Moray Downs' described as Lot 662 on PH 1491.

- (a) The approval holder must not undertake any activity or prepare a plan or program which would detrimentally impact upon any offset area management plans and research programs for the Moray Downs pastoral holding approved as part of the Biodiversity Offset Strategy for the Carmichael Coal Mine and Rail Project by the Commonwealth Minister for the Environment on 7 October 2016 and by the Coordinator-General on 25 October 2016.

Condition 8. Moray Downs offset area

The outcome sought by this condition is to ensure the project will not impact on the offset area on pastoral holding 'Moray Downs' described as Lot 662 on PH 1491.

- (a) The approval holder must not undertake any activity that would result in any direct or indirect impacts to the Moray Downs offset area either from groundwater drawdown or depressurisation, or other physical disturbance during construction, operations or post-mining.
- (b) At least six (6) months prior to commencing excavation of the first box cut, the approval holder must liaise with the proponent of the Carmichael Coal Mine and Rail Project to ensure:
 - (i) groundwater levels are monitored through an appropriate network of monitoring bores in all geological formations
 - (ii) other appropriate monitoring methods are employed that are designed to monitor groundwater drawdown impacts to any vegetation determined to be groundwater dependent, for either all or part of its water needs.

Definitions

'**box cut**' refers to the initial excavation of overburden to start the mined pit, and includes any blasting associated with its creation.

Condition 9. Doongmabulla Springs Complex, Lake Buchanan and Caukingburra Swamp

The outcome sought by this condition is to ensure the project will not impact on Doongmabulla Springs Complex, Lake Buchanan and Caukingburra Swamp.

- (a) The approval holder must not undertake any activity that would result in any direct or indirect impacts to the Doongmabulla Springs Complex, Lake Buchanan and Caukingburra Swamp either from groundwater drawdown or other physical disturbance during operations or post-mining.
- (b) To ensure the protection and long-term viability of the Doongmabulla Springs Complex, Lake Buchanan and Caukingburra Swamp the approval holder must monitor groundwater levels through an appropriate network of monitoring bores in all geological formations between the China Stone coal project mining lease and the Doongmabulla Springs Complex, Lake Buchanan and Caukingburra Swamp.

Condition 10. Groundwater management and monitoring program for MNES and impacts to the Moray Downs offset area

The outcome sought by this condition is to ensure groundwater impacts to matters of national environmental significance (MNES) are identified and appropriately managed, mitigated and monitored.

- (a) At least three (3) months prior to commencing excavation of the first box cut, the approval holder must submit to the Commonwealth Minister for the Environment for approval a Groundwater Management and Monitoring Program for potential impacts to MNES (GMMP for MNES) whether inside or outside the project area. The GMMP for MNES must be informed by the most up to date groundwater numerical model, including any revisions in accordance with the imposed conditions for groundwater in Appendix 1 of this Coordinator-General's evaluation report. The GMMP for MNES must contain the following:
 - (i) details of a groundwater monitoring network and program that includes:
 - (ii) control monitoring sites

- (iii) sufficient bores to monitor potential impacts on the Doongmabulla Springs Complex, Lake Buchanan Caulkingburra Swamp and the Moray Downs offset area
 - (iv) a rationale for the design of the monitoring network with respect to the nature of potential impacts and the location and occurrence of MNES (whether inside or outside the project area)
 - (v) baseline monitoring data
 - (vi) details of groundwater level early warning triggers for the Doongmabulla Springs Complex, Lake Buchanan, Caulkingburra Swamp and the Moray Downs offset area informed by groundwater modelling and corrective actions and/or mitigation measures to be taken if triggers are exceeded where caused by mining operations to ensure that groundwater drawdown as a result of the project does not impact on the Doongmabulla Springs Complex, Lake Buchanan, Caulkingburra Swamp and the Moray Downs offset area
 - (vii) details of timeframes for regular reviews of the GMMP, in accordance with the reviews of the groundwater management and monitoring program required by the imposed conditions for groundwater in Appendix 1 of the Coordinator-General's evaluation report and any environmental authority for the project issued under the *Environmental Protection Act 1994*
 - (viii) provisions to make monitoring data available to the Department of the Environment and Energy and Queensland Government authorities (if requested) on a six-monthly basis for inclusion in any cumulative impact assessment, regional water balance model, bioregional assessment or relevant research required by the Bioregional Assessment of the Galilee Basin sub-region and the Lake Eyre Basin and any subsequent iterations
 - (ix) provisions to make monitoring results publicly available on the approval holder's website for the life of the project.
- (b) A peer review of the GMMP for MNES must be undertaken by a suitably qualified independent expert including a report with recommendations and a table of changes made in response to the peer review, and approved by the Commonwealth Minister for the Environment in writing.
- (c) The approval holder must not commence excavation of the first box cut until the GMMP for MNES has been approved by the Commonwealth Minister for the Environment in writing.
- (d) The approved GMMP must be implemented.

Note: many elements of the GMMP for MNES are also required under the imposed conditions for Groundwater in Appendix 1 of the Coordinator-General's evaluation report for the project. Where possible, a combined document should be prepared that addresses both Queensland Government and the EPBC Act approval conditions.

Definitions

'**box cut**' refers to the initial excavation of overburden to start the mined pit, and includes any blasting associated with its creation.

Condition 11. Rewan Formation connectivity research plan

The outcome sought by this condition is to characterise the properties of the Rewan Formation within and adjacent to the project site and to determine how the Rewan Formation would react to mining activities.

- (a) The approval holder must submit for the approval of the Commonwealth Minister for the Environment, a Rewan Formation Connectivity Research Plan ('Research Plan') prepared by an appropriately qualified person that characterises the Rewan Formation within the

area impacted by the mine. The Research Plan must include but is not limited to the following:

- (i) research aims
 - (ii) personnel responsible for conducting research and their qualifications
 - (iii) timeframes for research and reporting
 - (iv) methods, including seismic surveys to determine the type, extent and location of faulting and fracturing and an examination of the hydraulic properties of the Rewan Formation, to better characterise the Rewan Formation and the contribution of fractures and faults to connectivity
 - (v) an assessment of potential impacts to MNES from surveying activities such as vegetation clearance and the establishment of drilling pads
 - (vi) research to inform any Regional Groundwater and Surface Water Monitoring and Assessment Program, Bioregional Assessment for the Galilee Basin sub-region and the Lake Eyre Basin
 - (vii) outputs to inform future updates to the groundwater numerical model required under Condition 1, Schedule 7, Appendix 1 and the Groundwater Management and Monitoring Program required under Condition 5, Schedule 7, Appendix 1.
- (b) The Research Plan must be peer reviewed by an appropriately qualified person
 - (c) The peer review report and the Research Plan must be submitted together to the Commonwealth Minister for the Environment for review and approval at least three (3) months prior to the excavation of the first box cut.
 - (d) Excavation of the first box cut cannot commence until the Research Plan has been approved by the Commonwealth Minister for the Environment in writing.
 - (e) The findings of the research outputs of the Research Plan must be published on the approval holder's project website and submitted to the Queensland Department of Natural Resources and Mines and Energy.
 - (f) The approved Research Plan must be implemented.

Definitions

'**box cut**' refers to the initial excavation of overburden to start the mined pit, and includes any blasting associated with its creation.

'**mining activity**' as defined in section 110 of the EP Act.

Condition 12. Groundwater offset strategy

The outcome sought by this condition is to counterbalance the impacts on groundwater resources during mining from the take of associated water.

- (a) The approval holder must submit a groundwater offset strategy to the Commonwealth Minister for the Environment for approval at least three (3) months prior to commencement of mining operations.
- (b) Offsets for water resource impacts must be managed in accordance with the approved groundwater offset strategy.
- (c) The groundwater offset strategy must achieve a measurable outcome in accordance with one or more of the following principles:
 - (i) reduce extraction rates from regional aquifers
 - (ii) increase pressure in regional aquifers
 - (iii) protect and rehabilitate groundwater dependant ecosystems in the region

- (iv) other measures consistent with government policies and strategies to protect and manage water resources in aquifers of the eastern part of the Galilee Basin.
- (d) The final groundwater offset measure is to be determined by the Commonwealth Minister for the Environment based on the outcomes of the updated groundwater numerical model required by the Coordinator-General's evaluation report (Condition 1, Schedule 7, Appendix 1), the Rewan Formation Connectivity Research Plan and the pre-clearing surveys for groundwater dependant ecosystems required by Condition 4, Schedule 1, Appendix 1 of this Coordinator-General's evaluation report.
- (e) The groundwater offset measure is to be developed and delivered in consultation with the Queensland Government department administering the authorisation of the water take.
- (f) Excavation of the first box cut must not commence until the groundwater offset strategy is approved by the Commonwealth Minister for the Environment in writing.
- (g) The approved groundwater offset strategy must be implemented.

Definitions

'box cut' refers to the initial excavation of overburden to start the mined pit, and includes any blasting associated with its creation.

Appendix 4. General recommendations

Schedule 1. Black-throated finch

Recommendation 1. **Black-throated Finch (southern subspecies) Bioregional Management Plan for the Galilee Basin and Desert Uplands Bioregion**

The outcomes sought by this recommendation are to address the impacts of mining projects approved under the *Mineral Resources Act 1999* and projects the subject of a Coordinator-General evaluation report within the Galilee Basin Region, on the black-throated finch (southern subspecies) (*Poephila cincta cincta*) (BTF) as well as to maximise the ongoing protection and long-term conservation of the BTF.

Preparation of the Plan

- (a) That the administering authority responsible for the threatened species provisions of the *Nature Conservation Act 1992* is to:
- (i) prepare a fit for purpose BTF Bioregional Management Plan for the Galilee Basin and Desert Uplands Region ('the Plan')
 - (ii) consult with the Department of the Environment and Energy (DEE), the BTF National Recovery Team and Galilee Basin mine proponents likely to significantly impact upon BTF habitat.

Content of the Plan

- (b) The Plan must:
- (i) provide for a bioregional survey and assessment of the BTF population and habitat in the Galilee Basin and Desert Uplands bioregion
 - (ii) establish best practice baseline survey methods that report on BTF movement patterns, habitat requirements and population dynamics
 - (iii) establish a protocol with Galilee Basin mine proponents for the delivery of BTF species and habitat condition survey data recorded by the proponents
 - (iv) collate baseline and ongoing survey data recorded by proponents
 - (v) identify a schedule of baseline bioregion-wide surveys and ongoing bioregion-wide surveys (developed from baseline surveys) for the species and habitat condition that complements data recorded by proponents, including monitoring parameters and frequency
 - (vi) identify performance indicators for assessing the success of BTF mitigation and management measures implemented for the management of mining activities and offset areas
 - (vii) assess the impacts of mining projects on the BTF in the Galilee Basin region, based on the available data, including but not limited to:
 - (A) vegetation clearing
 - (B) subsidence from underground mining
 - (C) mine dewatering impacts on groundwater dependent ecosystems
 - (D) ecological function changes to habitat, including habitat connectivity, species function and behaviour, size and composition of populations, and death or injury to individuals
 - (E) hydrological changes due to stream diversions and flood levees

- (F) weeds and pests.

Plan to inform adaptive management of BTF

- (c) The Plan must inform adaptive management of the BTF population and habitat in the Galilee Basin and Desert Uplands bioregion by documenting:
 - (i) baseline and ongoing BTF movement patterns, habitat requirements and population dynamics
 - (ii) impacts from mining-related activities relevant to the BTF in the Galilee Basin
 - (iii) best practice mitigation and management measures for the management of mining activities and offset areas, with a focus on:
 - (A) artificial watering points
 - (B) grazing management
 - (C) fire management
 - (D) exotic plant management
 - (E) predator management
 - (F) disturbance management
 - (iv) suitable habitat and offset areas within the Desert Uplands bioregion, having regard to the Galilee Basin Offsets Strategy
 - (v) priority actions for funding with reference to and consistency with relevant Recovery Plans, threat abatement plans, conservation advice and project species management plans
 - (vi) a reporting schedule for research actions.

Plan available on website

- (d) The Plan must be periodically updated and made available on the administering authority's website.

The Department of Environment and Science is designated as the agency responsible for this recommendation.

Definitions

'**mine dewatering**' is pumping out groundwater that has seeped into the open-cut pit or underground longwall mine.

'**mining activity**' as defined in section 110 of the EP Act.

Schedule 2. Transport

Recommendation 2. Traffic management plan

The outcome sought by this recommendation is to ensure impacts to the safety, efficiency and condition of state-controlled and local roads are adequately addressed.

- (a) The proponent must prepare a Traffic Impact Assessment (TIA) that covers each stage of the project, to analyse and address impacts on the safety, efficiency and condition of state-controlled and local roads.
- (b) The TIA must be provided to the affected DTMR districts (Northern District and Mackay/Whitsunday) offices for approval no later than six (6) months prior to the commencement of significant project related construction traffic, or as otherwise agreed between the proponent and DTMR.

(c) The TIA must:

- (i) be developed in accordance with the Department of Transport and Main Roads (DTMR) *Guide to Traffic Impact Assessment, 2017*²³.
- (ii) be prepared in accordance with the Draft Environmental Impact Statement supplement Attachment A Individual Responses to Submissions – item 23 DTMR Submission, in particular the following:
 - (A) Issue 23.005 recalculate the pavement impacts based on confirmed estimates of the Carmichael Coal Mine and Rail Project.
 - (B) Issue 23.006 use appropriate growth rates, taking into account changes in traffic volumes on all affected state-controlled roads. Consideration must also be given to with and without Carmichael Coal Mine and Rail Project development scenarios, which is expected to influence traffic growth rates.
 - (C) Issue 23.009 assessment of pavement impacts is to reflect a pavement assessment horizon for the life the project, commencing at year of opening of each stage including the final stage and for a period of twenty (20) years after opening the final stage.
 - (D) Issue 23.010 the project will result in the increase of heavy vehicles on the state-controlled road network. As a result, the TIA is to include a safety assessment undertaken in accordance with the Guide to Traffic Impact Assessment.
- (iii) demonstrate adequate community consultation has been conducted, especially for the proposed heavy vehicle haulage routes.
- (iv) be based on a DTMR endorsed traffic impact assessment scope and development profile.
- (v) clearly indicate where detailed estimates are not available and document the assumptions and methodologies that have been previously agreed in writing with DTMR, prior to TIA finalisation.
- (vi) assess the impacts to rail open level crossings using the Australian Level Crossing Assessment Model (ALCAM)
- (vii) include a completed DTMR 'Transport Generation proforma'²⁴ consolidating project-related traffic generation information or as otherwise agreed in writing with DTMR.
- (viii) undertake a Pavement Impact Assessment in accordance with the *Guide to Traffic Impact Assessment 2017*.
- (ix) detail the final impact mitigation proposals, whether these are works, contributions to road works/maintenance or road-use management strategies.
- (x) include concept design drawings for all intersections and/or links that require upgrading.
- (xi) provide confirmation that all proposed mitigation works have been designed and will be undertaken in accordance with all relevant DTMR standards, manuals and practices²⁵.

²³ Available at <http://www.tmr.qld.gov.au/business-industry/Technical-standards-publications.aspx>

²⁴ Available from Transport System Management Section, Brisbane. (email:MDP@tmr.qld.gov.au)

²⁵ Available at <https://www.tmr.qld.gov.au/business-industry/Technical-standards-publications.aspx>

- (d) The proponent must prepare a road-use management plan (RUMP) that covers all stages of the project. The RUMP must:
- (i) be developed in accordance with DTMR's *Guide to Preparing a Road-use Management Plan* with a view to also optimising project logistics and minimising road-based trips on all state-controlled and local roads
 - (ii) detail the non-infrastructure impact mitigation strategies proposed, such as designated heavy vehicle haulage routes to minimise road safety and pavement impacts
 - (iii) include a table of RMP mitigation commitments, detailing responsibilities for actions along with protocols to ensure the mitigation commitments are complied with
 - (iv) be provided to DTMR Northern District office no later than three (3) months prior to the commencement of significant project-related construction traffic, or as otherwise agreed between the proponent and DTMR.
- (e) The proponent must, prior to the commencement of any significant project-related construction traffic undertake any required works and other impact mitigation strategies as required by the TIA. These must be in accordance with latest relevant DTMR and Local Government Authority policies and standards at the time of approval or agreement, prior to commencement of significant construction works unless otherwise agreed to in writing by DTMR and/or Council. Works may include the upgrade of any necessary intersection/ accesses/ links in state-controlled and/or LGA road reserves, in accordance with the current DTMR and/or LGA road planning and design policies, principles and manuals, unless otherwise agreed in writing with the Northern District DTMR office.
- (f) Prior to the commencement of significant project-related construction traffic, the proponent must complete the required works/ make contributions towards works as required, unless otherwise agreed in writing with the affected DTMR office (Northern District and/or Mackay/Whitsunday).

The Department of Transport and Main Roads is designated as the agency responsible for this recommendation.

Definitions

'**minimise**' is to reduce to the smallest possible amount or degree.

'**Significant project-related construction traffic**' means an increase in project traffic equal to or greater than 5% in either traffic numbers (AADT) or standard axle repetitions (SARs), as outlined in the GTIA and/or traffic that has the potential to impact on community amenity. In particular, heavy vehicles associated with construction and/or operational haulage.

Recommendation 3. Infrastructure agreements

The outcome sought by this recommendation is ensure that infrastructure agreements are prepared and undertaken in accordance with the Department of Transport and Main Roads (DTMR) requirements.

- (a) To formalise arrangements about transport infrastructure works, contributions and road-use management strategies detailed and required under the approved Traffic Impact Assessment (TIA) and road-use management plan (RUMP), the proponent may enter into an infrastructure agreement with DTMR.
- (b) The infrastructure agreement should identify the following:
 - (i) project-specific works and contributions required to upgrade impacted road infrastructure and vehicular access to project sites as a result of the proponent's use of state-controlled and local roads by project traffic

- (ii) project-specific contributions towards the cost of maintenance and rehabilitation, to mitigate road or pavement impacts on state-controlled and local road infrastructure
 - (iii) infrastructure works and contributions associated with shared (cumulative) use of state-controlled and local road infrastructure by other projects subject to an environmental impact statement, if applicable
 - (iv) development of performance criteria to ensure that in the event the project details, traffic volumes and/impacts change, that consultation for reviewing and updating project-related traffic assessments and mitigation measures is to occur. The updated traffic assessment must be based on revised traffic volumes and impacts and is to ensure that any changes are adequately managed and addressed.
 - (v) the proponent's undertaking to fulfil all commitments as detailed in the 'Table of RUMP commitments'.
- (c) Any infrastructure agreement between the proponent and DTMR should be concluded three (3) months prior to commencement of construction of the project, or as otherwise agreed in writing between the proponent and DTMR.

DTMR is designated as the agency responsible for this recommendation.

Recommendation 4. Permits approvals and traffic management plans

The outcome of this recommendation is to ensure efficient processing of the project's required transport-related permits and approvals.

- (a) The proponent should, no later than three (3) months, or such other period agreed in writing with Department of Transport and Main Roads (DTMR), prior to the commencement of significant construction works or project-related traffic:
 - (i) submit detailed drawings of any works required to mitigate the impacts of project-related traffic for DTMR to review and approve, ensuring sufficient time is allowed to construct required works prior to the commencement of project traffic
 - (ii) obtain all relevant licences and permits required under the *Transport Infrastructure Act 1994* for works within the state-controlled road corridor (s33 for road works approval, s62 for approval of location of vehicular accesses to state roads and s50 for any structures or activities to be located or carried out in a state-controlled road corridor)
 - (iii) prepare a heavy vehicle haulage management plan for any excess mass or over-dimensional loads for all phases of the project in consultation with DTMR's Heavy Vehicles Road Operation Program Office, the Queensland Police Service and Council
 - (iv) prepare traffic management plan/s (TMP) as required by the Northern District office and Council if required. The TMP must be prepared and implemented during the construction and commissioning of each site where road works are to be undertaken, including site access points, road intersections or other works undertaken in the state-controlled road corridor.

DTMR is designated as the agency responsible for this recommendation.

Recommendation 5. Consultation with local community regarding project airstrip

The outcome sought by this recommendation is that the proponent engages with the community and Isaac Regional Council (IRC) regarding the proposed location, design and operation of the airstrip to ensure air traffic does not adversely impact land use activities currently undertaken on adjoining land.

- (a) The proponent must to consult with the community and IRC regarding the proposed location, design and operation of the project airstrip at least three (3) months prior to any airstrip construction activities commencing

- (b) The consultation outcomes must be included in the community and stakeholder engagement plan required by Condition 1, Schedule 4, Appendix 1 of this report.

The Coordinator-General is designated as the agency responsible for this recommendation.

Schedule 3. Groundwater

Recommendation 6. Make good agreements with registered groundwater users

The outcome sought by this recommendation is to adequately address the project's potential impacts on registered groundwater users.

- (a) That the authority responsible for administering the *Water Act 2000* ensure the associated water licence for the project requires the proponent to enter into make good agreements with landholders that have registered groundwater bores which may be potentially affected by the project, in accordance with the provisions in Chapter 3, Part 5 of the *Water Act 2000*.

Department of Natural Resources, Mines and Energy is designated as the agency responsible for this recommendation.

Recommendation 7. Regional water balance model

The outcome sought by this recommendation is to develop and maintain a numerical regional water balance model to address potential cumulative impacts on water resources in the Belyando-Suttor sub-catchment and the groundwater aquifers of the eastern part of the Galilee Basin.

- (a) That the authority responsible for administering the *Water Act 2000* ensure the development and maintenance of a numerical regional water balance model for the Galilee Basin. The regional water balance model should:
- (i) include the identification of linkages between hydrogeological formations, the likely extent of aquifer connectivity and groundwater/surface water interactions, and characteristics of aquifer recharge
 - (ii) have regard to baseline monitoring and site water balance model data provided by project proponents
 - (iii) have regard to relevant key deliverables expected from the Australian Government's Bioregional Assessment for the Galilee Basin subregion of the Lake Eyre Basin
 - (iv) determine potential impacts on groundwater resources in the eastern Galilee Basin
 - (v) determine potential impacts on surface water flow conditions, environmental values and existing surface water users
 - (vi) make results publicly available on the administering authority's website.

Department of Natural Resources, Mines and Energy is designated as the agency responsible for this recommendation.

Recommendation 8. Regional groundwater and surface water monitoring and assessment program

The outcome sought by this recommendation is to develop an ongoing regional groundwater and surface water monitoring and assessment program to address potential cumulative impacts on water resources in the Belyando-Suttor sub-catchment and the groundwater aquifers of the eastern part of the Galilee Basin.

- (a) That the authority responsible for administering the *Water Act 2000*, in consultation with the Department of Environment and Science (DES) and Galilee Basin mine proponents,

ensure the development of an ongoing regional groundwater and surface water monitoring and assessment program with reference to existing water users and the maintenance of environmental values. The monitoring and assessment program should:

- (i) establish a protocol with coal mine and coal seam gas proponents for delivery of surface water and groundwater monitoring data recorded by proponents in accordance with environmental authority and Coordinator-General requirements
- (ii) collate surface water and groundwater monitoring data that will inform the development of the regional water balance model referred to in Recommendation 7, of this Appendix
- (iii) have regard to relevant key deliverables expected from the Australian Government's Bioregional Assessment for the Galilee Basin
- (iv) based on data provided, impact assessment reports prepared by proponents, and the use of the model results referred to in Schedule 7, Appendix 1, produce a risk-based assessment of regional cumulative impacts, including impacts on existing water users, potential habitat loss and impacts on ecological systems. Regional cumulative impacts should include the impacts of proposed mining projects, including but not limited to:
 - (A) open-cut and underground mining operations
 - (B) mine dewatering
 - (C) mine waste management
 - (D) stream diversions and flood levees
 - (E) subsidence.
- (v) report on the outcomes of the Galilee Basin coal mine and coal seam gas proponents' water management measures to inform the ongoing adaptive management of water resources in the region
- (vi) periodically publish any relevant data and reports with reference to monitoring and assessment program outcomes.

Department of Natural Resources, Mines and Energy is designated as the agency responsible for this recommendation.

Definitions

'**mine dewatering**' is pumping out groundwater that has seeped into the open-cut pit or underground longwall mine.

Appendix 5. Proponent commitments

This appendix includes commitments or management measures described in the EIS. The relevant section of the EIS and/or AEIS is included in the table for reference. I expect the proponent to implement all commitments, management measures or corrective actions listed below and detailed in the EIS.

Commitment number	Proponent commitment	EIS/AEIS reference
General		
1.	The proponent will extract coal at a rate of up to 55 million tonnes per annum of Run of Mine coal over a mine life in the order of 50 years.	EIS Section 1.2
2.	The proponent will undertake longwall and open-cut mining operations in accordance with this EIS.	EIS Section 1.2
3.	The project will comply with all application legislation, policies and Australian Standards relevant to the project as discussed in Section 2 and Attachment 2-1. This includes obtaining all necessary secondary approvals as summarised in Section 2.3.	EIS Section 2 and Attachment 2-1
Consultation		
4.	EIS feedback consultation will be held with stakeholders during the EIS public exhibition period.	EIS Section 3.8
5.	Prior to the commencement of construction, the proponent will develop a comprehensive Stakeholder Communication Strategy. The strategy will include developing and maintaining strategic partnerships and actively collaborating with government and Adani Mining Pty Ltd and Carmichael Rail Network Pty Ltd (Adani) to ensure a coordinated approach to infrastructure upgrades and delivery.	EIS Section 3.8
Land use		
6.	The proponent will liaise with the Department of Natural Resources and Mines, the Isaac Regional Council and affected landowners in relation to the management and possible realignment of the stock route (U398), as necessary.	EIS Section 5.4.4
7.	The proponent will negotiate an agreement with the Wangan and Jagalingou People, as the registered Native Title claimants, in accordance with the requirements of the <i>Native Title Act 1993</i> (Commonwealth).	EIS Section 5.4.5
8.	The proponent will liaise with the Department of Natural Resources and Mines, the Isaac Regional Council and affected landowners in relation to the management of possible realignment of the stock route that traverses the project area. This consultation will occur prior to commencing construction.	AEIS Attachment A, Issue 11.003
9.	A search of historical petroleum and coal exploration boreholes will be conducted to identify and seal boreholes prior to the construction of the underground mines.	AEIS Attachment A, Issue 41.006
Subsidence		
10.	Subsidence management plans will be prepared throughout the life of the project in accordance with Department of Environment and Science requirements. The plans will be authorised under the conditions of the Environmental Authority and are required to be prepared prior to the	EIS Section 6.4

Commitment number	Proponent commitment	EIS/AEIS reference
	commencement of longwall mining that will result in subsidence. The plans will form the basis for all operational management activities related to the mitigation and management of subsidence impacts.	
Tailings and Power Station Waste Storage Facilities		
11.	The Tailings Storage Facility (TSF) and Power Station Waste Storage Facility (PSWSF) will be constructed to be geotechnically stable landforms.	EIS Section 7.3.5
12.	Surface run-off and any seepage from the TSF and PSWSF will be monitored to confirm run-off and leachate water quality. In particular, water samples will be taken on a quarterly basis from the Return Water Dam, TSF decant pond, PSWSF run-off collection sumps and TSF/PSWSF seepage collection sumps.	EIS Section 7.3.5
13.	The TSF and PSWSF foundation will be inspected and suitable preparation measures taken to provide a low permeability foundation.	EIS Section 7.4.3
14.	A seepage collection system will be installed along the downstream toe of the TSF embankment and along the downstream toe of the external PSWSF slope to collect and contain any water seeping from the TSF and PSWSF. The seepage drain will be lined with geo-fabric material.	EIS Section 7.4.3
15.	Rehabilitation of available areas of the TSF embankment and PSWSF will be undertaken progressively throughout the mine life and will be an integral part of the development and operation of the facilities. Rehabilitation of the TSF and PSWSF will involve construction of the landform, provision of capping and topsoil layers, and seeding. A self-sustaining native ecosystem will be established on the storage facilities.	EIS Section 7.4.5
16.	A benign capping material (soil or suitable subsoil) will be placed over the final surface of the tailings and power station waste storage facilities, followed by a layer of topsoil. This will ensure successful revegetation of the waste storage facilities and a stable final landform.	EIS Section 7.4.5
17.	Monitoring programs will be implemented for the TSF and PSWSF to monitor key environmental and design performance indicators. The results of the monitoring will be used to assess the performance of the TSF and PSWSF and to undertake regular reviews of the design and operating plans.	EIS Section 7.5
18.	Monitoring of the consolidation of the deposited tailings will be undertaken and included in the TSF design plan.	AEIS Attachment A, Issue 24.015
19.	The conceptual design of the final surface of the TSF plateau will include an internal drain with capacity to convey run-off from the Probable Maximum Precipitation to natural ground at the northern end of the TSF.	AEIS Attachment A, Issue 24.016
20.	The PSWSF final landform will be integrated with the TSF final landform so that the plateau area of the PSWSF is at the same level and contiguous with the TSF plateau.	AEIS Attachment A, Issue 24.016

Commitment number	Proponent commitment	EIS/AEIS reference
Rehabilitation		
21.	Topsoil will be stripped and stockpiled ahead of open-cut mining and construction of infrastructure and managed in accordance with a topsoil management plan that will be prepared for the project. The plan will include the measures outlined in Section 8.5.3. of the EIS	EIS Section 8.5.3
22.	Rehabilitation will be conducted in accordance with a rehabilitation management plan (RMP) that will be developed for the project. The RMP will include detailed rehabilitation designs and procedures in accordance with the strategies outlined in the EIS. The RMP will also including monitoring and maintenance programs for site rehabilitation, including monitoring of revegetation and erosion. Maintenance works will be undertaken as necessary on the basis of monitoring results.	EIS Section 8.2.4
23.	Mine closure will be conducted in accordance with a Mine Closure Plan (MCP) that will be developed for the project. The MCP will be prepared to provide guidance on mine closure activities and will include: rehabilitation goals; an overview of closure and rehabilitation activities; performance criteria; and monitoring and reporting.	EIS Section 8.2.5
24.	Coarse coal reject material and power station waste that will be stored within the overburden emplacements are not a suitable growth medium for revegetation. These materials will be buried within the overburden with a minimum 2 m cover and will not be present at the surface of the final landform.	EIS Section 8.2.1
25.	Subsidence will not alter the land suitability for grazing and subsided areas will be able to continue to be used for grazing post-mining.	EIS Section 8.4.1
26.	Mine infrastructure areas will be rehabilitated as part of mine closure and restored to their pre-mining land suitability, where possible. Management measures will be put in place to ensure that the suitability of land for grazing is unchanged.	EIS Section 8.4.1
Flora and fauna, including matters of national environmental significance		
27.	Clearing procedures will be implemented to minimise clearing impacts and unnecessary disturbance to native vegetation. Particular care will be taken in relation to any work in or adjacent to drainage lines.	EIS Sections 9.7.2, 10.7.2 and 11.8.2
28.	Pre-clearing surveys will be undertaken ahead of clearing, to limit fauna injury and mortality and to identify habitat features to be relocated.	EIS Sections 9.7.2 and 11.8.2
29.	A spotter catcher, in possession of relevant permits under the <i>Nature Conservation Act 1992</i> (NC Act), will be present during clearing and to rescue any animals still remaining in the clearing area following the pre-clearing surveys.	EIS Sections 9.7.2 and 11.8.2
30.	Areas of native vegetation in the project area, outside of the footprint of the open-cut mining and the mine infrastructure area, will be managed to conserve and enhance their conservation values.	EIS Sections 9.7.2 and 11.8.2
31.	The proponent will provide fauna watering points in areas that currently do not contain water in the dry season. These water sources will include cattle troughs, and areas of aquatic habitat created through excavating pools to provide a deeper reservoir of water. Such watering points will be fenced to prevent access by cattle.	EIS Sections 9.7.2, 10.7.2 and 11.8.2

Commitment number	Proponent commitment	EIS/AEIS reference
32.	A biodiversity management plan will be prepared for the project. It will include measures to conserve and enhance the conservation value of areas of native vegetation that will be retained in the project area as well as vegetation and threatened species monitoring.	EIS Sections 9.7.3 and 11.8.1
33.	A feral animal and weed management plan will be developed and implemented for the site in accordance with the provisions of the <i>Land Protection (Pest and Stock Route Management Act) 2002</i> .	EIS Sections 9.7.3 and 11.8.3
34.	A Species Management Program will be developed and implemented for the project in accordance with the requirements of the NC Act.	EIS Sections 9.7.3 and 11.8.3
35.	Speed limits along internal roads, appropriate signage and careful driving policies will be put in place to increase the awareness of drivers and decrease the risk of vehicles striking fauna.	EIS Sections 9.6.5 and 11.7.5
36.	Biodiversity offsets will be obtained for significant, residual impacts on matters of national environmental significance and matters of state environmental significance.	EIS Sections 9.8, 10.8 and 11.9
37.	The following actions will be undertaken in relation to the northern seasonal wetland prior to any subsidence of the wetland: <ul style="list-style-type: none"> • Undertake detailed ground survey of the wetland prior to subsidence; • Undertake a detailed review of potential impacts on the wetland, making use of subsidence predictions based on the detailed mine plan; • Design any necessary drainage works, such as drains or levees, in order to reduce potential impacts on the wetland; and • Determine offset requirements if significant, residual impacts on the wetland are predicted. 	EIS Section 10.6.3
38.	The following available guidelines and codes will be reviewed, where relevant, as part of the detailed design of any works in waterways: <ul style="list-style-type: none"> • <i>Guide for the Determination of Waterways using the Spatial Data Layer Queensland Waterways for Waterway Barrier Works</i> (DAFF 2013); and • <i>Fisheries Guidelines for Fish Habitat Buffer Zones</i> (Bavins et al. 2000). 	EIS Section 10.7.2
39.	The proponent will consult with DAF, as necessary, in relation to construction in drainage lines that could impact fish habitat or fish passage.	EIS Section 10.7.2
40.	Consultation will be undertaken with the DAF prior to the commencement of construction to confirm whether there are any forest products or quarry materials authorised under the Forestry Act on the project area. In the event these are identified, the DAF will be provided the opportunity to harvest forest products.	EIS Section 2, Attachment 2-1
41.	The assessment of impacts on the Northern Seasonal Wetland (based on detailed mine planning (informed by further exploration work) and subsidence predictions) that was proposed in the draft EIS will be described in the Plan of Operations for the relevant area.	AEIS Attachment A, Issue 24.013
42.	As per the requirements of the EPBC Act Offset Policy, the offset management plan will describe contingency measures to manage the risk of the offset not succeeding.	AEIS Attachment A, Issue 42.007

Commitment number	Proponent commitment	EIS/AEIS reference
43.	Detailed field surveys will be undertaken of the project site and oddest properties as part of the development of the offset management plan. This will include an assessment of habitat condition for the purpose of confirming offset area calculations.	AEIS Attachment A, Issue 12.009
Groundwater		
44.	Any impacts on private bores within the project area will be managed through land access agreements with landholders.	EIS Section 12.4.8
45.	The groundwater monitoring program established as part of EIS groundwater investigations will be continued throughout the life of the project.	EIS Section 12.5
46.	The proponent will consult with the Department of Natural Resources and Mines and Energy (DNRME) in relation to its obligations under the <i>Water Act 2000</i> and will comply with the relevant requirements for groundwater take.	EIS Section 12.6
47.	Where the project is predicted to contribute to cumulative water supply bore impacts, the proponent will liaise with Adani to negotiate make good agreements, proportionate to the predicted project contribution to any impacts.	AEIS Section 5.3
Surface water		
48.	Site drainage infrastructure will be designed in accordance with relevant engineering guidelines and standards.	EIS Section 13.4.1
49.	The highwall drains and the northern and southern drainage corridors will remain in place after mine closure and are designed to ensure they will remain stable in the long term.	EIS Sections 13.3.5 and 13.4.1
50.	An Erosion and Sediment Control Plan (ESCP) will be prepared for the project prior to commencement of construction to address erosion and the control of suspended sediment.	EIS Sections 13.3.4 and 13.6.1
51.	Sediment control structures will be managed in accordance with an ESCP. The ESCP will include an inspection plan for sediment control structures to ensure they are maintained and remain effective.	EIS Section 13.5.6
52.	The proponent will undertake remedial drainage earthworks to re-establish free drainage in areas where subsidence will cause surface ponding.	EIS Section 13.6.4
53.	Controlled release of any excess mine-affected water will be in accordance with DES Model Mining Conditions. Controlled releases will be necessary following extended wet periods where accumulated run-off in the open-cut pits exceeds the site pit water storage capacity.	EIS Sections 13.4 and 13.5.3
54.	Culverts will be designed so that the road and rail have flood protection from the 50 year Average Recurrence Interval flood event in the southern drainage corridor. Detailed design of culverts will be undertaken during detailed design.	EIS Sections 13.4.2 and 13.6.3
55.	All dams will be designed and constructed in accordance with relevant design standards and licence requirements, including standards defined in the <i>Water Act 2000</i> .	EIS Section 13.5.3
56.	A detailed consequence category assessment will be conducted at the detailed design stage to confirm whether any of the mine water dams will be regulated dams under the <i>Environmental Protection Act 1994</i> (EP Act)	EIS Section 13.5.3

Commitment number	Proponent commitment	EIS/AEIS reference
57.	If necessary, a small earth bund will be constructed at the northern end of the topsoil stockpile area to prevent erosion of any stockpiled topsoil in this area during flooding.	EIS Section 13.6.3
58.	Erosion protection and energy dissipation measures for the drainage features downstream of the northern highwall drain will be considered during detailed design.	EIS Section 13.6.3
59.	The southern drainage corridor will be monitored for erosion after flow events and erosion control measures will be installed, if necessary.	EIS Section 13.6.3
60.	Subsidence of drainage gullies will be monitored to identify any erosion or instability. Remedial stabilisation will be undertaken where necessary. All monitoring and remediation will be undertaken in accordance with the subsidence management plan.	EIS Section 13.6.4, Appendix B – <i>Draft Subsidence Management Plan</i>
61.	The water management system will be monitored monthly and managed in accordance with a site water management plan.	EIS Section 13.5.6
62.	Quarterly monitoring of water levels and quality (pH and EC) will be undertaken in mine water storage dams including the Return Water Dam, Mine Water Dam and intermediate pit water dams, and the Industrial Area Dam and associated infrastructure area catch dams.	EIS Section 13.5.6
63.	Annual water monitoring will be undertaken in mine water storage dams including the Return Water Dam, Mine Water Dam and intermediate pit water dams, and the Industrial Area Dam and associated infrastructure area catch dams, for a comprehensive suite of water quality parameters, including metals and metalloids.	EIS Section 13.5.6
64.	Implement a baseline water quality and flow monitoring program for the purpose of calculating receiving water flow criteria in North Creek and informing the REMP baseline and objectives.	AEIS Attachment A, Issue 24.019 and 24.020, and Attachment E Section 2
Air quality and greenhouse gas (GHG)		
65.	The proponent will consult with the relevant property owner and Adani, as the proponent of the Carmichael Coal Mine and Rail Project (CCM&RP), in relation to the management of any adverse cumulative impacts on sensitive receptors where the <i>Environmental Protection (Air) Policy 2008</i> objectives are predicted to be exceeded.	EIS Section 15.8.11

Commitment number	Proponent commitment	EIS/AEIS reference
66.	<p>The following measures will be implemented to control and manage dust emissions and minimise the potential air quality impacts of the project:</p> <ul style="list-style-type: none"> • Haul roads will be watered to minimise dust emissions; • Progressive rehabilitation will be conducted on the open-cut mine overburden emplacement areas; • Inactive disturbed areas will be rehabilitated as soon as possible; • Electrostatic precipitators will be installed on the power station to minimise emissions of particulate matter; and • Compliance with the relevant requirement of the Aurizon Coal Dust Management Plan at the train loading facility including the use of coal wagon veneering systems. 	EIS Sections 15.8.12 and 24.4.6
67.	<p>A complaints handling procedure will be implemented for the project. The procedure will include the investigation of any complaints in relation to air quality impacts. These investigations would include air quality monitoring, if necessary.</p>	EIS Section 15.8.12
68.	<p>The proponent will report yearly on GHG emissions, energy production and consumption in accordance with the <i>National Greenhouse and Energy Reporting Act 2007</i>.</p>	EIS Section 2, Attachment 2-1
69.	<p>The proponent will consider the following initiatives that may mitigate, reduce, control or manage GHG emissions through energy efficiency including:</p> <ul style="list-style-type: none"> • Regular assessment, review and evaluation of greenhouse gas reduction opportunities; • Procurement policies that require the selection of energy-efficient equipment and vehicles; • Monitoring and maintenance of equipment in accordance with manufacturer recommendations; • Optimisation of diesel consumption through logistics analysis and planning; and • Progressive rehabilitation of land areas to manage and limit the cumulative loss of carbon storage associated with land clearing. 	EIS Sections 15.9.2 and 24.4.6
70.	<p>The proponent will implement the Greenhouse Gas initiatives detailed in Section 15.9.2 of the draft EIS.</p>	AEIS Section 5.3
Noise and vibration		
71.	<p>Aircraft movements would be scheduled during the day and early evening where possible and aircraft flight-paths would be selected to minimise noise impact to receptors.</p>	EIS Section 16.6.7
72.	<p>A complaints handling procedure will be implemented for the project. The procedure will involve the investigation of any complaints in relation to noise and blast impacts. These investigations would include noise and blast impact monitoring, if necessary.</p>	EIS Section 16.7
Visual amenity		

Commitment number	Proponent commitment	EIS/AEIS reference
73.	<p>The following mitigation measures will minimise the visual and lighting impacts of the project:</p> <ul style="list-style-type: none"> • Progressive rehabilitation and revegetation of overburden emplacement areas to minimise the visual effect; • Use of neutral tones in the cladding of infrastructure to blend with the surrounding environment; and • Design of external lighting to minimise off-site impacts. 	EIS Section 17.4
Socio-economic impacts		
74.	The social impact assessment, including the social baseline, impacts and management measures, will be reviewed twelve months prior to the commencement of construction.	AEIS Attachment G, Issues 2 and 16
75.	The proponent will reassess the social baseline and impacts five years prior to the end of the first 20 years of the project.	Appendix N Section 3.5.1
76.	<p>Any required social impact management plans will be developed twelve months prior to the commencement of construction. At this stage, it is anticipated that the following management plans will be prepared:</p> <ul style="list-style-type: none"> • Workforce Management Plan • Housing and Accommodation Management Plan • Health and Community Wellbeing Management Plan • Local Business and Industry Content Plan • Cumulative Impact Management Plan. 	AEIS Attachment G, Issues 12 and 16
77.	Social impact management plans prepared for the construction phase will be reviewed and revised, as necessary, for the operation phase. This will occur at least twelve months prior to the completion of the construction phase.	AEIS Attachment H, Section 2.2.2
78.	The proponent is committed to engaging with interested and affected stakeholders including local communities, industry organisations, LGAs and state government departments during preconstruction, construction and early works, and operations.	AEIS Attachment H, Section 3.1
79.	The proponent will prepare a Landholder Engagement Protocol for the project 1 month prior to the granting of the mining lease. The protocol will be provided to the landholders and placed on the company website.	AEIS Attachment H, Section 3.4.4
80.	Prior to the commencement of the construction phase, the proponent will update the existing project labour study (Appendix D of Appendix N of the EIS).	EIS Section 18.7.1
81.	The proponent will engage at regular intervals with the state government regarding project labour sourcing strategies and associated workforce numbers.	EIS Appendix N Subsection 6.8.3
82.	The proponent will develop a project Recruitment Plan in consultation with the Queensland Department of Education and Training (DET) and the Federal Department of Employment, prior to the commencement of construction.	EIS Section 18.7.1

Commitment number	Proponent commitment	EIS/AEIS reference
83.	The proponent is committed to considering recruitment from nearby regional centres including Clermont and Charters Towers	EIS Appendix N Subsection 4.4.1
84.	The proponent will re-evaluate the feasibility of bus-in/bus-out and, in the long term, FIFO out of Charters Towers in order to increase the employment opportunities for residents of the Local Area, if feasible.	EIS Section 18.7.1
85.	The proponent will investigate the option of an off-site office in Charters Towers or Townsville, for administrative and community operations. This office would enable greater participation in the project by individuals with health or lifestyle conditions that limit their capacity to undertake FIFO work, e.g. persons with a disability.	EIS Appendix N Subsection 6.3.6
86.	The Training and Skilling Strategy will be reviewed throughout the construction phase and for the first five years of operations to ensure the strategy continues to respond to the labour demands of the project and any changes in the local and regional labour market.	AEIS Attachment H, Section 2.3.4
87.	The proponent is committed to the direct provision of, and investment in, education and training opportunities within the Local Area, particularly Charters Towers LGA.	Appendix N Section 6.3.5
88.	The proponent will keep local governments in the home base locations informed of project labour sourcing strategies and associated workforce numbers through regular face-to-face engagement.	EIS Section 18.7.1
89.	Where significant project-induced permanent resident population growth is identified, the proponent will support the affected local government in responding to any demand generated by the population.	EIS Section 18.7.1
90.	The proponent will keep the state government, CTRC and the IRC informed of the size of the non-resident worker population associated with the project.	EIS Section 18.7.1
91.	<p>The workforce accommodation facility for project operations will include the following design elements to support positive employee health and wellbeing during shift roster periods:</p> <ul style="list-style-type: none"> • High-speed internet connection in accommodation units to enable video calling; • Sports areas and gym equipment to encourage healthy activities; • Communal courtyards between accommodation units to encourage socialisation; • A nurse-led health centre with tele-health facilities; and <p>Notice boards for advertising online support networks (e-support), village activities and visiting specialists.</p>	EIS Appendix N Subsection 6.4.2
92.	The proponent will develop a Local Industry Participation Strategy prior to the commencement of construction, which will address the <i>Queensland Resource and Energy Sector Code of Practice for Local Content</i> and include the proponent's Australian Industry Participation Plan and proposed Local Content Plan.	EIS Section 18.7.1
93.	The proponent will develop a Project Servicing Strategy for the commencement of the construction phase. The Project Servicing Strategy will apply to all phases of the project.	EIS Appendix N Subsection 7.5.1

Commitment number	Proponent commitment	EIS/AEIS reference
94.	<p>The proponent will develop an Indigenous Participation Plan (IPP) for the project prior to the commencement of construction. The IPP will articulate the proponent's commitments to supporting Indigenous employment on the project and the creation of Indigenous small business opportunities. These commitments include:</p> <ul style="list-style-type: none"> • A dedicated Indigenous liaison role for the project; • Continuing to work with Traditional Owners and Indigenous groups to further develop Indigenous business and employment opportunities; • Engaging with Indigenous employment agencies such as Jenagar and Myuma, and state agencies such as the Department of Aboriginal and Torres Strait Islander Partnerships (DATSIP) to coordinate the provision of employment opportunities for Indigenous persons in the region, including the provision of structured training programs; • Providing culturally appropriate employment opportunities and supporting and implementing initiatives to assist Indigenous persons to be employed by the proponent or project contractors; and <p>Aiming to achieve Indigenous representation on the project matching Indigenous representation in the wider Australian population.</p>	EIS Section 18.7.1
95.	<p>The Indigenous Participation Strategy will be reviewed and updated twelve months prior to the commencement of the operation phase.</p>	AEIS Attachment H, Section 2.3.4
96.	<p>The proponent will establish an Employee Wellbeing Plan prior to the commencement of construction, which may include:</p> <ul style="list-style-type: none"> • The inclusion of a comprehensive discussion of FIFO lifestyle management in the induction programs for all employees; • Provision to all employees, the Guide for Long Distance Commuting (FIFO/DIDO) Workers developed by the QRC; • Mental health and isolation adjustment support for all employees for their first year of employment; • Engagement with FIFO families to establish a project FIFO Families group within the identified home base locations; and <p>The establishment of an on-site activities calendar to enhance social network building among the workforce.</p>	EIS Section 18.7.1
97.	<p>The proponent will prepare a Fitness for Work (FFW) Plan incorporating Fatigue Management Procedure as a component of a Workforce Code of Conduct. The FFW - Fatigue Management Procedure will be applicable to all employees and visitors associated with the project.</p>	EIS Appendix N Subsection 6.4.2
98.	<p>The proponent will develop a FFW – Drug and Alcohol Procedure as a component of the Workforce Code of Conduct. The proponent will apply a rigorous drug and alcohol procedure across the construction and operations phase workforces, which will involve entry tests, random drug and alcohol sampling and fitness for work drug and alcohol sampling. The appointed lead CEW contractor will also be responsible for ensuring employee contractor compliance with this policy during this project phase.</p>	EIS Appendix N Subsection 6.4.2
99.	<p>Mental health and isolation adjustment support will be provided for employee families as well as employees.</p>	AEIS Section 5.3

Commitment number	Proponent commitment	EIS/AEIS reference
100.	The proponent will engage with the Charters Towers Regional Council (CTRC) in relation to the provision of support (financial and/or in-kind) to assist the CTCRC with the development of infrastructure that enables the Charters Towers Local Government Area to capitalise on the opportunities presented by the proximity of the project and the project's supply chain routes.	EIS Section 18.7.1
101.	The proponent will conduct ongoing consultation with Queensland Health regarding medical services provision and project demand on health services in the region.	EIS Appendix N Subsection 6.4.2
102.	The proponent will provide a one-off donation of a heavy vehicle rescue kit to Queensland Fire and Emergency Services in Charters Towers to improve local emergency service response to incidents.	EIS Sections 18.7.1 and 22.6.5
103.	The proponent will register the airstrip with the Royal Flying Doctor Service.	EIS Appendix N Subsection 6.4.2
104.	The proponent is committed to supporting the participation of the operations phase workforce in volunteer roles across the surrounding area, where feasible. Employee policies that enable emergency services personnel to be released from duties to attend emergency calls and to perform crucial volunteer actions e.g. assist with the rural bushfire service will be developed for all phases of the project.	EIS Appendix N Subsection 6.6.9
105.	The proponent will coordinate project infrastructure upgrades, including communication infrastructure upgrades, with local emergency services and Adani to enable cost-effective expansion of emergency service communications along the Gregory Developmental Road.	EIS Sections 18.7.1 and 22.6.5
106.	The proponent will engage with Adani in relation to the proponent's participation in the Emergency Services Consultative Committee for the CCM&RP and the coordination of emergency response and sharing of resources, where appropriate.	EIS Sections 18.7.1 and 22.6.5
107.	The proponent will consult with the Isaac Regional Council, CTCRC, Department of Transport and Main Roads (TMR), Queensland Police Service (QPS), Adani and the Road Accident Action Group to determine the need for any additional driver rest areas along the primary project supply routes.	EIS Sections 18.7.1 and 22.6.5
108.	The proponent will provide bus services between Emerald and the project area, and Townsville and the project area prior to the construction of the airstrip to limit the number of construction workers commuting on the regional road network.	EIS Appendix N Subsection 6.6.9
109.	The proponent will investigate the potential opportunities to support the development of social connections between residents of the accommodation village at the proposed Carmichael Coal Mine and residents at the project accommodation village. This may include scheduled social and recreational events e.g. football games, barbeques.	EIS Appendix N Subsection 6.4.2

Commitment number	Proponent commitment	EIS/AEIS reference
110.	MacMines will monitor and evaluate the effectiveness of the stakeholder consultation strategy every six months during pre-construction and annually throughout the CEW and operations phase of the project. These reports will be placed on the company website.	AEIS Attachment H, Table 7 Section 3.6.1
Traffic and transport		
111.	The proponent will obtain all relevant permits from the QPS in accordance with the relevant legislation regarding escorting and scheduling of over-dimensional loads.	EIS Section 19.2.3
112.	The proponent will provide a detailed schedule regarding the number and size of over-dimensional loads and their timing in order to facilitate QPS planning once detailed construction planning has commenced.	EIS Section 19.2.3
113.	A basic right turn treatment and a basic left turn treatment will be provided at the mine access road intersection with Moray-Carmichael Road following resolution of the access road alignment.	EIS Section 19.2.5
114.	The project's pavement rehabilitation impact will be recalculated prior to the commencement of construction based on confirmed pavement loadings associated with the CCM&RP to enable the accurate quantification of any monetary contribution towards pavement rehabilitation activities in accordance with the DTMR guideline.	EIS Sections 19.2.7 and 24.4.11
115.	The project's pavement maintenance impact will be recalculated prior to the commencement of construction based on confirmed traffic estimates from the CCM&RP Road Impact Assessment, which is required to be submitted to DTMR prior to the commencement of construction. This will enable the accurate quantification of any monetary contribution towards pavement maintenance activities in accordance with the DTMR guideline.	EIS Sections 19.2.7 and 24.4.11
116.	The proponent will continue consultation with the relevant road authorities and stakeholders including DTMR, Isaac Regional Council (IRC), CTCRC and QPS, as appropriate, during the project planning and implementation phases of the project.	EIS Section 19.2.11
117.	Consultation will be conducted with the IRC in relation to the new mine access road and the location and design of the intersection of the access road with Moray-Carmichael Road.	EIS Section 19.2.11
118.	The airstrip will be designed, constructed and operated in accordance with the Civil Aviation Safety Authority (CASA) regulations and guidelines.	EIS Section 19.5
119.	Project air traffic control will be coordinated with the airports at the workforce source locations and will also be coordinated with the CCM&RP airstrip.	EIS Sections 19.5 and 24.4.11
120.	The Road Impact Assessment (RIA) will be updated six months prior to the commencement of construction.	AEIS Attachment A, Issue 23.002
121.	The proponent's DIDO Workforce policy will be enforced through the project employment agreements.	AEIS Attachment A, Issue 23.002

Commitment number	Proponent commitment	EIS/AEIS reference
122.	A road use management plan, including a commitment to monitor project generated traffic, and an Infrastructure Agreement, will be prepared for the project, if necessary.	AEIS Attachment A, Issues 16.013 and 23.002
Cultural heritage		
123.	The proponent will negotiate a cultural heritage management plan with the Wangan and Jagalingou People. Impacts on Aboriginal cultural heritage will be managed in accordance with the cultural heritage management plan.	EIS Section 20.2.2
124.	The General Manager and all staff or contractors of the proponent who will be responsible for undertaking initial clearance and ground disturbance activities will be informed of their obligations to report to DES any archaeological items that may constitute an important source of information about an aspect of Queensland's history.	EIS Section 20.3.7
125.	A Find Strategy will be implemented in the event that any staff or contractors of the proponent suspect that they have uncovered an archaeological object that may constitute an important source of information about an aspect of Queensland's history.	EIS Section 20.3.7
126.	In the event that archaeological monitoring or excavations are required as a result of implementing the Find Strategy, the standards outlined in the <i>EHP Guideline Archaeological Investigations</i> (EHP, 2013) will be applied (or any version of the DES guidelines that may supersede this document).	EIS Section 20.3.7
Non-mining waste		
127.	The proponent will develop and implement a waste management system for the project that will be based on all relevant regulatory requirements, and the values and principles described in Section 21.2. The waste management system will be subject to a continual improvement process with the aim of identifying new opportunities for waste minimisation and addressing any new waste streams generated.	EIS Section 21.2.5
128.	The landfill will be designed and managed to dispose of general (non-regulated and non-hazardous) wastes in accordance with the <i>Queensland Government Guideline - Landfill Siting, Design, Operation and Rehabilitation, EM2319, Version 2</i> (DEHP 2013).	EIS Section 21.2.5
129.	Wastes will be collected, handled and stored so as to protect mine site staff, community health and prevent nuisance.	EIS Section 21.2.6
130.	The proponent will maintain an inventory of all waste types and quantities produced on the site and their applicable disposal method in accordance with the <i>Waste Reduction and Recycling Act 2011</i> and Environmental Protection (Waste Management) Regulation 2000.	EIS Section 21.2.8
131.	The proponent will submit annual National Pollution Inventory reports in accordance with the <i>National Pollutant Inventory Guide</i> (SEWPaC 2012) and associated manuals (e.g. <i>Emission Estimation Technique Manual for Mining</i> , SEWPaC 2012) as required.	EIS Section 21.2.8
132.	Details of areas with Notifiable Activities will be provided to DES, in accordance with legislative requirements.	EIS Section 21.3.4

Commitment number	Proponent commitment	EIS/AEIS reference
133.	The proponent will reduce the risk of land contamination from project activities through the consideration of the design, construction and operation of project facilities and post-mining rehabilitation activities. This includes the appropriate containment and handling of hazardous or contaminated substances and training of key staff in spills prevention and clean up.	EIS Section 21.3.5
Hazard and risk		
134.	The proponent will comply with the <i>Coal Mining Safety and Health Act 1999</i> and will establish appropriate health and safety systems to ensure compliance with the Act.	EIS Section 22.2 and 22.3
135.	The proponent will prepare and implement a Safety Health Management System to address the construction, operations and decommissioning phases of the project in compliance with the <i>Work Health and Safety Act 2011</i> and associated regulations.	EIS Sections 22.2 and 22.3
136.	The proponent will develop a corporate Safety and Health Policy that demonstrates a commitment to safe operations and continual improvement in safety performance.	EIS Section 22.3.2
137.	A detailed risk register will be created for the project that will identify hazards and management controls to reduce risks.	EIS Section 22.3.2
138.	A high-level integrated risk management plan will be developed for the whole life of the project including construction, operations and decommissioning phases.	EIS Section 22.3.2
139.	The proponent will develop a series of principal hazard management plans in order to manage specific hazards at the site such as bushfires and the power station.	EIS Section 22.3.2
140.	The proponent will develop and implement a bushfire management plan to address bushfire hazards and risks, and management.	EIS Section 22.3.2
141.	The proponent will develop an emergency response management plan (ERMP) to specifically address major emergencies and incidents that could impact upon surrounding land uses.	EIS Section 22.3.2
142.	The proponent will consult with key stakeholders including emergency service providers, the IRC, the CTRC, State Government and other relevant community stakeholders during the development of the Safety and Health Management System (SHMS) and key management plans such as the ERMP.	EIS Section 22.3.2
143.	All site personnel (including contractors) will undergo a comprehensive site induction and familiarisation, which will cover all aspects of the SHMS. Refresher training on the SHMS will be provided regularly to employees and contractors. Employees and contractors will also be trained in basic first aid and fire training as part of their induction and refresher training.	EIS Section 22.3.2
144.	The proponent will develop a Hazard, Defect and Incident Procedure to report any incidents, identify new hazards and to monitor conformance with the SHMS.	EIS Section 22.3.2
145.	The proponent will conduct detailed management reviews of the SHMS on a monthly basis.	EIS Section 22.3.2

Commitment number	Proponent commitment	EIS/AEIS reference
146.	A rigorous re-appraisal of hazards associated with the project will be undertaken as part of the SHMS prior to the commencement of the construction, operations and decommissioning phases of the project, based on detailed design and operating plans.	EIS Section 22.4
147.	Detailed consequence category assessment will be conducted at the detailed design stage to confirm whether any of the mine water dams will be regulated structures under the EP Act.	EIS Section 22.6.1
148.	All dams on the project area will be designed by a suitably qualified engineer and will have their consequence category reassessed on an annual basis following construction. All dams will be designed and constructed in accordance with relevant design standards and licence requirements, including standards defined in the <i>Water Act 2000</i> and will comply with the conditions of the EA. Designs will adequately address the structural integrity of containment walls during climatic extremes, including drought and flood.	EIS Section 22.6.1
149.	A detailed consequence category assessment of the TSF including full dam break analysis will be conducted at the detailed design stage to confirm the consequence category.	EIS Section 22.6.2
150.	The design, construction and operation of the mine waste storage facilities will be undertaken by appropriately qualified and experienced engineers. All facilities will comply with the conditions of the EA and other relevant design standards and licence requirements. Regular monitoring will also be undertaken which will reduce the potential risk of an unplanned or unmanaged release from the facilities.	EIS Section 22.6.2
151.	The power station will be designed, constructed and operated in accordance with all relevant legislation, standards and guidelines. It will be operated as a discrete piece of infrastructure within the mine site, with fencing and a guard house and reception to manage entry and egress. A specific principal hazard management plan will be developed for the facility as part of the SHMS that will include a detailed risk assessment based on detailed project design.	EIS Section 22.6.3
152.	The airstrip will be designed, constructed and operated in accordance with all applicable CASA legislation and regulations. An aerodrome certification will be required to be obtained once it has been constructed.	EIS Section 22.6.2
153.	The transport, storage, handling and disposal of hazardous substances or dangerous goods will be planned and managed prior to arrival on-site. Appropriate measures will be implemented in accordance with the requirements of the SHMS and all relevant legislation and guidelines.	EIS Sections 22.6.5 and 24.4.14
154.	All chemicals and proprietary substances used for the project will carry a Material Safety Data Sheet (MSDS) which will clearly state whether the substance is hazardous or non-hazardous. Where an MSDS shows a substance to be hazardous, the appropriate risk and safety phrases will be provided to ensure best practice management measures are applied.	EIS Sections 22.6.5 and 24.4.14
155.	The project will appoint a radiation safety officer to ensure industrial gauges are stored and maintained in accordance with the relevant radiation safety standard. In addition, the project will develop a Standard Operating Procedure in accordance with Section 96 c (iii) of the Coal Mining Safety and Health Regulations 2001.	EIS Section 22.6.5

Commitment number	Proponent commitment	EIS/AEIS reference
156.	The bulk explosive material would be brought to site by a licensed contractor and the blasting would be undertaken by experienced and appropriately trained explosives contractors. Explosives will be stored more than 10 km from any sensitive receptors and have been located, as much as practical, to maximise separation from other potentially hazardous activities or facilities within the project area. The proponent will comply with the <i>Explosives Act 1999</i> and will establish appropriate health and safety systems to ensure compliance with this Act.	EIS Section 22.6.5
157.	The proponent will comply with the relevant acts, standards and policies regarding the storage, transport and use of hazardous materials to ensure health and safety. These are further discussed in Section 22.6.5 of the EIS.	EIS Section 22.6.5
158.	A spill management plan will be developed as part of the ERMP, prior to construction and will provide the procedure to be followed for the containment, clean-up, investigation and reporting of any spills.	EIS Section 22.6.5
159.	Numerous risk control measures will be put in place to reduce the health and safety risks on the project area. These are discussed in Table 22.5 of the EIS.	EIS Section 22.6.5
160.	Consultation with key stakeholders will be undertaken as part of the emergency response planning, including local and regional representatives from the emergency service providers.	EIS Section 22.8
161.	The proponent will provide information to local and regional emergency service providers as it becomes relevant or available.	EIS Section 22.8
162.	The detailed design process for the accommodation village will consider the need for acoustic insulation which, if necessary, will be included in the design of the accommodation units.	AEIS Attachment A, Issue 27.008
163.	The proponent has committed to developing a bushfire management plan as part of the project's Safety and Health Management System to address bushfire hazards, risks and management. The draft model code for Bushfire Hazards will be consulted in the development of this plan.	AEIS Attachment A, Issue 16.001a
164.	A site assessment will be conducted as part of the development of the bushfire management plan, if necessary, to determine the level of bushfire risk at the project area.	AEIS, Attachment A, Issue 16.001c
165.	In addition to addressing major on-site emergencies and incidents that could impact on surrounding land uses, the proponent will also address non-mining specific matters in the ERMP including transport emergencies, mass medical treatment and/or evacuations due to the remoteness of the project area.	AEIS Attachment A, Issues 16.002 and 8.001
166.	Testing of coal propensity for spontaneous combustion will be undertaken as part of the development of the Safety and Health Management System.	AEIS Attachment A, Issue 41.008
167.	Operating procedures will be developed for any surface activities that have a significant risk of spontaneous combustion outbreaks.	AEIS Attachment A, Issue 41.011

Commitment number	Proponent commitment	EIS/AEIS reference
Environmental management		
168.	The proponent will update the existing environmental policy prior to subsequent project phases to ensure the policy reflects the proponent's commitments to environmental mitigation and management for the site.	EIS Section 24.3.1
169.	An Environmental Management System (EMS) will be developed and implemented for the project. The EMS will be designed to achieve the objectives of the proponent's environmental policy and to ensure that all regulatory requirements are met. The EMS will be designed to generally be aligned with ISO 14001, which is a benchmark international standard for EMS development.	EIS Section 24.3.2
170.	The EMS will include the development and implementation of a grievance and dispute resolution procedure to ensure any complaints from landholders and other stakeholders are handled quickly and effectively. Where necessary, this may include monitoring or changes to environmental management plans and procedures.	EIS Section 24.3.2
171.	The EMS will be subject to review, and where necessary, revision of the environmental management plans, procedures or monitoring programs. This will be undertaken periodically, as necessary, and prior to commencement of subsequent project phases to enable the proponent to adapt to the changes in the predicted and actual environmental impacts arising in each project phase.	EIS Section 24.3.2
172.	Periodic audits of each environmental management plan will be undertaken, as necessary, to ensure compliance with regulatory requirements and the proponent's environmental policy.	EIS Section 24.3.2
173.	Employees and contractors will undergo site inductions and training relating to environmental management in accordance with the EMS documentation and the proponent's environmental management commitments.	EIS Section 24.3.2

Appendix 6. Recovery plans, conservation advices, threat abatement plans

The following is a summary of the content of the recovery plans, conservation advices and threat abatement plans which provide for MNES as discussed in the MNES section of the report. The full text of the plans and advices can be found on the Department of the Environment and Energy's website.

Schedule 1. Threatened species and communities recovery plans

Part A. National recovery plan for the community of native species dependent on natural discharge of groundwater from the Great Artesian Basin–2010²⁶

The overall objective of the recovery plan is to maintain or enhance groundwater supplies to the Great Artesian Basin (GAB) discharge spring wetlands, maintain or increase habitat area and health, and increase all populations of endemic organisms.

Specific objectives and a summary of their recovery actions, identified in the recovery plan are as follows:

- (1) Enhance aquifer pressure and ensure flows from springs do not decrease (lower than natural variability) by:
 - (a) controlling bores that may benefit flows to springs
 - (b) developing and implementing techniques to increase landholder participation in the GAB Sustainability Initiative
 - (c) completing historical documentation of spring flows
 - (d) controlling new groundwater allocations
 - (e) effectively monitoring spring flows
 - (f) improving understanding of the physical processes sustaining spring wetlands.
- (2) Achieve appropriate tenure-based security to protect against future threatening processes by:
 - (a) securing populations of native species within GAB discharge spring wetlands through perpetual conservation agreements
 - (b) ensuring landholders understand that excavation and related direct threatening processes are regulated activities
 - (c) minimising the impact of stock and feral animal disturbance and managing total grazing pressure

²⁶ Fensham R.J, Ponder, W.F. and Fairfax, R.J. (2010). *Recovery plan for the community of native species dependent on natural discharge of groundwater from the Great Artesian Basin*. Report to Department of the Environment, Water, Heritage and the Arts, Canberra. Queensland Department of Environment and Resource Management, Brisbane.

- (d) establishing fencing where appropriate including the option to regulate stock use rather than exclude stock
- (e) controlling feral animals.
- (3) Minimise the threat of exotic plants and aquatic animals, and reduce their effects by:
 - (a) studying the interaction between native and exotic fauna
 - (b) preventing further spread of gambusia and other exotic fauna
 - (c) eradicating exotic plants from springs and ensure no further deliberate introductions of exotic species occur.
- (4) Ensure that impoundments do not degrade spring values by ensuring that the impact of impoundments on spring values are properly considered in environmental impact assessments.
- (5) Maintain populations and improve habitat for endemic organisms where required using monitoring and adaptive management by:
 - (a) completing an inventory of endemic species in GAB discharge spring wetlands
 - (b) monitoring populations of endemic species and understanding their ecology and biology
 - (c) implementing protocols to avoid transportation of organisms from one spring to another
 - (d) re-establishing natural values of reactivated springs.
- (6) Engage custodians in responsible management of springs by:
 - (a) fostering responsible landholder management of spring wetlands
 - (b) increasing the involvement of Indigenous custodians in spring management.
- (7) Develop community education and extension programs by:
 - (a) raising community awareness of the importance of GAB discharge spring wetlands and their conservation requirements
 - (b) developing and implementing tourist visitation management plans for selected sites
 - (c) identifying information and develop communication products that can be used to further describe the present EPBC listed ecological community and the responsibilities pertaining to the listing.
- (8) Co-ordinate the implementation and evaluation of recovery plans relating to GAB springs by:
 - (a) establishing a recovery team or substitute to co-ordinate implementation and evaluations of the recovery plan
 - (b) convening a GAB springs forum at appropriate intervals.

Part B. National recovery plan for the Black-throated Finch southern subspecies (*Poephila cincta cincta*) – 2007²⁷

The overall objective of the recovery plan is to manage and protect the black-throated finch and its habitat, and to promote the recovery of the southern subspecies.

Specific objectives and a summary of their recovery actions, identified in the recovery plan are as follows:

Specific Objective 1: Identify and quantify threats

Action 1.1 Investigate breeding requirements and threats to key breeding areas

Action 1.2 Investigate feeding and other habitat requirements

Specific Objective 2: Quantify distribution and abundance

Action 2.1 Document sightings

A master database for black-throated finch sightings is developed and managed. The database will include historical records of sightings and new records of sightings by structured surveys by professionals/organisations or by amateur birdwatchers.

Action 2.2 Develop standard survey guidelines

Standard survey guidelines and environmental assessment guidelines will be developed and distributed to relevant agencies, individuals and consultants. Data collected will be added to the master database.

Action 2.3 Undertake mapping and habitat modelling

Create an essential habitat map to be used during assessments under the *Vegetation Management Act 1999* (VM Act). Collate existing and new mapping and habitat modelling to assist in the identification of further areas of potential habitat for the species.

Action 2.4 Undertake targeted surveys

Undertake surveys for potential habitat that warrant protection and management.

Specific Objective 3: Protect and enhance habitat

Action 3.1 Secure selected sites for conservation

The Black-throated Finch Recovery Team will identify four areas where management is or is likely to become consistent with the long-term conservation goals for the black-throated finch.

Action 3.2 Address threats on grazing lands

Areas identified through Actions 2.1 and 2.4 will be targeted for programs designed to improve awareness of the conservation needs of the black-throated

²⁷ Black-throated Finch Recovery Team, Department of Environment and Climate Change (NSW) and Queensland Parks and Wildlife Service. 2007. *National recovery plan for the black-throated finch southern subspecies Poephila cincta*. Report to the Department of the Environment and Water Resources, Canberra. Department of Environment and Climate Change (NSW), Hurstville and Queensland Parks and Wildlife Service, Brisbane.

finch and where possible establish formal conservation agreements to protect the species.

Action 3.3 Monitor management effectiveness

In combination with Actions 1.1 and 1.2 methods will be used to assess trends in black-throated finch numbers. These methods will include waterhole counts, transects, mark/recapture studies, pot counts at random sites.

Action 3.4 Investigate development of other statutory planning instruments to minimise impacts of development on black-throated finch

Means to protect black-throated finch habitat from incompatible development should be reviewed, protection measures put in place and the most efficient long term means progressed. For example, interim protection measures pursuant to part 6 of the *Nature Conservation Act 1992* (NC Act) or division 4 of the VM Act to declare an area of high nature conservation value.

Specific Objective 4: Investigate the potential for captive birds contributing to a re-introduction project

Action 4.1 Determine suitability of birds currently in captivity for a reintroduction project

A captive breeding colony may need to be established if re-introduction is to occur in parts of the subspecies former range. Consideration will be given to identifying captive-bred birds genetically similar to the southern subspecies as part of the re-introduction program.

Specific Objective 5: Increase public awareness

Action 5.1 Increase public awareness of the status of and threats to the subspecies

The Black-throated Finch Recovery Team and state and local government agencies will be responsible for improving awareness of the status and threats to the southern subspecies. Regional and national bird watching and conservation groups are also important conduits for, and source of, information on the southern subspecies.

Schedule 2. Conservation Advices

Part A. Approved conservation advice (*Geophaps scripta scripta*) squatter pigeon (southern)–2015²⁸

The squatter pigeon (southern) is one of two subspecies, the other being the squatter pigeon (northern) (*Geophaps scripta peninsulae*).

Conservation and Management Actions

Action 1: Identify sub-populations of high conservation priority, especially in the southern part of the squatter pigeon's (southern) range.

²⁸ Threatened Species Scientific Committee (2015). *Conservation Advice Geophaps scripta scripta squatter pigeon (southern)*. Canberra: Department of the Environment. Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/64440-conservation-advice-31102015.pdf>. In effect under the EPBC Act from 27-Oct-2015.

- Action 2: Protect and rehabilitate areas of vegetation that support important sub-populations.
- Action 3: Protect sub-populations of the listed subspecies through the development of covenants, conservation agreements or inclusion in reserve tenure.
- Action 4: Develop and implement a stock management plan for key sites.
- Action 5: Develop and implement a management plan, or nominate an existing plan to be implemented, for the control and eradication of feral herbivores in areas inhabited by the squatter pigeon (southern).
- Action 6: Raise awareness of the squatter pigeon (southern) within the local community, particularly among land managers.

Survey and Monitoring Priorities

Monitor selected sub-populations throughout the distribution of the subspecies to identify rates of population change.

Information and Research Priorities

- Priority 1: Identify preferred food plants, and the responses of these to fire and grazing regimes.
- Priority 2: Determine patterns of dispersal or residency, and the factors that may determine these.
- Priority 3: Assess reproductive success, and the factors that affect this.
- Priority 4: Assess the species' status, and the impacts of mining, in central Queensland.

Part B. Approved conservation advice for Australian painted snipe (*Rostratula australis*)–2013²⁹

The Australian painted snipe is listed as endangered as it has undergone a severe decline in excess of over 50% over the last three generations associated with wetland loss and degradation.

Research Priorities

- Priority 1: Support and enhance existing programs for the Australian painted snipe that area managed by BirdLife Australia.
- Priority 2: Continue to monitor the species to more precisely assess population size, distribution and the relative impacts of threatening processes.
- Priority 3: Identify and describe the ecological and hydrological character of sites that are suitable for the Australian painted snipe, particularly those known to be used by the species for breeding.
- Priority 4: Investigate potential food resources for the species and monitor changes to the abundance and diversity of these resources (e.g., invertebrates).

²⁹ Department of Sustainability, Environment, Water, Population and Communities (2013). *Approved Conservation Advice for Rostratula australis (Australian painted snipe)*. Canberra: Department of Sustainability, Environment, Water, Population and Communities. Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/77037-conservation-advice.pdf>. In effect under the EPBC Act from 15-May-2013

Priority 5: Directly monitor the breeding and non-breeding behaviour of the Australian painted snipe with the use of radio transmitters and/or tagging methods.

Regional Priority Actions

- Action 1: Management actions to prevent habitat loss, disturbance and modification
- Action 2: Management actions to prevent occurrence of invasive weeds
- Action 3: Management actions to prevent livestock trampling, browsing or grazing
- Action 4: Control numbers of feral animals
- Action 5: Develop and implement fire management strategy for the habitat of the snipe
- Action 6: Raise awareness of the Australian painted snipe within the local community, encourage surveys, engage with landholders, facilitate the exchange of information regarding sightings, research and management approaches.

Part C. Approved conservation advice for the Koala (*Phascolarctos cinereus*) (combined populations of Queensland, New South Wales and the Australian capital Territory)³⁰

The koala is listed as vulnerable under the EPBC Act and has undergone a substantial decline over three generations, due to the combination of a range of factors. The main identified threats to this species are loss and fragmentation of habitat, vehicle strike, disease and predation by dogs, Drought and incidences of extreme heat are also known to cause very significant mortality, and post-drought recovery may be substantially impaired by the range of other threatening factors.

Research Priorities

- 1) Develop and implement an integrated program of koala population monitoring and abundance estimates across the koala's range, with particular focus on those regions for which population size and trends are currently least known. Targeting regions where there were previous surveys but where there are no recent estimates will enable trends to be determined over a broader range of the species
- 2) Develop landscape-scale population models, to provide a framework for the assessment of relative threat risk and management intervention cost-effectiveness
- 3) Develop understanding of gene flow and landscape connectivity
- 4) Identify and delineate key populations
- 5) Maintain or enhance research programs directed at the assessment of the incidence and consequences to populations of disease, and of mechanisms to reduce the impacts of disease

³⁰ Department of Sustainability, Environment, Water, Population and Communities (2012). *Approved Conservation Advice for Phascolarctos cinereus (combined populations in Queensland, New South Wales and the Australian Capital Territory)*. Canberra: Department of Sustainability, Environment, Water, Population and Communities. Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/197-conservation-advice.pdf>. In effect under the EPBC Act from 02-May-2012

- 6) Maintain or enhance research programs directed at the assessment of the incidence and consequences to populations of koala mortality or injury due to dogs and traffic, and of mechanisms to reduce the impacts of these threatening factors
- 7) Determine the ability of inland koala populations to persist after, or recover from, drought and evaluate the likely influence of climate change on these processes
- 8) Determine the social and economic benefits of costs of and barriers to implementing effective management interventions to conserve the koala across its range, including the governance arrangements.

Priority Management Actions

Habitat loss, disturbance and modification

- 1) Develop and implement a development planning protocol to be used in areas of koala populations to prevent loss of important habitat, koala populations or connectivity options
- 2) Development plans should explicitly address ways to mitigate risk of vehicle strike when development occurs adjacent to, or within, koala habitat
- 3) Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary
- 4) Identify populations of high conservation priority
- 5) Investigate formal conservation arrangements, management agreements and covenants on private land and for crown and private land investigate and/or secure including in reserve tenure if possible
- 6) Manage any other known, potential or emerging threats such as Bell Miner Associated Dieback or eucalyptus rust
- 7) Develop and implement options of vegetation recovery and re-connection in regions containing fragmented koala populations, including inland regions in which koala populations were diminished by drought and coastal regions where development pressures have isolated koala populations.

Animal predation

- 8) Develop and implement a management plan to control the adverse impacts of predation on koalas by dogs in urban, peri-urban and rural environments.

Conservation information

- 9) Engage with private landholders and land managers responsible for the land on which populations occur and encourage these key stakeholders to contribute to the implementation of conservation management actions.

Part D. National Koala Conservation and Management Strategy 2009-2014³¹

The koala is listed as vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and as special least concern under the NC Act. Koalas occur in a variety of habitats and usually require large areas of continuous habitat to sustain

³¹ Department of the Environment (2009). *National Koala Conservation and Management Strategy 2009-2014*. Canberra: Department of the Environment. Available from: <http://www.environment.gov.au/system/files/resources/165139fc-3ab5-4c96-8b15-d11a1ad882ab/files/koala-strategy.pdf>

viable populations. The EPBC Act Referral Guidelines describe the study area as critical habitat for the koala.

Habitat Identification and Protection

- Action 1.01: Incorporate koala habitat conservation into existing multi-species or landscape scale conservation programs.
- Action 1.02: Assess, develop and implement options for protecting priority koala habitat on public lands using legislation, covenants or agreements, or by new acquisition of koala habitat.
- Action 1.03: Assess, develop and implement options for protecting koala habitat on private lands.
- Action 1.04: Prioritise conservation of populations under immediate pressure.
- Action 1.05: Revegetate habitat to facilitate natural dispersal and reduce fragmentation effects.
- Action 1.06: Develop standard monitoring/habitat assessment protocols.
- Action 1.07: Establish a national database of koala population distribution and density and habitat mapping data.
- Action 1.08: Establish or continue surveying and monitoring programs.
- Action 1.09: Incorporate causes of habitat loss or degradation, other than land clearing, into planning for koala habitat conservation.

Over-browsed Habitats

- Action 2.01: Continue and refine management programs to regulate koala density to a level below that which causes severe tree defoliation.
- Action 2.02: Identify potential problems at an early stage through regular assessment of koala abundance and the extent of crown defoliation of preferred food tree species.
- Action 2.03: Develop and adopt national translocation guidelines for translocation of koalas for introduction, reintroduction and supplementation, and for management of overabundant populations.

Direct Mortality of Individual Koalas

- Action 3.01: Develop appropriate national guidelines for road design in koala habitat.
- Action 3.02: Implement strategies which minimise the impacts of dogs on koala populations.
- Action 3.03: Assess and develop appropriate methods to reduce vulnerability of populations to disease.

Community Involvement

- Action 4.01: Provide extension and advisory services to encourage retention and restoration of koala habitat and to encourage management practices on private land which are not harmful to koalas or koala habitat.
- Action 4.02: Develop and distribute educational material.
- Action 4.03: Extend community involvement in koala conservation and engagement with government.

Caring for Koalas in Captivity

- Action 5.01: Develop national guidelines with states for all aspects of care, handling and management of captive, sick, injured or orphaned koalas.
- Action 5.02: Review as necessary conditions and agreements under the EPBC Act (Part 13A) for export of koalas.

Research

- Action 6.01: Develop techniques for, and undertake, broad-scale remote sensing to identify areas for further analysis of koala habitat and distribution.
- Action 6.02: Identify and prioritise knowledge gaps in koala research.
- Action 6.03: Identify directions for research on effects of climate change on koalas.
- Action 6.04: Facilitate development of a network to support koala research.
- Action 6.05: Develop methods for enabling comparison of disparate data on koala distribution and abundance.
- Action 6.06: Develop mechanisms to support access to funding, or conduct and disseminate dedicated research.

Part E. **Approved Conservation Advice for the Yakka Skink (*Egernia rugosa*)—2014³²**

The yakka skink is endemic to Queensland. The core habitat of this species is within the Mulga Lands and Brigalow Belt South bioregions, the Brigalow Belt North and Einsaleigh Uplands bioregions and the Queensland/NSW border. It is found in open dry sclerophyll forest or woodland. It will take refuge in dense ground vegetation, large hollow logs, cavities in soil-bound root systems, beneath rocks. They retreat at the first sign of disturbance; their presence is indicated by a shared site where they deposit their droppings. The distribution of this species is associated with the 'Brigalow (*Acacia harpophylla* dominant and co-dominant) EPBC Act-listed threatened ecological community.

Research Priorities

- Priority 1: More precisely assess population size, distribution, ecological requirements and the relative impacts of threatening processes.
- Priority 2: Undertake survey work in suitable habitat and potential habitat to locate any additional populations/occurrences/remnants.
- Priority 3: Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.

Regional and Local Priority Actions

- Action 1: Management actions to prevent habitat loss, disturbance and modification.
- Action 2: Management actions to control the impacts of animals, in particular foxes and feral cats.

³² Department of the Environment (2014). *Approved Conservation Advice for Egernia rugosa (Yakka Skink)*. Canberra: Department of the Environment. Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/1420-conservation-advice.pdf>. In effect under the EPBC Act from 29-Apr-2014

- Action 3: Develop and implement a fire management strategy for the yakka skink habitat.
- Action 4: Raise awareness of the yakka skink and other reptiles within the local community. Engage with landholders and land managers to contribute to the implementation of conservation management actions.

Schedule 3. Threat abatement plans

Part A. Threat abatement plan for predation by feral cats—2015³³

The goal of the feral cat threat abatement plan (TAP) is to minimise the impact of cats on biodiversity in Australia and its territories by:

- 1) protecting affected threatened species
- 2) preventing further species and ecological communities from becoming threatened.

To achieve this goal, the plan has four objectives:

- 1) Effectively control feral cats in different landscapes:
 - (a) ensure broad-scale toxic baits targeting feral cats are developed, registered and available for use across all of Australia, including northern Australia
 - (b) develop and register other cat control tools, including devices exploiting cat grooming habits
 - (c) continue research into understanding interactions between feral cats and other predators: (i) in different landscapes; and (ii) any potential beneficial/perverse outcomes if other predator populations are modified
 - (d) continue research into understanding the role of other major landscape modifiers, such as fire or grazing by introduced herbivores, in feral cat activities and control
 - (e) continue research into the scale, efficiency, cost-effectiveness, sustainability and risks of feral cat control options
 - (f) continue development of new or enhanced attractants for cats to improve cat control and monitoring. Ensure availability of any attractants that are developed
 - (g) research into other control and monitoring technologies and enhancing available technology
 - (h) re-investigate diseases and other potential biocontrol agents, biotechnology and immunocontraceptive options for cats, and commence research on promising options. Undertake social research on promising options to gauge community support
 - (i) Code of Practice and/or Standard Operating Procedures developed for new tools and agreed by governments.
- 2) Improve effectiveness of existing control options for feral cats:

³³ [Department of the Environment \(2015\). Threat abatement plan for predation by feral cats. Canberra, ACT: Commonwealth of Australia. Available from: <http://www.environment.gov.au/biodiversity/threatened/publications/tap/threat-abatement-plan-feral-cats>. In effect under the EPBC Act from 23-Jul-2015](http://www.environment.gov.au/biodiversity/threatened/publications/tap/threat-abatement-plan-feral-cats)

- (a) understand motivations and provide incentives for land managers to include feral cat management into standard land management for biodiversity outcomes
 - (b) provide information, in various media and through training, on best practice methods and standard operating procedures for controlling and monitoring feral cats
 - (c) ensure areas prioritised for feral cat management across Australia maximise benefits to biodiversity at a local, regional and national level
 - (d) governments agree to consistent legislation that identifies feral cats as a pest, has requirements for control, and identifies control techniques that may be used.
- 3) Develop or maintain alternative strategies for threatened species recovery:
- (a) eradicate, or control, cats on offshore islands of high, or potentially high, biodiversity value
 - (b) establish, enhance or maintain biosecurity measures for cat-free offshore islands to prevent incursions
 - (c) establish and maintain further fenced reserves (“mainland islands”) for threatened species where it is identified cats cannot be controlled to the level required for threatened species recovery
 - (d) research methods to understand thresholds of cat abundance required to improve survival rates for threatened species heavily preyed upon by feral cats. Research ways in which adaptation by threatened species may improve survival rates
 - (e) continue research into cat diseases, including *Toxoplasma gondii* and sarcosporidiosis, their prevalence, ability to transmit to other species (including livestock and humans) their impacts, and ways to mitigate the impacts.
- 4) Increase public support for feral cat management and promote responsible cat ownership:
- (a) quantify the proportion of the domestic and stray cat population that transitions to the feral cat population
 - (b) promote to and seek engagement of the community in:
 - (i) an understanding of the threat to biodiversity posed by cats and support for their management;
 - (ii) an understanding of the transitions between domestic, stray and feral cats, and the need for responsible ownership;
 - (iii) support for the containment of domestic cats where their roaming may impact on identified conservation areas
 - (c) promote and seek community engagement on the reduction of food and other resources to stray cats
 - (d) develop specific communication campaigns to accompany the release of new broad-scale cat control techniques and other current/new cat control techniques and management programs—2015.

Part B. Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*)—2017³⁴

The goals of this TAP are to prevent further species and ecological communities from becoming threatened or extinct due to predation, habitat degradation, competition and disease transmission by feral pigs, and to improve protection for EPBC listed species and ecological communities currently threatened by feral pigs. A reduction in the total number of EPBC listed species and ecological communities threatened by feral pigs is also desirable.

To achieve these goals the following objectives:

- 1) Prioritise key species, ecological communities, ecosystems and locations across Australia for strategic feral pig management by:
 - Action 1.1: Identify key species, ecological communities, ecosystems and locations for priority protection.
 - Action 1.2 Implement feral pig control in priority areas, combining national priorities and local knowledge into on-ground action.
- 2) Encourage the integration of feral pig management into land management activities at regional, state and territory, and national levels by:
 - Action 2.1 Encourage the integration of feral pig management into land management activities at all levels of government, and regional groups.
- 3) Encourage further scientific research into feral pig impacts on nationally threatened species and ecological communities, and feral pig ecology and control by:
 - Action 3.1 Research into feral pigs impacts on nationally threatened, and near threatened, species and ecological communities.
 - Action 3.2 Research into feral pig population dynamics and ecology.
 - Action 3.3 Research into spatial and temporal use of landscapes by feral pigs.
 - Action 3.4 Research into the effectiveness of feral pig control methods.
- 4) Record and monitor feral pig control programs, so their effectiveness can be evaluated by:
 - Action 4.1 Encourage monitoring to enable the evaluation of the effectiveness of feral pig control.
 - Action 4.2 Develop further effective monitoring techniques.
 - Action 4.3 Encourage the use of existing FeralPigScan platform for centralised recording platform of feral pig control actions and any monitoring/recording of their effectiveness.
- 5) Build capacity for feral pig management and raise feral pig awareness amongst landholders and land managers:

³⁴ Department of the Environment and Energy (2017). *Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (Sus scrofa) (2017)*. Canberra, ACT: Commonwealth of Australia. Available from: <http://www.environment.gov.au/biodiversity/threatened/publications/tap/feral-pig-2017>. In effect under the EPBC Act from 18-Mar-2017

- Action 5.1 Increase delivery of training courses and/or extension programs to build feral pig management skills amongst landholders and land managers.
- Action 5.2 Increase understanding of social impediments to feral pig control.
- 6) Improve public awareness about feral pigs and the environmental damage and problems they cause:
 - Action 6.1 Develop and deliver a public education program about feral pigs and the environmental damage and problems they cause.
 - Action 6.1 Ensure deterrents are in place to discourage the translocation of feral pigs, and include this information in community education programs.

Part C. Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads– 2011³⁵

The goal of the cane toad TAP is to address the key threatening process (lethal toxic ingestion) of this species on native fauna in a feasible, effective and efficient manner. The three main objectives and associated recovery actions in order to achieve this goal are as follows:

- 1) Identifying priority native species and ecological communities at risk from the impact of cane toads by:
 - (a) identifying native species, ecological communities and off-shore islands currently known to be at high to moderate risk
 - (b) identifying the ways in which cane toads impact the native species and ecological communities listed under the EPBC Act
 - (c) establishing and supporting research where impacts are unknown but may be high, to further understand the impact of cane toads on the native species and ecological communities. Where appropriate, research ways to assist with the recovery of priority native species and ecological communities
 - (d) developing a prioritisation tool to guide allocation of resources for protection of native species and communities. Apply it to native species and ecological communities identified under the EPBC Act.
- 2) Reducing the impact of cane toads on populations of priority native species and ecological communities by:
 - (a) focusing the management of cane toad impacts by Australian Government agencies on designated high priority native species and ecological communities, and seek cooperative action on priorities by jurisdictions and other stakeholders
 - (b) implementing and monitoring emergency management of cane toad impacts for known high priority native species and ecological communities using currently available tools and techniques (e.g. trapping, fencing of small areas, manual removal from designated sites)

³⁵ Department of Sustainability, Environment, Water, Population and Communities (2011). *Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads*. Canberra, ACT: Commonwealth of Australia. Available from: <http://www.environment.gov.au/resource/threat-abatement-plan-biological-effects-including-lethal-toxic-ingestion-caused-cane-toads>. In effect under the EPBC Act from 06-Jul-2011

- (c) implementing or adjusting the management of cane toad impacts using available tools and techniques as new species and communities are added to the list of priority native species and ecological communities. Additional tools and techniques will become available with the registration of toxins for euthanasia of captured toads and development of other impact management or cane toad control techniques. Codes of practice and standard operating procedures for cane toad control will provide guidance on these techniques
 - (d) preparing guidelines, including codes of practice and standard operating procedures that can be applied to both emergency responses and on-going management for high priority native species and ecological communities for endorsement by the Vertebrate Pest Committee (VPC)
 - (e) preparing and implementing management plans, (including identifying and addressing gaps in management techniques and tools) for designated high priority species and ecological communities on land managed by Australian Government agencies
 - (f) providing the guidelines for emergency and on-going cane toad management to all stakeholders. Liaising with responsible jurisdictions/agencies to encourage the preparation and implementation of such plans in their areas of responsibility. Where mutual obligations exist, the Australian Government will work cooperatively to prepare such plans
 - (g) monitoring the development and implementation of guidelines and cane toad management plans for designated high priority species and ecological communities
 - (h) monitoring the literature about the spread and impact of the cane toad and review/amend guidelines and develop new management plans as required
 - (i) establishing guidelines for humane management actions to control cane toads for VPC and Animal Welfare Committee endorsement
 - (j) distributing guidelines to all Australian Government agencies with land management responsibilities
 - (k) seek cooperative adoption of guidelines by states/territories including incorporation in state-based regulations as appropriate.
- 3) Communicating information about cane toads, their impacts and the TAP by:
- (a) implementing a one-stop-shop webpage on the Department of the Environment and Energy website with links to jurisdictional and stakeholder information on cane toads and including information on:
 - (i) the threat cane toads pose to biodiversity
 - (ii) management actions to limit this threat
 - (iii) guidelines for cane toad management
 - (iv) information to help identify cane toads from other amphibians
 - (v) codes of practice and standard operating procedures
 - (vi) management plans (as they are developed) for areas designated as high priority
 - (b) encouraging monitoring, evaluation and reporting on cane toad management actions is maintained and communicated to stakeholders
 - (c) ensuring Australian Government fact sheets and other communications material on cane toads are current and reflect the strategy developed in this TAP.

Part D. Threat abatement plan for competition and land degradation by rabbits—2016³⁶

The goal of this TAP is to minimise the impact of rabbit competition and land degradation on biodiversity in Australia and its territories by:

- 1) protecting affected threatened species and ecological communities
- 2) preventing further species and ecological communities from becoming threatened.

To achieve this goal, the plan has four main objectives:

- 1) strategically manage rabbits at the landscape scale and suppress rabbit populations to densities below threshold levels in identified priority areas by:
 - (a) supporting regional control programs, and
 - (b) promoting and maintaining control programs in areas adjacent to priority areas.
- 2) improve knowledge and understanding of the impact of rabbits and their interactions with other species and ecological processes through:
 - (a) the consideration of unintended consequences of actions taken to achieve the objectives,
 - (b) the use of integrated pest and weed control measures,
 - (c) the publication of research papers that inform whether rabbit control is detrimental or beneficial to the survival of native species.
- 3) improve the effectiveness of rabbit control programs by:
 - (a) improving conventional control options and tools for land managers
 - (b) improving the coordination of monitoring and surveillance of rabbit control programs
 - (c) continuing research into new biocontrol and other novel control options and
 - (d) increasing the adoption of standard operating procedures
- 4) increase engagement of, and awareness by, the community of the environmental impacts of rabbits and the need for integrated control by:
 - (a) ensuring better communication, engagement and awareness with and between land managers on the threat of rabbits on native species and other ecological processes, and
 - (b) how the use of integrated management methods can further reduce rabbit numbers.

³⁶ Department of the Environment and Energy (2016). *Threat abatement plan for competition and land degradation by rabbits*. Canberra, ACT: Commonwealth of Australia. Available from: <http://www.environment.gov.au/biodiversity/threatened/publications/tap/competition-and-land-degradation-rabbits-2016>. In effect under the EPBC Act from 07-Jan-2017.

Part E. Threat abatement plan for predation by the European red fox — 2008³⁷

The goal of this TAP is to minimise the impact of foxes on biodiversity in Australia and its territories by:

- 1) protecting affected native species and ecological communities; and
- 2) preventing further species and ecological communities from becoming threatened.

To achieve this goal, the plan has five main objectives:

- 1) prevent foxes occupying new areas in Australia and eradicate foxes from high-conservation value 'islands' by developing and implementing management plans to protect such areas from foxes
- 2) promote the maintenance and recovery of native species and ecological communities that area affected by fox predation by:
 - (a) identifying priority areas for investment in fox control and
 - (b) implementing and supporting regional control programs and applying incentives for promoting and maintaining control programs adjacent to the priority areas
- 3) improve knowledge and understanding of fox impacts and interactions with other species and other ecological processes by:
 - (a) developing simple, cost-effective methods for monitoring impacts
 - (b) improving knowledge of interactions between foxes and native carnivores and between foxes, cats and wild dogs
 - (c) identifying the unintended effects of fox control in isolation from other activities
- 4) improve the effectiveness, target specificity, integration and humaneness of control options for foxes by:
 - (a) improving control methods
 - (b) training land managers to make the best use of control methods, and
 - (c) increasing the adoption of standard control methods
- 5) increase awareness of all stakeholders of the objectives and actions of the TAP, and of the need to control and manage foxes by ensuring that the TAP actions are better communicated to interested parties by preparing and distributing extension materials.

Part F. Threat abatement plan to reduce the impacts on northern Australia's biodiversity by the five listed grasses – 2012³⁸

The goal of this TAP is to address the key threatening process (KTP) 'ecosystem degradation, habitat loss and species decline due to invasion of northern Australia' by introduced gamba

³⁷ Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008). *Threat abatement plan for predation by the European red fox*. DEWHA, Canberra. Available from: <http://www.environment.gov.au/biodiversity/threatened/publications/tap/predation-european-red-fox>. In effect under the EPBC Act from 01-Oct-2008

³⁸ Department of Sustainability, Environment, Water, Population and Communities (2012). *Threat abatement plan to reduce the impacts on northern Australia's biodiversity by the five listed grasses*. Department of Sustainability,

grass (*Andropogon gayanus*), para grass (*Urochloa mutica*), olive hymenachne (*Hymenachne amplexicaulis*) mission grass (*Pennisetum polystachion*) and annual mission grass (*Pennisetum pedicellatum*).

To achieve this goal, the TAP has 6 objectives as follows:

Objective 1: *Develop an understanding of the extent and spread pathways of infestation by the five listed grasses.*

Action 1.1: Undertake mapping of the five listed grasses at a scale that allows for appropriate planning and adaptive management approach

Action 1.2: Develop a better understanding of spread pathways

Objective 2: *Support and facilitate coordinated management strategies through the design of tools, systems and guidelines*

Action 2.1: Encourage complementary weed status for the five listed grasses across all jurisdictions to which the TAP applies

Action 2.2: Develop best-practice guidelines for use and/or management of the five listed grasses in agricultural and conservation contexts, and encourage their implementation

Action 2.3: Develop hygiene protocols, focusing on high-priority spread pathways

Action 2.4: Further develop prioritisation tools to identify high-priority areas for monitoring and management actions

Action 2.5: Include strategic management of the five listed grasses in management plans for all affected land tenures, giving priority to identified key assets

Action 2.6: Improve and promote understanding of invasive grass control and land rehabilitation methods to maximise native vegetation restoration and minimise site damage

Action 2.7: Facilitate collaborative applied research that can be used to inform or support improved management of the five listed grasses.

Objective 3: *Build capacity and raise awareness among stakeholders*

Action 3.1: Identify key assets for priority protection

Action 3.2: Identify areas at risk of invasion, prioritise for monitoring and determine appropriate management actions

Objective 4: *Identify and prioritise key assets and areas for strategic management*

Action 4.1: Develop and deliver communication strategies to raise awareness of the threats posed by the five listed grasses

Action 4.2: Better assist the capacity of Indigenous people to participate in the management of the five listed grasses

Environment, Water, Population and Communities. Available from: <http://www.environment.gov.au/resource/threat-abatement-plan-reduce-impacts-northern-australias-biodiversity-five-listed-grasses>. In effect under the EPBC Act from 11-Dec-2012

Objective 5: *Implement coordinated, cost-effective on-ground management strategies in high-priority areas*

Action 5.1: Foster a coordinated partnership approach to the management of the five listed grasses. Facilitate information sharing and encourage coordination of the implementation of management and monitoring actions across all land tenures to maximise the efficiency and effectiveness of management programs

Action 5.2: Where feasible, implement immediate management actions in high-priority areas around key assets and spread pathways

Action 5.3: Where feasible, implement management actions in other infested areas to reduce the area and/or density of occupancy of the five listed grasses

Action 5.4: Where feasible, apply land rehabilitation methods to high-priority areas as they are cleared of the five listed grasses

Action 5.5: Liaise with land managers of areas containing key assets to identify resources available for the implementation of priority actions.

Objective 6: *Monitor, evaluate and report on the effectiveness of management programs*

Action 6.1: Ensure that management plans for high-priority areas include recognition of the asset being protected as well as appropriate monitoring of managed sites. Encourage monitoring to enable the effectiveness of actions to be determined

Action 6.2: Report on progress and effectiveness of management programs against their goals.

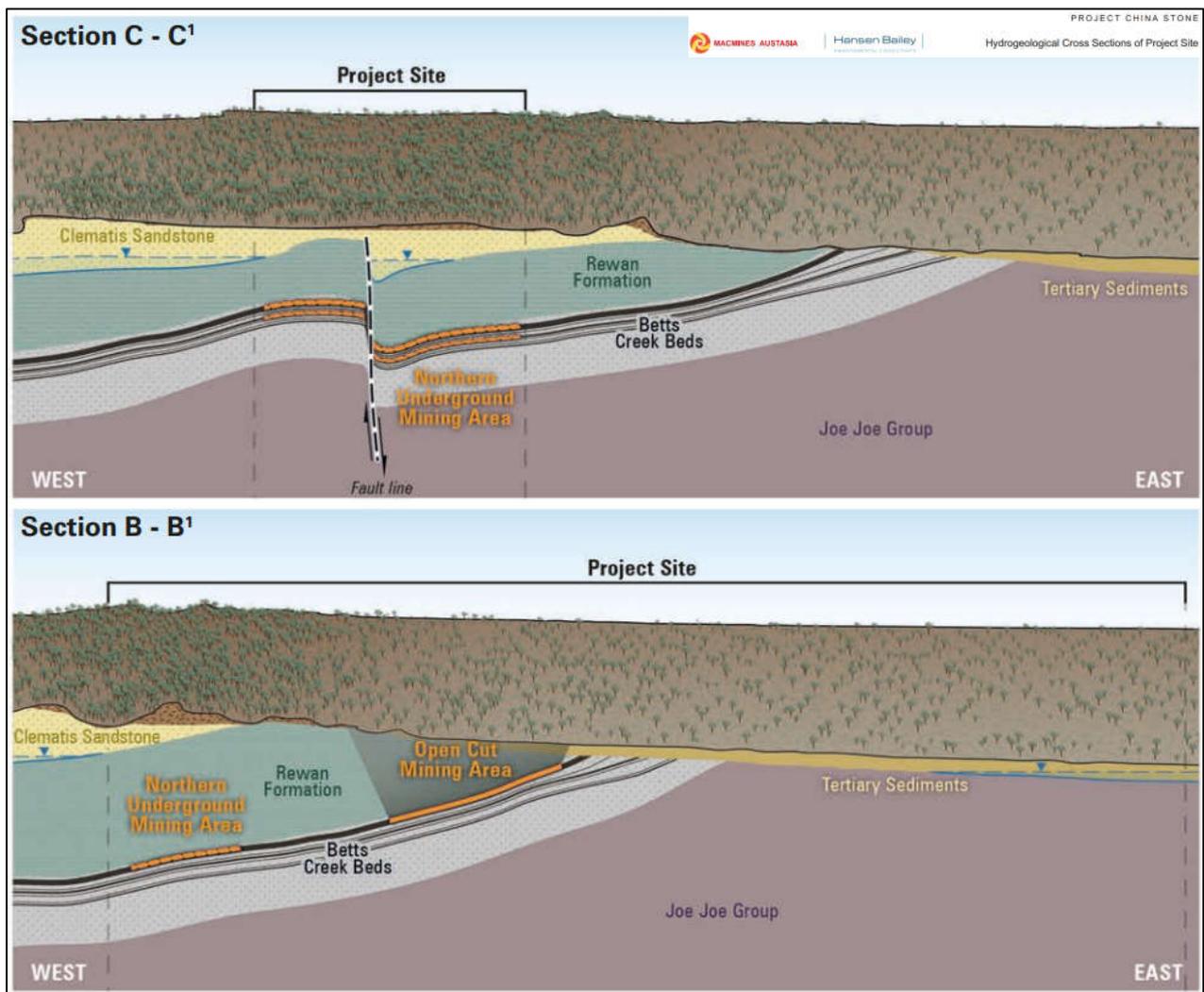
Appendix 7. China Stone Coal project Groundwater Model Targeted Peer Review

China Stone Coal Project Groundwater Model Targeted Peer Review

Prepared for:

Office of the Coordinator-General
(QLD Dept of State Development)

25 Sept
2017



hydrogeologic

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1. Introduction.....	3
2. Scope and Method.....	3
3. Targeted Peer Review	4
3.1 Groundwater Flow Directions	4
3.1.1 Conceptualisation	4
3.1.2 Groundwater Flow Systems and Boundary Conditions	5
3.1.3 Available Information.....	6
3.2 Reduction in Hydraulic Conductivity with Depth.....	8
3.2.1 Coal Seam Kh (horizontal permeability)	8
3.2.2 Interburden Kz (vertical permeability).....	9
3.2.3 Specific Storage (Ss)	10
3.2.4 Base Case Parameters	10
3.3 Recharge Rates.....	11
3.4 Fault in Northern Underground Mining Area	12
3.5 Post-Mining Final Voids	13
3.6 Model Capability for Impact Assessment	17
4. Conclusions	18
5. Recommendations	19
6. Declaration.....	20
7. References	20

Table 1 - selected impact assessment capabilities of China Stone model	17
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Figure 1 - pre-mining groundwater levels (after AGE, 2015, Figure 16).....	4
Figure 2 - pre-mining groundwater levels (after AGE, 2015, Figures B6-B8).....	5
Figure 3 - conceptualisation as reported (after AGE, 2015, Figure 25).....	6
Figure 4 - Kh-depth relationships (after AGE, 2017, Figure C8; citing Mackie, 2009)	9
Figure 5 - conceptual final landforms (after Hansen Bailey, 2015, Figure 8-5)	14

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Middlemis H (2017). China Coal Project Groundwater Model Targeted Peer Review. Prepared by Hydrogeologic for the Office of the Coordinator General. September 25, 2017.

1. Introduction

This report presents the findings of a targeted peer review of the groundwater model that was developed to support the Environmental Impact Statement (EIS) of the China Stone Coal Project in the northern Galilee Basin of central Queensland.

The purpose of the targeted peer review is to inform the Coordinator-General regarding the:

- assessment of the mine's potential impacts to groundwater resources;
- preparation of the groundwater chapter of the evaluation report for the project;
- preparation of any conditions upon which the project may proceed.

The evidentiary basis for the peer review comprised several report volumes (components of the China Stone EIS), but the following reports were the main targets:

- AGE Consultants (2015). Project China Stone Groundwater Report (Appendix I to EIS; includes Appendix B Numerical Modelling Report). Prepared for Hansen Bailey. June 2015.
- Hansen Bailey (2017). Project China Stone. Attachment A Response to NRM Submission on Draft EIS. Prepared for Macmines Australasia Pty Ltd. 14 July 2017.
- AGE Consultants (2017). Project China Stone. Attachment D Additional Information on Groundwater for Macmines Australasia Pty Ltd. Prepared for Hansen Bailey. August 2017.

2. Scope and Method

The Request for Quote indicated that the peer review should consider six key questions (targets):

1. Is the conceptualisation of pre-mining groundwater flow directions determined by AGE representative of the aquifer systems based on the information available to the proponent?
2. Is the extent/magnitude of the reduction in horizontal hydraulic conductivity with depth in the coals seams that has been modelled for the project justified and supported by local data? If the revised horizontal hydraulic conductivities (July 2017) in the coal seams are supported, should additional sensitivity analysis be carried out using these revised parameters as part of the base case scenario?
3. Are the modelled recharge rates within acceptable ranges based on the information and data available?
4. Has the fault in the northern underground mining area been modelled appropriately to represent the likely impacts on groundwater flow and mining induced drawdown?
5. Is there sufficient evidence to support the concept that the final voids will act as groundwater sinks (as the final void water balance modelling shows), rather than groundwater through-flow systems that may pose a risk to groundwater quality?
6. Is the groundwater model capable of predicting potential impacts, at an appropriate scale, to Doongmabulla springs, Lake Buchanan and/or landholder bores?

The RfQ indicated that the response to question 6 should consider the approach taken to predict cumulative impacts of China Stone and the adjacent Carmichael mine. Where appropriate, the RfQ required that responses to all questions should provide recommendations to refine the model and enhance the level of confidence in its prediction of impacts. The RfQ stated that no other issues need be considered in the peer review. The desktop peer review was carried out consistent with the peer review elements of the established best practice groundwater modelling guidelines (Barnett et al. 2012; Middlemis et al. 2001). Two telephone discussions were arranged by the Office of the Coordinator-General (6 and 20 Sept. 2017) to clarify various issues with Hansen Bailey and AGE consultants. A key aim of this peer review is to identify whether any assessments made or conclusions reached are supported by the evidence presented, and/or whether additional information, monitoring, assessment and/or modelling may be required.

3. Targeted Peer Review

3.1 Groundwater Flow Directions

This review finds that the conceptualisation of pre-mining groundwater flow directions determined by AGE Consultants (2015) is not adequately representative of the aquifer systems based on the information available to the proponent (mainly a documentation issue). However, the pre-mining groundwater flow directions that are simulated by the model developed by AGE Consultants (2015) do provide reasonable representations of the flow systems.

3.1.1 Conceptualisation

The conceptualisation of AGE Consultants (2015) is represented in Figures 16 and 25 of the EIS (refer to Figure 1 and Figure 2 below):

- Figure 16 (Groundwater Levels - Rewan Formation and Permian Stratigraphy):
 - the Rewan Formation data points are all aligned on a north to south-east arc along Darkies Range, and mostly on/adjacent the lease area, which is insufficient to infer the eastern flow directions indicated; the data points could also be used to infer a south to south-easterly flow direction (e.g. along Rewan outcrop strike), as indeed the groundwater model indicates (AGE, 2015, Figures B6-B8, captured on next page);
 - the ‘Permian Stratigraphy’ groundwater levels plot (Figure 16 of the EIS) is reasonably representative in that it shows a more south to south-easterly flow direction (towards the Carmichael River and the Doongmabulla Springs Complex), as well as a westerly component towards Lake Buchanan in the north; however, there seem to be only four data points on the lease area and no data points in the northern part of the plot (near the local high of 320 mAHD), so the basis for the plot is not well established east and west of the lease area;

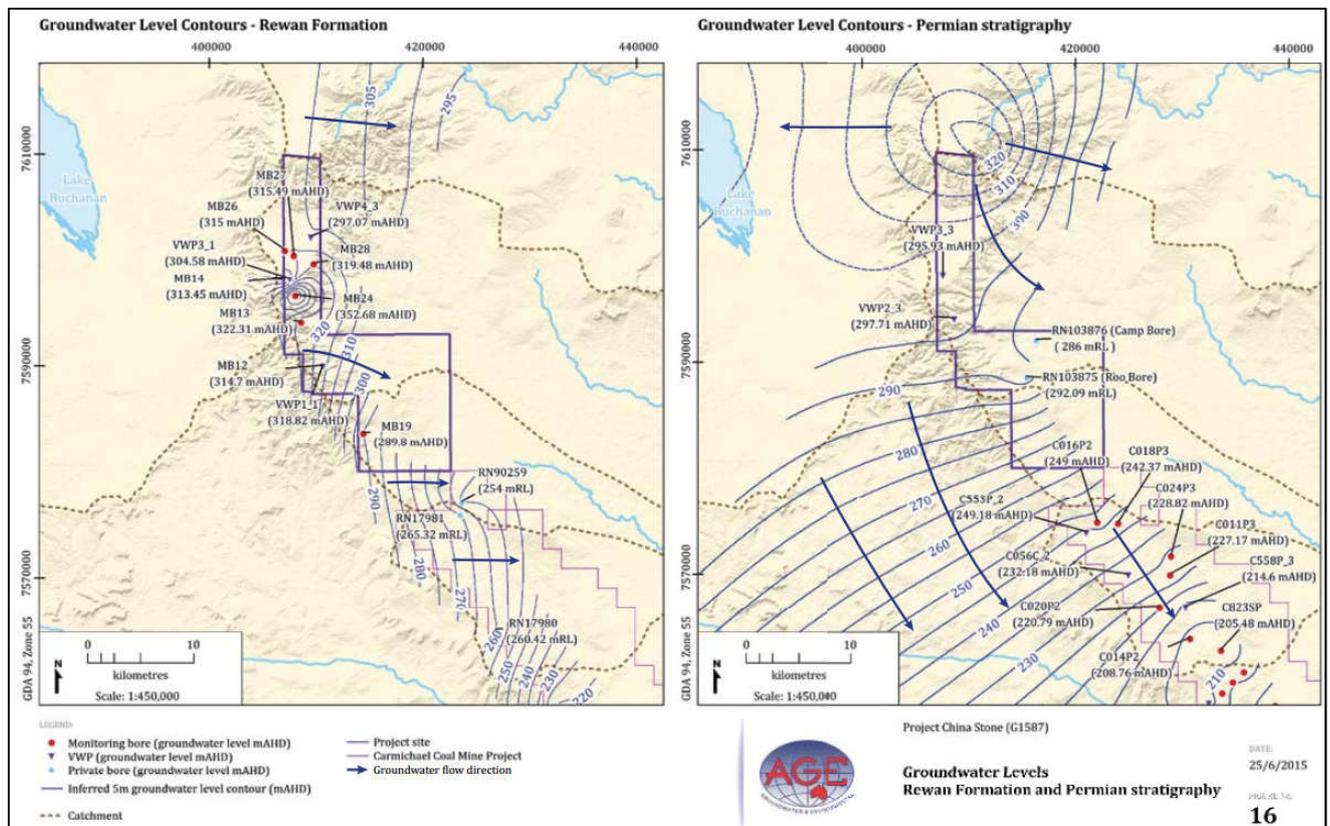


Figure 1 - pre-mining groundwater levels (after AGE, 2015, Figure 16)

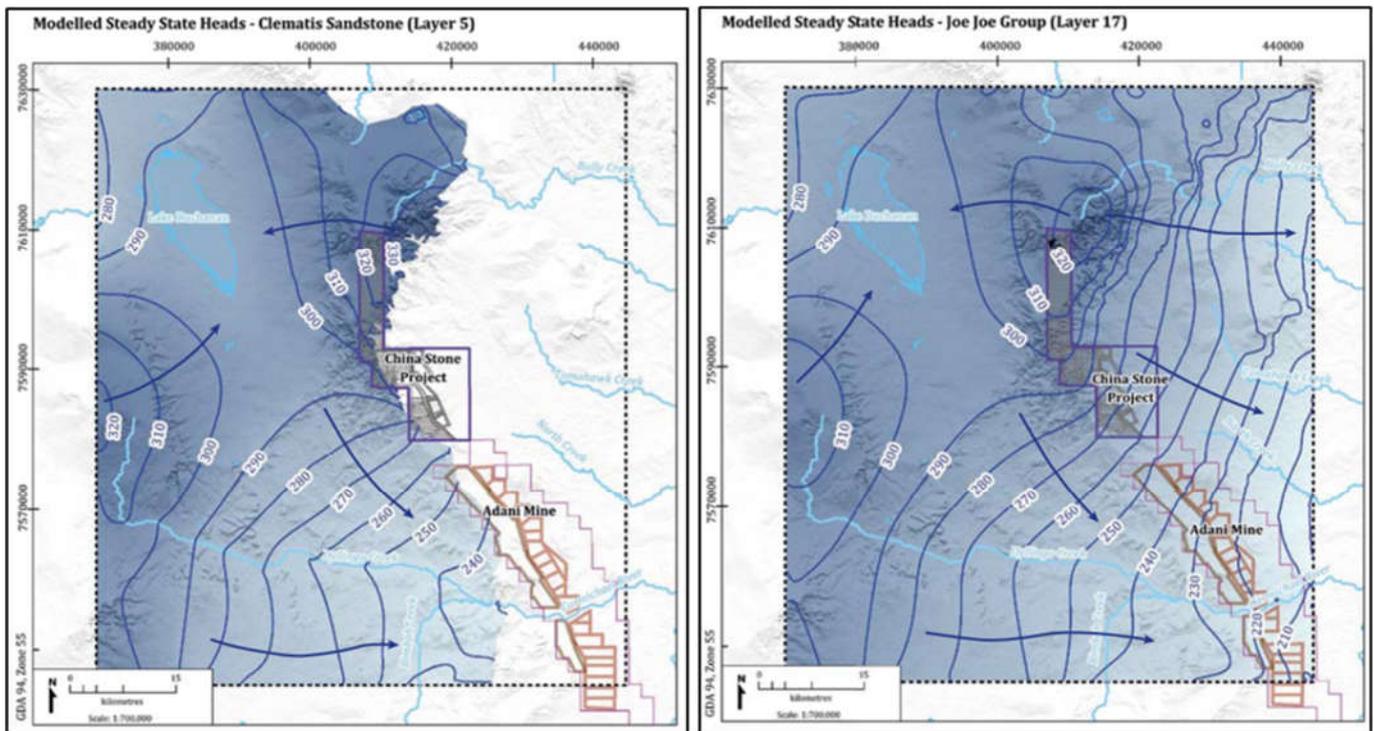


Figure 2 - pre-mining groundwater levels (after AGE, 2015, Figures B6-B8)

- Figure 25 (Conceptual Groundwater Regime; see Figure 3 below):
 - this conceptual cross-section is representative of groundwater flow system directions (apart from the mis-labelling of ‘east’ and ‘west’ on the figure), except where it shows Lake Buchanan as a regional groundwater sink, as this (incorrectly) suggests that there is no potential for regional groundwater flow towards the GAB to the west;
 - Lake Buchanan may well be a groundwater discharge zone for flow in the shallow Quaternary and Tertiary units on a local to catchment scale (as conceptualised), but flow in deeper Triassic units (Moolayember Formation and Clematis Group) is likely to have a western component underneath Lake Buchanan and towards the Great Artesian Basin (GAB). The model shows this (Figures B6-B8; see Figure 2 above) but the conceptualisation (Figure 25; see Figure 3 below) does not.

3.1.2 Groundwater Flow Systems and Boundary Conditions

Although the conceptualisation (Figure 3 below) may be poorly presented in certain details, the pre-mining groundwater flow directions simulated by the model developed by AGE Consultants (2015; Figures B6-B8; see Figure 2 above) exhibit much better representations of the flow systems, such as showing:

- regional groundwater flow mainly from west to east, with some local flow systems around Lake Buchanan
- significant south-easterly flow towards the Carmichael River
- some groundwater outflow to the west (in the northern half of the modelled area), beyond Lake Buchanan (i.e. towards the GAB).

There is an issue with the flow patterns near the southern model boundary, which was reportedly set perpendicular to inferred groundwater level contours (AGE (2015), section B.1.2.3, ‘Model Boundaries’). However, Figures B6-B8 (Figure 2 above) show that the modelled contours are not completely orthogonal to the southern boundary, indicating significant contributions to/from the head-dependent flow conditions in this area. Similar issues apply to the northern boundary. This model performance suggests sub-optimal model design, parameterisation (including the GHB boundary conditions) and/or calibration. However, the issue is arguably not material to the

current focus of the impact assessment on the flow systems in the central part of the model (i.e. the predicted impacts currently do not extend to the southern and northern boundaries).

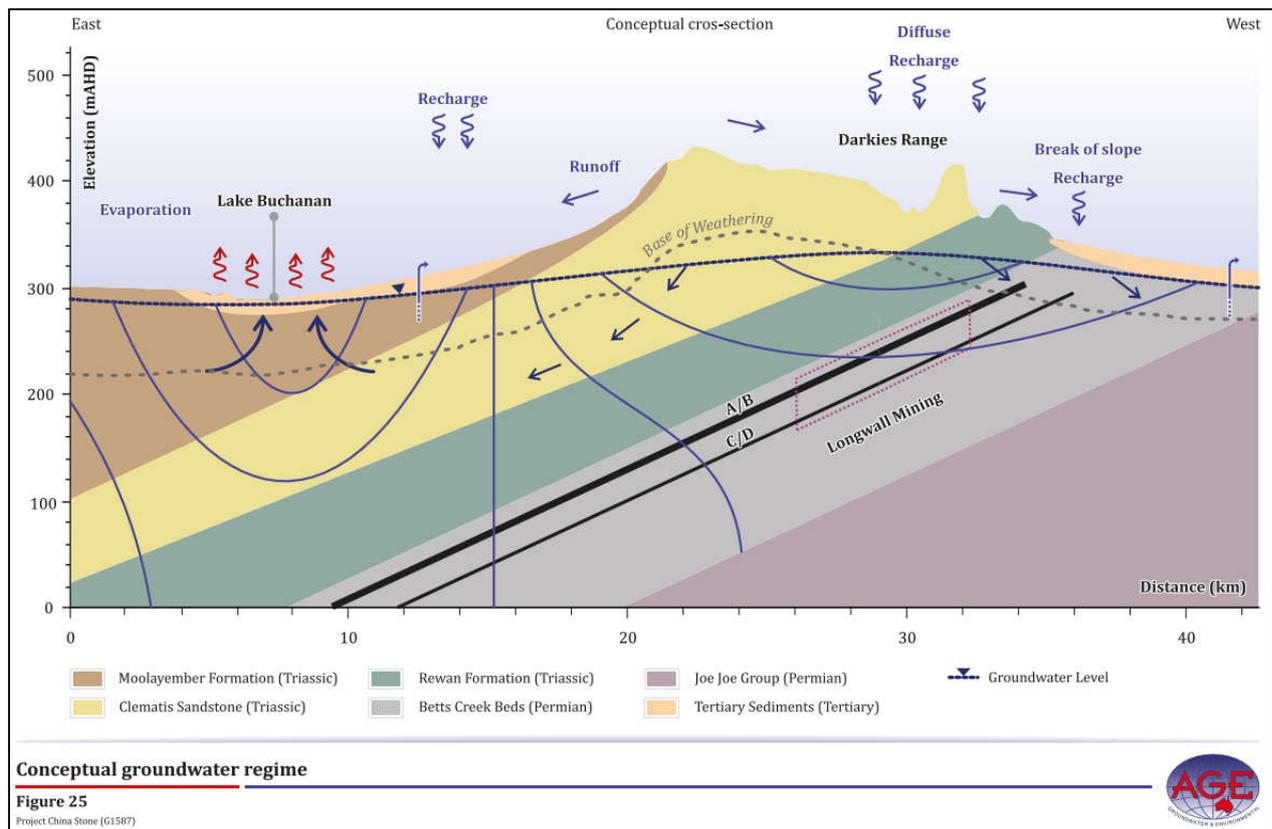


Figure 3 - conceptualisation as reported (after AGE, 2015, Figure 25)

It is worth noting that this boundary condition issue would be material if any of the following applied (e.g. subject to future model revisions):

- if the model predicted impacts near the boundaries (because the model boundary conditions are affecting flow patterns just inside the boundaries);
- if the model was required to comprehensively assess cumulative impacts (the current model does not contain the entire Carmichael project, for example); the current method of superposition of China Stone and Carmichael project drawdown impacts is a reasonable first estimate, but it is not a comprehensive assessment of cumulative impacts;
- if the model was to be required to represent in detail the Doongmabulla Springs (this review has not identified a specific model feature for the Springs, although the existing evapotranspiration and river features in the model could form suitable surrogates).

If these issues were deemed critical, then there is an argument that the China Stone southern model boundary should be revised to align with the Carmichael River, as most pre-mining groundwater levels are orthogonal to the river, and it represents an approximate line of symmetry for the drawdown impacts due to the Carmichael Coal project.

3.1.3 Available Information

Key information on groundwater flow systems that is available to the proponent (but which has not been referenced in the EIS) includes the 2014 'Context Statement' report on the Bioregional Assessment (BA) for the Galilee Sub-region (Evans et al. 2014), which shows contour maps of groundwater level for:

- the Triassic aquifers (e.g. Clematis Group), shown at Figure 32;

- the Jurassic-Cretaceous aquifers of the western margin of the Eromanga Basin (GAB) that overlie the Galilee Basin, shown at Figures 33 and 34.

These BA groundwater level (potentiometric) surfaces are described as ‘preliminary’, as they assume hydraulic connectivity between the Triassic aquifer units (Warang Sandstone, Clematis Group and Dunda Beds), based on data available from RPS (2012) (which compiled data from the Queensland DERM and QPED databases). As the individual water level data measurements were taken at different times, the BA maps do not represent a ‘snapshot’ of levels at a certain time, but they can be used to infer semi-regional groundwater flow system patterns. The model as constructed appears to adequately represent the groundwater flow systems.

Figure 32 in the BA report (Evans et al. 2014) shows that groundwater in the Triassic aquifers of the Galilee Basin (e.g. Clematis Group) exhibit “a general convergence of flow towards ... the Carmichael River”, with “the potential to leak into the Carmichael River, provided a pathway exists”. This is consistent with the results from the China Stone model (AGE, 2015; Figure B6), where there are significant groundwater flow components towards the Carmichael River, which is clearly a gaining stream (contour lines perturbed upstream at intersection with the river) upstream from the Adani lease. However, whereas the Carmichael Coal model was calibrated to spring discharge in terms of longitudinal flow accretion profiles for the groundwater-fed reaches of the Carmichael River (Middlemis, 2014), the China Stone model has not been executed in a similar manner.

Figure 36 in the BA report (Evans et al. 2014) shows that the Triassic Moolayember Formation in the area surrounding and west of Lake Buchanan is overlain by a partial aquifer unit in the Eromanga Basin (GAB), suggesting potential for inter-aquifer leakage. Aquifer pressures of 280-290 mAHD in the Triassic units immediately west of Lake Buchanan (AGE, 2015; Figures B6-B8) appear to be similar to those in the overlying GAB units (Evans et al. 2014; Figure 34), indicating that groundwater flow interaction volumes would likely be small in this area.

Further to the south-west, Figure 34 in the BA report (Evans et al. 2014) shows predominantly western flow in Eromanga Basin (GAB) aquifers that overlie the Galilee Basin units, towards a low level of less than 250 mAHD in the area north-west of Aramac and north-east of Longreach. In the area north of Aramac, Figure 32 shows higher levels (about 300 mAHD) in the underlying Triassic Galilee Basin aquifers (e.g. Clematis Group), indicating the potential for flow contributions from the Galilee aquifer units to the GAB units via the leaky aquitard of the Moolayember Formation. Evans et al. (2014) discuss this potential for inter-aquifer leakage, indicating more potential for leakage in the area north of Longreach and west of Aramac (where there is almost no information available on Triassic aquifer levels), but less potential north of Aramac, even though Triassic levels are indicated as being up to 50 m higher than in the GAB.

Taken together, the available information establishes the potential for westwards regional groundwater flow from the north-eastern Galilee Basin (west of China Stone), with subsequent leakage into the GAB, but the amount and spatial distribution is quite uncertain.

In terms of the China Stone groundwater model, this potential for westwards regional flow is exhibited in the north-western corner of the modelled area (AGE, 2015, Figures B6-B8; see Figure 2 herein), even though the conceptualisation (Figure 3 herein) does not make this clear. This would appear to be an issue where improved conceptualisation documentation may be warranted, rather than corrective action being required on the groundwater model as such. However, improvements are also warranted in the analysis of model results to quantify any changes in outflows to the west under the prediction scenarios (i.e. changes to boundary flows could indicate one element of potential impacts on the GAB that may have not been explored in detail in the EIS, in that section 8.5.1 and Figure 42 of AGE (2015) has a focus on water “take” during mining).

3.2 Reduction in Hydraulic Conductivity with Depth

This review finds that the extent and magnitude of the reduction in horizontal hydraulic conductivity (K_h , or “permeability”) with depth in the coal seams that has been modelled for the China Stone project is not adequately justified and supported by local data, and that additional sensitivity analysis should be carried out using revised parameters as part of a base case scenario. The base case parameter revision should also apply to the vertical hydraulic conductivity (K_z) values generally, and to the fractured zone K_z values above longwall panels, as they were all based on factors applied to the K_h values (AGE, 2015, Tables B5 and B8; AGE, 2017, Table H). Vertical connectivity (and thus transmission of drawdown effects) depends on the K_z value as well as the (uncalibrated) confined aquifer specific storage (‘ S_s ’) value, which is set too high at $2 \cdot 10^{-5} \text{ m}^{-1}$ and warrants reduction to values that are more realistic and more consistent with the Carmichael Coal model. It is recommended that the China Stone base case S_s parameters be revised to the following (unless detailed justification is given):

- S_s not higher than $2 \cdot 10^{-6} \text{ m}^{-1}$ for the Rewan Group and Joe Joe Group and intervening interburden units;
- S_s in the range $5 \cdot 10^{-6} \text{ m}^{-1}$ to $1 \cdot 10^{-5} \text{ m}^{-1}$ for coal seams (preferably the low-range value unless soundly justified);
- S_s not higher than $2 \cdot 10^{-5} \text{ m}^{-1}$ for the other units.

Put simply, the China Stone model aquifer permeability values (K_h and K_z) are low and the storage (S_s) is high, none of them are adequately justified, and the combination would tend to under-estimate drawdown impacts. There are complex interactions between parameters, which means that the model should be re-calibrated with revised base case parameters before re-running the composite and other sensitivity analyses and the predictions.

3.2.1 Coal Seam K_h (horizontal permeability)

The key document in this case is the recent report: Additional Information on Groundwater (AGE, 2017). Figure C8 (captured below in Figure 4) shows that the ‘local data’ test results mostly indicate K_h values above 10^{-3} m/day , apart from four packer tests at the Carmichael site that indicate 10^{-4} m/day . Figure C8 also shows that the K_h -depth relationships applied to the base case model predictions (solid pink and blue lines) invoke a steep regression slope and low minimum value of 10^{-5} m/day . This is not consistent with the local data beyond about 200 m depth, and its application to the base case model has minimised the regional extent of drawdown in the coal seams (due to the lower K_h). The ‘sensitivity’ regressions (dashed lines) were discussed with DNRM (Hansen Bailey, 2017, issue 41.021; referencing AGE, 2017) as being more representative of the local data (e.g. minimum K_h of 10^{-4} m/day) and yet still consistent with the background relationships derived by Mackie (2009). These more realistic K_h -depth relationships should be applied to the base case model parameters.

Figures D1-D14 (AGE, 2017) show that the model results are not sensitive to applying the revised K_h -depth parameter values of Figure C8 to the coal seams. AGE (2017) state that this also involved changing the K_z values using the established $K_h:K_z$ factors (AGE, 2017, Table H), presumably using one of the Fortran utilities (AGE, 2015). While this is appropriate, it is interpreted by this reviewer to mean that the sensitivity test has involved changing the K_h and K_z values for the coal seams only, as the K_h -depth relationship applies only to the coal layers but not to the interburden layers.

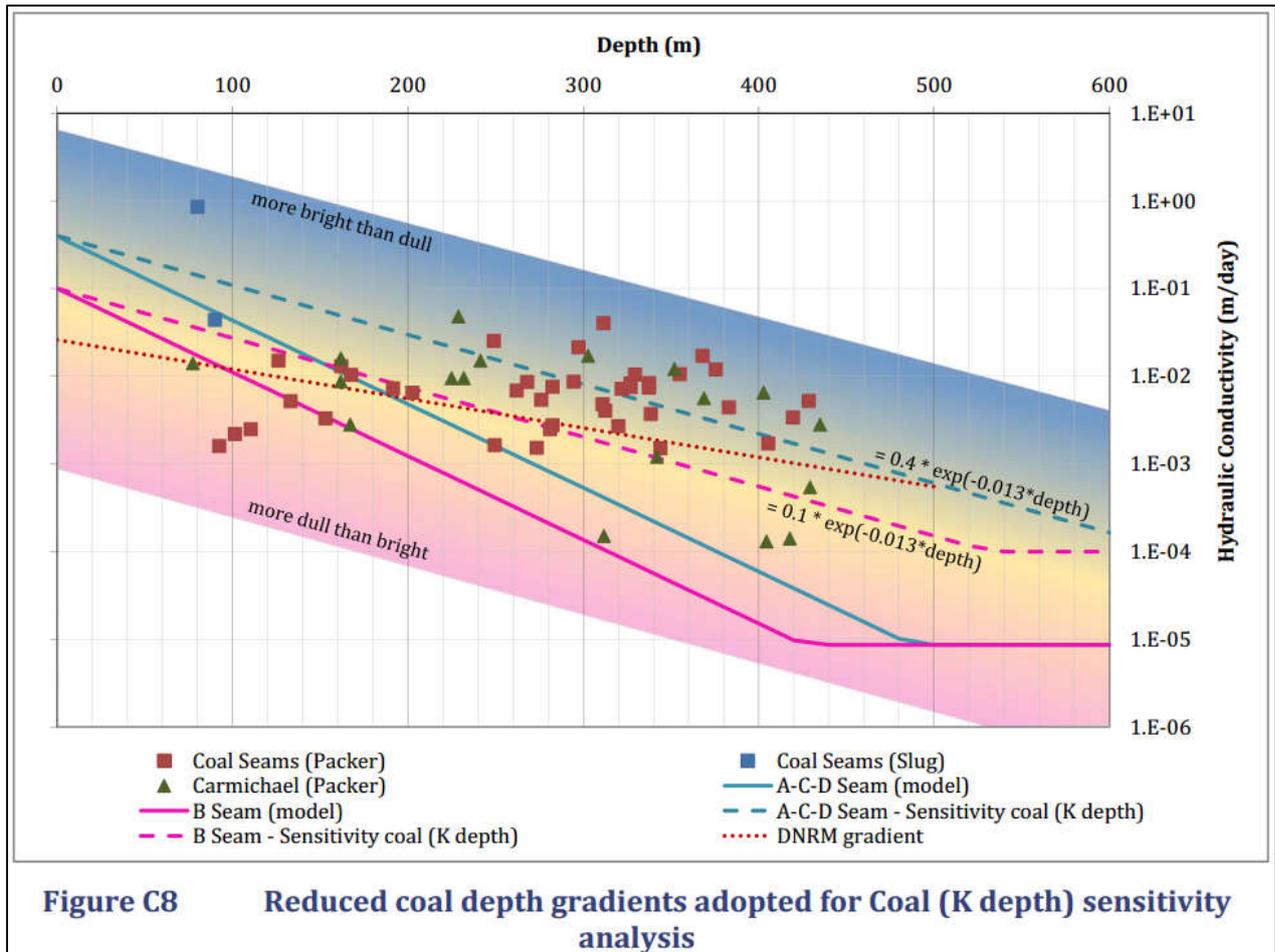


Figure 4 - Kh-depth relationships (after AGE, 2017, Figure C8; citing Mackie, 2009)

3.2.2 Interburden Kz (vertical permeability)

Further to the discussion above, the Kz values for two interburden units warrant revision:

- The Kz values for the Betts Creek Beds overburden to the A seam (layer 9 in the model; $K_z = 1.12 \cdot 10^{-6}$ m/d), and for the overburden to the D seam (layer 15; $K_z = 6.85 \cdot 10^{-6}$ m/d), are orders of magnitude lower than for any other interburden unit (K_z ranges from $2.5 \cdot 10^{-5}$ to $5.2 \cdot 10^{-4}$ m/d), but this has not been adequately justified or investigated in terms of uncertainties. The Kh:Kz ratio for these two interburden units are 100:1 and 67:1, whereas the ratio is in the range of 3:1 to 7:1 for the other interburden units (AGE, 2017, Table H).
- The composite sensitivity plot (AGE, 2015, Figure B10) showed that the model results are more sensitive to the Kz for these two layers than for all other sensitivities apart from the Clematis Kh and the identified key sensitivity factors (Rewan recharge (break of slope), Clematis recharge, weathering Kh factor and Tertiary Kh).

While the current low Kz for the A seam overburden would arguably maximise the potential drawdown in the coal seams (by limiting leakage from above) it would also tend to reduce the transmission of drawdown effects upwards in areas outside the longwall fracture zone. For example, Mackie (2009) showed that individual lower conductivity units can significantly influence the bulk vertical values for a sequence of coal seams and interburden units and hence also influence the extent and magnitude of drawdown (note: the actual parameter values applied to the fracture zone for the A seam overburden are not being questioned here; the factor of 1000 invoked for the goaf on the A seam overburden may seem inordinately high, but that is because the Kz of this unit is so very low). The sensitivity to A-seam and D-seam overburden parameters and inconsistency with other interburden properties suggests that the interburden base case

parameters require some refinement and/or uncertainty assessment and detailed justification of the values adopted.

3.2.3 Specific Storage (Ss)

The vertical leakage process (and transmission of drawdown effects) depends on the Kz value and on the confined aquifer specific storage ('Ss') values. The Ss value is an uncalibrated parameter, set at a relatively high value of 2.10^{-5} m^{-1} (for almost all layers). This is 20 times higher than the value applied to most layers of the Carmichael Coal model (1.10^{-6} m^{-1}). As an example of why it is considered too high, we note that an Ss value of 2.10^{-5} m^{-1} applied to a 150 m thickness ('b') Clematis unit would generate a confined aquifer storage coefficient ('S') value of 3.10^{-3} ($S=Ss*b$). This is a high S value, indicating a productive aquifer, which is fine for the Clematis. However, there is no justification for such high Ss values for the other units in the sequence (Moolayember, Dunda, Rewan, Betts Creek Beds). A high S (or Ss) means that more storage is available in the China Stone model, which reduces the drawdown impact in the model and slows its lateral transmission.

Recent investigations into specific storage used pumping test and geotechnical test data from the Surat Basin, along with first principles ("text book") calculations, to indicate a reasonable range for specific storage of around 5.10^{-7} to around 2.10^{-5} m^{-1} where there is no site-specific test data available (Evans et al, 2015). This is lower than the Ss range of 5.10^{-6} to 5.10^{-5} m^{-1} suggested by Mackie (2009), which was estimated from first principles calculations (not field testing), and which was used for guidance by AGE (tele-conference 20 Sept. 2017).

This review finds that the assumed specific storage parameter has been over-estimated in the China Stone base case model, and thus there is potential for the under-prediction of drawdown. Adoption of a base case Ss value of 2.10^{-5} m^{-1} (even for a coal seam unit) is at the high end of a reasonable range (Evans et al, 2015) and must be properly justified (e.g. with field testing). It is noted that the Carmichael Coal model adopted a low-range base case value of 1.10^{-6} m^{-1} for the Rewan formation and underlying interburden units, but a high-range value of 1.10^{-5} m^{-1} for the A seam and D seam (GHD, 2014; Table 7 and Appendix D, Table 18), the same value as that applied to the Clematis, Dunda and Moolayember formations.

It is recommended that the China Stone base case Ss parameters be revised to the following, unless detailed justification is given:

- Ss not higher than 2.10^{-6} m^{-1} for the Rewan Group and Joe Joe Group and intervening interburden units;
- Ss in the range 5.10^{-6} m^{-1} to 1.10^{-5} m^{-1} for coal seams (preferably the low-range value unless soundly justified);
- Ss not higher than 2.10^{-5} m^{-1} for other units.

3.2.4 Base Case Parameters

In summary, the above outlines a combination of realistic parameter settings that should be applied to the base case model, which may require some recalibration, and then all sensitivity analyses (including the composite sensitivity analysis) should be re-run to properly evaluate the potential effects of these fundamental parameter changes (see section 5 for a listing of all the changes required). The implementation of these refinements would help identify the range of uncertainties affecting the dewatering impact predictions.

3.3 Recharge Rates

This peer review finds that the modelled diffuse recharge rates (AGE, 2015) are generally within acceptable ranges based on the information and data available, but the 'break of slope' (enhanced) recharge rates as reported do not appear to be reasonable.

The diffuse recharge rates applied to broad areas of the China Stone groundwater model (AGE, 2015; Table B2, Figure B3) range from 0.01% to 0.3% of annual average rainfall (0.3% is reported as equivalent to 1.8 mm/a, which indicates that rainfall is 600 mm, even though that is not entirely consistent with the rainfall data presented in Figure 5). Such recharge rates are consistent with the rates applied to the Carmichael Coal model (Middlemis, 2014), which were tested extensively against other information and methods including chloride mass balance and thus should be considered reasonable, although possibly at the low end of the range, especially for the Clematis Group outcrop. The lack of a dynamic response in measured groundwater levels to rainfall trends is not unexpected, given previous work in the Galilee Basin near Lake Buchanan (RPS, 2012) that showed poor correlations between Ronlow beds groundwater levels and nearby tipping bucket rainfall gauge data (gauges 600306A and 600309A).

In the China Stone model, the Clematis Group received the highest diffuse recharge rate (0.3% or 1.8 mm/a), with the Rewan receiving much lower rates (0.12%, or 0.72 mm/a). Interestingly, this was reversed for the enhanced recharge rates applied to small 'break of slope' areas of the model (Table B2): the Rewan break of slope recharge is listed as 3.19% (19 mm/a). Despite the very small area this was applied to, the Rewan break of slope recharge contributes the greatest amount of recharge volume across the entire model at 1.92 ML/d (compared to a total of 2.21 ML/d for all diffuse sources combined and 2.17 ML/d for all break of slope areas combined; Table B2). In comparison, the reported Clematis break of slope recharge rate was 0.13% (0.78 mm/a), and that contributed just 0.05 ML/d, while the Clematis diffuse recharge rate was 0.3% (1.8 mm/a), contributing 1.13 ML/d.

The commendable work on the model composite sensitivity plot (AGE, 2015, Figure B10) shows that the model is very sensitive to Clematis recharge and to the break of slope recharge, especially for the Rewan. However, there appears to be inadequate justification for the very high recharge applied to Rewan break of slope areas. Most of these high recharge areas in the model are concentrated on the eastern side of Darkies Range (i.e. closer to the mine lease area), but no explanations are given as to why there are no enhanced recharge areas on the western slopes. It is suggested that it would be more justifiable to apply higher recharge rates to the high permeability Clematis outcrop area than to the low permeability Rewan.

An apparent effect of the current setup can be seen on the south-eastern margins where the modelled groundwater level contours of Figures B6-B8 show perturbations south of the Carmichael River where break of slope enhanced recharge rates are also applied (Figure B3). There are similar perturbations apparent in the contours within the lease area and to the north-east where most of the break of slope recharge has been applied. This shows that high recharge rates perturb the modelled contours.

This raises the question of whether the model has been adequately tested for sensitivity to recharge. AGE (2015) reportedly applied a sensitivity factor of 10 to recharge rates (section B3), which resulted in maximum rates of up to 180 mm/a (Hansen Bailey, 2017, submitter issue 41.026). While this sensitivity analysis has tested high rates of recharge, the test has effectively been applied only to the small areas of break of slope recharge (rate increased from 19 to 180 mm/a), and to the areas of Clematis outcrop (rate increased from 1.8 to 18 mm/a). Almost all other recharge rates are less than 0.1 mm/a (Figure B3), so a factor of 10 change is not a strong stress test across most of the model. The test on the Clematis rate can be argued to have tested a reasonable range, and the model results can be seen to be sensitive to these changes in terms

of mine inflows (within the first 5 years; Figures B12-B14), and the predicted maximum depressurisation of the Clematis during and post-mining (Figures B16-B18).

AGE (2015) tends to overlook this sensitivity to Clematis recharge (although they rightly indicate the main sensitivities are in relation to aquifer storage and hydraulic conductivity parameters). The report does not adequately explain complexities/uncertainties regarding the break of slope recharge and its influence on the results. Uncertainties could be explored by reducing the Rewan break of slope recharge and increasing the Clematis diffuse recharge. Further sensitivity scenarios such as these may also be warranted to explore key uncertainties and combinations of uncertainties.

3.4 Fault in Northern Underground Mining Area

This peer review finds that the fault in the northern underground mining area may not have been modelled appropriately to represent the likely impacts on groundwater flow and mining-induced drawdown, in that uncertainties have not been adequately explored.

The northern fault has been identified from drilling results in the area, and it is understood that DNRM agree that the fault is delineated appropriately (i.e. the drilling results indicate that it is truncated to the north and the south). The fault displacement is reported as 100 m maximum (AGE, 2015, section 4.3), and a Clematis aquifer saturated thickness of up to 50 metres is reported on the (downthrown) eastern side, with the western side unsaturated (AGE, 2015, section 7.3 and Figure 22). However, no actual evidence is presented to confirm the isolated aquifer nature (e.g. there are some dry Clematis bores on the western side of the fault but there are no Clematis monitoring bores on the eastern side of the fault in this area to confirm the saturated character).

The northern fault has been modelled with low permeability properties applied to it, and appropriate sensitivity tests have also been run assuming that it is permeable (Clematis aquifer properties were applied). The high permeability test was implemented by applying Clematis properties to the 75x75 metre cells that represent the fault alignment, presumably extending through the underlying Dunda, Rewan and Betts Creek Beds layers (although that has not been documented in the report). The inflow reportedly increased by 2 ML/d with high permeability properties applied to the fault (AGE, 2015; section B3.1, Figures B12-B13). The summary of Table B9 reflects that result in terms of a 15% increase in the maximum inflow from 5072 to 5860 ML/a, suggesting relatively low sensitivity. Although sensitivity to fault permeability has been tested, the test results have not been included in the otherwise commendable model composite sensitivity assessment (AGE, 2015, Figure B10). This means that the influence of the fault property uncertainties cannot be adequately compared to other factors.

The groundwater assessment adopted the commendably conservative assumption regarding subsidence above longwall panels that “where the zone of continuous cracking is predicted to intersect only part of a geological unit, the entire thickness of that geological unit is assumed to be continuously cracked” (AGE 2015, section 8.3). They go on to say that, “the vertical hydraulic conductivity assigned to the cracked Clematis Sandstone is so high as to be considered uniformly free-draining”, citing Gale (2007) (although that reference is not actually listed).

The modelling report (AGE, 2015, Appendix B) states that, in the northern underground mining area where dual seam mining occurs, “the height of connective cracking would therefore intersect the overlying Clematis Sandstone” (AGE, 2015, section B2.2). Table B8 shows that the vertical hydraulic conductivity (Kz) for the Clematis above dual seam mining has a value of 0.13 m/d, or a factor of 10 times the basic value of 0.013 m/d. Applying the subsidence factors, the model predictions indicate that pre-mining Clematis saturated thickness of 50 m east of the fault would be reduced “by up to 33 m in response to subsidence and connective cracking” (AGE, 2015, section 8.4.1 and Figure 29). The results show that the saturated Clematis thickness is

reduced to about 17 m, but that does not reflect free-draining conditions as such, suggesting that the fractured zone Kz values listed in Table B8 (AGE, 2015) are set too low. Therefore, the high permeability fault sensitivity test may also be questionable, or at least it has not been well-justified.

The Subsidence report (Gordon Geotechniques, 2014) shows several areas at Figure 37 where there is strong potential for connective cracking to extend to the surface. One such area is within around 1 km south of the Northern Seasonal Wetland (Cumberland Ecology, 2015), and it is noted that the northern fault alignment also passes nearby. However, as the model does not have a feature to represent the Northern Seasonal Wetland, it cannot be used to investigate potential interaction effects with connective cracking above longwall panels and/or the northern fault and related uncertainties (i.e. connective cracking could potentially crack any partial seal underlying the wetland that may help support the seasonal existence of the wetland).

This review finds that, while the groundwater model has been used to investigate some effects in the northern underground mining area, it has not been used to investigate other uncertainties or combinations of uncertainties that could produce significant (unwanted) impacts. Corrective action is warranted to provide evidence of the Clematis saturation on either side of the northern fault, and to incorporate the fault properties into the composite sensitivity assessment. Further uncertainty scenarios are warranted to explore the potential for interactions between the Northern Seasonal Wetland, the fault alignment and properties, the underlying fracture/subsidence zone associated with the northern underground mining area (especially the effect of connective cracking to the surface), and recharge variability (see section 3.3 above).

3.5 Post-Mining Final Voids

This peer review finds that, there is insufficient evidence to support the concept that the final voids will act as groundwater sinks (as the final void water balance modelling shows) rather than groundwater through-flow systems. However, experienced judgement would suggest that the conditions are such that the final voids will likely act as groundwater sinks. More evidence and details should be provided to establish the final void character and to explore assumptions and uncertainties (e.g. evaporation rates).

The EIS reports provide very little information on the ‘final void’ assessment, which can be summarised as follows:

- The EIS provides three paragraphs within the model overview at section 12.4.2 and one figure (12-10), but that is a very basic summary only.
- The same summary information is repeated in AGE (2015) section 8.4.3, along with Figures 35-41 that show depressurisation contours. However, those plots do not show the actual post-mining water table levels that would confirm whether or not the pit void acts as a sink, and the text provides no details on the model setup for these pit void scenarios.
- The modelling report (AGE, 2015, Appendix B) does not provide any details on the pit void model setup or results.
- A little more information is presented in AGE (2015) section 8.7.1 (again, only three paragraphs), but including some geochemical information indicating a low risk regarding leachate quality via the spoil material around the final pit lakes, and referencing the ‘surface water assessment’, indicating a final equilibrium (average) pit void lake level of 255 mAHD.
- The Water Management System Modelling Report (Hansen Bailey, 2015) presents some information in section 7 on the ‘Final Void Modelling’ (less than one page in total, plus Figure C-6). The report describes a water balance analysis in very brief terms, listing an input of (undocumented) results from a groundwater model scenario to quantify the groundwater inflow to the final void (it does not describe the groundwater model pit void setup or results). Other inputs to the water balance include surface runoff estimates

from the AWBM lumped parameter model, and climate data including evaporation, although the evaporation rate is not specified. This ‘Final Void Modelling’ is a water balance analysis (rather than a final pit void scenario implemented in a groundwater model), but it was run over a long post-mining period of 200 years, with reasonable climatic variability stresses.

- The Rehabilitation report (Hansen Bailey, 2015) shows the final mining area layout in Figure 8-4 and the final landform in Figure 8-5 (Figure 5). There are separate final pit void lakes in the north and south mining areas, both with slender shapes aligned in a north-south direction (i.e. such arrangements would maximise sheltering effects that would reduce evaporation). The arrangement of these final voids appears to be designed to allow for potential future access to the coal seams (suggested by Johnson and Wright (2003) as a suitable purpose).

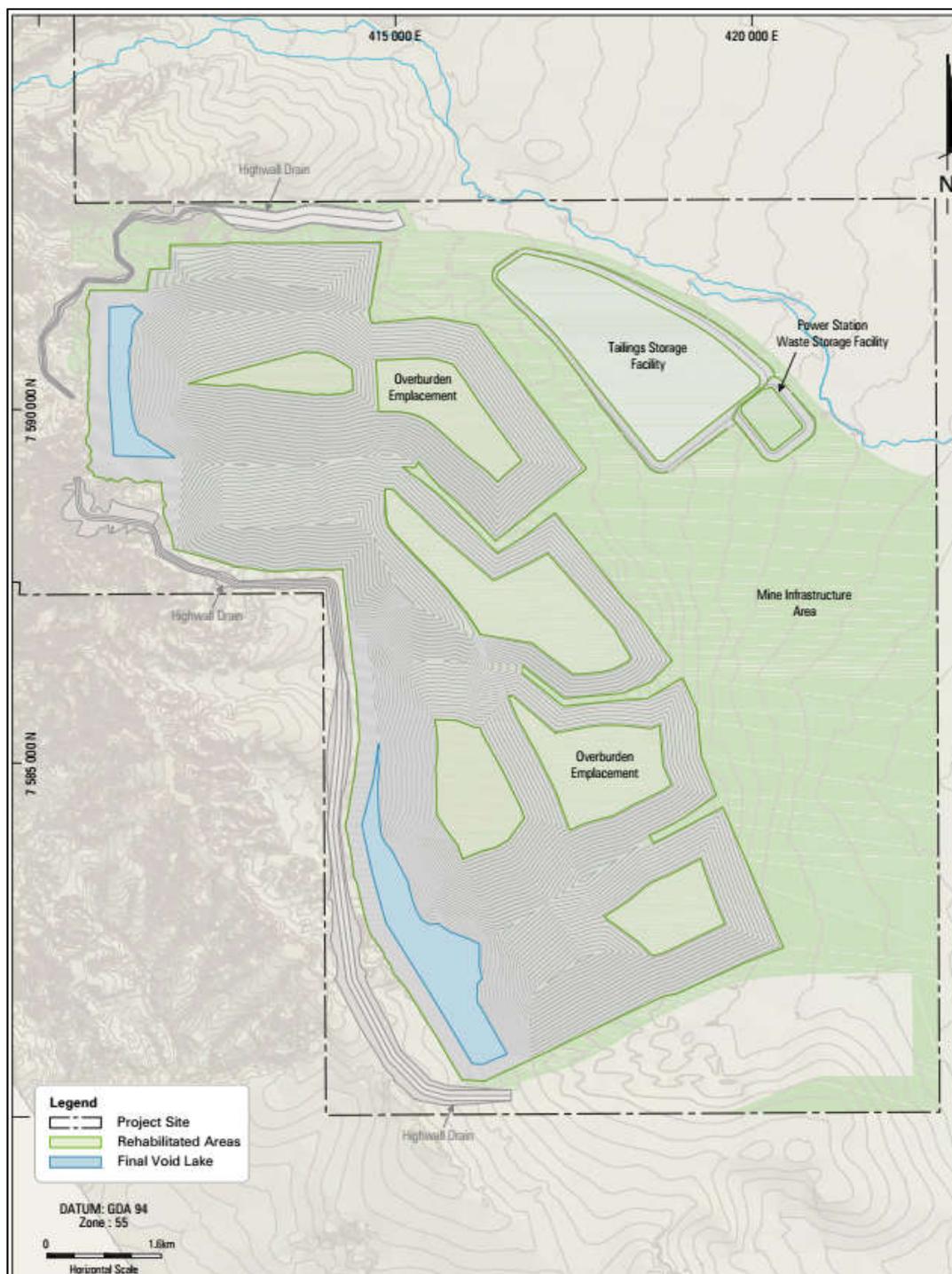


Figure 5 - conceptual final landforms (after Hansen Bailey, 2015, Figure 8-5)

Based on a brief consideration of the final landforms (see Figure 5), there would appear to be adequate and suitable waste rock and/or tailings material available to backfill the relatively small residual final voids to at least the pre-mining water level. Given the otherwise low leachate risks (AGE, 2015), reduction of long term risks to water resources could be achieved by backfilling to the pre-mining water level (Younger and Wolkersdorfer, 2004) to minimise final void lake evaporation and salinisation impacts. There appears to be little exploration of options or justification of the final arrangement in these terms.

Given the lack of report documentation on the final pit void lakes, a telephone conference was organised by the Office of the Coordinator-General on 6 September 2017, when further information was verbally provided by Hansen Bailey and AGE Consulting representatives. The evaporation data used was reported as the SILO climate database (<https://www.longpaddock.qld.gov.au/silo/>) lake evaporation (un-factored). This would likely over-estimate the evaporation rate applying to the pit void lake surface due to the sheltering effect of the final landform in terms of wind, solar inputs and water temperature. This means that there is a high probability that the final pit void lake equilibrium water level would be higher than the 255 mAHD predicted due to the lower effective evaporation (but still likely to be tens of metres lower than the final land surface).

The final voids modelling procedure involved running the groundwater model via a series of runs with a range of fixed head levels applied to the pit lake to quantify the relationship for lake elevation versus groundwater inflow for input to the water balance. The final iteration involved re-running the groundwater model with the average final void lake level of 255 mAHD (output from the water balance modelling) as a fixed head input to a 200-year run to evaluate the long term post-mining depressurisation effects.

The final post-mining model run is executed poorly, for the following reasons:

- the long term lake level (estimated from the water balance analysis) is specified as an initial condition to the post-mining groundwater model run; this means that it is applied instantaneously at the end of mining; this is quite unrealistic, resulting in the pit void lake acting as a recharge source until the surrounding groundwater levels recover;
- the time taken for aquifer recovery is not reported, and time series plots and contour plots of predicted groundwater levels have not been presented to demonstrate that the surrounding groundwater levels have re-equilibrated to the final pit void sink condition by the end of the 200-year run; this means that the predicted “maximum zone of depressurisation post-mining” presented in Figures B16-B17 (AGE, 2015) is not established conclusively, and the predicted impacts on third-party bores are uncertain.

The application of best practice would avoid these problems by running the model in steady state for the post-mining scenario (Barnett et al, 2012), with a fixed head to represent the estimated final lake level (and with appropriate parameters applied to represent the backfill and the lakes). It is noted that the model was calibrated to pre-mining conditions in steady state, and predictions in steady state do not involve aquifer storage parameters (see section 3.2.3 above), so a steady state post-mining approach would reduce uncertainties in the post-mining predictions. A steady state post-mining run would not allow analysis of the time taken for recovery, but it would provide a conservative estimate of the long term extent and magnitude of depressurisation (i.e. improving confidence in the predicted impacts on third parties or environmental receptors). Such an approach could also allow investigation of options and uncertainties for the final pit void treatment (e.g. the lake evaporation rate assumptions), provided the fixed head were replaced by an evaporation function in the model.

Evaporation is a key factor (and uncertainty) in final void assessments (McCullough and Schultze, 2015), but the assumptions applying to evaporation have not been detailed in this case. For example, detailed documentation is required on the evaporation data and any factors applied, the pit void hypsographic information (level-volume-area data for each of the final voids), the

modelled configuration of the voids (e.g. whether the ‘final void modelling’ assumed one composite pit void or somehow combined the information for the two separate voids), details on the groundwater model setup and the results (e.g. elevation-inflow relationships) including the final post-mining scenario and results. Long term increases to solute concentrations in any terminal sink pit lake would increase water density and this may cause density-driven outflow under certain conditions (McCullough and Schultze, 2015). This potential impact has not been considered in the EIS, and it should be addressed for any final pit void lake scenario.

The Coordinator-General’s question, which stems from the IESC advice, assumes no groundwater quality risks to the surrounding groundwater regime if the voids form terminal sinks. However, terminal pit void lake sinks do pose water quality risks, typically via salinity increases due to evapo-concentration (Johnson and Wright, 2003). If this process results in hyper-saline pit void lakes, there is the potential for density-driven plumes to move away from the lake (e.g. down-dip to the west, or possibly in a southerly direction based on hydraulic gradients under Darkies Range), but that typically takes many hundreds or thousands of years (if at all). In comparison, while a through-flow pit void lake could also have water quality impacts (Johnson and Wright, 2003), in this case the impacts may be limited, due to the reported benign nature of the waste infill and less opportunity (time) to significantly change concentrations due to exposure to atmosphere. However, significant reductions in risks to groundwater quality could be achieved by backfilling the pit voids to the pre-mining groundwater level to minimise final void lake evaporation and salinisation impacts (Johnson and Wright, 2003; Younger and Wolkersdorfer, 2004). These issues, and related uncertainties (notably the evaporation rate assumptions), have not been explored in the EIS to identify minimum impact closure options.

Having said all that, the water balance prediction that the dynamic equilibrium water levels post-mining will be 249-260 mAHD (Figure C6) does not appear to be unreasonable in principle (based on my experienced judgement). It is, however, not justified by appropriate documentation, and key uncertainties (e.g. evaporation assumptions) have not been explored. The analysis does not provide any information on the increase in solute concentrations in the final void lake, which could easily be investigated via the water balance model at least in terms of salinity. Substantially more evidence, details and uncertainty testing is required on the post-mining and pit void lake scenarios for the purpose of a comprehensive impact assessment.

It is worth noting that the groundwater model is suitable for investigating uncertainties affecting the predicted long term lake level, notably the assumed evaporation rate. Whether a through-flow pit void lake is a desired outcome, or a terminal sink, the model could be used to investigate a range of backfilling options for the final voids (from partial to total to none), to identify an optimum scenario to minimise risks to groundwater quality, and to evaluate how those predictions are affected by uncertainties. It is suggested that steady state model runs be used to investigate post-mining scenarios, as the model was calibrated in steady state, that approach does not involve storage parameter assumptions (i.e. uncertainty is reduced accordingly), and it would provide a conservative assessment of the extent and magnitude of post-mining depressurisation effects.

3.6 Model Capability for Impact Assessment

Table 1 summarises the findings of this peer review on the question of whether the groundwater model is capable of predicting potential impacts, at an appropriate scale, to the Doongmabulla Springs, Lake Buchanan and the landholder bores.

Table 1 - selected impact assessment capabilities of China Stone model

Receptor	Capable?	Reasoning
Doongmabulla Springs Complex	Yes/No	China Stone model can predict drawdown at Doongmabulla springs, but current predictions show drawdown does not reach there. Further, there is no specific feature in the China Stone model to represent the discharge from the Doongmabulla springs, but the existing evapotranspiration and river features could form suitable surrogates (in a manner similar to that applied to the Carmichael Coal model). Whereas the Carmichael Coal model was calibrated to spring discharge in terms of longitudinal flow accretion profiles for the groundwater-fed reaches of the Carmichael River (Middlemis, 2014), the China Stone model has not been executed in a similar manner. Similar refinement of the existing China Stone model features at Doongmabulla is needed to provide the capability to assess any spring discharge impacts that may arise due to any drawdown impacts (if predicted).
Lake Buchanan	Yes	Model results show shallow groundwater flows towards Lake Buchanan and deeper groundwater underflow bypassing the Lake and flowing west (i.e. outflow to GAB). Model can be interrogated to quantify impacts in terms of groundwater levels and water balance changes (e.g. in terms of evapotranspiration and/or lake-aquifer interchange volumes). Assumption of 5m water level in Lake Buchanan (Table B3; AGE, 2015) questionable and sensitivity/uncertainty analyses is warranted.
Landholder bores	Yes/No	Model is capable, but results are notably sensitive to horizontal hydraulic conductivity for weathered regolith and Tertiary aquifers. While sensitivity results have been provided, there is low confidence in the post-mining predictions of the regional extent and magnitude of post-mining depressurisation (see section 3.5 for more detail and section 5 for recommendations for further work).
Cumulative Impacts of China Stone and Carmichael coal mines	Yes	Addition of predicted drawdown impacts (principle of superposition) due to China Stone and Carmichael coal projects is a reasonable method to provide a first estimate of cumulative impacts during mining (one that was applied to the Surat Basin (USQ, 2011) prior to development of the cumulative impacts model). However, there is low confidence in the post-mining impact predictions for China Stone (see point above). Detailed assessment of cumulative impacts would require a regional model designed to investigate cumulative impacts.

4. Conclusions

This peer review has concluded the following on the six key questions:

1. The conceptualisation of pre-mining groundwater flow directions determined by AGE Consultants (2015) is not adequately representative of the aquifer systems based on the information available to the proponent. However, the pre-mining groundwater flow directions simulated by the model developed by AGE Consultants (2015) provide better (reasonable) representations of the flow systems than does the conceptualisation.
2. The extent and magnitude of the reduction in horizontal hydraulic conductivity (K_h) with depth in the coals seams that has been modelled for the China Stone project is not adequately justified and supported by local data, and additional sensitivity analysis should be carried out using revised parameters as part of a base case scenario.
 - The base case parameter revision should also apply to the vertical hydraulic conductivity (K_z) values generally, and to the fractured zone K_z values above longwall panels, as they were all based on factors applied to the K_h values.
 - Vertical connectivity (and thus transmission of drawdown effects) depends on the K_z value as well as the (uncalibrated) confined aquifer specific storage (' S_s ') value, which is set too high at $2 \cdot 10^{-5} \text{ m}^{-1}$ and warrants reduction to a more realistic value and more consistent with the Carmichael Coal model values. It is recommended that the China Stone base case S_s parameters be revised to the following, unless detailed justification is given:
 - S_s not higher than $2 \cdot 10^{-6} \text{ m}^{-1}$ for the Rewan Group and Joe Joe Group and intervening interburden units;
 - S_s in the range $5 \cdot 10^{-6} \text{ m}^{-1}$ to $1 \cdot 10^{-5} \text{ m}^{-1}$ for coal seams (preferably the low-range value unless soundly justified);
 - S_s not higher than $2 \cdot 10^{-5} \text{ m}^{-1}$ for the other units.
3. The modelled diffuse recharge rates are generally within acceptable ranges based on the information and data available, but the 'break of slope' (enhanced) recharge rates as reported do not appear to be reasonable (further justification is warranted).
4. The fault in the northern underground mining area may not have been modelled appropriately to represent the likely impacts on groundwater flow and mining-induced drawdown, in that uncertainties have not been adequately explored.
5. There is insufficient evidence presented to support the concept that the final voids will act as groundwater sinks (as the final void water balance modelling shows) rather than as groundwater through-flow systems. However, application of the reviewer's experienced judgement indicates that the conditions are such that the final voids as currently configured will likely act as groundwater sinks. The final post-mining model run has been executed poorly (see section 3.5 for details), meaning that the predicted "maximum zone of depressurisation post-mining" is not established conclusively, and the predicted post-mining impacts on third-party bores are uncertain. Steady state model runs should be used to provide conservative assessments of the extent and magnitude of post-mining impacts.
6. The China Stone model is capable of adequately predicting potential impacts during mining, at an appropriate scale, to Lake Buchanan and the landholder bores, but there is low confidence in the post-mining predictions. The model is capable of predicting drawdown impacts to Doongmabulla Springs, and the consequent impacts in terms of spring discharge could be predicted by refining the existing evapotranspiration and river model features (in a manner similar to that applied to the Carmichael Coal model).
 - The arithmetic addition of predicted drawdown impacts (applying the principle of superposition) due to the China Stone and Carmichael coal projects is a reasonable method to provide a first estimate of cumulative impacts during mining. The method was applied to the Surat Basin (USQ, 2011) prior to development of the cumulative impacts model.

- There is low confidence for the post-mining impact predictions for China Stone, however, and hence low confidence in the cumulative post-mining impacts (including Carmichael Coal).
- More detailed cumulative assessment of the China Coal and Carmichael Coal impacts would require a regional model that is specifically designed to investigate cumulative impacts, with appropriate surface water interaction features including the Doongmabulla Springs.

5. Recommendations

This review has identified a combination of realistic parameter settings that should be applied to the base case model, which may require some recalibration, and then all sensitivity analyses (including the composite sensitivity analysis) should be re-run to properly evaluate the potential effects of these fundamental parameter changes.

A process of model revision, recalibration, sensitivity testing and independent review is warranted to implement the following changes:

- the revised (realistic) coal seam Kh-depth relationship (dashed lines in Figure 4 herein);
- justification of the Kh:Kz ratio for interburden units (outside the fracture zones; see section 3.2.2);
- a decreased specific storage (see section 3.2.3):
 - Ss not higher than $2 \cdot 10^{-6} \text{ m}^{-1}$ for the Rewan Group and Joe Joe Group and intervening interburden units;
 - Ss in the range $5 \cdot 10^{-6} \text{ m}^{-1}$ to $1 \cdot 10^{-5} \text{ m}^{-1}$ for coal seams (preferably the low-range value unless soundly justified);
 - Ss not higher than $2 \cdot 10^{-5} \text{ m}^{-1}$ for other units.
- a revised recharge distribution, or justification of existing assumptions (see section 3.3);
- the northern fault properties in the composite sensitivity analysis (see section 3.4);
- refinements to river and evapotranspiration features to represent discharge from the Doongmabulla Springs Complex.

Corrective action is warranted to provide evidence of the Clematis saturation on either side of the northern fault, and to incorporate the fault properties into the composite sensitivity assessment. Further uncertainty scenarios are warranted to explore the potential for interactions between the Northern Seasonal Wetland (which may require a specific feature in the model), the fault alignment and properties, the underlying fracture/subsidence zone associated with the northern underground mining area (especially the effect of connective cracking to the surface), and recharge variability.

Improvements are also warranted in the analysis of model results to quantify any changes in outflows to the west under the prediction scenarios (i.e. changes to boundary flows could indicate one element of potential impacts on the GAB that may not have been explored in detail in the EIS, in that section 8.5.1 and Figure 42 of AGE (2015) has a focus on water “take” during mining).

Substantially more evidence and details should be provided to establish the final void hydrological character and to explore assumptions and uncertainties (e.g. evaporation rates). It is recommended that the groundwater model be used to investigate uncertainties affecting the predicted long term lake level, notably the assumed evaporation rate, and the effect of the current assumption that the final pit void lake is full immediately at the end of mining. Steady state post-mining model scenarios are recommended to provide conservative assessments of the extent and magnitude of post-mining impacts. Whether a through-flow pit void lake is a desired outcome, or a terminal sink, the model could be used to investigate a range of backfilling options

for the final voids (from partial to total to none), to identify an optimum scenario to minimise risks to groundwater quality, and evaluate how those predictions are affected by uncertainties.

6. Declaration

For the record, the peer reviewer, Hugh Middlemis, is a civil engineer, hydrogeologist and independent modelling specialist with more than 35 years' experience. Hugh was principal author of the MDBA groundwater modelling guidelines (Middlemis et al. 2001) and was awarded a Churchill Fellowship in 2004 to benchmark groundwater modelling against international best practice.

Hugh has not undertaken any work at China Stone, although he has undertaken investigations in the Galilee Basin, including:

- independent review of the Carmichael Coal Project groundwater modelling studies (Middlemis, 2014) pursuant to the conditions of approval (endorsed by Office of Water Science, 2014);
- independent review (unpublished) of the Galilee Basin component of Lake Eyre Basin Springs Assessment (Fensham et al. 2016) prepared for the Office of Water Science (for OWS, 2016);
- supervision of groundwater and modelling consulting services provided by RPS Aquaterra in relation to the South Galilee Coal Project in the period 2012-2014.

Having outlined previous experience on projects in the Galilee Basin, we assert no conflict of interest in relation to this independent review task.

7. References

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Acronyms and abbreviations

Acronym	Definition
µg/m ³	micrograms per cubic metre
ACH Act	<i>Aboriginal Cultural Heritage Act 2003</i> (Qld)
Adani	Adani Mining Pty Ltd and Carmichael Rail Network Pty Ltd
AEIS	additional information to the environmental impact statement
AEP	annual exceedance probability
AGE	Australasian Groundwater and Environmental Consultants Pty Ltd
AHD	Australian Height Datum
AQMP	Air quality management plan
AWL	associated water license
BAU	Business as usual
BIBO	bus-in bus-out
BMP	Bushfire Management Plan
BoM	Bureau of Meteorology
BOS	biodiversity offset strategy
BTF	Black-throated finch
CASA	Civil Aviation Safety Authority
CCM&RP	Carmichael Coal Mine and Rail Project
CCS	carbon capture and storage
CER	Clean Energy Regulator
CGE	computable general equilibrium
CHMP	cultural heritage management plan
CHPP	coal handling and preparation plant
CIE	Centre for International Economics
CMSH Act	<i>Coal Mining Safety and Health Act 1999</i> (Qld)
CO	carbon monoxide
CO ₂ -e	carbon dioxide equivalent
COAG	Council of Australian Governments
CSEP	community and stakeholder engagement plan
CTRC	Charters Towers Regional Council
Cwlth	Commonwealth
CWP	coal workers' pneumoconiosis
DATSIP	Department of Aboriginal and Torres Strait Islander Partnerships
DAF	Department of Agriculture and Fisheries
dB	decibel
dBA	decibels measured at the 'A' frequency weighting network
dBL	linear decibels
DEE	Department of the Environment and Energy (Cwlth) (including the former Department of the Environment)

Acronym	Definition
DES	Department of Environment and Science (including the former Department of Environment and Heritage Protection (DEHP))
DEWS	the former Department of Energy and Water Supply
DIDO	drive-in, drive-out
DNRME	Department of Natural Resources, Mines and Energy (including the former Department of Natural Resources and Mines)
DSC	Doongmabulla Springs Complex
DSDMIP	Department of State Development, Manufacturing, Infrastructure and Planning (including the former Department of State Development)
DTMR	Department of Transport and Main Roads
EA	environmental authority
EC	electrical conductivity
EIS	environmental impact statement
EP Act	<i>Environmental Protection Act 1994</i> (Qld)
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cwlth)
EPC	exploration permit for coal
EPP (Air)	<i>Environmental Protection (Air) Policy 2008</i>
EPP (Noise)	<i>Environmental Protection (Noise) Policy 2008</i>
EPP (Water)	<i>Environmental Protection (Water) Policy 2009</i>
EP (Waste Management) Regulation	Environmental Protection (Waste Management) Regulation 2000
ERA	environmentally relevant activity
ERMP	emergency response management plan
ESCP	erosion and sediment control plan
FIFO	fly-in, fly-out
FTE	full time equivalent
GAB	Great Artesian Basin
GAB WRP	<i>Water Resources (Great Artesian Basin) Plan 2006</i>
GABORA Water Plan	<i>Water Plan (Great Artesian Basin and Other Regional Aquifers) 2017</i>
GDE	groundwater dependent ecosystems
GDEMP	Groundwater Dependent Ecosystem Management
GDP	gross domestic product
GHG	greenhouse gas
GMMP	Groundwater Management and Monitoring Program
GRP	gross regional product
GSP	gross state product
GSQ	Geological Survey of Queensland
GWP	Global Warming Potential
ha	hectare

Acronym	Definition
HAMP	Housing and Accommodation Management Plan
HIPAP	Hazardous Industry Planning Advisory Paper
IAS	initial advice statement
ICH	Indigenous cultural heritage
ICN	Industry Capability Network
IESC	Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development
ILUA	Indigenous land use agreement
IRC	Isaac Regional Council
km	kilometre
LA10, 18hr	noise level exceeded for 10% of the measurement period, over an 18 hour period
LA90, 15 min	noise level exceeded for 90% of the time, equivalent to the noise level representing the quietest 10% of the time, in a 15 minute period
L _{Aeq}	equivalent continuous (or 'average') noise level
L _{Amax}	the maximum average A-weighted sound pressure measured over a specified period of time
LGA	Local Government Area
m	metre
Mm ³	million cubic metres
MacMines	MacMines Austasia Pty Ltd
MCP	Mine closure plan
MDG	Mining Design Guidelines
MDLA	mineral development licence application
Meijin	Shanxi Meijin Energy Group
MIA	mine industrial area
ML	megalitres
MLA	mining lease application
MMC	Model Mining Conditions (DES)
mm/s	millimetres per second
MNES	matters of national environmental significance
MPP	Moray Power Project
MR Act	<i>Mineral Resources Act 1989</i> (Qld)
MSDS	Material Safety Data Sheet
MSES	matters of state environmental significance
Mtpa	million tons per annum
MW	megawatts
MWh	megawatt hour
MWMP	mineral waste management plan
MWRMP	mining waste and rejects management plan

Acronym	Definition
NC Act	<i>Nature Conservation Act 1992 (Qld)</i>
NEPM	national environment protection measure
NEPP	National Energy Productivity Plan
NGER Act	<i>National Greenhouse and Energy Reporting Act 2007 (Cwlth)</i>
NO ₂	nitrogen dioxide
NPA	National Partnership Agreement
NSW	New South Wales
NT Act	<i>Native Title Act 1993 (Cwlth)</i>
PAA	priority agricultural area
pH	a measure of hydrogen ion concentration
PHA	preliminary hazard assessment
Planning Act	<i>Planning Act 2016 (replaced the Sustainable Planning Act 2009 on 3 July 2017)</i>
PM ₁₀	particulate matter with equivalent aerodynamic diameter less than 10 micrometres
PM _{2.5}	particulate matter with equivalent aerodynamic diameter less than 2.5 micrometres
PMF	probable maximum flood
PSGHG Plan	Power station GHG emissions reduction management plan
PSWSF	power station waste storage facility
QGSO	Queensland Government Statistician's Office
QH Act	<i>Queensland Heritage Act 1992 (Qld)</i>
Qld	Queensland
QPS	Queensland Police Service
QRC	Queensland Resources Council
RE	regional ecosystem
REMP	Receiving Environment Monitoring Program
RIA	road impact assessment
RMP	rehabilitation management plan
RUMP	road-use management plan
ROM	run of mine
RP1	Release Point 1
RPI Act	<i>Regional Planning Interests Act 2014</i>
SCMP	Spontaneous Combustion Management Plan
SDA	state development area
SDPWO Act	<i>State Development and Public Works Organisation Act 1971 (Qld)</i>
SDWPO Regulation	State Development and Public Works Organisation Regulation (Qld)
SHMS	Safety and Health Management System
SIA	social impact assessment

Acronym	Definition
SIA study area	The social and geographical boundaries for the SIA
SIMP	social impact management plan
social baseline	Description of social conditions and trends within the SIA study area to provide a benchmark against which potential social impacts can be assessed.
SMP	subsidence management plan
SO ₂	sulfur dioxide
SPP	state planning policy
SRI	significant residual impacts
SRN	stock route network
Ss	Specific storage (for a groundwater aquifer)
SSBV	state significant biodiversity values
SSRC Act	<i>Strong and Sustainable Resources Communities Act 2017</i> (Qld)
SSRC Bill	Strong and Sustainable Resources Communities Bill 2016 (Qld)
t	tonne
TAP	threat abatement plan
the project	The China Stone Coal project
TIA	traffic impact assessment
TJ	terajoule
TMP	traffic management plan
TOR	terms of reference
TSF	tailings storage facility
UNFCCC	United Nations Framework Convention on Climate Change
VM Act	<i>Vegetation Management Act 1999</i> (Qld)
VPC	Vertebrate Pest Committee
vpd	vehicles per day
VWP	vibrating wire piezometer
Water Act	<i>Water Act 2000</i>
WH&S Act	<i>Work Health and Safety Act 2011</i> (Qld)
WH&S Regulation	Work Health and Safety Regulation 2011 (Qld)
WRR Act	<i>Waste Reduction and Recycling Act 2011</i> (Qld)

Glossary

Term	Definition
alluvium	Sediment deposited by a flowing stream, consisting of unconsolidated materials including gravel, clay, silt and sand.
application for a change to a coordinated project	An application to the Coordinator-General to evaluate the environmental effects of a proposed change to the project the subject of a Coordinator-General Evaluation Report or to a condition or recommendation within that Report.
appropriately qualified person/s	is a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authorities assessment, advice and analysis to performance relative to the subject matter using the relevant protocols, standards, methods or literature.
aquifer	Rock or sediment in a formation, group of formations or part of a formation that is saturated and sufficiently permeable to transmit economic quantities of water to wells and springs.
aquitard	Rock or sediment in a formation, group of formations or part of a formation that is solid and low to impermeable and hinders the transport of water
assessment manager	For an application for a development approval, means the assessment manager under the <i>Planning Act 2016</i> (Qld).
best practice	Best practice environmental management <ol style="list-style-type: none"> 1. The best practice environmental management of an activity is the management of the activity to achieve an ongoing minimisation of the activity's environmental harm through cost-effective measures assessed against the measures currently used nationally and internationally for the activity. 2. In deciding the best practice environmental management of an activity, regard must be had to the following measures— <ol style="list-style-type: none"> a) strategic planning by the person carrying out, or proposing to carry out, the activity; b) administrative systems put into effect by the person, including staff training and monitoring and review of the systems; c) public consultation carried out by the person; d) product and process design; e) waste prevention, treatment and disposal. 3. Subsection (2) does not limit the measures to which regard may be had in deciding the best practice environmental management of an activity.
Betts Creek Beds	Geological unit consisting of sandstone interbedded with siltstone, claystone, coal and minor tuff. Contains the target coal seams for the project.
bilateral agreement	The agreement between the Australian and Queensland Governments that accredits the State of Queensland's EIS process. It allows the Commonwealth Minister for the Environment to rely on specified environmental impact assessment processes of the state of Queensland in assessing actions under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cwlth).
carbon dioxide equivalent - CO ₂ -e	A metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential.
Clematis Sandstone	Geological unit, designated Great Artesian Basin aquifer consisting of massive quartzose sandstone with minor interbedded siltstone.
coal resource	The total amount of useable coal in a given area, as determined through geological surveys.

commencement of construction of the project	Physical construction, including significant and continuous site preparation work such as major clearing or excavation for foundations or the placement, assembly or installation of facilities or equipment at any site related to the project.
commencement of mining activities	The first instance of any mining activity. Commencement of mining activity includes any physical disturbance including clearing of vegetation, earthworks, new road works, new rail works, construction of camp, development of mining associated infrastructure and mining operations. Commencement does not include: <ul style="list-style-type: none"> a) erection of signage or fencing b) minor physical disturbance necessary to undertake pre-clearance surveys or establish monitoring programs or associated with the mobilisation of plant, equipment, materials, machinery and personnel prior to the start of railway and road development or construction; or c) activities that are critical to commencement that are associated with mobilisation of plant and equipment, materials, machinery and personnel prior to the start of railway or road development or construction only if such activities will have no adverse impact on MSES, and only if the environmental authority holder has notified the administering authority in writing before an activity is undertaken.
Commercial place	A place used as a workplace, an office or for business or commercial purposes and includes a place within the curtilage of such a place reasonably used by persons at that place.
construction areas	The construction worksites, construction car parks, and any areas licensed for construction or on which construction works are carried out.
controlled action	A proposed action that is likely to have a significant impact on a matter of national environmental significance; the environment of Commonwealth land (even if taken outside Commonwealth land); or the environment anywhere in the world (if the action is undertaken by the Commonwealth). Controlled actions must be approved under the controlling provisions of the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cwlth).
controlling provision	The matters of national environmental significance, under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cwlth), that the proposed action may have a significant impact on.
coordinated project	A project declared as a 'coordinated project' under section 26 of the SDPWO Act. Formerly referred to as a 'significant project'.
Coordinator-General	The corporation sole constituted under section 8A of the <i>State Development and Public Works Organisation Act 1938</i> and preserved, continued in existence and constituted under section 8 of the SDPWO Act.
dBA	A-weighted decibels, where the A-weighting means frequencies below 500Hz and above 10kHz are artificially reduced to approximate the frequency response of an average human ear
dBL	Linear decibels, used to explicitly define a decibel scale in the absence of any frequency weighting
decant pond	The low point on the surface of the distributed tailings facilities beach where supernatant water and run-off collects.
decommission	Safe removal of plant and equipment following the completion of mining operations.

effluent	Treated waste water discharged/released from sewage treatment plants
emission intensity	Quantity of CO ₂ -e produced per MWh of electricity produced
environment	As defined in Schedule 2 of the SDPWO Act, includes: <ul style="list-style-type: none"> a) ecosystems and their constituent parts, including people and communities b) all natural and physical resources c) the qualities and characteristics of locations, places and areas, however large or small, that contribute to their biological diversity and integrity, intrinsic or attributed scientific value or interest, amenity, harmony and sense of community d) the social, economic, aesthetic and cultural conditions that affect, or are affected by, things mentioned in paragraphs (a) to (c).
environmental nuisance	As defined under Chapter 1 of the <i>Environmental Protection Act 1994</i>
environmentally relevant activity (ERA)	An activity that has the potential to release contaminants into the environment. Environmentally relevant activities are defined in Part 3, section 18 of the <i>Environmental Protection Act 1994</i> (Qld).
ephemeral	A watercourse, with defined bed and banks, which flows only intermittently after rain.
fauna	Includes birds, mammals and reptiles
fauna crossing and habitat connectivity measures	Purpose-built structures which are designed to allow passage for fauna.
fine rejects	Coal material between 4 mm and 0.3 mm in size.
fly ash	A lighter component of the residue from the combustion of coal within the power station that is emitted from the power station stack.
fly-in fly-out worker	For a large resource project is defined under the <i>Strong and Sustainable Resources Act 2017</i> (SSRC Act) as a worker who travels to the project by aeroplane, or another means, from a place that is not a nearby regional community for the project to work on the operational phase of the project
groundwater unit	A groundwater unit is comprised of the water in and from the geological formations located in the area of the groundwater unit. (i.e. the Clematis is a groundwater unit and the Clematis Sandstone, Moolayember Formation and Rewan Formation are all geological formations. The Clematis is a unit and geological formation.
hybrid technologies	Integrates a renewable energy generation technology with other energy generation systems, such as solar with gas, or wind.
hydraulic conductivity	Hydraulic conductivity, is a property of vascular plants, soils and rocks, that describes the ease with which a fluid can move through pore spaces or fractures. It depends on the intrinsic permeability of the material, the degree of saturation, and on the density and viscosity of the fluid.
imposed condition	A condition imposed by the Queensland Coordinator-General under section 54B of the SDPWO Act. The Coordinator-General may nominate an entity that is to have jurisdiction for the condition.
initial advice statement (IAS)	A scoping document, prepared by a proponent, that the Coordinator-General considers in declaring a coordinated project under Part 4 of the SDPWO Act. An IAS provides information about: <ul style="list-style-type: none"> • the proposed development • the current environment in the vicinity of the proposed project location • the anticipated effects of the proposed development on the existing environment

	<ul style="list-style-type: none"> • possible measures to mitigate adverse effects.
large resource project	<p>Defined under the SSRC Act a resource project:</p> <ul style="list-style-type: none"> a) for which an EIS is required; or b) that holds a site-specific environmental authority under the <i>Environmental Protection Act 1994</i> and— <ul style="list-style-type: none"> i) has, or is projected to have, a workforce of 100 or more workers; or ii) has a smaller workforce decided by the Coordinator-General and notified in writing by the Coordinator-General to the owner of the project.
leachate	any liquid that, in the course of passing through matter, extracts soluble or suspended solids, or any other component of the material through which it has passed
longwall mining	A method of underground mining in which extensive panels of coal (typically 3 km to 4km long, and 250 m to 400m in width) are extracted from a seam using a series of mining units, consisting of hydraulic jacks (chocks), roof supports and shields, and mechanical shearers.
matters of national environmental significance	<p>The matters of national environmental significance protected under the <i>Environment Protection and Biodiversity Conservation Act 1999</i>. The eight matters are:</p> <ol style="list-style-type: none"> 1. world heritage properties 2. national heritage places 3. wetlands of international importance (listed under the Ramsar Convention) 4. listed threatened species and ecological communities 5. migratory species protected under international agreements 6. Commonwealth marine areas 7. the Great Barrier Reef Marine Park 8. nuclear actions (including uranium mines).
mine-affected water	<p>Means the following types of water:</p> <ul style="list-style-type: none"> (a) pit water, tailings dam water, processing plant water (b) water contaminated by a mining activity which would have been an environmentally relevant activity under Schedule 2 of the Environmental Protection Regulation 2008 if it had not formed part of the mining activity (c) rainfall run-off which has been in contact with any areas disturbed by mining activities which have not yet been rehabilitated, excluding rainfall run-off discharging through release points associated with erosion and sediment control structures that have been installed in accordance with the standards and requirements of an Erosion and Sediment Control Plan to manage such ru-noff, provided that this water has not been mixed with pit water, tailings dam water, processing plant water or workshop water (d) groundwater which has been in contact with any areas disturbed by mining activities which have not yet been rehabilitated (e) groundwater from the mine’s dewatering activities (f) a mix of mine-affected water (under any of paragraphs i)-v) and other water. <p>Does not include surface water run-off which, to the extent that it has been in contact with areas disturbed by mining activities that have not yet been completely rehabilitated, has only been in contact with:</p>

	<ul style="list-style-type: none"> (a) land that has been rehabilitated to a stable landform and either capped or revegetated in accordance with the acceptance criteria set out in the environmental authority but only still awaiting maintenance and monitoring of the rehabilitation over a specified period of time to demonstrate rehabilitation success, or (b) land that has partially been rehabilitated and monitoring demonstrates the relevant part of the landform with which the water has been in contact does not cause environmental harm to waters or groundwater, for example: (c) areas that are been capped and have monitoring data demonstrating hazardous material adequately contained with the site (d) evidence provided through monitoring that the relevant surface water would have met the water quality parameters for mine affected water release limits in this environmental authority, if those parameters had been applicable to the surface water run-off, or (e) both.
mine dewatering	Pumping out groundwater that has seeped into the open-cut pit or underground longwall mine.
mining activity	As defined in section 110 of the EP Act.
nominated entity (for an imposed condition for undertaking a project)	An entity nominated for the condition, under section 54B(3) of the SDPWO Act.
open-cut mining	Process used to remove minerals found over a large area, close to the surface. The mine is dug downward in benches or steps which slope towards the centre of the pit.
operational phase	Defined under the SSRC Act for a large resource project, as the period from the start to the end of production of coal, a mineral or petroleum for the project.
properly made submission (for an EIS or a proposed change to a project)	Defined under Schedule 2 of the SDPWO Act as a submission that: <ul style="list-style-type: none"> a) is made to the Coordinator-General in writing b) is received on or before the last day of the submission period c) is signed by each person who made the submission d) states the name and address of each person who made the submission e) states the grounds of the submission and the facts and circumstances relied on in support of the grounds.
pH	a measure of hydrogen ion concentration, "Power of hydrogen"
potentiometric surface	In confined aquifers, the level that the water rises to in a bore is the potentiometric surface. This is similar to the water table for an unconfined aquifer. The potentiometric surface provides an indication of the level to which water will rise in a bore screened in a confined aquifer. The potentiometric surface also indicates the groundwater flow direction.
project area	The area contained within Mining Lease Applications 70514, 70515, 70516, 70517 and 70518 and comprising around 20,000 ha.
proponent	The entity or person who proposes a coordinated project. It includes a person who, under an agreement or other arrangement with the person who is the existing proponent of the project, later proposes the project.
receiving waters	means the waters into which this environmental authority authorises releases of mine affected water.

Rewan Formation	Geological unit, regionally recognised aquitard, marker bed for the base of the Great Artesian Basin. Consists of fine grained, grey-green lithic sandstone, siltstone and claystone.
sensitive place	includes the following and includes a place within the curtilage of such a place reasonable used by persons at that place: <ol style="list-style-type: none"> 8. a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises; or 9. a motel, hotel or hostel; or 10. a kindergarten, school, university or other educational institution; or 11. a medical centre or hospital; or 12. a protected area under the <i>Nature Conservation Act 1992</i>, the <i>Marine Parks Act 1992</i> or a World Heritage Area; or 13. a public thoroughfare, park or gardens; or 14. For noise, a place defined as a sensitive receptor for the purposes of the <i>Environmental Protection (Noise) Policy 2008</i>.
sensitive receptor	as defined under Schedule 1 Acoustic quality objectives of the <i>Environmental Protection (Noise) Policy 2008</i>
sewage	<ol style="list-style-type: none"> a) drainage and other wastes from any form of toilets, urinals, and WC scuppers; b) drainage from medical premises (dispensary, sick bay, etc.) via wash basins, wash tubs and scuppers located in such premises; (c) drainage from spaces containing living animals; or (d) other waste waters when mixed with the drainage defined above.
Significant project	A project declared (prior to 21 December 2012) as a 'significant project' under section 26 of the SDPWO Act. Projects declared after 21 December 2012 are referred to as 'coordinated projects'.
significant project traffic	means an increase in project traffic equal to or greater than 5% in either traffic numbers (AADT) or standard axle repetitions (SARs), as outlined in the GTIA and/or traffic that has the potential to impact on community amenity. In particular, heavy vehicles associated with construction and/or operational haulage
social impact	Defined under the SSRC Act as the potential positive and negative impacts of the project on the social environment of communities affected by the project.
social impact assessment	Defined under the SSRC Act for a large resource project, as an assessment of the social impact of the project.
songline	a route through the landscape which is believed to have been travelled during the Dreamtime (or Alcheringa) and which features a series of landmarks thought to relate to events that happened during this time.
spontaneous combustion	Oxidisation of coal is a normal process and this produces heat and certain gases. All coal oxidises. Spontaneous combustion is the process by which certain material can ignite as a result of internal heat which arises spontaneously due to reactions liberating heat faster than it can be lost to the environment.
stated condition	<p>Conditions stated (but not enforced by) the Coordinator-General under sections 39, 45, 47C, 49, 49B and 49E of the SDPWO Act. The Coordinator-General may state conditions that must be attached to a:</p> <ul style="list-style-type: none"> • development approval under the <i>Sustainable Planning Act 2009</i> • proposed mining lease under the <i>Mineral Resources Act 1989</i>

	<ul style="list-style-type: none"> • draft environmental authority (mining lease) under Chapter 5 of the <i>Environmental Protection Act 1994</i> (EPA) • proposed petroleum lease, pipeline licence or petroleum facility licence under the <i>Petroleum and Gas (Production and Safety) Act 2004</i> • non-code compliant environmental authority (petroleum activities) under Chapter 4A of the EPA.
stratigraphy	The arrangement and succession of rock layers and layering (stratification)
stygo fauna	Aquatic invertebrates that live within the groundwater systems.
tailings	Tailings are reject coal and non-coal materials that are less than 0.33 mm in size, and that will be subject to dewatering.
Tertiary	The period of geological time from 63 million to 2 million years ago.
vibrating wire piezometers:	Used to monitor bore water pressure and water levels
void	An area of land excavated in the carrying out of a mining activity.

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