

Carmichael Coal Mine and Rail project:

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

May 2014

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Synopsis

This report evaluates the potential impacts of the Carmichael Coal Mine and Rail project (the project). It has been prepared pursuant to section 35 of the *State Development and Public Works Organisation Act 1971* (Qld) (SDPWO Act).

The proponent, Adani Mining Pty Ltd, proposes to construct a 60 million tonnes per annum open-cut and underground greenfield coal mine and a 189 kilometre (km) greenfield rail line connecting the mine to the existing Goonyella and Newlands rail system south of Moranbah. The mine is located in the Galilee Basin and is situated within the Isaac Regional Council (IRC) Local Government Area.

The project, which will require A\$16.5 billion of investment, also includes the development of an airport, industrial area, workers accommodation village, five quarries and water supply infrastructure. At full export capacity of 60 mtpa, the project is expected to contribute \$929.6 million annually to the Mackay Region's Gross Regional Product and \$2.97 billion annually to the Queensland economy.

The project is expected to create an estimated 2475 jobs during the construction phase and 3920 jobs during the operational phase. It contributes to a key Queensland Government objective of realising the timely development of the Galilee Basin, while ensuring net community benefits and environmental objectives are maximised.

In undertaking my evaluation of the environmental impact statement (EIS), I have considered the EIS documentation, issues raised in submissions during the two public consultation periods, the additional information to the EIS (AEIS), further documents provided by the proponent, and advice I have received from state government agencies, IRC and the Australian Government Department of the Environment (DE).

The following provides an overview of the main issues arising from my evaluation.

Matters of national environmental significance

Threatened species

Black-throated finch

The project area contains habitat for a significant population of the black-throated finch (southern) (*Poephila cincta cincta*) (BTF) which will be impacted by large scale clearing for open-cut mining and related infrastructure, and subsidence from underground mining operations. The BTF is listed as endangered under both the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the State's *Nature Conservation Act 1992* (NC Act). The project could impact up to 16 500 hectares (ha) of BTF habitat.

The proponent has altered the mine layout to avoid BTF habitat where possible and will continue a monitoring and research program and implement management measures to mitigate impacts to the species, including the development and implementation of a BTF Management Plan. Further baseline information and research is required to fully understand the habitat preferences of the species in the project area; to quantify distribution and abundance, movement patterns and population dynamics; to determine the ecological importance of the Mellaluka Springs Complex for the BTF and to develop

specific measures for the management of grazing, fire and water supply. I have stated conditions in Appendix 1, Schedule I of this report to ensure the BTF Management Plan is implemented on the mining lease, consistent with the BTF national recovery and threat abatement plans. For project areas outside the mining lease, I have recommended a condition (Appendix 2, Section 2) requiring the development and implementation of mitigation measures that maximise the ongoing protection and long-term conservation of threatened species.

The proponent has committed to maintaining and enhancing habitat and populations of the BTF on unmined parts of the mining lease, the proponent's own property of Moray Downs and proposed offset areas on adjacent properties which meet the habitat and water requirements of the species.

To maximise the ongoing protection and long-term conservation of the BTF southern subspecies and its habitat in the Galilee Basin and Desert Uplands bioregion, I have recommended a condition for the Department of Environment and Heritage Protection (DEHP) to develop and implement a Bioregional Management Plan for the BTF and associated threatened species and have conditioned the proponent to contribute funds and baseline research towards the plan (Appendix 1, Section 2, Part B and Appendix 1, Section 3).

Given my stated conditions for avoidance, mitigation and offsetting and the requirements for the management of the BTF, I have concluded that the project will not have unacceptable impacts on the BTF.

Squatter pigeon, yakka skink, ornamental snake

The EIS confirmed the presence of the squatter pigeon (southern) (*Geophaps scripta scripta*) on the project site and determined that the yakka skink (*Egernia rugosa*) and ornamental snake (*Denisonia maculata*) were also likely to occur. All three species are listed as vulnerable under the EPBC Act and the NC Act. I am satisfied that the avoidance and mitigation measures outlined by the proponent can adequately address the potential impacts of the project on these species.

I have recommended conditions of approval to the Commonwealth Minister for the Environment requiring offsets for residual impacts on habitat for these species, and for the development of a management plan by the proponent for MNES species and communities.

Migratory species

The ecological assessments undertaken for the EIS and AEIS confirmed the presence of four migratory bird species listed under the EPBC Act and determined that an additional 10 species are likely to occur, based on previous records and the known presence of suitable habitat in the project area. However, the habitat in the project area does not constitute 'important habitat' as defined in the EPBC Act Significant Impact Guidelines.

I am satisfied that the proponent has outlined mitigation measures that will adequately address the potential impacts of the project on migratory species using the project area. I have recommended a condition for the development of management plans for

the project and offset areas to ensure appropriate management of threats to MNES protected under the EPBC Act.

Waxy cabbage palm

The waxy cabbage palm (*Livistona lanuginosa*) (WCP) is listed as vulnerable under the EPBC Act and the NC Act. It is endemic to the Burdekin-Ravenswood-Cape River area inland from Ayr. Field surveys undertaken for the EIS identified a total of 831 adult and juvenile WCP individuals along a 17.5 km stretch of the Carmichael River and at the nearby Moses Spring.

Clearing associated with the construction of a haul road across the Carmichael River is predicted to impact 5.47 ha of WCP habitat. However, the primary impact on the population will be from groundwater drawdown from mine dewatering, of between 1 to 4 metres (m), in the vicinity of the Carmichael River. This could have an impact on a further 21.7 ha of WCP habitat.

To ensure the WCP populations are appropriately identified and quantified, I have stated a condition for the Environmental Authority (EA) (Appendix 1, Schedule I) requiring the development and implementation of a Groundwater-Dependent Ecosystem Management Plan (GDMP) that will include the WCP. This condition will require the proponent to monitor, identify and describe any adverse impacts to groundwater-dependent ecosystem (GDE) environmental values, ecology, water quality and groundwater level due to mining activities.

Threatened communities

Brigalow

The Brigalow Threatened Ecological Community (TEC) is present within the rail study area, the mine study area and in small patches in the off-lease infrastructure area. The project footprint has been located in areas already cleared to minimise impacts to native vegetation. However, residual impacts could result in the clearing of approximately 276 ha of the TEC with an additional 3 ha potentially affected by subsidence impacts. The proponent proposes direct land-based offsets for this community, with the availability of suitable offsets estimated at 5078 ha in the preferred offset areas.

Great Artesian Basin springs

The Doongmabulla Springs Complex, comprised of three separate springs, is classified as a 'community of native species dependent on natural discharge of groundwater from the Great Artesian Basin' (GAB spring wetlands) TEC and is listed as endangered under the EPBC Act. Located approximately 8 km from the western edge of the mining lease boundary, the primary potential impact on the complex is an indirect reduction in groundwater pressure as a result of mine de-watering operations. Biodiversity values supported by the complex include habitat for threatened and near-threatened flora and fauna species protected under Queensland and Australian Government legislation.

I consider it necessary for the proponent to establish a comprehensive baseline dataset on the current condition of the springs prior to the commencement of mining activities and an ongoing monitoring and reporting program. Monitoring is required to identify

impacts, develop specific mitigation measures and inform ongoing management. I have stated conditions to this effect for inclusion in the project's EA, including the development of a GDEMP.

Great Barrier Reef World Heritage Area, Great Barrier Reef National Heritage Place and Great Barrier Reef Marine Park

The project lies within the Belyando River catchment, forming part of the Burdekin River Basin which discharges through the Burdekin Falls Dam to the coast at Upstart Bay within the Great Barrier Reef World Heritage Area (GBRWHA), approximately 320 km downstream of the project. Given this distance, the project is unlikely to have any direct impacts on the Outstanding Universal Value (OUV) of the GBRWHA. Potential impacts which could occur indirectly via the river pathway include the release of mine affected water (MAW) from the site, increased sedimentation and turbidity and a reduction in downstream flow which could increase concentrations of existing contaminants in downstream waters.

To protect the quality of water leaving the mine site, I have stated conditions in the draft EA (Appendix 1, Schedule F). I have included conditions and recommendations in Appendix 2, Section 1 and Appendix 2, Section 2 to manage impacts on surface water run-off from the rail and off-lease infrastructure. Based on these conditions and the mitigation measures committed to by the proponent, I have concluded that the project will not have an unacceptable impact on the OUV of the GBRWHA, the Great Barrier Reef National Heritage Place (GBRNHP) or the Great Barrier Reef Marine Park (GBRMP).

Wetlands of international importance

The Shoalwater and Corio Bays area and Bowling Green Bay wetland, located approximately 380 km and 236 km from the project respectively, are wetlands of international importance considered by DE to be potentially impacted by the project. As is the case for the GBRWHA, GBRNHP and GBRMP, given the significant distance between the project and wetland areas, there is unlikely to be any direct or indirect impacts as a result of the project. I am satisfied that the proponent's proposed management measures for protecting water quality of the GBRWHA, GBRNHP and GBRMP will equally apply to wetlands of international importance. I consider that the conditions I have stated for the mine, rail and off-lease areas (appendices 1 and 2), and the mitigation measures the proponent has committed to, will ensure the project will not have an unacceptable impact on these wetlands.

Groundwater

The EIS outlined that mining will occur below the regional water table and that it will be necessary to conduct dewatering in order for mining to occur safely. As the mine footprint does not extend far enough west to intercept the closest GAB aquifers, potential impacts on the GAB and therefore the Doongmabulla Springs Complex may only arise indirectly. This could occur from groundwater draining via geological fault structures from the Clematis Sandstone through the Dunda Beds and the Rewan Formation (an aquitard defined as the base of the GAB) into the aquifers of the Bandanna Formation and Colinlea Sandstone.

While I accept that the Rewan Formation is a regional aquitard that prevents significant inter-aquifer transmission of water within and between basins, I have recommended to the Commonwealth Minister for the Environment a condition requiring the development of a Rewan Formation Connectivity Research Plan to be imposed as part of any future approval of this project (Appendix 1, Section 2, Part A). I have also stated conditions for the project's EA (Appendix 1, Schedule E) requiring the implementation of a Groundwater Management and Monitoring Program, including requirements for the systematic review of program effectiveness and groundwater model updates.

There is potential for groundwater levels to remain lower than pre-development levels after mining activities cease and for a permanent reduction in the availability of groundwater to current users and the environment. The proponent has committed to partial filling of mine voids at the end of mining operations that might otherwise lose groundwater through evaporation. I have stated conditions for the project's EA (Appendix 1, Schedule H) for the voids to be partially filled and revegetated to above the usual groundwater level.

The main groundwater use within the vicinity of the project is domestic use and stock watering. The proponent's modelling predicts potential impacts on groundwater levels at 36 properties within the vicinity of the mine. Potentially significant impacts on groundwater levels are predicted at 11 registered bores during the mine's operation and at 15 bores after the end of mining operations.

Under the *Water Act 2000*, the Department of Natural Resources and Mines (DNRM) has the authority to ensure that any water licence issued for mine dewatering for the project contains 'make good' provisions so that all impacts on landowner groundwater supplies are addressed as part of a consultative process with the affected landowners. I have recommended a condition that, prior to the commencement of mining activities, the proponent must develop a detailed plan to guarantee the long-term security of water for all current groundwater users predicted to be affected by the project (Appendix 1, Section 2, Part A). The proponent has committed to 'make good' all impacts on landowner water supplies and has already commenced discussions with all potentially affected landowners.

With regards to potential impacts on GDEs, I have stated conditions (Appendix 1, Schedule E) requiring an adaptive approach to the management of affected GDEs, including the monitoring of groundwater fluctuations in proximity to GDEs and the identification of groundwater drawdown trigger levels which will trigger the implementation of corrective measures for each GDE and/or the provision of offsets.

Surface water

Carmichael River surface flow

A reduction in groundwater flows due to mine de-watering could reduce the Carmichael River base flow by 33 per cent (1000 m³/day) on a long-term daily average for the operating life of the mine and by 31 per cent (950 m³/day) post mine closure. In addition, the proposed changes to catchment areas could reduce flow to the Carmichael River by 1.9 per cent of the total flow at the site or around 5000 ML per year. Approvals for the take of water from the mine site will be required under the

Water Act 2000 and will ensure the protection and appropriate allocation of surface water resources.

Given the relatively small proportion of flow that the Carmichael River contributes to the Belyando/Burdekin River System, I do not consider that there is potential for significant downstream impacts on surface water resources. The proponent has committed to undertake detailed monitoring of groundwater levels and flows in the Carmichael River corridor both upstream and downstream of the mine site.

Subsidence impacts on surface water

Three potential impacts of subsidence on surface water include—alteration of drainage patterns and overland flow through changes in surface topography, reduced downstream flows from surface tension cracking and ponding, and capture of water in subsidence troughs and increased erosion from ponding.

The proponent has committed to undertake subsidence baseline monitoring including in-stream monitoring points at each mapped watercourse that transects the underground mine footprint, monitoring of bed forms and existing bed and bank scour points, monitoring the extent of ponding, inspecting subsided areas for new and existing tension cracks and monitoring stream diversions adjacent to subsided areas.

Further work is required during the next project stage to assess the potential impacts of subsidence on water resources and the development of effective mitigation measures. To this end, I have stated conditions to be included in Schedule J of the draft EA for the project (refer to Appendix 1) requiring the development and implementation of a Subsidence Management Plan prior to the commencement of activities that could result in subsidence, and the annual inspection of subsided longwall panels to assess structural, geotechnical and hydraulic adequacy.

Flooding around the mine site

The mine site requires stormwater management and flood protection to prevent inundation during operations. The proponent has proposed a number of measures to manage flooding, including building levees to protect the adjacent pits from flooding by the Carmichael River, diversion drains that will allow local waterways to pass through the site without causing flooding and redirection of overland flow around operational areas. Water storages will be constructed to manage any contaminated runoff on site.

A change in the duration of flood inundation arising from the proposed construction of flood levees and a cross river bridge has the potential to impact on the health of riparian vegetation and WCPs along the Carmichael River and Cabbage Tree Creek. The proponent has committed to ensuring that the bridge will span the main channel of the Carmichael River with no pylons or supports within the low flow channel. The proponent will also ensure a corridor (minimum of 500 m) will be retained on either side of the centre line of the Carmichael River to protect it and the riparian zone from mining operations. Modelling undertaken by the proponent has demonstrated that there is unlikely to be any impact on riparian vegetation and WCPs due to increased flood inundation duration.

Water quality

Potential water quality impacts include the release of MAW, stormwater run-off and increased flow velocity across disturbed areas and reduction in downstream flow from extraction of water resources and loss of catchment area. I consider that the proponent's assessment documentation adequately describes the potential surface water quality impacts of the project and the proposed avoidance and mitigation measures.

The proponent's water management strategy for the mine focuses on re-using water on site as much as possible and on minimising the long-term storage of MAW. The proponent has committed to constructing water management structures to ensure that no contamination of surrounding waterways occurs. To ensure the proponent's proposed mitigation measures are implemented, I have stated a suite of conditions for inclusion in the EA (Appendix 1, in Schedule F (surface water), Schedule G (sewage treatment), Schedule H (chemicals and flammable or combustible liquids) and Schedule K (dams and levees)) that can protect surface water quality values. The conditions define storage and handling requirements, release limits and contaminant trigger levels and will ensure that appropriate investigation, monitoring and corrective actions are undertaken.

Matters of state environmental significance

Flora and fauna

Residual impacts to Regional Ecosystems (REs) listed as endangered or of concern under the *Vegetation Management Act 1999* (VM Act) are estimated at approximately 410 ha. Total clearing for the project will potentially result in the loss of 1324 ha of remnant and 1308 ha of non-remnant vegetation during the construction phase and an additional 9123 ha of remnant and 8482 ha of non-remnant vegetation during the operation phase.

Apart from the WCP, no other threatened flora species have been recorded in the project area or are considered likely to occur, based on a desktop assessment and likelihood of occurrence analysis. Where matters of state environmental significance (MSES) are also protected under the EPBC Act they have been assessed as MNES.

Species protected under the NC Act only (MSES), including one fauna species listed as vulnerable and five species listed as near threatened under the NC Act, were either confirmed present or considered likely to occur.

I am satisfied that the mitigation and management measures the proponent has committed to implement can minimise risks to MSES from all components of the project and that where any significant residual impacts remain, the values could be offset.

Regarding the management of areas outside the mining lease, I have made recommendations in Appendix 2, Section 2 requiring pre-clearance surveys and the development of management measures to maximise the ongoing protection and long-term conservation of threatened species.

Bygana West Nature Refuge

The Bygana West Nature Refuge covers approximately 1487 ha and is wholly contained within the mine footprint. Potential impacts to the nature refuge include the clearing of approximately 1238 ha of remnant vegetation with a further 182 ha potentially affected by subsidence. Environmental values supported within the nature refuge include areas of endangered REs and habitat suitable for threatened species known to occur in the project area.

Nature refuges are voluntary arrangements between the State and landowners to protect significant biodiversity values while allowing compatible land uses to continue. The declaration of a nature refuge does not alter any existing or future rights to mineral exploration or extraction under the *Mineral Resources Act 1989*. I am satisfied that the proponent has adequately assessed the environmental values of the nature refuge and note that residual impacts to environmental values contained within the nature refuge have been considered in the preparation of the Environmental Offsets Package.

Offsets

The proponent has assessed the project and identified residual impact areas of MNES that could potentially require an offset in accordance with the EPBC Act Environmental Offsets Policy.

The proponent has provided an Environmental Offsets Package outlining the residual impacts of the project likely to require offsets and a proposal to acquit these offset requirements. The proponent identified residual impacts to 48 environmental values including 27 threatened fauna species, one threatened flora species, one TEC, listed REs as well as habitat connectivity, watercourses and wetlands. The Offsets Package indicates that residual impacts to all MNES and the majority of MSES can be offset within the five properties identified in the package, all of which are components of the government's Galilee Basin Offsets Strategy.

For coordinated projects, the Coordinator-General has all the powers necessary to decide State offsets as part of the broad conditioning powers under the SDPWO Act. The Coordinator-General will determine and approve any State offset conditions that are considered necessary to deal with significant residual impacts over and above Australian Government requirements. The Coordinator-General will not require any additional offsets for impacts to MSES if the Australian Government also requires an offset for the same values.

I have imposed a condition (Appendix 1, Section 3) requiring the proponent to finalise a Biodiversity Offset Strategy for my approval that details how EPBC Act offset requirements will be met and identifies any significant residual impacts for MSES that could need offsetting. The approved strategy will be implemented through conditions I have stated for the EA (Appendix 1, Schedule I).

Mine issues

Subsidence

Underground mining is predicted to cause a maximum disturbance of 7786.76 ha with resulting impacts including ponding of surface water, surface cracks up to 280

millimetres (mm) wide and subsidence of up to 5.5 m. The proponent has prepared a draft Subsidence Management Plan outlining control measures to manage impacts from subsidence. I have stated a condition for the development and implementation of this plan in the EA (Appendix 1, Schedule J).

The potential maximum subsidence impacts will be used for the determination of offsets for MNES and MSES residual impacts. However, I require the proponent to deliver up-front offsets for only the first 10 years of mining operations. The ongoing monitoring of subsided areas will confirm the actual extent of impact and inform each stage of the offset delivery, thus providing the incentive for the proponent to manage the effects of subsidence and minimise impacts.

Mine waste

The Mine Waste Characterisation Report prepared by the proponent concluded that the majority of overburden/interburden waste from all lithological groups is likely to be non-acid forming (NAF) and most of these materials are not expected to be an immediate source of salinity. Nevertheless, the proponent has proposed a range of mitigation measures, including the development and implementation of a Mine Waste Management Plan and an ongoing geochemical characterisation program, specialised storage of tailings and potentially acid forming (PAF) materials, ongoing monitoring of groundwater and surface water adjacent to storage areas and capping and rehabilitation of waste rock dump facilities post closure.

I have stated a number of conditions to ensure that the proponent's commitments are implemented and that mine wastes do not have any adverse impacts on groundwater and surface water quality, aquatic ecology and rehabilitation success (Appendix 1, Schedule C and Schedule H).

Rehabilitation and final land use

The proponent intends to return the mine to a stable landform capable of supporting land uses similar to those currently in practice, namely grazing on pastures and woodland habitat. Post-mining land uses have been proposed for each of the mine domains and monitoring of rehabilitated areas will be undertaken for a minimum of five years on all domains after mine closure. Areas representing a higher level of environmental risk such as the final voids, spoil dumps and the underground mining area will be monitored for a longer period to ensure they are safe, stable, sustainable and non-polluting.

I have stated draft EA conditions (Appendix 1, Schedule H) which relate to the rehabilitation of land disturbed by mining and detail completion criteria, monitoring and residual void treatment. I am satisfied that these conditions will ensure the effective closure of the mine and a return of the site to acceptable post-mining land uses.

In the event that the proponent's long-term preference to sell or relinquish the railway line and associated infrastructure does not eventuate, a rehabilitation strategy for the rail alignment has been developed and will be implemented. The strategy will see the alignment returned to conditions suitable for grazing on a landscape of pasture and woodland habitat.

Landholder impacts

Landholders directly affected by the proposed rail alignment raised concerns during the public submission periods about the potential impacts of the project on their residential amenity and agricultural businesses. The proponent has committed to mitigate these impacts by replacing any infrastructure impacted by rail line construction or operation, realigning or grade-separating the five affected stock routes, implementing a land access protocol and implementing a coal dust management plan.

No significant impacts from dust, noise or vibration are predicted for landholders from either the mine or rail and the proponent has proposed adequate mitigation measures to ensure appropriate standards are met. Nevertheless, I have stated conditions in Appendix 2, Section 1, Part A that require the proponent to adhere to dust, blasting and vibration limits. I have also made recommendations in Appendix 2, Section 2 to ensure that the proponent maintains the condition and connectivity of stock routes and follows land access protocols in order to protect the interests of landholders surrounding the project sites.

Flooding from the rail line

The rail alignment crosses 6 significant floodplains, 12 major waterways and 76 minor waterways. Construction of a railway embankment could potentially lead to altered hydrological flows, degradation of water quality, increased extent and depth of flooding, increased periods of inundation, altered drainage patterns, the loss of grazing land for the duration of flooding, weed invasion and inundation of farm roads and tracks. The proponent has committed to implementing a range of mitigation measures, including undertaking further detailed flood modelling and analysing the potential impacts of the project on floodplains, properties, assets and other infrastructure.

I have required other Galilee rail proponents to adhere to consistent drainage design criteria and have therefore imposed a condition (Appendix 2, Section 3) setting limits for the extent of inundation, afflux, culvert exit velocities and inundation times. The condition requires the proponent to consult with land and asset owners, including government agencies, regarding the potential impacts of the railway and the mitigation measures proposed to address flooding impacts.

Coal dust management

Coal dust emissions from coal wagons in transit have been identified as a potential issue for air quality, rail safety and economic efficiency. However, the issue can be managed when coal wagons are treated to prevent the emission of coal dust using veneering or an equivalent technique. To ensure potential impacts of coal dust from rail operations are addressed, I have made a recommendation in Appendix 2, Section 2, requiring the proponent to develop and implement a Coal Dust Management Plan that will have both environmental and rail maintenance benefits and produce outcomes similar to the recognised industry standards stated in the QR Network (2010) Coal Dust Management Plan.

Road impacts

While the project will generate additional traffic on the state-controlled road network and local roads surrounding the project site, I consider that once intersections, infrastructure and sections of the road network are upgraded to support the additional demands generated by the project, the transport network will adequately accommodate project traffic. Further work is required during the detailed design phase of the project to assess the road impacts of the project and identify an agreed mitigation program in conjunction with the Department of Transport and Main Roads and IRC to ensure the project does not impact on the safety and efficiency of the road network. Accordingly, I have made a number of recommendations within Appendix 2, Section 2 to address these and related matters.

Social and local economic impacts

A social impact assessment was completed to identify the potential social impacts arising from the project, which considered the social and cultural area of influence, community engagement, a social baseline study, a workforce profile, potential impacts and mitigation measures and management strategies.

I expect the project to generate positive benefits including direct and indirect local, regional and Indigenous employment and training opportunities, local and regional contracting and supply opportunities for individuals and businesses, and enhanced economic development opportunities generally throughout the region.

Given the remote location of the mine site, the mine workforce is expected to be predominantly fly-in fly-out (FIFO) and residing on-site for the duration of each shift rotation. The proponent has indicated that there may be opportunities to recruit locally and regionally once the mine is operational, pending the establishment of an all-weather access connection road that could facilitate bus-in bus-out (BIBO) arrangements. While the railway construction workforce is also expected to be predominantly FIFO, the proponent has stated that there may be short-term employment opportunities for local workers in labouring, equipment operation and transport roles.

Potential negative impacts such as rising living costs in Clermont, labour market drain from other sectors into the mining industry, increased demand on emergency and community services, disruption to cattle operations, increased labour requirements and reduced amenity for landholders have been identified. However, I consider the strategies the proponent has proposed to be adequate to mitigate, manage and monitor these potential impacts.

The proponent's workforce management commitments include structured training programs to be delivered in conjunction with local and regional training providers, the development of an Indigenous Participation Plan with specific training targets and performance indicators, and comprehensive employee induction and code of conduct arrangements.

I have imposed a condition (Appendix 1, Section 3) requiring the proponent to provide an annual report to the Coordinator-General during the construction and operational phases describing the actions undertaken to avoid, manage or mitigate project-related

impacts on local community services, social infrastructure and community safety and wellbeing.

Environmental management plans, proponent commitments and conditions

The proponent will manage the impacts of the project by implementing mitigation measures in accordance with my conditions and recommendations, the environmental management plans (EMPs) prepared to address specific environmental issues and the proponent commitments (Appendix 7).

Overarching EMPs have been developed for the mine, off-lease infrastructure area and rail alignment. The mine EMP applies to project components located within the mining lease area, the rail EMP applies to rail construction and associated workers camps, laydown areas and quarries; and the off-lease EMP applies to infrastructure outside of the mining lease including the mine workers accommodation village, heavy industrial area and the airport. The provisions of the mine EMP will be implemented through the project EA. My report includes stated conditions for a substantially complete and outcome-focused EA, which will ensure the effective environmental management of activities on the mining lease (Appendix 1, Section 1). The rail and off-lease EMPs will be implemented in accordance with my conditions in Appendix 2.

I have also made a number of recommendations regarding information requirements for future state government approvals required for the project, including approvals under the *Water Act*, *Transport Infrastructure Act 1994* and for any application for an MCU within a state development area.

Coordinator General's overall conclusion

I consider that the environmental impact assessment requirements of the SDPWO Act for the Carmichael Coal Mine and Rail project have been met and that sufficient information has been provided to enable a thorough evaluation of the potential impacts of the project.

I conclude that there are significant local, regional and state benefits to be derived from the development, and that any adverse environmental impacts can be acceptably avoided, minimised, mitigated or offset through the implementation of the measures and commitments outlined in the EIS documentation. The conditions I have specified in this report have been formulated in order to further manage all impacts associated with the project.

Accordingly, I approve the project to proceed 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 be provided to the Commonwealth Minister for the Environment, pursuant to section 36(2) of the SDPWO Regulation and the bilateral agreement between the State of Queensland and the Australian Government to support a decision on the controlled action for the project pursuant to section 133 of the EPBC Act.

A copy of this report will also be provided to the proponent, IRC and relevant state government agencies, and will also be made publicly available at www.dsdip.qld.gov.au


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Barry Broe
Coordinator-General
7 May 2014

1. Introduction

This report has been prepared pursuant to section 35 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 Carmichael Coal Mine and Rail project (the project).

It is not intended to record all the matters that were identified and subsequently settled. Rather, it concentrates on the substantive issues identified during the EIS process. 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 EIS, additional information¹ to the EIS (AEIS), submissions made on the EIS and AEIS, and information and advice from advisory agencies and other parties
- states conditions under which the project may proceed.

¹ In the *State Development and Public Works Organisation Act 1971*, this additional information is referred to as 'supplementary information'.

2. About the project

2.1 The proponent

The proponent² for the project is Adani Mining Pty Ltd (Adani), an Australian subsidiary of Adani Enterprises Limited based in Ahmedabad, India. Adani Enterprises has interests in global trading, development and operation of ports, inland container terminals, establishment of special economic zones, oil refining, logistics, gas distribution and power generation, transmission and trading.

Adani was established in Australia in mid-2010 with the intent of exploring for, mining, and exporting coal resources. Adani Abbot Point Terminal Pty Ltd (Adani APT) has also been established in Australia by Adani Enterprises Limited to develop the Abbot Point coal terminals as part of its overall program for coal export.

2.2 The project

The Carmichael Coal Mine and Rail project includes a 60 million tonnes per annum (mtpa) open-cut and underground greenfield coal mine and a 189 kilometre (km) greenfield rail line connecting the mine to the existing Goonyella and Newlands rail system south of Moranbah. The coal will be transported by rail for export via the Port of Hay Point (Dudgeon Point expansion) and the Port of Abbot Point. The project also includes the development of off-lease quarries and mine support infrastructure, including a workers accommodation village, industrial precinct and an airport.

2.2.1 Location

The project is located in the Galilee Basin, approximately 160 km north-west of Clermont in Central Queensland (refer to Figure 2.1).

The proposed mine site lies predominantly within the Isaac Regional Council (IRC) Local Government Area (LGA) with the exception of 167 hectares (ha) of the north-western corner of the project site which is located within the Charters Towers Regional Council (CTRC) LGA. The mine site is intersected by the Carmichael River which flows west to east approximately through the centre of the site. There are seven leasehold properties surrounding the mine site which are used for low intensity cattle grazing. The mine is proposed to be developed from two Exploration Permits for Coal (EPC)—EPC 1690 over mining lease application (MLA) 70411, and EPC 1080 over MLA70505 (eastern portion) and MLA 70506.

The proposed 189 km greenfield rail line extends from the mine site towards the east, connecting with existing rail infrastructure south of Moranbah and sits wholly within the IRC LGA. The proposed rail alignment traverses 11 leasehold and 10 freehold properties, which are predominantly used for cattle grazing and the nearest sensitive receptors² are more than 1 km away from the rail. The five quarries proposed to provide construction and ballast material for the rail and road upgrading are also located on these properties.

² For a definition, refer to the glossary on page 583

The Bygana West Nature Refuge is situated within the project site, south of the Carmichael River. It covers an area of approximately 1487 ha, is approximately 6 km long and is comprised of open grassy woodland and shrubland habitats. Both underground and open-cut mining are proposed for the area of land covered by the refuge.

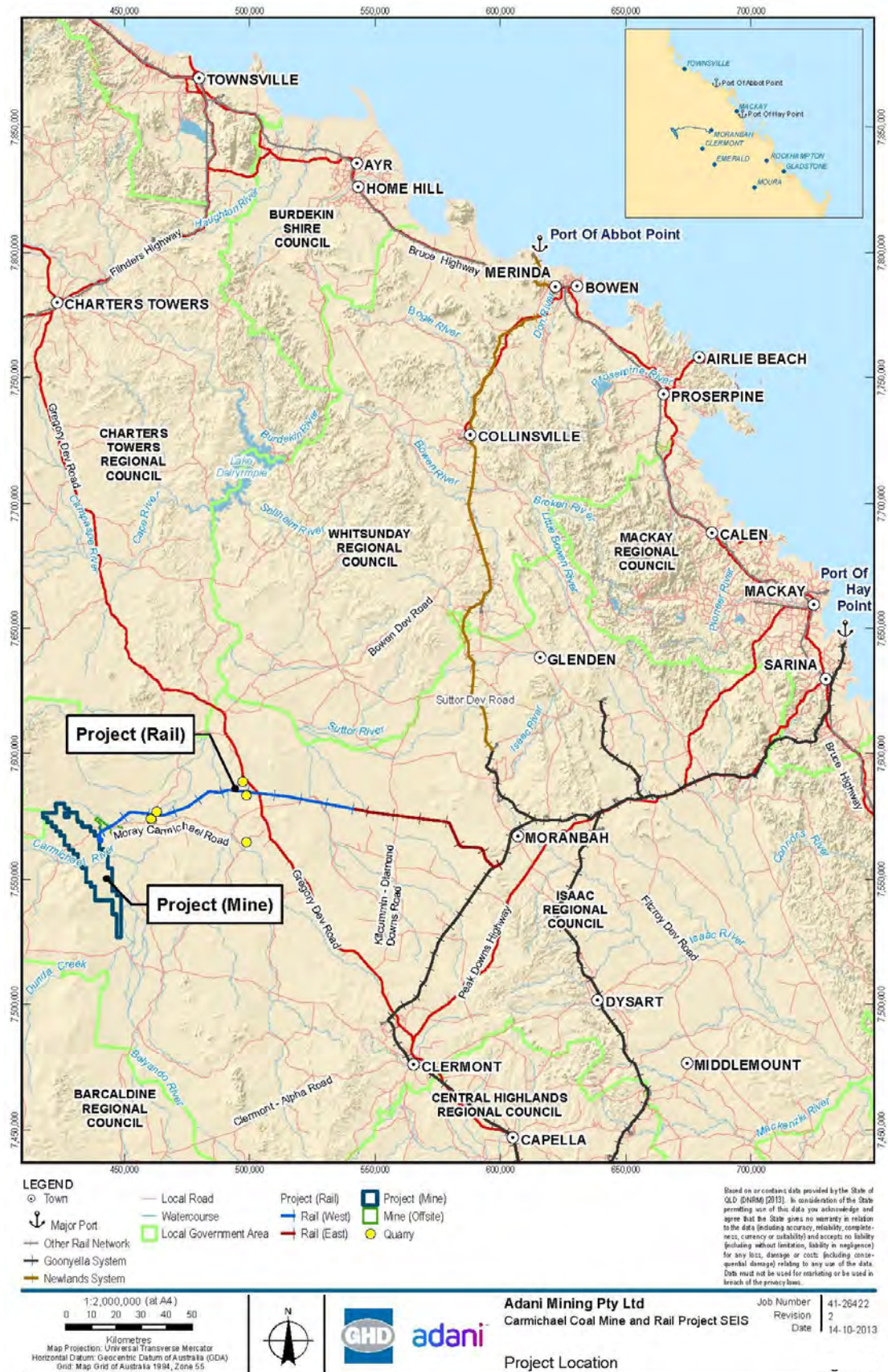


Figure 2.1 Project location

About the project
Carmichael Coal Mine and Rail project:

2.2.2 Components

Mine

Development on the mine site within the mining lease will include:

- **six open-cut pits** with a combined capacity of 40 mtpa product coal, predominantly mined by a truck and shovel/excavator operation, supplemented by draglines and dozers for overburden removal
- **five independent underground longwall mines** with a combined capacity of 20 mtpa of product coal, mining two seams over 45 km north to south with a conceptual longwall panel length of 5000 metres (m), 300 m wide longwall panel voids and between 3–4.5 m high extraction face
- **five mine infrastructure areas** servicing each of the open-cut and underground mines (UGMs) comprising mine service areas, power supply, fuel supply and storage, water supply and management, mine water management, roads, transport facilities, waste disposal facilities, communications and medical facilities
- a **coal handling and processing plant** designed to process 74.5 mtpa of raw coal
- **out-of-pit waste rock structures** for the storage of the initial volumes of the project's 13.1 billion bank cubic metres (bcm) of over and interburden prior to storage of waste rock in mine voids when available
- coal stockpiles, tailings storage cells, water management structures, a 2.5 km portion of the rail loop and coal-loading facilities adjacent to the rail.

Off-lease infrastructure

- The project includes substantial development off the mining lease including:
- a **workers accommodation village (MWAV) and associated facilities** located 12 km east of the mine, which includes accommodation for up to 3500 employees with medical, kitchen/dining, laundry and recreational facilities, car parking, sewerage and power infrastructure, a maintenance shed, hazardous materials and chemical storage
- an **airport** to provide access for the project's fly-in, fly-out (FIFO) workforce accommodating 150-seater aircraft and including a runway and terminal with security, amenities, café, departure lounge, parking and passenger set-down areas, emergency fuel storage and aerodrome rescue and fire fighting services facilities. The airport may process up to 701 flights per annum when operating at maximum capacity
- a **heavy industrial area** with facilities for service and maintenance of the mine, offsite infrastructure and rail including vehicle and equipment fabrication and maintenance workshops, concrete batching plant, hot mix bituminous plant, bulk fuel storage, vehicle wash areas, warehouse and storage, office and administration buildings. The industrial area is proposed to be located directly north of the proposed rail alignment to allow access to a rail siding for use in supply logistics to the mine development
- **water supply infrastructure** to allow extraction, storage and delivery of up to 12.5 gegalitres (GL) per year of water (with an average annual extraction of 10 GL)

About the project

Carmichael Coal Mine and Rail project:

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

including a flood water harvester on the Belyando River, a 70 km raw water supply pipeline from the Belyando River to the mine site, pump stations and an off-site storage facility

- the upgrade and realignment of Moray-Carmichael Road to circumvent the mine footprint.

Mine and off-lease infrastructure components are presented in Figure 2.2.

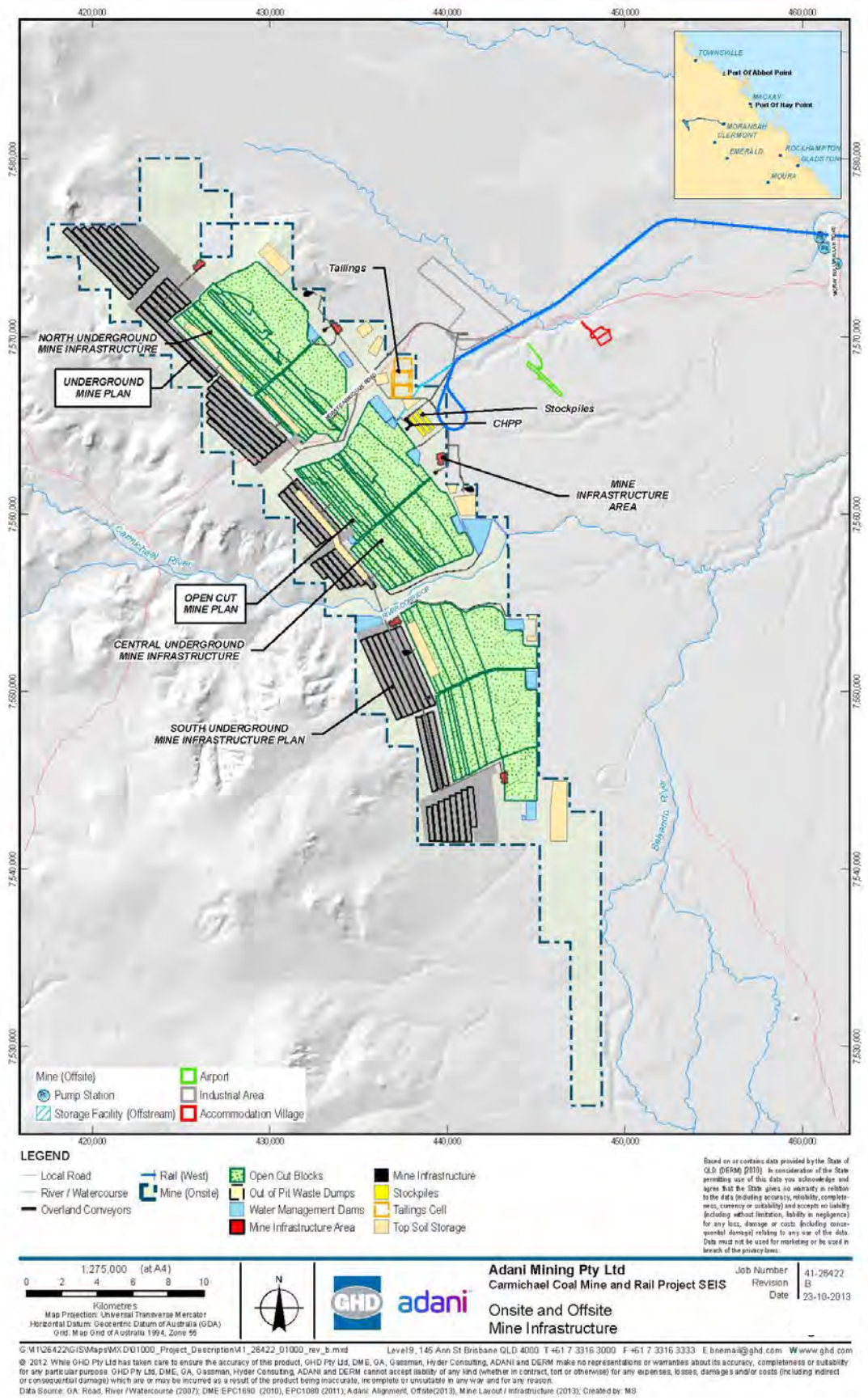


Figure 2.2 Mine and off-lease infrastructure

Rail and quarries

- The rail component of the project includes:
- a **greenfield rail line**: connecting the mine to the existing Goonyella and Newlands rail systems to provide for the export of coal via the Port of Hay Point (Dudgeon Point expansion) and the Port of Abbot Point, respectively including:
 - rail (west): a 120 km dual gauge portion from the mine site running west to east to Diamond Creek
 - rail (east): a 69 km narrow gauge portion running east from Diamond Creek connecting to the Goonyella and Newlands rail system south of Moranbah
 - 4.5 km dual gauge reception and departure lines and an 18.7 km balloon loop loading line predominantly located off the mining lease
- **rail construction infrastructure**: four construction camps accommodating 400 people each located approximately every 60 km along the proposed rail line, 29 track and 25 bridge laydown areas and a construction depot in close proximity to the Borrow 7 quarry and the Gregory Developmental Road
- **quarries**: five quarries adjacent to the rail line to extract fill materials for the construction and maintenance of the railway, road construction and upgrades and embankment material.

Table 2.1 **Quarries**

Quarry	Footprint (ha)	Quantity of resource (tonnes)	Expected life
Disney	92.57	11 750 000	Construction phase
Borrow 7	36.17	19 930 000	Life of project
North Creek	7.64	603 000	Construction phase
Moray	91.2	692 000	Construction phase
Back Creek South	55.5	4 516 395	2 years

The total disturbance area resulting from the project components will be as shown in Table 2.2. Refer to Appendix 8 for detailed maps of disturbance areas for all project components.

Table 2.2 Disturbance areas

Activity	Maximum disturbance areas (ha)
Mine	
Open-cut voids and slopes	8331.54
UGM area (including subsidence)	7786.76
Mine infrastructure area	2032.77
Out-of-pit spoil dumps	8308.69
Water storage areas including mine affected water (MAW) dams, raw water dams and stream diversions	817.53
Stream diversions	472.68
Tailings drying cell	216.17
Carmichael River corridor	50.78
Sub-total	28 016.92
Offsite infrastructure	
Industrial infrastructure	968.00
Airport	56.34
Mine workers accommodation village (MWAV)	70.91
Water supply infrastructure	167.90
Roads and tracks	115.60
Sub-total	1378.75
Rail	
Railway corridor (west and east)	1737.70
Balloon loop—internal, out of corridor	217.30
Turning circles	50.70
Laydown areas	121.60
Batching plants	23.00
Construction depot rail precinct	264.50
Maintenance depot	52.34
Bridge laydown	148.30
Ballast stockpile	28.00
Construction camps	28.00
Quarries (Disney, Borrow 7, Back Creek Adani, Moray, North Creek)	389.50
Quarry access roads	7.95
Camp access roads	8.60
Sub-total	3077.49
Total mine, offsite and rail disturbance areas	32 473.16

2.2.3 Development stages

Mine and off-lease infrastructure

Adani has advised that the life of mine is 60 years and that construction activities for mine infrastructure such as the MWAV, airport, power, and construction water supply are scheduled to commence in 2014, subject to obtaining relevant project approvals. Construction of the first open-cut pit is scheduled to commence in 2015 and the first underground mine is scheduled for 2018. Open-cut and underground mining will commence in the northern part of the project site initially, with the southern part developed in the later stages of the project.

The proponent anticipates that the first coal will be shipped from the open-cut pits in 2016 and the longwall operations in 2019.

Infrastructure construction, maintenance, rehabilitation and decommissioning activities would be undertaken throughout the operating life of the mine with final decommissioning and rehabilitation scheduled to commence in 2071.

Rail

Construction of the rail component of the project is anticipated to commence in late 2014 subject to obtaining the relevant approvals, with completion of the alignment and operation of the first coal train expected to commence in 2016.

2.2.4 Project changes

- Since the project's original presentation in its initial advice statement³ (IAS) a number of changes to the project scope as presented in the EIS and AEIS have occurred including:
 - reduction of the project's mine life from 150 to 60 years
 - reduction of capital investment from \$26 billion to \$16.5 billion
 - addition of the eastern portion of EPC1080 to the mine footprint
 - updated mine plans
 - refinement of the project's rail options with coal to be transported to Abbot Point and/or Hay Point (Dudgeon Point) via a west to east option connecting the project to the existing Goonyella and Newlands System south of Moranbah and a possible connection to north-west lines built by others
 - minor relocation of infrastructure including the airport, rail alignment, rail balloon loop, rail construction depot and two rail laydown areas
 - increased workforce accommodation requirements from 2000 to 3500 beds
 - inclusion of five quarries in project assessment and approvals
 - increase of external water requirements from 9.3 GL per year to 12.5 GL per year (with an average annual extraction of 10 GL), in order to wash up to 75 per cent of run-of-mine open-cut coal
 - removal of offsite bore fields and associated pipelines and removal of in-stream storages within North and Obungeena creeks

³ For a definition, refer to the glossary on page 583

- realignment of the stock route crossing the site, rather than closure.

Subsequent to the AEIS public and agency comment period, the proponent provided documentation advising of the relocation of the proposed topsoil storage area from the western portion of the mine site to the eastern edge, reducing the area of potential Black-throated Finch (southern) (*Poephila cincta cincta*) (BTF) habitat affected by approximately 40 per cent.

I have considered all of the abovementioned changes as part of my evaluation of the project.

2.2.5 Dependencies and relationships with other projects

The project has a relationship with several third party projects and approvals that will be completed separately to this environmental assessment.

Power

The proponent is currently investigating options to deliver power to the project. In August 2013, the Deputy Premier announced that Adani Group's Galilee Transmission Pty Ltd was investigating a 250-kilometre transmission line linking Powerlink Queensland's Strathmore substation near Collinsville to the new Galilee substation to be located on Moray Downs, 10 km east of the proposed Carmichael mine. The proposed transmission line would provide an electricity supply to the proposed Carmichael mine and connect emerging and existing customers in the Northern Galilee Basin.

Rail

Upgrades to the existing Aurizon rail system

Transportation of coal from the project via existing rail infrastructure would require the upgrade of existing Aurizon Holdings Limited (Aurizon) brownfield rail lines. Aurizon has proposed the Central Queensland Integrated Rail project, which involves the development of new greenfield rail lines and the upgrade of existing brownfield rail lines in Central Queensland to support the transportation of coal from the Galilee Basin to the Port of Abbot Point.

This project was declared by the then Coordinator-General⁴ to be a coordinated project for which an EIS is required on 27 January 2012 and the proponent is currently preparing the draft EIS. The upgrade of the North Goonyella to Newlands brownfield rail lines would support the transportation of coal from the Carmichael Coal mine.

However, additional upgrades and development would also be required between the proposed rail component of the Carmichael Coal Mine and Rail project to allow for the coal to be transported by this route.

Development of the North Galilee Basin Rail project

Separate to the Carmichael project, Adani has also proposed to develop the North Galilee Basin Rail (NGBR) project. The NGBR project would support the development

⁴ For a definition, refer to the glossary on page 583

of the Carmichael project by providing a direct linkage to the Port of Abbot Point through construction of a 300 km standard gauge rail line. This rail line would connect to the Carmichael east-west rail corridor, approximately 710 km east of the mine site. I declared this project to be a 'coordinated project' on 14 June 2013 and the EIS under the SDPWO Act is progressing.

Port

The project is dependent on the development of an appropriate port facility to allow for the shipment of coal from the project. The EIS proposed that coal would be shipped through coal terminal facilities at the Port of Abbot Point and the Port of Hay Point (Dudgeon Point expansion) (EIS, Volume 1, section 2).

The Abbot Point Coal Terminal expansion was proposed by Adani Abbot Point Terminal Pty Ltd and was approved with conditions by the Commonwealth Minister for the Environment on 10 December 2013 under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwth) (EPBC Act).

The Dudgeon Point Coal Terminals Project at the Port of Hay Point, proposed by the North Queensland Bulk Ports Corporation (NQBP), was declared by the then Coordinator-General to be a 'coordinated project' on 27 October 2011. NQBP selected Adani and Dalrymple Bay Coal Terminal Management Pty Ltd as preferred proponents for the development of the proposed coal export facilities including the design, construction and operation. NQBP remains the project proponent for the purposes of state approvals and is currently preparing the draft EIS documentation for my assessment.

Other coal projects in the Galilee Basin

Other projects proposed in the Galilee Basin which, if they proceed, may contribute to regional impacts include the:

- China Stone Coal project—a 60 mtpa open-cut and underground coal mine project to the north of the Carmichael Coal Mine and Rail mining lease proposed by Macmines Austasia Pty Ltd. I declared this project to be a 'coordinated project'⁵ on 31 October 2012 and a draft EIS is currently being prepared by the proponent for my assessment. For further information on the declaration of coordinated projects and the EIS process, refer to section 3 of this report.
- Alpha Coal project—a 30 mtpa open-cut coal mine and rail in the south of the Galilee Basin proposed by Hancock Coal Pty Ltd. I determined that the Alpha Coal project could proceed subject to conditions on 29 May 2012. The project received the Commonwealth Minister for the Environment's approval under the EPBC Act, subject to conditions, on 23 August 2012.
- Kevin's Corner project—a 30 mtpa open-cut and underground coal mine project in the south of the Galilee Basin proposed by Hancock Galilee Pty Ltd. I determined that the Kevin's Corner Project could proceed subject to conditions on 30 May 2013. The project received the Commonwealth Minister for the Environment's approval under the EPBC Act, subject to conditions, on 1 November 2013.

⁵ For a definition, refer to the glossary on page 583

- Galilee Coal (Northern Export Facility) project—a 40 mtpa open-cut and underground coal mine and rail project in the south of the Galilee Basin proposed by Waratah Coal Pty Ltd. I determined that the Galilee Coal Project could proceed subject to conditions on 9 August 2013. The project received the Commonwealth Environment Minister’s approval under the EPBC Act, subject to conditions, on 19 December 2013.
- South Galilee Coal project—a 17 mtpa open-cut and underground coal mine in the south of the Galilee Basin proposed by AMCI (Alpha) Pty Ltd and Alpha Coal Pty Ltd. On 4 June 2010, the then Coordinator-General declared this project to be a ‘coordinated project’ and an AEIS is currently being prepared by the proponent for my assessment.

2.2.6 Galilee Basin policies

Galilee Basin Rail Policy

In June 2012, the Deputy Premier announced the government’s preference for the development of two common rail corridors to service the Galilee Basin. The first was generally to be located on a ‘west to east’ alignment and the second was generally located on a ‘south to north’ alignment between the Galilee Basin and the Port of Abbot Point. Also at this time, the Deputy Premier noted the potential use of the State Development Area (SDA) powers under the SDPWO Act to facilitate land acquisition and management the rail corridor. The project’s rail alignment is consistent with the preferred alignment for the east-west corridor.

In June 2013, the Deputy Premier reiterated that the government was committed to working with ‘first mover’ proponents to encourage consolidation of the required infrastructure within the common corridors. It was also indicated that the government would support Galilee Basin project proponents with the approvals in place and the financial capacity to provide a ‘pit-to-port’ solution. Providing a proponent’s railway could be developed on a shared or multi-user basis, and with limited impact on landholders and the natural environment⁶, the government would assist a proponent to acquire land for their project. A range of options is being considered to support proponents with the capacity to be the first mover.

Galilee Basin Development Strategy

In November 2013, the Premier announced the Galilee Basin Development Strategy (GBDS) that would support development across the basin’s southern and central coal resources. One of the key initiatives within the GBDS is the potential declaration of an SDA under section 77 of the SDPWO Act that I would administer. If declared, the Galilee Basin SDA would protect the geographic area where new rail infrastructure could be located from incompatible land uses whilst minimising impacts on landholders and other stakeholders. The primary function of the Galilee Basin SDA would be to facilitate the development of a corridor to service the southern area of the Galilee Basin and a corridor to service the central area of the Galilee Basin, to transport coal to the Port of Abbot Point.

⁶ For a definition, refer to the glossary on page 583

2.3 Project rationale

The project aims to extract thermal coal resources in the currently undeveloped Galilee Basin for export. Key objectives of the project are to:

- produce a 100 per cent thermal coal product
- achieve a maximum production of 60 mtpa of product coal sourced from open-cut and underground mining
- produce coal with an energy and ash requirement saleable on the international seaborne thermal coal trading market, predominantly the Indian domestic power market.

The project meets Queensland Government objectives in realising the timely development of the Galilee Basin while ensuring the community benefits and environmental objectives are supported, therefore contributing to a four-pillar economy. Overarching project-wide benefits include:

- A\$16.5 billion investment
- employment for construction, operation, and other indirect employment benefits, including the creation of an estimated 2475 construction jobs and 3920 operational jobs
- local and state economic benefits
- significant state and federal government taxes and royalties
- improved infrastructure into the region, including new rail infrastructure for transporting coal, road upgrades and the possible facilitation of additional power and water supplies to the region
- direct and indirect local, regional and Indigenous employment opportunities beyond traditional agricultural sector roles
- local and regional contracting and supply opportunities for individuals and businesses
- enhanced economic development opportunities throughout the region.

Refer to section 5.5 of this report for an evaluation of social and economic impacts resulting from the project.

3. Impact assessment process

3.1 Overview

This section details the steps involved in the project's environmental impact statement (EIS) assessment process. For an explanation of the EIS process, refer to www.dsdip.qld.gov.au/cg

In undertaking this evaluation, I have considered the following:

- IAS
- EIS
- issues raised in submissions relating to the EIS
- AEIS response submissions
- issues raised in submissions relating to the AEIS
- revised reports and plans in response to AEIS submissions
- advice received from state and local government agencies
- advice received from the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Developments (IESC)
- advice received from the Australian Government Department of the Environment (DE)
- comments and properly made submissions⁷ from non-government organisations and members of the public.

Table 3.1 shows the steps taken in the project's EIS process.

Table 3.1 Overview of EIS process

Date	Process
22 October 2010	Final IAS and request for project declaration received
18 November 2010	Project referred to Commonwealth Minister for the Environment
26 November 2010	Project declared a 'coordinated project' by Coordinator-General
6 January 2011	Australian Government determined project is a 'controlled action' ⁷
12 February 2011	Submission period on draft terms of reference (TOR) commenced
28 March 2011	Submission period on draft TOR closed
25 May 2011	TOR finalised
15 December 2012	EIS released for public and agency comment
11 February 2013	Submission period on EIS closed
26 March 2013	AEIS requested by the Coordinator-General
25 November 2013	AEIS made available for public and agency comment
20 December 2013	Submission period on the AEIS closed

⁷ For a definition, refer to the glossary on page 583

3.2 Coordinated project declaration

On 26 November 2010, the then Coordinator-General declared this project to be a 'significant project'⁸ under section 26(1)(a) of the Queensland 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.

The SDPWO Act was amended in December 2012 (with the amendments taking effect on 21 December 2012). The amendments replaced the term 'significant project' with the term 'coordinated project'. The project will be referred to as a coordinated project throughout this evaluation report.

3.3 Controlled action

The Commonwealth has accredited the State of Queensland's EIS process, conducted pursuant to the SDPWO Act, under a bilateral agreement⁸ between the Commonwealth and the Queensland Government. Under the agreement (made in accordance with section 45 of the Act), if a controlled action is a 'coordinated project for which an EIS is required' under the SDPWO Act, certain types of projects do not require assessment under Part 8 of the EPBC Act.⁹ The agreement enables the EIS to satisfy the impact assessment requirements of both the SDPWO Act and the EPBC Act.

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 controlled action has, will have, or is likely to have on matters of environmental significance, and provide enough information about the controlled action and its relevant impacts to allow the Commonwealth Minister for the Environment to make an informed decision whether or not to approve the controlled action under the EPBC Act.

The controlled action may be considered for approval under section 133 of the EPBC Act, once the minister has received the Coordinator-General's EIS evaluation report (prepared under section 35 of the SDPWO Act).

On 6 January 2011, the then Commonwealth Minister for Sustainability, Environment, Water, Population and Communities determined that the project is a 'controlled action' under the EPBC Act (EPBC reference 2010/5736).

The relevant controlling provisions⁸ of the Commonwealth Minister's determination under the EPBC Act are:

- sections 12 and 15A World Heritage properties
- sections 15B and 15C National Heritage places
- sections 16 and 17B Wetlands (Ramsar)
- sections 18 and 18A Listed threatened species and communities
- section 20 and 20A Listed migratory species
- sections 24B and 24C Great Barrier Reef Marine Park (GBRMP).

⁸ For a definition, refer to the glossary on page 583

⁹ The bilateral agreement has no effect for projects in a Commonwealth area, actions by the Commonwealth or a Commonwealth agency or an action in the Great Barrier Reef Marine Park.

On 21 June 2013, the Environment Protection and Biodiversity Conservation Amendment Bill 2013 (Cwlth) received Royal Assent after being passed in the Federal Parliament on 19 June 2013. This amendment provided for additional controlling provisions, requiring water resources to be assessed as a matter of national environmental significance in relation to the impacts of coal seam gas and large coal mining development.¹⁰ On 24 October 2013, the Commonwealth Minister for the Environment determined that the project would trigger these new controlling provisions (sections 24D and 24E: protection of water resources from coal seam gas development and large coal mining development).

Section 5.1 of this report (matters of national environmental significance¹¹ (MNES)) lists each controlling provision under the EPBC Act and explains the extent to which the Queensland Government EIS process addresses the actual or likely impacts of the project on the matters covered by each provision.

The Commonwealth Minister for the Environment will use the information in section 5.1 to make a decision on the project under the EPBC Act.

3.4 Terms of reference

The draft TOR for the EIS was released for public and advisory agency comment from 12 February 2011 to 28 March 2011. Twenty submissions were received on the draft TOR, comprising eleven from advisory agencies, five from non-government organisations and four from public submitters.

A final TOR was prepared having regard to submissions received and was issued to the proponent on 25 May 2011.

3.5 Review of the EIS

The EIS, prepared by the proponent, was released for public and advisory agency comment from 15 December 2012 to 11 February 2013.

Sixty-seven submissions from advisory agencies, non-government organisations (NGOs) and the public were received during the comment period, copies of which were forwarded to the proponent and the then Australian Government Department of Sustainability, Environment, Water Population and Communities (SEWPaC). In addition, 14 396 online-facilitated submissions were received during the comment period via a number of activist websites.

Table 3.2 summarises the submissions on the EIS. For an assessment of the environmental impacts of this project, refer to sections 5, 6 and 7 of this report.

¹⁰ For more information on the EPBC Amendment Bill, refer to <http://www.environment.gov.au/legislation/environment-protection-and-biodiversity-conservation-act/what-protected/water-resources>

¹¹ For a definition, refer to the glossary on page 583

Table 3.2 Summary of public and agency submissions on the EIS

Agency	Issue
Queensland Government (16 submissions)	
<ul style="list-style-type: none"> • Department of Aboriginal and Torres Strait Islander and Multicultural Affairs (DATSIMA) • Department of Agriculture, Fisheries and Forestry (DAFF) • Department of Communities, Child Safety and Disability Services (DCCSDS) • Department of Community Safety (DCS) • Department of Education, Training and Employment (DETE) • Department of Environment and Heritage Protection (DEHP) • Department of Energy and Water Supply (DEWS) • Department of Housing and Public Works (DHPW) • Department of Natural Resources and Mines (DNRM) • Department of State Development, Infrastructure and Planning (DSDIP) (×2) • Department of Transport and Main Roads (DTMR) • Queensland Health (QH) • Queensland Police Service (QPS) • Queensland Treasury and Trade (QTT) • Skills Queensland 	<ul style="list-style-type: none"> • air quality • biodiversity impacts and offsets • cumulative impacts • economic impacts • emergency management • flooding impacts • Great Artesian Basin (GAB) springs impacts • groundwater impacts • land use and tenure • legislation and approvals • mine waste and water management • noise and vibration • public health and safety • regulated structures • rehabilitation • social impacts • soils management • stakeholder consultation • subsidence management • surface water impacts • transport impacts • water supply
Local Government (3 submissions)	
<ul style="list-style-type: none"> • IRC • Mackay Regional Council (MRC) • Whitsunday Regional Council (WRC) 	<ul style="list-style-type: none"> • air quality • biodiversity impacts and offsets • cumulative impacts • economic impacts • flooding impacts • greenhouse gas emissions • land use impacts and tenure • noise and vibration • public health and safety • rehabilitation • social impacts • stock route impacts • surface water impacts • transport impacts • waste management • water supply

Agency	Issue
Non-government organisations (17 submissions) <ul style="list-style-type: none"> • Asia Pacific Strategy • Aurizon Operations Limited • Australian Sustainable Business Group • BirdLife Southern Queensland • Black-throated Finch Recovery Team • Chalk and Fitzgerald, Lawyers and Consultants • Coast and Country Association of QLD Inc • Doctors for the Environment Australia Inc • Economists at Large • Greenpeace Australia Pacific • Hoch and Wilkinson Livestock and Property Pty Ltd • Lock the Gate Alliance • Mackay Conservation Group • Macmines Austasia Pty Ltd • North Queensland Conservation Council • Powerlink Qld • Townsville Enterprise Limited 	<ul style="list-style-type: none"> • air quality • biodiversity impacts and offsets • climate change impacts • cumulative impacts • economic impacts • greenhouse gas emissions • groundwater impacts • land use and land tenure • mine water management • noise and vibration • public health and safety • social impacts • stakeholder consultation • surface water impacts • transport impacts • water supply
Private individuals (31 submissions)	<ul style="list-style-type: none"> • air quality • biodiversity impacts • cultural heritage • cumulative impacts • emergency management • flooding impacts • greenhouse gas emissions • groundwater impacts • land impacts • land tenure • social impacts • stakeholder consultation • stock route impacts • transport impacts • visual amenity impacts
Online-facilitated submissions generated through activist websites (14 396 submissions)	<ul style="list-style-type: none"> • climate change impacts • biodiversity impacts • economic impacts • GAB springs impacts • general anti-mining, anti-fossil fuel usage and/or anti-project sentiment • Great Barrier Reef (GBR) impacts • greenhouse gas impacts • groundwater impacts • land impacts • social impacts
Total: 14 463 submissions	

DE provided advice on 19 December 2012 and 11 February 2013. Key matters raised included:

- threatened species and communities
- water resources
- subsidence
- cumulative impacts
- offsets.

For an assessment of the impacts of this project on MNES, refer to section 5.1 of this report.

3.6 Additional information to the EIS

On 26 March 2013, I requested that Adani submit additional information to address matters raised in submissions on the EIS. Specific issues requiring additional information included:

- revised mine plan
- revised mine Environmental Management Plan (EMP)
- draft Rehabilitation Plan
- draft Subsidence Management Plan
- updated water balance model
- updated work on water quality for proposed mine water discharge
- updated work on soil management
- further development of BTF work
- revised groundwater modelling including the GAB springs and Mellaluka Springs
- peer review of the groundwater modelling
- revised surface water hydraulic modelling, including updated flood modelling
- revised offsets strategy
- revised cumulative impact assessment
- revised social impact material
- updated rail flood modelling work
- impacts of the rail line on pastoral properties
- revised off-lease EMP
- offsite ecological surveys
- updated MNES report.

Given the amount of new or updated information outlined in the AEIS, I determined that the document should be released for public comment; and DE concurred.

Subsequently, the AEIS was made available for public and agency comment from 25 November 2013 to 20 December 2013.

Table 3.3 summarises the public and agency submissions received during the AEIS comment period and included in my evaluation. For an assessment of the project's key issues and potential impacts, refer to sections 5, 6 and 7 of this report.

Table 3.3 Summary of public and agency submissions on the AEIS

Agency	Issue
Queensland Government (16 submissions)	
<ul style="list-style-type: none"> • DATSIMA • DAFF • DETE (×2) • DEWS • DEHP • DHPW • DNRM • DSDIP (×3) • DTMR • QH • QPS • QTT (×2) 	<ul style="list-style-type: none"> • air quality • approvals and conditions • biodiversity impacts and offsets • cultural heritage assessment and management • cumulative impacts • GAB springs impacts • groundwater impacts and management • land use and tenure • mine water management • natural hazards • noise and vibration • rehabilitation • social impacts and management • subsidence impacts and management • surface water impacts and management • transport impacts • waste management
<hr/>	
Local Government (3 submissions)	
<ul style="list-style-type: none"> • IRC • MRC • WRC 	<ul style="list-style-type: none"> • cumulative impacts • groundwater impacts • mine water management • noise and vibration • social impacts and management • transport impacts and management • water supply

Agency	Issue
<p>Non-government organisations (16 submissions)</p> <ul style="list-style-type: none"> • Asia Pacific Strategy • Aurizon Operations Limited • Capricorn Bulk Haulage Pty Ltd • Clermont Community and Business Group • Coast and Country Association of Queensland Inc • Coolum District Coast Care Group Inc • Doctors for the Environment Australia • GetUp! • Greenpeace Australia Pacific • Lock the Gate Alliance • Mackay Conservation Group • Marcoola Coast Care • North Queensland Conservation Council • Northern Archaeology Consultancies • Powerlink Queensland • Protect the Bush Alliance 	<ul style="list-style-type: none"> • air quality • approvals processes • biodiversity impacts and offsets • climate change impacts • cultural heritage impacts • cumulative impacts • economic assessment • GAB springs impacts • greenhouse gas emissions • groundwater impacts and management • matters of national environmental significance • noise and vibration • stakeholder consultation • surface water impacts and management • transport impacts • water supply
<p>Private individuals (32 submissions)</p>	<ul style="list-style-type: none"> • air quality • biodiversity impacts and offsets • climate change impacts • cultural heritage assessment and impacts • economic impacts • GAB springs impacts • general anti-mining, anti-fossil fuel usage and/or anti-project sentiment • GBR impacts • greenhouse gas emissions • groundwater impacts and management • hazard and risk • land impacts • natural hazards • rehabilitation • social impacts • surface water impacts and management • transport impacts • waste management • water supply

Agency	Issue
Online-facilitated submissions generated through activist websites (4007 submissions)	<ul style="list-style-type: none"> • biodiversity impacts • climate change impacts • economic impacts • general anti-mining, anti-fossil fuel usage and/or anti-project sentiment • GBR impacts • greenhouse gas emissions • health and safety • land impacts • proponent record • social impacts • surface water impacts
Total: 4074 submissions	

DE provided comment on 20 December 2013. Key matters raised included:

- the management of BTF and other threatened species and communities including the waxy cabbage palm
- water resources
- Subsidence Management Plan.

For an assessment of the impacts of this project on MNES, refer to section 5.1 of this report.

3.7 Referral to the Independent Expert Scientific Committee

Queensland is a signatory to the Council of Australian Governments (COAG) National Partnership Agreement on Coal Seam Gas and Large Coal Mining Development (NPA). 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.

Prior to the inauguration of the statutory committee in November 2012, an interim committee (IIESC) provided advice to SEWPaC (now DE) on proposed projects. A request for advice was submitted to the IIESC for the project on 23 May 2012, to which final advice was provided on 29 June 2012. This was subsequently provided to my office on 15 January 2013, which informed my determination on the scope of additional information to the EIS I required (refer to section 3.6).

Following the Commonwealth Minister for the Environment's determination that the project would trigger new controlling provisions relating to water, it became mandatory under Section 131AB of the EPBC Act, for the Minister to obtain advice from the IESC¹².

¹² For a definition, refer to the glossary on page 583

On 6 November 2013, I submitted to the IESC a joint request for advice (with DE) for the project. The IESC provided final advice to DE and I on 16 December 2013.

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

4. Project approvals

Following the release of this evaluation report, the proponent will need to obtain a range of statutory approvals from Australian, State and Local Government agencies before the project can lawfully proceed.

Approvals sought by the proponent and for which this Coordinator-General's evaluation report has provided recommended or stated conditions are listed in Table 4.1. Other approvals which are the subject of future separate applications and assessment are listed in Table 4.2.

The proponent has prepared a number of draft application documents and other supporting information for future approvals in accordance with the relevant local planning scheme as part of the AEIS.

Information about Australian, State and Local Government approvals is provided in the subsections below.

Table 4.1 Conditions for approvals sought directly from this Coordinator-General's report for the project

Project component/ activity	Relevant approval	Legislation	Authority	Status
Whole of project	EPBC Approval	EPBC Act	DE	Commonwealth Minister's decision due within 30 days of receiving Coordinator-General's report.
Mining and associated activities on the mining lease	Environmental Authority (EA) for mining lease	<i>Environmental Protection Act 1994</i> (EP Act)	DEHP	Conditions that must be included in the EA are stated in Appendix 1, Section 1 of this report.
Rail maintenance facility and construction depot	Material Change of Use (MCU)	<i>Sustainable Planning Act 2009</i> (SP Act) or SDPWO Act if a GBSDA is declared	IRC or Coordinator-General	MCU recommendations are in Appendix 2, Section 2 and draft application documents/ supporting information are provided in Volume 4, Appendix C3a of the AEIS.
Rail maintenance facility and construction depot—Sewage Treatment Plant (STP) under Environmentally Relevant Activity ¹³ (ERA)	EA	EP Act	DEHP	Conditions for an EA are stated in Appendix 2, Section 1, Part B and draft application documents and supporting information are provided in Volume 4, Appendix C3a of the AEIS.

¹³ For a definition, refer to the glossary on page 583

Project component/activity	Relevant approval	Legislation	Authority	Status
Accommodation buildings and MWAV	MCU	SP Act or SDPWO Act if a GBSDA is declared	IRC or Coordinator-General	MCU recommendations are in Appendix 2, Section 2 and draft application documents/supporting documents for the MWAV are provided in Volume 4, Appendix C4b of the AEIS.
Accommodation buildings and MWAV—STP under ERA 63	EA	EP Act	DEHP	Conditions for an EA are stated in Appendix 2, Section 1, Part B and draft application documents/supporting documents for the MWAV are provided in Volume 4, Appendix C4b of the AEIS.
Temporary rail construction camps	MCU	SP Act or SDPWO Act if a GBSDA is declared	IRC or Coordinator-General	MCU conditions and recommendations are included in Appendix 2, Section 1, Part A and Appendix 2, Section 2 and draft application documents/ supporting information for temporary rail construction camps are provided in Volume 4, Appendix C3c of the AEIS.
Temporary rail construction camps—STP under ERA 63	EA	EP Act	DEHP	Conditions for an EA are stated in Appendix 2, Section 1, Part B and draft application documents/supporting information for the temporary rail construction camps are provided in Volume 4, Appendix C3c of the AEIS.
Off-lease industrial precinct	MCU	SP Act or SDPWO Act if a GBSDA is declared	IRC or Coordinator-General	MCU recommendations are in Appendix 2, Section 2 and draft application documents/ supporting information for the off-lease industrial precinct are provided in Volume 4, Appendix C4c of the AEIS.

Project component/activity	Relevant approval	Legislation	Authority	Status
Off-lease industrial precinct—STP under ERA 63	EA	EP Act	DEHP	Conditions for an EA are stated in Appendix 2, Section 1, Part B and draft application documents/supporting information for the off-lease industrial precinct are provided in Volume 4, Appendix C4c of the AEIS.
Airport	MCU	SP Act or SDPWO Act if a GBSDA is declared	IRC or Coordinator-General	MCU recommendations are in Appendix 2, Section 2 and draft application documents/supporting information are provided in Volume 4, Appendix C4d of the AEIS.
Airport—STP under ERA 63	EA	EP Act	DEHP	Conditions for an EA are stated in Appendix 2, Section 1, Part B and draft application documents/supporting information are provided in Volume 4, Appendix C4d of the AEIS.
Quarrying activities	MCU	SP Act or SDPWO Act if a GBSDA is declared	IRC or Coordinator-General	MCU recommendations are in Appendix 2, Section 2 and draft application documents/supporting information for each of the quarries are provided in Volume 4, Appendices C5a – C5e of the AEIS.
Quarrying activities—ERA 16 (2) extractive activities and 16 (3) screening activities	EA	EP Act	DEHP	Conditions for an EA are stated in Appendix 2, Section 1, Part B and draft application documents/supporting information for each of the quarries are provided in Volume 4, Appendices C5a – C5e of the AEIS.

Table 4.2 Subsequent approvals likely to be required for the project

Item	Relevant approval	Legislation	Status
Mining and associated activities on the mining lease	Mine lease for MLAs 70411, 70505 and 70506	<i>Mineral Resources Act 1989</i> (MR Act)	Applications submitted July 2013, public notification processes to occur following issue of draft EA by DEHP.
Freeholding of off-lease infrastructure	Freeholding processes	<i>Land Act 1994</i>	Freeholding processes will occur at the appropriate project stage.
Forest products and quarry materials	Interfering with or use of forest products and quarry materials on State lands and certain freehold lands owned by the State	<i>Forestry Act 1959</i>	Draft quarry application documents are provided in Volume 4, Appendices C5a–C5e of the AEIS and will be lodged at the appropriate time.
Airport	Aerodrome certification	Civil Aviation Safety Regulations 1998	To be lodged after airport construction is finalised.
Subdivision of industrial precinct	Reconfiguration of a lot: community title subdivision	SP Act	Draft application documents for the reconfiguration of a lot are provided in Volume 4, Appendix C4c of the AEIS and will be lodged at the appropriate time.
Indigenous cultural heritage (ICH)	Cultural heritage management plans (CHMPs)	<i>Aboriginal Cultural Heritage Act 2003</i> (ACH Act)	Four CHMPs have been agreed, signed and registered (refer to section 5.4 for further information).
Dewatering of open-cut pits and UGM workings	Water licence	<i>Water Act 2000</i> (Water Act)	Information which will be used to support water licence applications is provided in Volume 2, Chapter 6 of the AEIS. The proponent will submit formal applications at the appropriate stage to ensure a water licence is obtained prior to dewatering of any aquifers standard. (Standard license conditions are in Appendix 5.)
Taking and/or diverting overland flow that cannot be undertaken in accordance with the relevant Water Resource Plan	Water licence	Water Act	Information which will be used to support water licence applications is provided in Volume 2, Chapter 6 of the AEIS. Formal applications will be applied for at the appropriate stages of mine development.

Item	Relevant approval	Legislation	Status
Taking and/or interfering with water in a watercourse, lake or spring	Water licence	Water Act	Draft documents for the harvesting of water in the Belyando River are provided in Volume 4, Appendix C4e of the AEIS.
Sourcing and taking water for the rail construction (an activity with a reasonably foreseeable conclusion date)	Water permit	Water Act	Draft application documents for the taking of water at Mistake Creek are provided in Volume 4, Appendix C3i of the AEIS and will be lodged at the appropriate time.
Water-related operational works ¹⁴ associated with sourcing and taking water for the rail construction (off the mining lease)	Development permit	SP Act	Formal applications will be applied for prior to drilling bores.
Excavation or placement of fill in a watercourse, lake or spring that cannot be undertaken in accordance with the riverine protection permit exemption requirements	Riverine protection permit	Water Act	A riverine protection permit may be required if the proposed activity cannot be undertaken in accordance with the riverine protection permit exemption requirements. Draft documents relating to this have been provided in Volume 4, Appendix C3h of the AEIS. Formal applications will be applied for at the appropriate stages of mine and rail development.
Construction of bridge works across waterways for the rail	Constructing waterway barrier works	<i>Fisheries Act 1994</i>	Draft application documents are provided in Volume 4 Appendix C3e of the AEIS and will be lodged at the appropriate time.
Revocation of the Bygana West Nature Refuge	Agreement with DEHP	<i>Nature Conservation Act 1992 (NC Act)</i>	Discussions will be held with DEHP at the appropriate time.
Mapping of assessable remnant vegetation for rail and off-lease	Property Map of Assessable Vegetation (PMAV) for the rail and off-lease and Property Vegetation Management Plan (PVMP) for off-lease	<i>Vegetation Management Act 1999 (VM Act)</i>	PMAVs for the rail are provided in Volume 4, Appendices AI and AJ of the EIS. PMAVs and PVMP for the off-lease are provided in Volume 4, Appendices J7a and J7b.

¹⁴ For a definition, refer to the glossary on page 583

Project approvals

Carmichael Coal Mine and Rail project:

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

Item	Relevant approval	Legislation	Status
Clearing native vegetation for the rail and off-lease	Clearing native vegetation	VM Act	Draft applications documents and supporting information for the rail are provided in Volume 4, Appendices C3d and C3f. Off-lease documents are provided in Volume 4, Appendices J7a and J7b.
Impacts to protected plants off-lease, on the rail line and at the quarries	Clearing permit for protected plants	Nature Conservation (Protected Plants) Conservation Plan 2000	Applications for the off-lease component will be lodged after further investigations have been undertaken to determine the presence of listed species. Volume 4, Appendix C5f of the AEIS provides draft application documents for clearing of protected plants at the quarries which will be lodged at the appropriate time. Note: Mining leases granted after 31 March 2014 will be subject to the amended regulation which will require applications for clearing permits on the mine site.
Possible damage to protected wildlife habitat and/or interfering with breeding places off-lease and on the rail line	Species Management Plan/Threatened Species Management Plan or damage mitigation permit	Nature Conservation (Wildlife Management) Regulation 2006	Specific species management plans for Endangered, Vulnerable and Near Threatened (EVNT) and special least concern species as well as industry-generic plans for least concern species on the rail line are provided in Volume 4, Appendix C3g of the AEIS.
Activities in strategic cropping land (SCL) area	Impacts to SCL Note: under section 6 of the <i>Strategic Cropping Land Act 2011</i> (SCL Act), this may be exempt if a GBSDA is declared	SCL Act	A mitigation deed will be negotiated with the Department of Natural Resources and Mines (DNRM) at the appropriate project stage if assessed under the SCL Act. Note: the commencement of the Regional Planning Interests Bill 2013 will repeal the SCL Act, with policy objectives being integrated ¹⁵ . There is intent from the state government to remove SCL triggers associated with development subject to the SP Act. However, it is unknown when these changes will take effect.

¹⁵ For information on the review of the strategic cropping land framework, refer to www.nrm.qld.gov.au/land/planning/pdf/strategic-cropping/scl-review-report.pdf

Item	Relevant approval	Legislation	Status
Altering stock routes (mine and rail)	Agreement with authorities (DNRM and IRC)	<i>Land Protection (Pest and Stock Route Management) Act 2002</i>	A formal agreement will be negotiated with DNRM and IRC at the appropriate time.
Construction of the rail	Operational works (excavation and fill)	SP Act	Draft application documents and supporting information are provided in Volume 4, Appendix C3b of the AEIS and will be lodged at the appropriate time.
Vegetation clearing for the MWAV, rail camps, industrial precinct and airport construction	Operational works for vegetation clearing	VM Act	Draft application documents for the MWAV, industrial precinct and airport are provided in Volume 4, Appendices C4b, C4c and C4d of the AEIS, respectively and will be lodged at the appropriate time.
Earthworks for the construction of the MWAV, the industrial precinct and airport	Operational works for bulk earthworks	SP Act	Draft application documents for the MWAV, industrial precinct and airport are provided in Volume 4, Appendices C4b, C4c and C4d of the AEIS, respectively and will be lodged at the appropriate time.
Open/close government roads	Upgrade and realign parts of Moray–Carmichael Road	SP Act and <i>Transport Infrastructure Act 1994</i> (TI Act)	Information to support future applications is provided in Volume 4, Appendix P of the AEIS. Applications will be lodged after surveys of current road alignments are completed.
Roadworks—state-controlled roads (SCR)	Approval to undertake ancillary works to a SCR	TI Act	Information to support future applications is provided in Volume 4, Appendix P of the AEIS. Applications will be lodged after surveys of current road alignments are completed.
Roadworks—local roads	Approval to make an alteration or improvement to a local government road and approval for carrying out works on a road	<i>Local Government Act 2009</i> (LG Act)	Information to support future applications is provided in Volume 4, Appendix P of the AEIS. Applications will be lodged after surveys of current road alignments are completed.

Item	Relevant approval	Legislation	Status
Roadworks—local roads (operational work)	Road crossings	SP Act LG Act	Information to support future applications is provided in Volume 4, Appendix P of the AEIS. Applications will be lodged after surveys of current road alignments are completed.
Construction of the rail involving works for SCR	Ancillary works and encroachment, declaration of common areas, approval for construction and maintenance access to SCR	TI Act	Applications involving works as SCR will be lodged after further design work for the rail line is undertaken.

4.2 Australian Government approvals

4.2.1 Project-wide

Controlled action

The project was declared by the Commonwealth Minister for the Environment to be a 'controlled action' pursuant to section 75 of the EPBC Act on 6 January 2011. The EIS process has been undertaken in accordance with the requirements of the bilateral agreement relating to environmental assessment between the Queensland and Australian governments.

Accordingly, subsequent to this report, the controlled action will be considered by the Commonwealth Minister for the Environment for approval under section 133 of the EPBC Act.

The minister will use the information in the report to make a decision under the EPBC Act as to whether the project should proceed, and if so, apply any additional conditions to those I have included in my report, necessary to limit the impacts on MNES.

Aerodrome certification

The proponent is proposing an airport to cater for 150-seater aircraft and associated infrastructure including a runway and terminal to the east of the mine site. The proponent must seek aerodrome certification from the Civil Aviation Safety Authority (CASA) pursuant to Part 139 of the Civil Aviation Safety Regulations 1998 (Cwlth).

4.3 State government approvals

4.3.1 Mine and off-mining-lease components

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

- MR Act, which regulates the mining tenures

- EP Act, which regulates mining activities and related ERAs on and off the mine site
- SP Act, which regulates development off the mining lease, or SDPWO Act if the off-mining-lease component of the project is included in the potential GBSDA and assessed under the development scheme.

Mining lease application

Mining and associated mining activities undertaken as part of the project will be carried out within MLAs 70411, 70505 and 70506.

Before mining commences, a mining lease must be granted pursuant to the MR Act. This grant is subsequent to the issue of the EA for mining activities pursuant to the EP Act.

Environmental Authority

Under the EP Act, an EA is required to carry out a 'mining activity' as defined under section 110 of that Act. 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
- actions taken to prevent environmental harm.

DEHP has provided me with recommended draft conditions for an application for an EA to carry out mining activities. I have included these as stated conditions in Appendix 1, Section 1 of this report. I have also developed additional stated conditions for inclusion in Appendix 1, Section 1 to complement DEHP's recommended draft conditions.

In accordance with Section 47C of the SDPWO Act, the stated conditions in Appendix 1, Section 1 must be included in the draft EA subject to objections and referral to the Land Court under Section 185 of the EP Act. The stated conditions must also be included in the final EA for the mine and cannot be amended by a decision of the Land Court.

Additional conditions may be developed by DEHP or recommended by the Land Court for inclusion in the final EA, but these must be consistent with the Coordinator-General stated conditions.

Environmentally relevant activities

Under the EP Act, an EA issued by DEHP is required to carry out an ERA. The provisions of the EA (mining activities) also may provide authority for any non-mining ERAs that occur on the mining lease, as long as these ERAs support the mining activity.

The proponent is required to make applications for ERAs that fall outside of the mining activities EA and mining lease areas. Relevant ERAs for the off-lease component of the project include:

Project approvals

Carmichael Coal Mine and Rail project:

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

- ERA 16 (2)—extractive activities
- ERA 16 (3)—screening activities
- ERA 63—sewage treatment.

DEHP has provided advice to me on conditions for these ERAs which are stated in Appendix 2, Section 1, Part B of this report. Any final draft EA may contain additional ERA conditions developed by DEHP that are consistent with the stated conditions.

Other state approvals

Other approvals will be required for project activities on the mining lease that are not related to the EA (mining lease) or development approvals. For further information on these, refer to Table 4.1 and Table 4.2. Approvals related to ICH are discussed in section 5.4 of this report.

4.3.2 Rail component

Approvals on the mining tenement

For the small portion of the rail line loop located on the mining tenement, approvals and environmental management will be dealt with under the draft EA conditions (mining activities), included in Appendix 1, Section 1 of this report.

Approvals off the mining tenement

At the time of writing this report, the state government has yet to make a decision on whether the declaration of the proposed GBSDA will proceed, the timing of the declaration, or the rail alignments and infrastructure precincts that would be included. The proposed GBSDA released for public and stakeholder comment includes the western component of the project's rail, but not the eastern portion.

Should the GBSDA be declared to include at least part of the project's rail alignment, the Coordinator-General would need to assess the component against the SDA's development scheme and consider an MCU approval under the SDWPO Act. A draft development scheme has been prepared which the Coordinator-General would use, when finalised, to assess the application to ensure it aligns with the GBSDA's purpose. The declaration of the GBSDA would exempt the proponent from applying through the relevant IRC planning schemes for that portion of the rail line, excluding clearing of native vegetation which would still need to be assessed by DNRM. Operational works and building approvals would be issued through the IRC.

For any component of the project's rail alignment not included in the GBSDA, there are two regulatory approval options currently available:

- a development approval for an MCU under the relevant local planning scheme (SP Act) administered by IRC, with state interests coordinated through DSDIP
- Community Infrastructure Designation (CID) under the Sustainable Planning Regulation 2009 administered by DTMR. Under a CID, those development aspects of the project included in the designation would be regulated under conditions arising from the CID and not require approval under any local government planning scheme. However, any state regulator requirements would still apply. A CID for the

project's rail would be declared by the Minister for Transport. A determination as to whether the project's rail would meet the statutory requirements for a CID has yet to be made.

4.4 Local government approvals

4.4.1 Mine and off-mining-lease components

The mine and off-site infrastructure components of the project are predominantly located within the LGA of IRC, excluding 167 ha within the north-western corner of EPC1690, which is situated within the CTRC LGA.

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

The proponent has prepared draft assessment and application documents for the off-mining-lease components of the project, including for a preliminary planning approval under the SP Act (AEIS, Volume 4, Appendix C4a). When finalised, these will be assessed by IRC under the local planning scheme. In the event that the GBSDA is declared over this area, the proponent will be required to update these documents in accordance with the development scheme for the SDA and the recommended conditions in Appendix 2, which I would assess under the SDPWO Act.

4.4.2 Rail component

Should components of the rail not be included in the proposed GBSDA or a CID, a development approval for an MCU under the SP Act would be required. This would be administered by IRC.

5. Evaluation of environmental impacts—project wide

5.1 Matters of national environmental significance

5.1.1 Listed threatened species and communities (sections 18 & 18A)

Methodology of assessment

Desktop searches

A desktop assessment of the ecological values of the study area was initially undertaken by the proponent to inform the EIS. It was comprised of a review of relevant literature, databases and technical reports. Sources of relevance to the assessment of matters protected under the EPBC Act are:

- DSEWPaC—Protected Matters Search Tool
- DSEWPaC—Environmental Reporting Tool
- DSEWPaC—Directory of Important Wetlands
- Birds Australia—Bird Atlas Data
- DNRM—Regional ecosystem (RE) mapping
- DNRM—Essential habitat mapping
- DEHP—Wetland mapping
- DEHP—Biodiversity Planning Assessment mapping and expert panel reports for the Brigalow Belt bioregion and Desert Uplands bioregion
- DEHP—Burdekin Natural Resource Management Region Back on Track Actions for Biodiversity report
- DEHP—Wildlife Online database
- DEHP (Queensland Herbarium)—HERBRECS specimen database
- Queensland Museum—Data search
- Global Biodiversity Information Facility—Atlas of Living Australia
- Burdekin Dry Tropics & Australian Government (Carter and Tait 2008)—Freshwater Fish of Burdekin Dry Tropics Natural Resource Management Region
- DEHP—Expert Panel Reports: Burdekin Region.

Survey effort

Field surveys to ‘ground truth’ the desktop assessment and investigate the terrestrial and aquatic ecological values of the study areas were undertaken between November 2010 and December 2013. The survey work contributing to the EIS, AEIS and assessment undertaken post AEIS is detailed in Table 5.1.

Flora surveys employed standardised approaches using CORVEG methodologies¹⁶. The surveys included a combination of comprehensive survey sites and rapid survey sites located in areas of remnant vegetation. Sampling methods used at each site included generating site species lists, brief site descriptions, verification of REs using quaternary site assessment methods, random meander searches and targeted searches where suitable habitat was encountered.

The fauna surveys employed a combination of comprehensive and rapid assessment sites. Comprehensive survey sites involved a systematic trapping effort including Elliot 'A' traps, cage traps, funnel traps and pitfall traps. Remote cameras, habitat assessment, opportunistic searches, standardised bird surveys, active herpetofauna searches, ultrasonic bat detection, spotlighting and call playback techniques were also employed. A habitat assessment was undertaken at each rapid assessment site recording the following parameters:

- landscape context
- structural and floristic complexity of vegetation
- structural complexity and relative heterogeneity of ground-level microhabitats
- habitat features
- relative abundance of hollows and hollow-bearing trees
- sources of disturbance.

In addition, remote cameras, active and opportunistic searches, standardised bird surveys, ultrasonic bat detection, spotlighting, call playback techniques and water body watches were employed at some of the rapid assessment sites.

¹⁶ VJ Neldner, BA Wilson, EJ Thompson and HA Dillewaard, *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* (Version 3.1 Updated September 2005), Queensland Herbarium, Environmental Protection Agency, Brisbane, 2005.

Table 5.1 Field surveys relevant to the assessment of MNES

Location	Survey type	Total survey effort	Timing
Surveys undertaken for the EIS			
Rail	Terrestrial and aquatic flora	24 terrestrial and 3 aquatic sites (autumn) 24 terrestrial and 1 aquatic sites (spring)	May 2011 (autumn) September 2011 (spring)
Rail	Terrestrial and aquatic fauna	2 terrestrial and 3 aquatic sites (autumn) 22 terrestrial and 1 aquatic sites (spring)	May 2011 (autumn) September 2011 (spring)
Rail	PMAV assessment	Various sites along corridor	June/July 2012 (winter)
Mine	Terrestrial and aquatic flora	60 terrestrial and 19 aquatic sites (spring) 168 terrestrial and 17 aquatic sites (autumn)	November 2010 and 2011 (spring) April/May 2011 (autumn)
Mine	Terrestrial and aquatic fauna	69 terrestrial and 19 aquatic sites (spring) 40 terrestrial and 17 aquatic sites (autumn)	November 2010 and 2011 (spring) April/May 2011 (autumn)
Mine	Doongmabulla and Mellaluka Springs survey	Unstructured, opportunistic survey	May 2012 (autumn)
Off-lease	Terrestrial and aquatic habitat rapid assessment	Unstructured, opportunistic survey	June 2012 (winter)
Off-lease	Targeted black-throated finch survey	9 water watch sites, 31 watch sites, 6 remote cameras	May 2012 (autumn)
Surveys undertaken for the AEIS			
Quarries	MNES survey	5 sites	January/February 2013 (summer) March 2013 (autumn) July 2013 (winter)
Mine	Targeted black-throated finch survey	8 water body counts, 20 remote camera sites, 52 habitat and finch survey sites, 8 incidental observation sites	May 2013 (autumn)
Mine	Doongmabulla and Mellaluka Springs survey	Unstructured, opportunistic survey	May 2012 (autumn) March/April 2013 (autumn)
Mine	Waxy cabbage palm survey	Population survey along 17.5 km of the Carmichael River	April 2013 (autumn)
Mine	Targeted black-throated finch survey	16 water body counts, 17 remote camera sites, 67 2 ha habitat survey sites	October 2013 (spring)
Mine	Ecological equivalence	46 sites	December 2013 (summer)

Location	Survey type	Total survey effort	Timing
Off-lease	Terrestrial and aquatic ecology	49 flora sites, 38 fauna sites, 2 trapping sites, 14 remote camera sites, 12 aquatic sites	April/May 2013 (autumn)
Off-lease	BioCondition	10 sites	April/May 2013 (autumn)
Off-lease	PVMP and PMAV assessment	49 flora sites	April/May 2013 (autumn)

PMAV = property maps of assessable vegetation, PVMP = property vegetation management plan

Occurrence of MNES

Threatened species and communities not addressed as MNES

Protected matters that have not been included in the assessment are the koala (*Phascolarctos cinereus*) and the Threatened Ecological Community (TEC) Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin. The koala was listed as vulnerable under the EPBC Act after the project was designated a controlled action and targeted surveys for this species were not undertaken. However, the fauna surveys conducted, including habitat assessments, scat searches and spotlighting, provide information relating to this species, which has been assessed as a state significant biodiversity value, rather than a matter of NES. The grassland TEC corresponds to the REs 11.4.4 and 11.4.11 which are present in the rail corridor. However, as these REs are intercepted by the rail alignment outside the Northern Bowen Basin subregion, they are not considered to form part of the TEC and have not been assessed as a matter of NES impacted by the project.

Likelihood of occurrence

A likelihood of occurrence assessment for flora and fauna species of conservation significance was undertaken for the EIS. It considered factors including species habitat preferences, known distribution, relative abundance, previous records from the region, occurrence of habitat in the study area and field observations. Species were then categorised as either 'unlikely to occur', 'may occur', 'likely to occur' or 'confirmed present', as follows:

- species considered 'unlikely to occur' had either not been recorded in the region, the study area was outside their known distribution or suitable habitat was unavailable in the study area
- species that 'may occur' had not previously been recorded in the region but the study area contains suitable habitat and was within the known species distribution range
- species determined 'likely to occur' had previously been recorded in the region and suitable habitat is present in the study area
- species listed as 'confirmed present' are those that were recorded in the field surveys undertaken in the study area for the EIS assessment.

Habitat modelling and impact mapping

To identify potential habitat for threatened species and communities that have been confirmed present or considered as likely to occur, a mapping methodology taking into consideration the known distribution, ecology and preferred habitat characteristics of each species and TEC was adopted for the study area and surrounding landscape. The habitat mapping was undertaken to account for the extensive size of the study area and the inability to access many areas during the field surveys. It has been undertaken at a regional scale and applies to the following matters:

- black-throated finch (southern)
- squatter pigeon (southern)
- reptiles of the brigalow belt, including ornamental snake and yakka skink
- brigalow (*Acacia harpophylla* dominant and co-dominant) TEC
- the community of native species dependent on natural discharge of groundwater from the GAB.

Direct impacts

Areas of direct impacts on MNES were calculated for the mine, rail and off-lease infrastructure areas. The disturbance areas for the mine have been revised since the AEIS submission period to produce a finer scale calculation for each domain and to account for the staging of disturbance consistent with the following mine stages:

- Mine Stage 1: Year 1 to Year 10
- Mine Stage 2: Year 11 to Year 20
- Mine Stage 3: Year 21 to Year 60.

The final proposed disturbances to MNES are detailed in a revised Environmental Offset Package (March 2014)¹⁷ available on the proponent's website.

Indirect impacts—subsidence predictions

In response to comments received on the EIS, the proponent developed a Subsidence Management Plan (SMP) as part of the AEIS to quantify subsidence impacts and identify relevant control, mitigation and management measures for subsidence impacts from underground operations.

The SMP (section 5.1) identifies a maximum subsidence impact of up to 5.5 m, noting that as the mine layout for the two coal seams is offset, the final pattern of subsidence will be a series of parallel troughs between 2 and 5 m deep and approximately 400 m wide. The length of the troughs will be variable.

Table 5.2 outlines the proponent's methodology to assess the severity of impacts due to underground mining operations causing surface subsidence, cracking and ponding and land disturbance due to proposed infrastructure.

¹⁷ For a copy of the report, refer to the proponent's website at http://adanimining.com/Australia_Carmichael_coal.aspx

Table 5.2 Ranking of predicted subsidence impacts

Impact	Ranking
Subsidence	High: slope change greater than 2 per cent (>5 m)
	Low: slope change less than 2 per cent (<5 m)
Cracking	High: greater than 100 mm (width)
	Low: less than 100 mm (width)
Ponding	High: duration of ponding greater than 2 days
	Low: duration of ponding less than 2 days
Infrastructure	High: impacted by infrastructure
	Low: not impacted by infrastructure

An impact ranking was developed based on outcomes of the subsidence assessment report (MSEC, 2013: AEIS Volume 4, Appendix I1), outcomes of modelled ponding (GHD, 2013: AEIS Volume 4, Appendix K5) and a review of relevant literature.

The proponent has quantified residual impacts of subsidence on MNES to only include 'high' impact subsidence areas, which includes a combination of high impacts of subsidence, and/or cracking, and/or ponding and infrastructure. The proponent notes that management and mitigation measures are proposed for 'low' impact areas and hence these areas have not been considered as residual impacts.

In accordance with this methodology, a total of 166.15 ha is predicted by the proponent to be potentially subject to high subsidence impacts, with the remaining 7620.61 ha predicted to be potentially subject to low subsidence impacts. The high subsidence impact area represents approximately 2 per cent of the total combined subsidence impact area.

Coordinator-General's conclusion

As a precautionary approach, and based on advice from DE, I have determined that until further information is available regarding the effectiveness of mitigation and management measures implemented for the project for subsidence impacts, the total underground mining area should be used to determine offsets.

The proponent will need to ensure the availability of offsets for each MNES value affected within the subsidence disturbance area. However, as residual impacts may be significantly lower than estimated, and to encourage the proponent to implement appropriate mitigation measures, the offset delivery requirements will need to be reviewed and quantified by ongoing monitoring and evaluation of residual impacts.

To this end, I have stated a condition in the draft EA (Appendix 1, Schedule J) requiring the development of an SMP prior to the commencement of activities that could result in subsidence. The SMP must include options for mitigating impacts associated with subsidence and how these measures will be implemented. It must include a monitoring program to review the effectiveness of the SMP, be reviewed each year and quantify the area of on-ground impacts, including residual impacts requiring offsets.

In relation to the provision of MNES offsets, I recommend that the proponent be required by the Commonwealth Minister for the Environment, to provide upfront, sufficient offsets for residual impacts that reflect the planned total underground mining area for the first 10 years of mining operations. Should the revision referred to in the previous paragraph identify that residual impacts are less than the total underground mining area, adjustments should be made to subsequent offset provisions.

Table 5.3 shows my predicted residual impact areas for EPBC listed species and communities.

Table 5.3 Predicted residual impact areas for EPBC listed species and communities

Environmental value	Mine	Subsidence	Off lease infrastructure	Rail
Threatened ecological community				
Brigalow	249.19	3	0.00	26.66
Threatened fauna				
Yakka skink	10,363.89	6,162	2.48	0
Ornamental snake	951.69	3	314.06	349.48
Squatter pigeon (southern)	10,748.8	6,913	5.02	337.04
Black-throated finch (southern)	9,607.67	6,883	2.53	16.24
Threatened flora				
Waxy cabbage palm	27.17	0	0.00	0
Migratory birds				
Eastern great egret	20.45	0	0.00	299.80
Cattle egret	8,612.58	5,069	0.14	2,087.92
Glossy ibis	20.45	0	0.00	0
White-bellied sea-eagle	20.45	0	0.00	61.00
Latham's snipe	28.84	3.06	0.01	143.23
Black-tailed godwit	20.45	0	0.00	0
Common greenshank	20.45	0	0.00	0
Marsh sandpiper	20.45	0	0.00	0
Common sandpiper	20.45	0	0.00	0
Curlew sandpiper	20.45	0	0.00	0
Caspian tern	20.45	0	0.00	0
Fort-tailed swift	10,513.91	6,944	285.90	2,703.19
White-throated needletail	10,513.91	6,944	285.90	2,703.19
Rainbow bee-eater	10,756	6,944	0.00	2,703.19
Satin flycatcher	10,677.23	3	285.90	361.37

Threatened flora—waxy cabbage palm

Description

The waxy cabbage palm (*Livistona lanuginosa*) (WCP) is listed as vulnerable under the EPBC Act and Queensland's NC Act. The WCP is a very distinctive species with abundant woolly scale on the petiole (leaf stalk) and rachis bracts (main stalk).¹⁸ The undersides of the leaves appear bluish due to its waxy coating¹⁹ and the species has the largest fruits of all the Australian *Livistona* spp.²⁰

The WCP is endemic to the Burdekin-Ravenswood-Cape River area inland from Ayr, where it is found on the tributaries of the Burdekin River.²¹ The main occurrence of the species is the lower Cape River (a tributary of the Burdekin River) and most of its primary and secondary tributaries.²²

The approved Conservation Advice for the WCP²³ states that the distribution of WCP individuals along streams is scattered, with rare dense congregations. The Conservation Advice references a study conducted by Pettit and Dowe (2004) which estimates that the total WCP population comprises approximately 5000 individuals, including 510 adult plants.²⁴ Dowe (2007) suggests that additional field work is required to determine the total population coverage of the WCP. The species is suspected to occur in inaccessible/remote areas, where ecological inventory work has been minimal.²⁵

All known populations of WCP are growing on sandy, ephemeral watercourses or their floodplains. In periodic severe drought conditions, only stands growing on permanent soaks in stream beds survive¹⁸. Seeds are well adapted for dispersal by flood waters¹⁸.

The Species Profile and Threats database²⁵ considers that suitable habitat for the WCP is present in REs 10.3.13, 10.3.14, 10.3.6 and 11.3.4.

Baseline information

The proponent states that WCP was not predicted to occur on the project site (rail, off-lease infrastructure area or mine project components) by DE's Protected Matters Search Tool.²⁶ However, the WCP was subsequently confirmed present during field surveys within the mine area.

Survey effort

Relevant field surveys for the WCP included:

- May 2012—Doongmabulla Springs Complex and Mellaluka Springs Complex

¹⁸ Rodd, Revision of *Livistona* (Arecaceae) in Australia, *Telopea*. 8(1):49-153, 1998.

¹⁹ J Price, A.N. Rodd's revision of *Livistona* in Australia, *Palms and Cycads*. 35:2-53, 1999.

²⁰ BRI Rare and Threatened Plant database (2001)

²¹ DL Jones, *Palms in Australia; revised edition*, *Telopea*, 8(1):49-153, 1987.

²² JL Dowe, *Notes on Endangered and Vulnerable Australian Palms: Livistona lanuginosa*, Australian Centre for Tropical Freshwater Research, James Cook University, Townsville, 2007.

²³ www.environment.gov.au/biodiversity/threatened/species/pubs/64581-conservation-advice.pdf

²⁴ NE Pettit and JL Dowe, Distribution and population structure of the vulnerable riparian palm *Livistona lanuginosa* A.N.Rodd (Arecaceae) in the Burdekin River catchment, north Queensland. *Pacific Conservation Biology*. 9(3):207-214, 2004.

²⁵ www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=64581

²⁶ www.environment.gov.au/topics/about-us/legislation/environment-protection-and-biodiversity-conservation-act-1999/protected

- March/April 2013—Doongmabulla Springs Complex and Mellaluka Springs Complex
- March/April 2013—Carmichael River (mine area—17.5 km in total) and Moses and Little Moses Springs (part of the Doongmabulla Springs Complex, upstream of the mine area).

The Carmichael River survey was divided into 35 plots, each 500 metres long measured in parallel with the river's flow direction, replicating the survey method of Pettit and Dowe.²⁴ This allowed for a direct comparison to the Burdekin Basin populations of WCP. No other specific guidelines exist for the species.

Detailed survey information is contained within AEIS Appendix J4: Population Survey of WCP Report.

Results of field surveys

A total of 831 WCP individuals have been identified as part of the field surveys, with 19 of the individuals recorded at Moses Spring and the remainder (812) in the Carmichael River. Adult palms account for 11 per cent of the WCP population. This is similar to the proportion of adult to juvenile palms (10 per cent) recorded by Pettit and Dowe.⁷ Figure 5.1 illustrates the location of WCP populations at the Moses Spring and along the 17.5 km stretch of the Carmichael River.

The WCP population structure differs between the Moses Spring and Carmichael River locations. The Moses Spring population is smaller, located in atypical habitat and relatively isolated, whilst the Carmichael River population has a high level of internal connectivity and is located in more typical habitat for the species.

Four threatening processes were identified during the field surveys:

- (1) weed infestation
- (2) feral pigs
- (3) cattle grazing, including trampling of seedlings, watercourse bed and banks and grazing of foliage
- (4) bushfire.

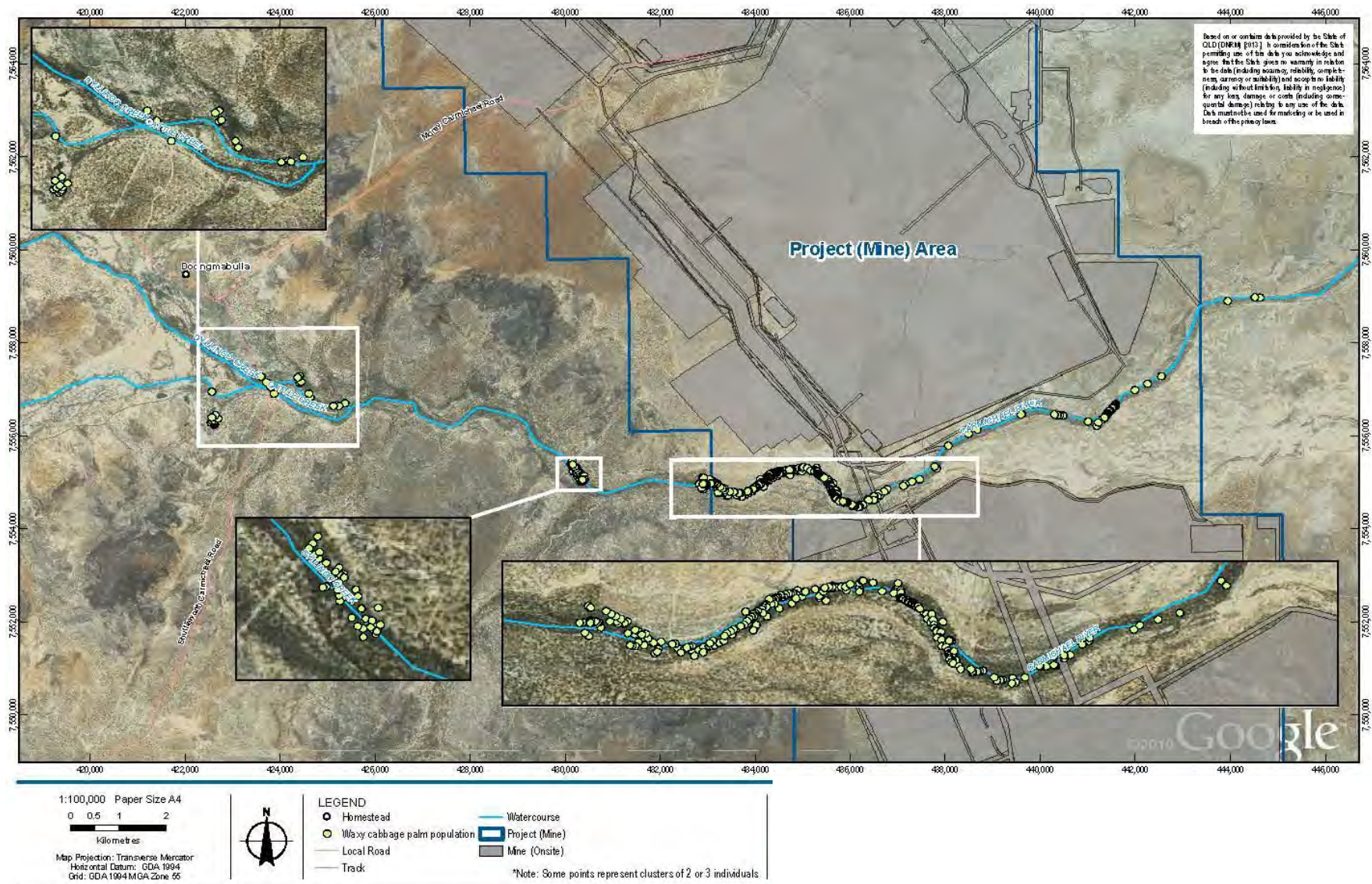


Figure 5.1 Location of recorded waxy cabbage palm populations

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Rubber vine is established at various points along the Carmichael River, from Joshua Spring located 10.2 km west of the western edge of the mining lease boundary to the furthest downstream point surveyed, 2.5 km east of the mining lease boundary. Rubber vine is a declared Class 2 pest plant under Queensland legislation (*Land Protection (Pest and Stock Route Management) Act 2002*) and a Weed of National Significance.

The Moses spring, located 8.8 km directly west from the western edge of the mining lease boundary, is part of the Doongmabulla Springs Complex and is recognised as an endangered GAB discharge spring wetlands TEC under the EPBC Act. The Moses spring consists of a cluster of mounding and non-mounding artesian springs with large wetland areas.

WCP at the Moses Spring are located within 100 m of a central point, generally within the river red gum/weeping paperbark community on the outskirts of the spring wetland, with a core population of 16 palms located within a 50 m radius. Although situated in the Carmichael River catchment, the location of the palms in a GAB spring wetland is unique for this species.

Within the Carmichael River, WCP were recorded on the banks of the river channel and on the adjacent floodplain. Habitat where the species was encountered is characterised by an open forest with a canopy from 20–25 m tall dominated primarily by river red gums and weeping paperbark and narrow-leaved paperbark dominating and co-dominating in places. The WCP constitutes a sub-canopy where it is present, but elsewhere there is a negligible to absent lower tree and shrub layer.

The Carmichael River population comprises considerably higher numbers of seedlings than in the sub-adult or adult stages. The population is not spread evenly along the Carmichael River, with the majority of individuals (including most of the adults) located within the western half of the mine area.

Sixty per cent of all WCP individuals in the survey area, including the Carmichael River and Moses Spring, are located in one 3 km long cluster. This cluster includes more than 80 per cent of the adults and is situated on a reach of the river inside the western boundary of the mine area (extending some 5 km from the western mining lease boundary), where groundwater is recorded as being closest to the surface (0.5 m above the floor of the river channel). Groundwater model results show this area of the Carmichael River appears to be ‘gaining’ flow, i.e. river flow is being supplemented by groundwater, sections of the river further downstream (where palms were recorded in lower densities) appear to be ‘losing’ flow due to ground seepage and evaporation. This suggests the species favours areas where groundwater is more accessible.

The proponent considers that the Carmichael River and Moses Spring supports an ‘important population’ of the WCP, noting that an important population of an (EPBC Act) vulnerable species is defined as a population that is necessary for a species’ long-term survival and recovery, including populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity
- populations that are near the limit of the species range.

The proponent also considers that habitat for this species within the Carmichael River and Moses Spring is considered 'habitat critical to the survival of the species' as defined in the Australian Government's Significant Impact Guidelines.²⁷

Potential impacts

Potential impacts on WCP as a result of the project (mine component) include:

- vegetation clearing
- changes in hydrology
- water quality degradation
- introduction or spread of aquatic and terrestrial weed and/or pest species
- changes to the fire regime.

The proponent predicts that 5.47 ha of WCP habitat will be directly impacted by clearing associated with the construction of a haul road across the Carmichael River. WCP habitat has been based on REs mapped within the Carmichael River corridor. Based on field survey results, the proponent notes that this area includes five individual palms. In addition, 21.7 ha of WCP habitat is likely to be affected by hydrological changes to the Carmichael River.

Groundwater drawdown from mine dewatering of between 1 to 4 metres is predicted to occur in the vicinity of the Carmichael River (AEIS, Appendix H). Groundwater modelling results suggest that:

- near the western boundary of the mining lease, drawdown will be approximately 1 m and zero flow periods will increase to approximately 5 per cent of the time, from zero per cent currently
- in general, drawdown of the water table along the Carmichael River is greatest near the middle of the mine area, at approximately 4 m, and decreases gradually towards both the western and eastern boundaries
- at the eastern mining lease boundary, base flow will be reduced by around 1000 m³/day (33 per cent of pre-development base flow) during the operational phase, falling to approximately 950 m³/day (31 per cent of pre-development base flow) post mine closure
- zero flow periods at the eastern mining lease boundary will increase by 30 per cent to 60 per cent of the time during operation and post mine closure.

Drawdown of the water table is predicted to reduce the volume of base flow to the Carmichael River. These base flow reductions are predicted to cause the point at which base flow in the Carmichael River is reduced to zero (through leakage to the ground in 'losing' sections of the river) to migrate 10 km upstream, from 25 km downstream of the eastern mining lease boundary pre-development, to 15 km downstream post-development.

Figure 5.2 illustrates the predicted baseflow reductions in the Carmichael River with respect to recorded WCP populations.

²⁷ Department of Environment, Water, Heritage and the Arts (DEWHA – now Department of the Environment), Matters of National Environmental Significance – *Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999*, Canberra, 2009.

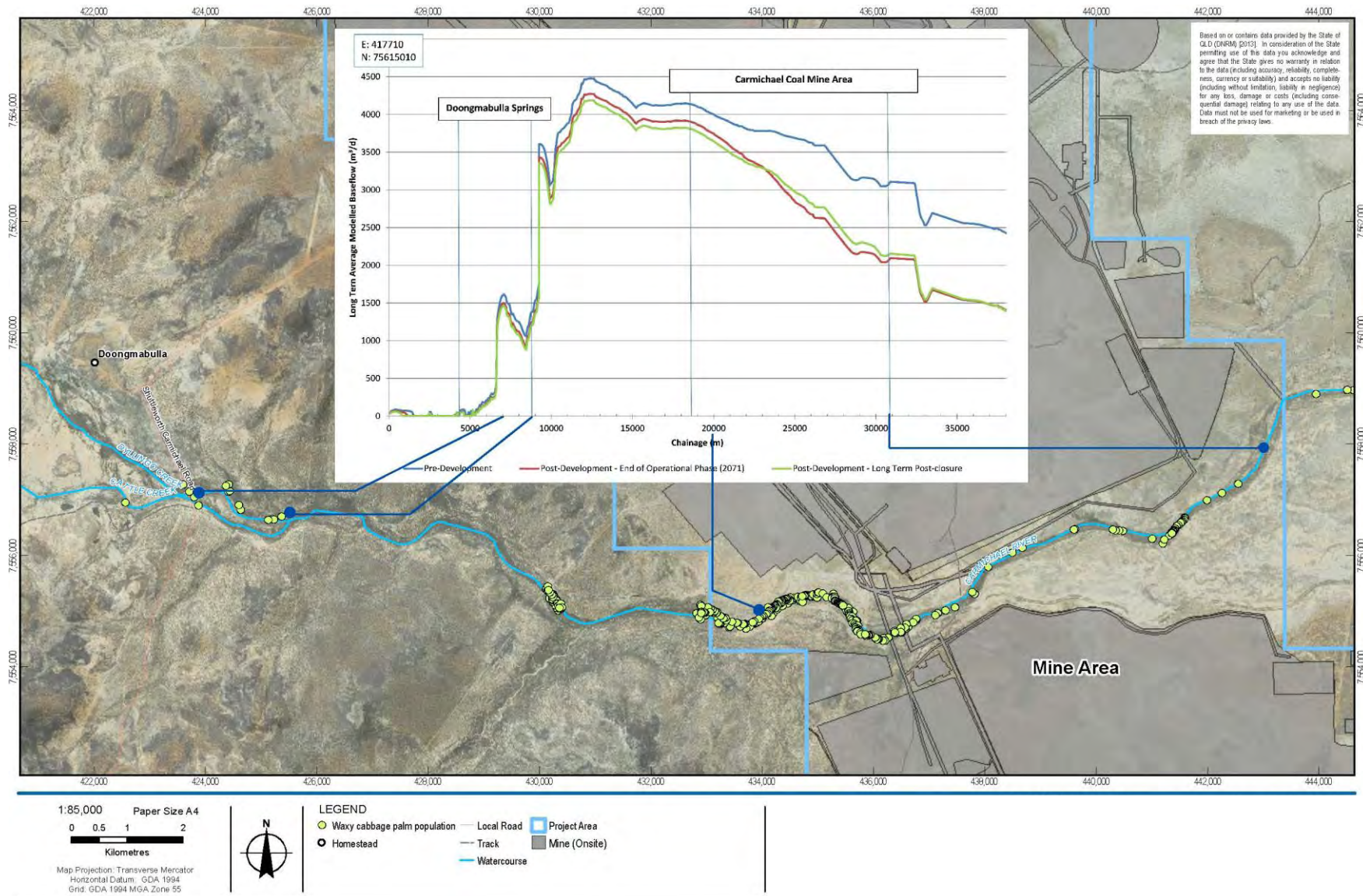


Figure 5.2 Predicted baseflow reductions in the Carmichael River

Evaluation of environmental impacts—project wide
Carmichael Coal Mine and Rail project::

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

The proponent considers that the majority of WCP located within the western half of the mine area will persist despite the predicted hydrological changes. In the eastern half of the mine area, however, the river habitat for the WCP is predicted to be significantly impacted by groundwater drawdown within the Carmichael River channel. In this area, the predicted declines in base flow combined with increased zero base flow events are considered likely to result in stress to the 169 WCP individuals, including 9 adults, with stress levels increasing with proximity to the eastern boundary and beyond for WCP located downstream (east of the mining lease eastern boundary).

A potential reduction in health, leading to stress and mortality of the dominant riparian species (river red gums and paper barks) is also predicted in the eastern half of the mine area. Where dieback of some or all of the trees in the canopy occurs, Appendix H of the AEIS predicts that without mitigation measures:

- a loss of open forest canopy will favour the proliferation of weeds and shrubs. In particular, rubber vine infestations currently in the Carmichael River within the mine area will increase in height, area and density, with the capability to render the watercourse inaccessible to humans and large animals
- these weeds will increase the quantity of seed movement downstream to other sections of the Carmichael and Belyando Rivers
- such weed infestations provide havens for feral pigs, which damage WCP seedlings and exacerbate erosion and bank damage
- increasing weeds can lead to a consequent reduction in species diversity and ecosystem complexity, reducing the biological diversity of watercourse habitat
- a loss of large trees growing in banks and channel bars will result in increased instability of those banks and channel bars. High flow events in the future will result in increasing bank and channel erosion, and bank slumping
- increased erosion leads to increased sedimentation downstream, with consequent declines in water quality
- loss of the forest canopy alters environmental conditions (humidity, dappled shade/sun, temperature gradients in pools) that are important for in stream aquatic macrophytes and invertebrates, with a high potential for reduction in the populations of these species
- a general loss of breeding, roosting and foraging riparian habitat for fauna utilising riparian vegetation.

Potential impacts—assessment findings

DEHP and DE have identified the following issues regarding the assessment of potential impacts:

- An assessment of potential impact of the mine on the WCP should consider the spatial and temporal variation of available water within the root zone of the palms, which includes consideration of retention of water supplied by river flows. This level of baseline information has not been provided.
- The prediction of impacts to 169 WCP individuals in the eastern section of the mine area assumes that a reduction in available water for the WCP will be uniformly perpendicular to the flow of the river. This assumption may not be valid.

-
- It is not clear where the western section of the mine area ends and the eastern section of the mine area begins.
 - Impacts will likely extend downstream of the mining lease boundary. Potential or actual WCP habitat affected by reduced base flows in the Carmichael River to the east of the mine site should be considered. The proponent's field surveys only extend 2.5 km downstream of the mining lease boundary.
 - The proponent's statement that the WCP individuals in the western half of the mine area are likely to persist needs to be supported with evidence as to the persistence of refugia habitats and 'permanent soaks' in drought conditions, in light of the expected impact on groundwater. Long-term average modelled base flow is not sufficient to make this determination. The extent of post mining drawdown is also not sufficiently certain.

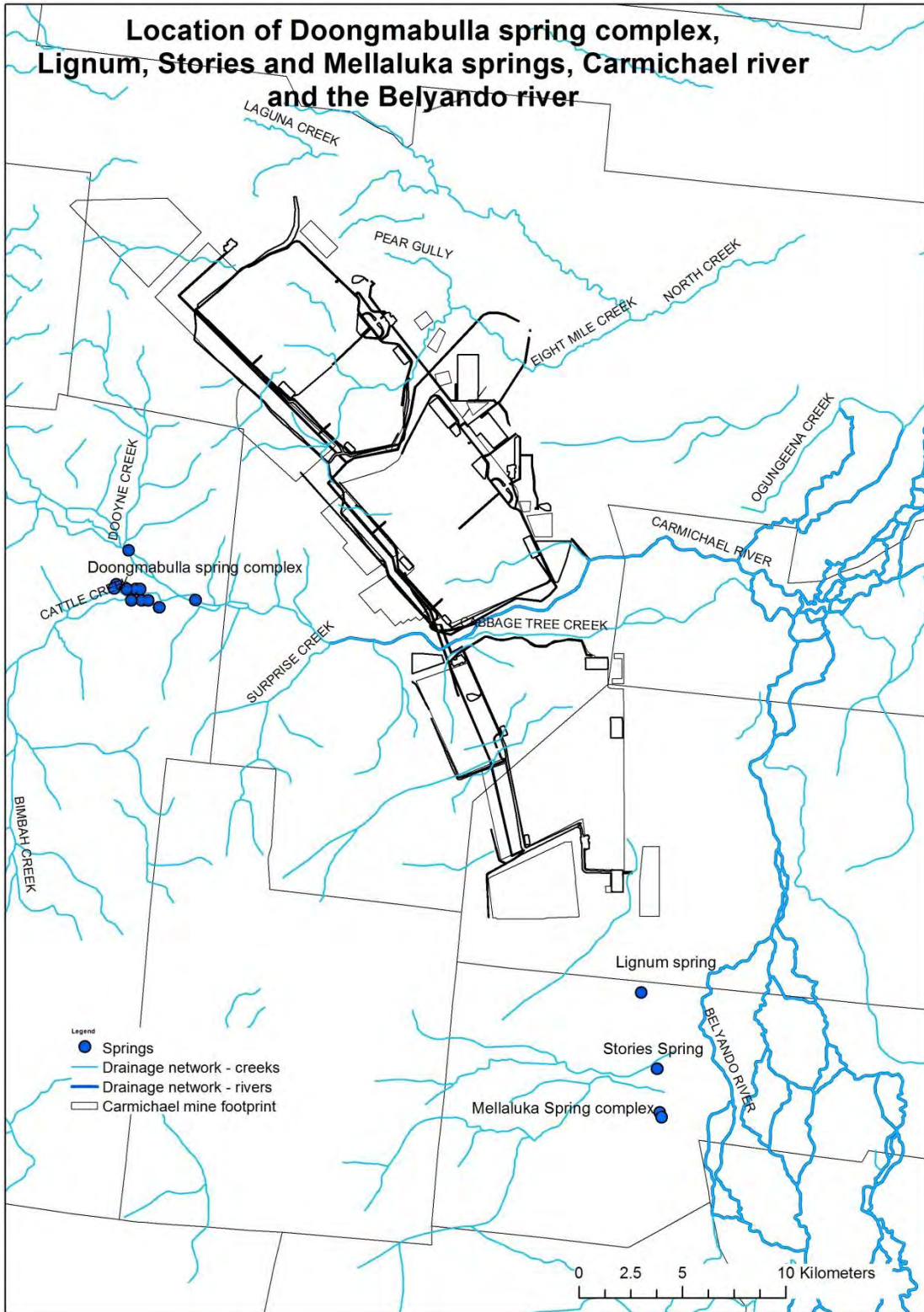


Figure 5.3 Location of GDEs to be included in the GDEMP

Avoidance, mitigation and management measures

The proponent has committed to implementing a number of mitigation and management measures to minimise impacts to the WCP. These measures, as described in AEIS Appendix H and included in the Proponent Commitments Register (Appendix 7), include:

- restricting the extent of vegetation clearing to the minimal amount necessary (commitment M4.17)
- management of fire regimes (commitment P6.75)
- erosion and sediment control (commitment P6.73)
- management of weeds and pests (commitments P6.71 and P6.72).

The proponent has committed to develop and implement a number of management plans to facilitate the implementation of the above measures, including:

- GDEMP (commitment M4.27)
- Project (Mine and Off lease Infrastructure) Bushfire Management Plan (commitment P6.75)
- Project Land Management (Flora and Fauna) Plan (commitment P6.68)
- Project Vegetation Management Plan (commitment P6.69)
- Project Weed and Pest Management Plan (weeds) (commitment P6.71)
- Project Weed and Pest Management Plan (introduced animals) (commitment P6.72)
- Project Erosion and Sediment Management Plan (commitment P6.73).

Groundwater Dependent Ecosystem Management Plan (GDEMP)

Subsequent to the AEIS, the proponent produced a draft GDEMP for the project. The purpose of the GDEMP is to identify and describe actions necessary to prevent or minimise, to the greatest extent possible, impacts to the GDEs associated with the project, including the WCP. WCP mitigation and management measures identified in the GDEMP focus on ameliorating weed and pest impacts through removal and management. This includes the removal of rubber vine and the implementation of ongoing management measures to monitor resurgence, and the control of the existing feral pig population which is damaging WCP habitat and seedlings (commitment P6.39).

Section 9.4 of the GDEMP notes that consideration was given to supplementing base flows in the Carmichael River during dry periods through controlled releases from the mine site, at a point in the river where there is a 'gaining' section. However the proponent now considers that this mitigation measure is unlikely to be achievable from mine-related discharges.

Section 9.9 of the draft GDEMP details a WCP monitoring program in order to increase the current level of information for the WCP and inform the development of management measures. WCP monitoring is focused on providing for adaptive management in addressing the inevitable indirect impacts of groundwater drawdown—in particular on the WCP population in the western section of the mine site where the

proponent expects the WCP to persist. Key monitoring commitments, as identified in the Proponent Commitments Register (Appendix 7), include:

- **Development of a detailed ‘ecological features’ map of the Carmichael River:** to assist in dieback and river health monitoring, identifying priority management areas including the locations of WCP, rubber vine infestations, riparian composition and health, areas of connectivity/disconnection with the groundwater based on the modelling, gaining/losing areas of the river relative to the groundwater (commitment P6.38).
- **Establishment of permanent CORVEG primary monitoring transects at regular intervals along the river:** for the purpose of establishing a riparian community health baseline. In the initial development/operational phases of the mine, monitoring of the plots will be seasonal, reflecting high flow/low flow variability in the Carmichael River (twice annually). This monitoring will continue into the mid operational life of the mine, and increase to a quarterly frequency when drawdown is at its maximum. If possible, depth-to-groundwater data will be incorporated (commitment P6.40).
- **Bi-annual monitoring of the health of the WCP population:** to be undertaken preferably at the start of the wet season and the start of the dry season (December and May) (commitment P6.41).
- **Mapping and long-term research on the Carmichael River WCP population:** to detect responses to observed changes in groundwater depth and base flow volume and frequency. This will include complete mapping of the Carmichael River WCP population (particularly downstream of the mine area, where base flow reductions will have an impact) and long-term flow monitoring and measurements of groundwater depth changes at a minimum of three locations along the river where adult WCPs are located (preferably, chosen to contrast different change regimes) (commitment P6.42).
- **Vegetation monitoring with regard to groundwater monitoring/base flow monitoring:** Locations for monitoring bores will be chosen with respect to selected environmental features along the Carmichael River (such as deep pools, particular riparian communities, areas with WCP) to enable more meaningful interpretation of potential direct interactions between these features and the groundwater (commitment P6.43).
- **Monitoring the base river flow, including the establishment of gauging stations, in areas of particular ecological interest:** Flow data will be monitored on an ongoing basis prior to construction, during operation and post operation upstream, downstream and within the mine area (commitment P6.44).
- **Detailed monitoring of groundwater levels and surface water flows at the Carmichael and Belyando Rivers:** to be undertaken prior to construction, during operation and post operation upstream, downstream and within the mine area will be undertaken to measure changes to groundwater and surface flows (commitment P6.45).

Coordinator-General's conclusions

I consider that ongoing monitoring is required to further define the baseline conditions for the WCP and that the draft GDEMP inadequately describes specific, effective mitigation measures for the WCP. In order to ensure impacts to the WCP populations are appropriately identified and quantified, including the stretch of the Carmichael River downstream of the mining lease boundary. I have stated a condition for the draft EA which requires the development and implementation of a GDEMP prior to the commencement of activities that impact groundwater level or quality (Appendix 1, Schedule I). The GDEMP will ensure that impacts to the WCP populations are appropriately identified and quantified and:

- requires the proponent to monitor, identify and describe any adverse impacts to GDE environmental values, ecology, water quality and groundwater level due to mining activities, which by definition will include the WCP population and wider riparian zone associated with the stretch of Carmichael River between the Doongmabulla Springs Complex and the Belyando River (approximately 20 km downstream of the eastern mining lease boundary—refer to Figure 5.3)
- include detailed baseline monitoring and ongoing condition monitoring of the specific ecology of each GDE. Baseline monitoring must be undertaken prior to the commencement of mine construction. The environmental values to be monitored must include, but are not limited to, groundwater level, groundwater and surface water quality, ecology, threatened species, and ecosystem function
- include a description of how the results of baseline monitoring and ongoing condition monitoring are to be used to determine any changes in GDE ecology attributable to mining activities
- include a description of potential impact to each GDE from each project stage including mine dewatering of aquifers, water discharge, hydrological changes and weed and pest infestation
- identify specific mitigation measures to be undertaken to avoid, mitigate, offset and manage impacts to GDE environmental values resulting from each stage of the project
- include detail on the effectiveness of avoidance, mitigation and management actions in curtailing adverse impacts on GDEs
- describe any adaptive management initiatives implemented.

An adaptive management and monitoring approach, as outlined in the draft GDEMP, is appropriate. However, it must be supported by impact thresholds which will trigger the implementation of corrective measures for each of the GDEs and/or the provision of offsets. Impact thresholds, such as groundwater drawdown trigger level limits relevant to GDEs, have generally not been defined in the draft GDEMP.

To ensure the development of appropriate groundwater drawdown trigger level limits for the WCP, I have stated conditions for the draft EA (Appendix 1, Schedule E and Schedule I). These conditions will require:

- (1) **Monitoring of groundwater fluctuations.** Groundwater bores must be installed at locations that capture groundwater fluctuations surrounding State Significant Biodiversity Values (SSBV), including the WCP and riparian vegetation in the

vicinity of the Carmichael River. Groundwater bore locations must be submitted to the administering authority one year after the issue of the EA.

- (2) **Setting of groundwater drawdown trigger level limits which, when reached, will require the implementation of mitigation measures or provision of offsets.** Groundwater trigger levels must be provided to the administering authority within 5 years of the issue of the EA and must be based on background groundwater monitoring data collected pursuant to the groundwater monitoring requirements of the draft EA (Schedule E).
- (3) **Review of trigger levels.** Trigger levels must be reviewed by a suitably qualified person 10 years after the issue of the EA, and from then on every five years.

Offsets

The proponent acknowledges that offset obligations under the EPBC Act are likely to be required for 5.47 ha of WCP, associated with on-site clearing for the construction of a haul road for the mine component of the project, and for 21.7 ha of habitat likely to be affected by hydrological changes to the Carmichael River.

Subsequent to the AEIS, the proponent submitted a revised Environmental Offset Package (dated 20 March 2014) for the project that included suitable properties within the Galilee Basin to offset residual impacts to the WCP. Five offset properties have been identified in the Offsets Package, of which two properties reportedly contain 6056.84 ha of potential WCP habitat.

Properties within the Environmental Offset Package have yet to be ground-truthed to determine the actual extent and suitability of environmental values on the ground and figures presented in the package are based on a desktop and spatial analysis only.

While the proponent contends that hydrological impacts will be limited to the eastern half of the Carmichael River within the mine area, significant residual impacts are likely to occur to the entire WCP population located in the mine area. This equates to 812 WCP individuals recorded on the mine area within the Carmichael River.

As noted above, I have stated conditions for the project's draft EA which will require detailed baseline monitoring (prior to the commencement of activities that impact on groundwater) in order to identify the extent of WCP on the Carmichael River, including downstream of the mine site.

I expect that the proponent will work directly with DE in order to progress its assessment of offsets against the Offsets Assessment Guide and to ensure compliance with the EPBC Act Offset Policy.

To ensure the provision of sufficient offsets for impacts on SSBVs (including the WCP) for the project, I have stated conditions as part of Schedule I of the draft EA (Appendix 1 of this report). In the event that groundwater fluctuations exceed the defined GDE groundwater drawdown trigger levels, the proponent will be required to investigate and submit a report to the administering authority within 28 days to determine the cause—for example, whether the fluctuations are a result of mining activities, or other causes such as pumping from licensed bores or seasonal variation. In the event that groundwater fluctuations are determined to be a result of mining activities, the

proponent must mitigate this impact and provide supplementary offsets for the impacted GDE that may not reasonably be mitigated.

Should the Australian Government require an offset for the additional residual impacts on GDEs in accordance with the EPBC Act Offset Policy, I will not require any additional offsets for impacts on the same SSBVs. The conditions stated in Schedule I of the draft EA will provide a mechanism to deliver the EPBC Act's offsets using the approved Biodiversity Offsets Strategy. It will be the proponent's responsibility to demonstrate that the loss of values being offset under the EPBC Act are the same as those identified through state offset requirements. See section 6.1 for an explanation as to how I will deal with any State offset requirements once the EPBC Act offsets have been determined.

I have recommended a condition of approval to the Commonwealth Minister for the Environment (Appendix 1, Section 2, Part A) requiring the proponent to develop and implement an Offset Management Plan that includes monitoring and management measures of offset areas for EPBC listed threatened species and communities.

Conservation advice, recovery plans and threat abatement plans

- A recovery plan has not been developed for the WCP.
- There is one relevant Threat Abatement Plan (TAP) for the WCP: Threat Abatement Plan for predation, habitat degradation, competition and disease transmission by feral pigs²⁸ (feral pigs TAP).

The feral pigs TAP identifies five main objectives to manage the threat by feral pigs, including:

- preventing feral pigs from establishing in key areas
- integrating feral pig management plans into natural resource planning
- increasing awareness and understanding about the damage that feral pigs cause and management options
- quantifying the impacts feral pigs have on biodiversity
- improving the effectiveness, efficiency and humaneness of techniques and strategies for managing environmental damage due to feral pigs.

Feral pigs have been recorded in the project area and are identified by the proponent as a key threatening process to the WCP.

The approved conservation advice for the WCP²⁹ identifies the following main identified and potential threats:

- fire
- trampling and grazing by stock
- clearing for agricultural development
- dams that affect water level and flow in the area of occurrence
- introduction of invasive weeds.

²⁸ www.environment.gov.au/system/files/resources/eddf958-49e0-4c11-a994-68b113724b3a/files/feral-pig-tap.pdf

²⁹ www.environment.gov.au/biodiversity/threatened/species/pubs/64581-conservation-advice.pdf

The conservation advice identifies that proper management of habitat for the WCP is important for the conservation of the WCP, including managing overgrazing and any hydrological changes appropriately, and implementing suitable fire and weed management strategies.

As noted above, the proponent has committed to a number of these measures, to be implemented through the proposed draft GDEMP, Project Bushfire Management Plan and Project Weeds and Pests Management Plan. The draft GDEMP includes WCP mitigation and management measures that focus on ameliorating weed and pest impacts through removal and management—in particular, the removal of rubber vine and control of feral pigs.

Coordinator-General's conclusion—WCP

My requirement for the proponent is to undertake further baseline surveys (prior to the commencement of activities that impact groundwater) and ongoing condition surveys of the WCP and its habitat (Appendix 1, Schedule E and Schedule I)—in particular downstream of the mining lease boundary—will ensure that potential impacts to WCP populations are appropriately identified.

I have stated conditions (Appendix 1, Schedule E and Schedule I) requiring an adaptive approach to the management of WCP, including the monitoring of groundwater fluctuations in proximity to WCP and the identification of groundwater drawdown trigger levels which will trigger the implementation of corrective measures for each of the GDEs and/or the provision of offsets.

Impacts will be managed through the implementation of the GDEMP, for which I have stated a condition as part of the project's draft EA (Appendix 1, Schedule I). This condition will ensure the development of specific mitigation and management measures for the GDE for threats posed by the project, including groundwater drawdown, weeds and feral pests where they represent a threat to the species on site. The GDEMP must also identify relevant guidelines, policies and plans (e.g. TAPs).

Residual impacts of the project will be offset by protecting and enhancing habitat for the WCP in accordance with my conditions stated for the draft EA (Appendix 1, Schedule I) and the EPBC Act Offsets Policy.

I consider that my recommended conditions of approval are consistent with the relevant TAP and approved Conservation Advice for the WCP. Considering the above, and assuming compliance with my recommended conditions, I am satisfied that the project would not have an unacceptable impact on the WCP.

Threatened fauna—black-throated finch (southern)

Description

The black-throated finch (southern) (*Poephila cincta cincta*) (BTF) is listed as endangered under the EPBC Act and Queensland's NC Act. The BTF was previously thought to occur at two general locations—in the Townsville region and at scattered sites in central-eastern Queensland.³⁰ The species is thought to require a mosaic of

³⁰ www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

different habitats in which it can forage for seed. Habitat consists predominantly of grassy, open woodlands and forests, typically dominated by Eucalyptus, Corymbia and Melaleuca, and occasionally tussock grasslands or other habitats (for example freshwater wetlands) along or near watercourses, or in the vicinity of water.

The Significant Impact Guidelines for the BTF³¹ note that the BTF requires access to three key habitat resources:

- water sources
- grass seeds
- trees providing suitable nesting habitat.

The presence and configuration between and within these three key resources governs the distribution of the BTF. Any disruption to the connectivity between these resources will have a serious impact on an area's ability to sustain BTF populations.³¹ While suitable nesting sites are likely to be relatively common in the landscape, the distribution and availability of water and foraging habitat is much more limited and will, in turn, limit the number of nesting sites available to the BTF.

In the Townsville area, breeding typically occurs in the wet season, usually between February and May.³² It is likely that breeding at the project site also occurs in the wet season, which in the Galilee Basin is between December and February.

Baseline information

Survey effort

The proponent has conducted a considerable survey effort for the BTF on the project site and surrounds, including surveys undertaken on and off the mining lease during 2010 (November), 2011 (April/May, August/September, November), 2012 (May), and 2013 (March, May and October). A combination of three survey methods was employed based on the recommended methods within the Significant Impact Guidelines for the BTF³¹, including water source watches, two-hectare area bird counts and remote fauna cameras.

Table 5.4 is a summary of the BTF survey effort across the Carmichael Coal Mine and off-lease infrastructure area and Figure 5.4 maps the BTF survey locations.

³¹ DEWHA, *Significant impact guidelines for the endangered black-throated finch (southern) (Poephila cincta cincta)*. National threatened species and ecological communities. EPBC Act policy statement 3.13. Australian Government, Canberra, 2009.

³² Natural Resource Assessment Environmental Consultants (NRA), *Survey and Assessment of the Black-throated Finch (Poephila cincta cincta) at the Chisholm Trail Rural Residential Development*, Townsville. Unpublished report prepared for the Department of Environment and Water Resources, 2007.

Table 5.4 BTF survey effort across the Carmichael Coal mine site and off-lease infrastructure area

Survey events		Two hectare area bird counts		Remote fauna camera		Water body watches	
		No. of sites	No. of person hours	No. of cameras	No. hours	No. of water body sites	No. of person hours
Undertaken as part of the EIS	November 2010 (EIS Survey—EPC1690)	52	28	16	1088	21	41
	April and May 2011 (EIS Survey—EPC1690)						
	August and September 2011 (EIS Survey—EPC1690)						
	November 2011 (EIS Survey—EPC1080)	46	90	4	240	22	70
	May 2012—(targeted BTF surveys)	31	21	9	1440	9	28
Post-EIS (including AEIS)	March 2013 (off-lease surveys)	40	15	14	2016	20	23
	May 2013 (targeted BTF surveys)	52	80	20	15 528	8	29
	October 2013 (targeted BTF surveys)	67	89	17	1992	16	26

Note: Based on information provided by the proponent to the Office of the Coordinator-General on 11 March 2014.

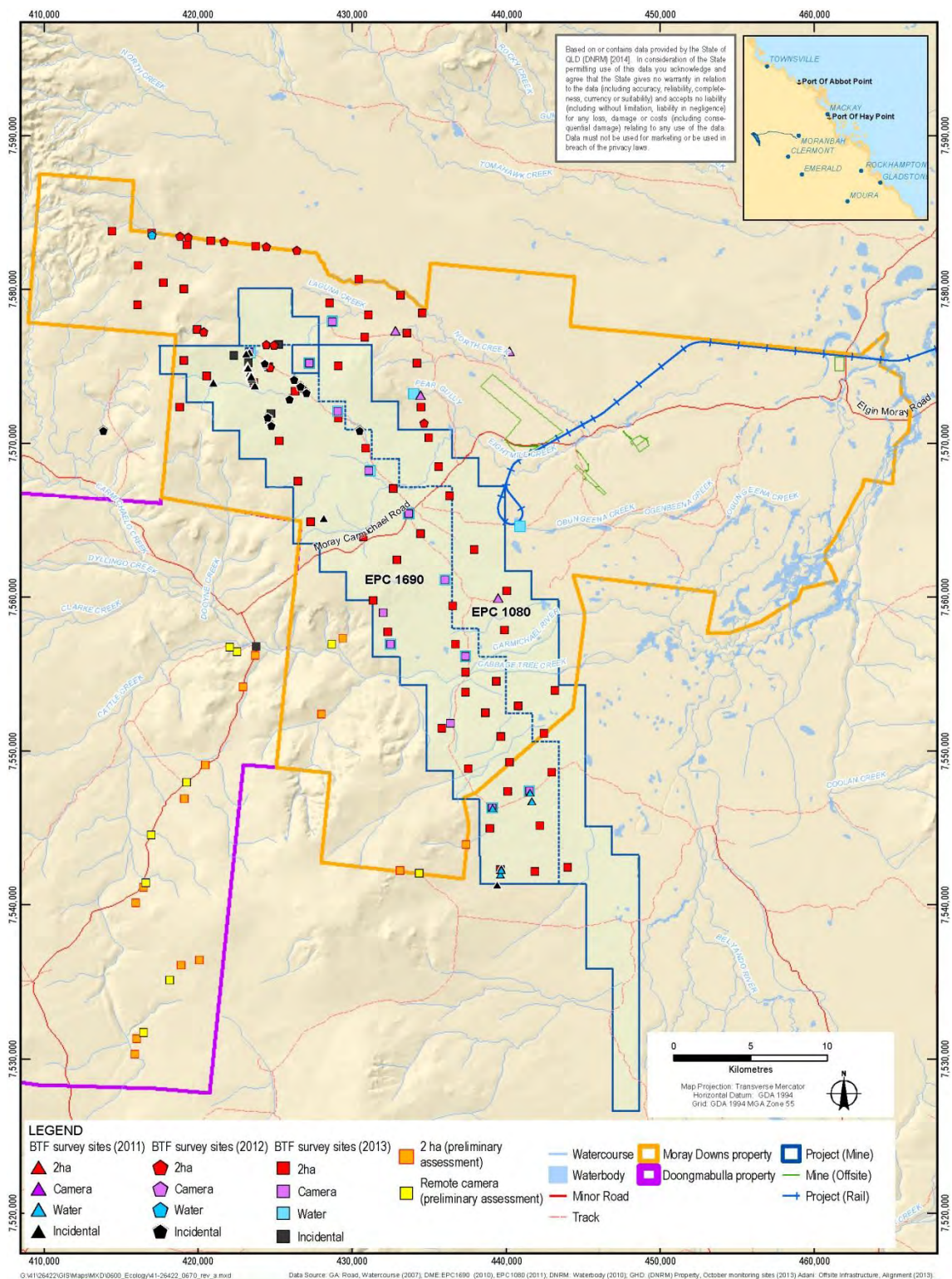


Figure 5.4 BTF survey site locations 2011–2013

Results of field surveys

Recorded sightings

Figure 5.5 illustrates recorded BTF sightings between 2011 and 2013, providing a general sense of the locations in the landscape where BTF are recorded consistently and in high numbers.

The high number of BTF observations suggests that the subspecies occurs in large numbers in the area of the mine site and that much of the habitat is in good condition. The sub-population of BTF in the landscape that encompasses the mine area and adjacent properties to the north and west is seemingly large and significant in the context of existing known populations (i.e. Townsville).

No BTF have been detected during any surveys of the rail or off-lease infrastructure areas. DEHP considers that adequate survey effort was undertaken in these off-lease areas.

The region to the north of the mine site around ten mile bore and the troughs in the south of the mine site (Carmichael bore, Bygana bores 1–3) consistently returned a large number of records of the BTF, compared to the central locations of the mine site. This suggests these are the most important locations for the species.

Nesting sites have also been identified near the ten mile bore survey location; however, there has been no evidence of breeding in the surveys conducted to date (nests are used by the BTF for both breeding and night time roosting).³³ The proponent considers that while the ten mile bore area is likely to be important for nesting, other nesting areas may occur and that further survey effort is required to document the distribution of nesting habitat within the project area.

³³ DEWHA, *Significant impact guidelines for the endangered black-throated finch (southern) (Poephila cincta cincta)*. National threatened species and ecological communities. EPBC Act policy statement 3.13. Australian Government, Canberra, 2009.

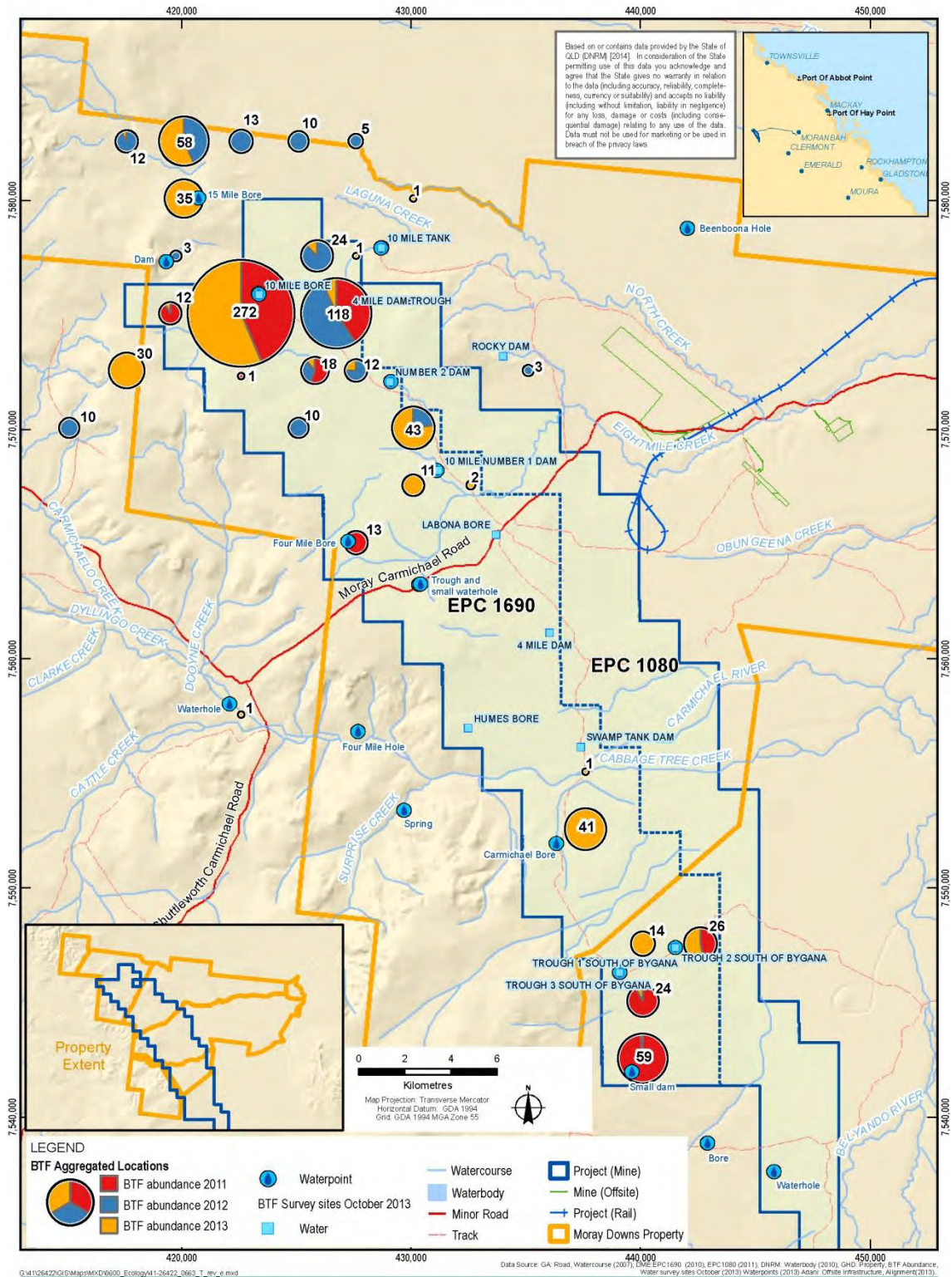


Figure 5.5 BTF abundance from 2011-2013 BTF surveys

Note: Locations are mapped as pie charts scaled to the total abundance over time (i.e. the larger the circle the higher the abundance) and split for each year where surveys have occurred.

A documented sighting by the CSIRO/James Cook University scientific group of a single flock of at least 400 BTF on the mine site in September 2013 is the largest number of BTF ever recorded at a single location. The sighting was located in the high value habitat near ten mile bore. It is the only known location in Queensland where the BTF is reliably sighted and the only known nesting site outside of the Townsville region. The population of BTF at the project site and surrounds is considered by the scientific group to be the largest known population in Australia.

Based on the available information acquired from desktop and field studies, and in consideration of the Significant Impact Guidelines³⁴, the proponent considers that the mine site study area supports a 'population'³⁵ of the BTF and contains habitat critical to the survival of the species. The mine site is within approximately 50 km of a cluster of 'important areas' (i.e. habitat within 5 km of a post-1995 sighting) for the subspecies exhibited in the Whole of range important areas map presented in the BTF Significant Impact Guidelines. As such, the proponent considers it possible that the population in the study area is part of a collection of local populations.

Habitat mapping

Habitat mapping was undertaken following completion of the field surveys to incorporate all recorded BTF sightings and estimate the extent of potential habitat on Moray Downs in the context of the mine site and wider region. Section 4.4.4 of AEIS (Appendix H) provides detailed information and rationale regarding the categorisation of BTF habitat, which comprises the following categories:

- **High value habitat (permanent water):** REs 10.3.6, 10.3.9, 10.3.28, 10.5.5 and 11.3.27 where BTF have been recorded feeding and nesting and less than 3 km from permanent artificial water sources
- **High value habitat:** REs 10.3.6, 10.3.9, 10.3.28, 10.5.5 and 11.3.27 where BTF have been recorded feeding and nesting, more than 3 km from permanent artificial water sources and within 1 km of drainage lines of the stream order 1, 2, 3 (ephemeral water used during the wet season)
- **Low value habitat:** REs 10.3.13, 10.4.8, 10.5.1, 10.7.11, 11.3.12, 11.3.25, 11.3.30, 11.3.35, 11.11.9 which are listed in the Recovery Plan and Significant Impact Guidelines as potential habitat. However, based on the primary surveys in the project area, these REs do not contain important feeding and nesting sites and are therefore not considered high value habitat.

Figure 5.6 provides habitat mapping, inclusive of BTF monitoring surveys conducted in October 2013. This figure illustrates that high value habitat is located on the project (mine) site and adjacent areas to the north, south and west. Limited high value habitat has been recorded east of the mine site, including in the proximity of the off-lease infrastructure area or the rail corridor.

³⁴ www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

³⁵ A 'population' of an (EPBC Act) endangered species is defined as 'the occurrence of the species in a particular area' where occurrence relates to: a geographically distinct regional population, or collection of populations, or a population, or collection of local populations, that occurs within a particular bioregion.

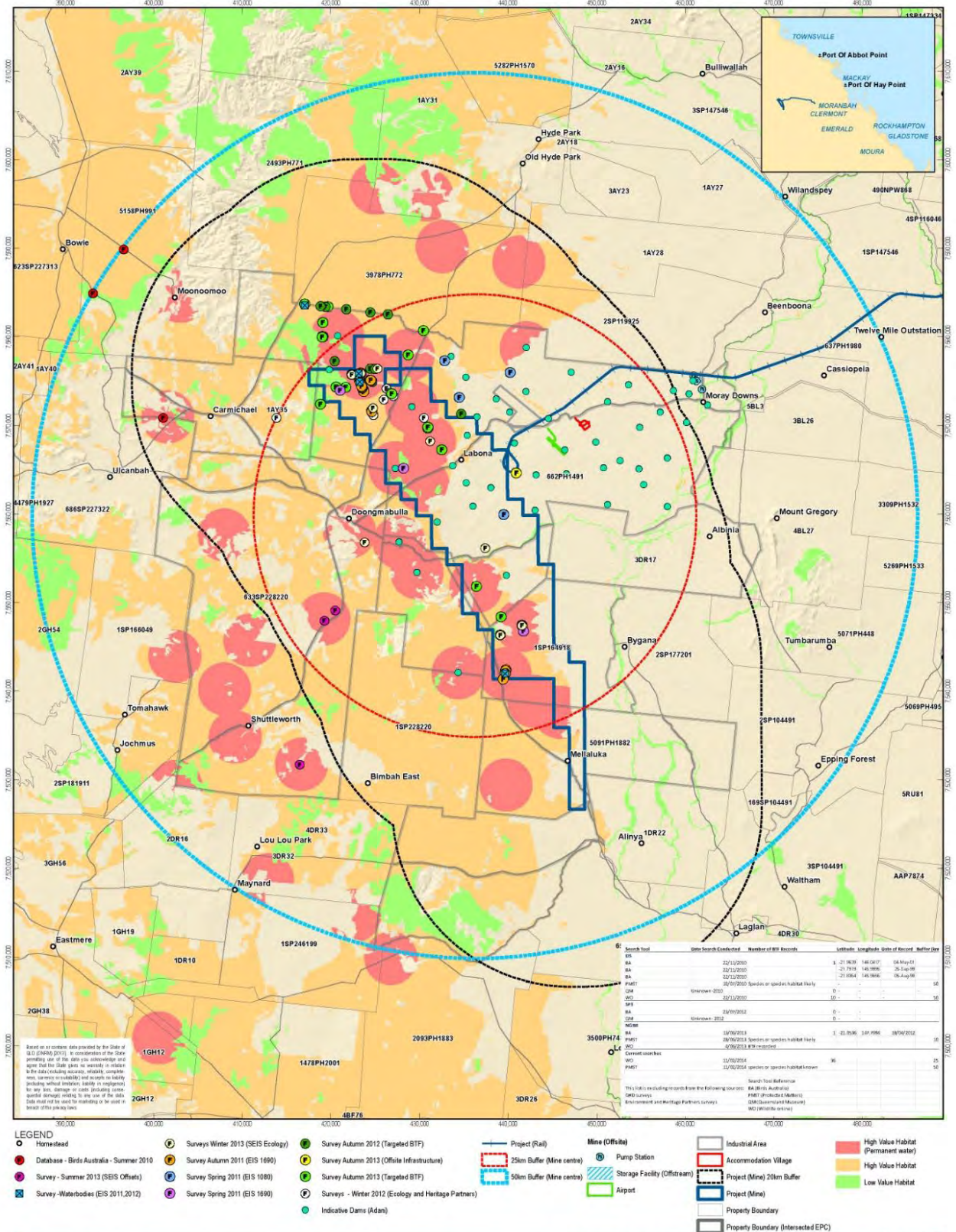


Figure 5.6 BTF habitat map for the project site and surrounds

Species ecological knowledge

Based on field surveys conducted to date, the proponent has made the following site-specific observations about the local population on the project (mine) site and surrounds:

- **Water sources:** BTF are more likely to utilise smaller and ephemeral water sources (troughs, scrapes, puddles in drainage lines) than large exposed water points.
- **Grass seeds:** Whilst observations of feeding have been made during the wet season surveys (for example, around ten mile bore), no observations of feeding have been recorded during the dry season. During the dry season surveys, grass species recorded as food sources were not in season, and other annual species had died and become litter. It therefore remains uncertain where the BTF feed in the dry season. The BTF Monitoring Report 2 considers it likely that there are key locations where perennial tussock and annual grasses, with larger and persistent seeds, remain on the ground during the dry season. These would provide key dry season food sources. Additionally, only one of the grass species from Townsville is located at the mine site. BTF feed requirements throughout the year needs to be determined to then manage the relevant grass species.
- **Habitat associations:** The highest numbers of BTF are consistently recorded in intact remnant vegetation dominated by *Eucalyptus melanophloia* woodlands (RE10.5.5) and the associated *E. similis* (RE 10.5.1) and *E. populnea/bronii* woodlands (RE 10.3.6/10.2.28). High quality habitat in the local landscape seems to occur in the north-west (Moray Downs northern boundary), west (Carmichael mining lease boundary) and south-west (Bygana boundary). These areas are notable for the low historical grazing pressure (due to their adjacency to paddocks that contain poison bush which is toxic to cattle), the general low nutrient status of the soils and low pasture value for cattle. Good condition, lightly grazed sites appear to provide more suitable habitat for the BTF.
- **Seasonal movement:** the relative abundance of BTF declines between May and October. This is a typical seasonal pattern for granivorous birds, when ephemeral water sources and food sources decline.
- **Mixed flocks:** BTF are often found in mixed species feeding flocks with other granivorous species. Mixed feeding flocks play an important ecological and functional role via predator vigilance and avoidance while feeding, and cooperative feeding (e.g. ground feeding birds flush insects that hawking feeders eat). Habitat disturbance can disrupt mixed flocks and this can have a cascading effect on some woodland bird species due to the loss of predator vigilance when feeding. Therefore the management of grazing and fire in remaining BTF habitat and offset properties is considered important to maintain habitat condition.
- **Monitoring techniques:** a combination of monitoring techniques should be adopted over multiple survey sessions and seasons, including water body counts (particularly during the dry season), two-hectare area bird counts (particularly during the wet season) and camera trapping. Camera trapping also provides valuable secondary information on other species such as feral animals (pigs and cats) which can be incorporated into broader pest management strategies for the project.

Recognised threats

Based on ecological information obtained during BTF habitat surveys, the proponent considers the following threats to be particularly relevant for the project area:

- clearing that fragments the available foraging, watering and nesting resources so that the remaining habitat is too small, or the distances between the resources too large to support a viable population
- increased exotic pasture and weed invasion of key habitat areas via poor grazing land management, machinery, soil disturbance, direct replacement (over-seeding) or other vectors that results in a homogenous unpalatable exotic pasture and weed composition
- large-scale wildfire that can reduce, homogenise and change the ground cover from preferred food species, especially at key periods in the dry season and just after the wet season (when grass curing is sufficient) where it can destroy significant seed sources on the ground
- loss or degradation of water sources via cattle and pig access, or changes in the groundwater and surface flows
- feral animal predation on adult birds, nestlings or eggs may also be a factor; however the magnitude of its effect is unknown.

Wet season surveys

More surveys for the BTF and its habitat will need to be conducted during the wet season and further baseline information is required to fully understand the ecological requirements of the species. Whilst targeted BTF surveys have been conducted during the month of May (2012 and 2013), rainfall data presented in the proponent's revised Water Balance Report dated 28 February 2014 (available on the proponent's website) indicates that May is not considered to be the wet season but rather the start of the dry season.³⁶

Whilst I recognise that surveys completed to date by the proponent are substantial, I consider that additional surveys are required during the wet season, to support the development of specific measures to manage the BTF and its habitat, for the following reasons:

- surveys conducted within a single season do not allow seasonal variations to be identified
- the species is most likely to be breeding during the wet season (as is the case for the Townsville population of BTF)
- floristic data can only be collected during the wet season when annual species, considered to be likely food sources for the BTF, are present and grasses are flowering. This is essential for the identification and mapping of key food sources
- the preliminary observed trends between May and October highlight the importance of conducting wet season surveys.

³⁶ The background paper to the BTF Significant Impact Guidelines states that 'as a rough guide' wet season surveys should be conducted in May in locations above latitude 23 degrees, and in February in locations below latitude 23 degrees. DE considers that the proponent has done this, but the long-term rainfall data indicates that the wet season in the project area is December to February, so May wet season surveys may not be appropriate.

To enable the development of specific management measures, more refined ecological knowledge is required about the BTF in the Galilee Basin within the Desert Uplands bioregion, including whether the BTF is:

- sedentary, locally migratory or regionally migratory
- using specific habitat, selective waters and a particular location at or near the resource project sites; or if they are using a variety of habitats, variety of waters and general areas at or near the proposed project sites
- using a variety of habitats, waters and general locations across properties in the immediate environs and further afield in the Galilee Basin.

Mellaluka Springs Complex

The MNES Report (AEIS, Appendix H) states that the Mellaluka Springs Complex, a network of three springs—Lignum Spring Group, Stories Spring Group and Mellaluka Spring Group—located near the south-eastern corner of the mine area (refer to Figure 5.7), provides no potential BTF habitat (low, high or high plus permanent water). Therefore, the Mellaluka Springs Complex has not been included in the proponent's prediction of impacts as identified in Table 5.5 and mapped in Figure 5.10.

The Mellaluka Springs Complex is likely to be indirectly impacted by mine groundwater drawdown. In the event that worst-case drawdown occurs, the ecological function of the springs would be impacted (refer to section 5.1.7 of this report for more information). The draft GDEMP states that the BTF is one of the species considered likely to occur at the Mellaluka Springs Complex (based on a desktop assessment) and that the springs complex is a constant source of water for flora and fauna communities in the region. The proponent's BTF habitat mapping presented in Figure 5.10 also classifies the Lignum spring (the northern-most spring of the complex) as providing high value habitat with permanent water (refer to the water point location named 'waterhole' in Figure 5.5).

This location was not surveyed specifically for the BTF (refer to Figure 5.4). Appendix J3 of the AEIS states that surveys at the Mellaluka Springs Complex involved one survey, including bird surveys, in the 2013 wet season (March/April). It is unclear from the proponent's documentation as to whether the proponent adopted the BTF survey methods described in Table 5.4 to conduct this survey.

DE notes that the BTF On-site Monitoring Survey 2 Report dated February 2014 indicates the BTF may only frequent permanent water sources towards the latter half of the dry season, and the species is likely to move round the landscape at different times of year, frequenting ephemeral water sources during the wet season. Given the springs represent a permanent source of water, it appears that this survey was conducted at the wrong time of year to identify BTF use of the habitat. DE therefore considers that insufficient baseline surveys have been conducted of the Mellaluka Springs Complex to identify the importance of the springs to BTF habitat.

Further baseline information is required to determine the ecological importance of this spring complex for the BTF.

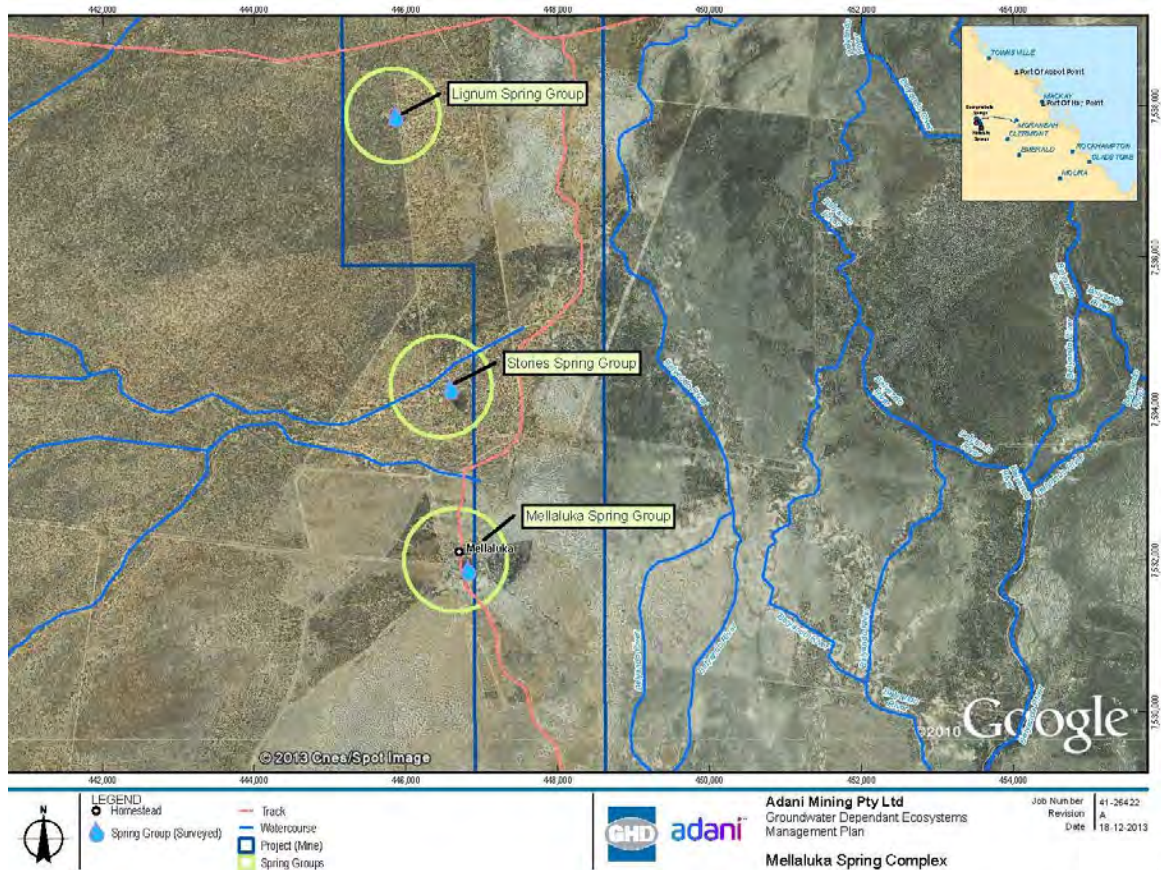


Figure 5.7 Location of Mellaluka Springs Complex

Coordinator-General's conclusions—baseline information

I note the proponent's commitment to continue BTF monitoring on the project site and surrounds (commitment P6.57, Proponent Commitments Register). The extent and scope of additional baseline surveys needs to be defined and these must be undertaken prior to the commencement of mining activities.

Given the importance of the population of BTF and the level of uncertainty that remains regarding the species' ecological requirements, including the extent of potential habitat, I have imposed a condition (Appendix 1, Section 3) requiring additional baseline research prior to the commencement of activities that impact BTF habitat. This research should commence as soon as possible before the EA and mining lease are finalised. The baseline research must include further seasonal work to provide a minimum of two verifiable wet season surveys and two dry season surveys of the Mellaluka Springs Complex to determine:

- the extent to which the Mellaluka Springs Complex provides BTF habitat, particularly as a refuge during the dry season
- movement patterns, habitat requirements and population dynamics, including dietary requirements, home range and nesting requirements
- responses to grazing management, fire management and water body locations.

Potential impacts

Table 5.5 identifies the predicted impacts to BTF habitat (high and low value) for each project component (adapted from Table 14, AEIS Appendix H).

Table 5.5 Potential impacts to BTF habitat

Project component	Impact area (ha)
Rail	16
Off-lease	3
Mine	9607.67
Mine subsidence	6883
Total	16 509.67

Note: Based on updated information provided by the proponent on 14 March 2014. The categorisation of high and low value habitat was only undertaken for the mining lease area. Indirect subsidence impacts apply to all BTF habitat located in the underground mining area.

Figures 5.8, 5.9 and 5.10 spatially illustrate direct (e.g. clearing required for open cut pits and infrastructure) and indirect (i.e. high and low impact subsidence) impacts to potential BTF habitat.

As noted above, key BTF locations as identified by the latest monitoring report are considered to be around ten mile bore to the north of the mine site and Carmichael bore and Bygana bores 1–3, located to the south of the mine site.

These figures show that one of the key BTF locations—Bygana bore 2—will be directly impacted by the project through the construction of an open-cut pit. Other locations where BTF have been recorded, such as around number 2 dam and ten mile dam, will also be directly impacted through the construction of open-cut pits and out-of-pit spoil dumps.

The remaining key BTF locations, including ten mile bore, Carmichael bore and Bygana bores 1 and 3 will be indirectly impacted through subsidence. Carmichael bore and Bygana bores 1 and 3 are shown to be impacted by ‘low impact’ subsidence, however ten mile bore—the only location where nesting has been identified—is shown to be subject to areas of ‘high impact’ subsidence. These important locations for the species, in particular the ten mile bore location, will require careful management and mitigation actions once underground mining commences (year 5 of the mine).

The project will also result in a reduction in connectivity of habitat across the site. This may lead to fragmentation of populations and decrease the viability of the BTF on the project mine site and more broadly in the region. The project also has the potential to impact on BTF through the loss of watering points, introduction of weed and pest species and alteration to fire regimes on retained habitat.

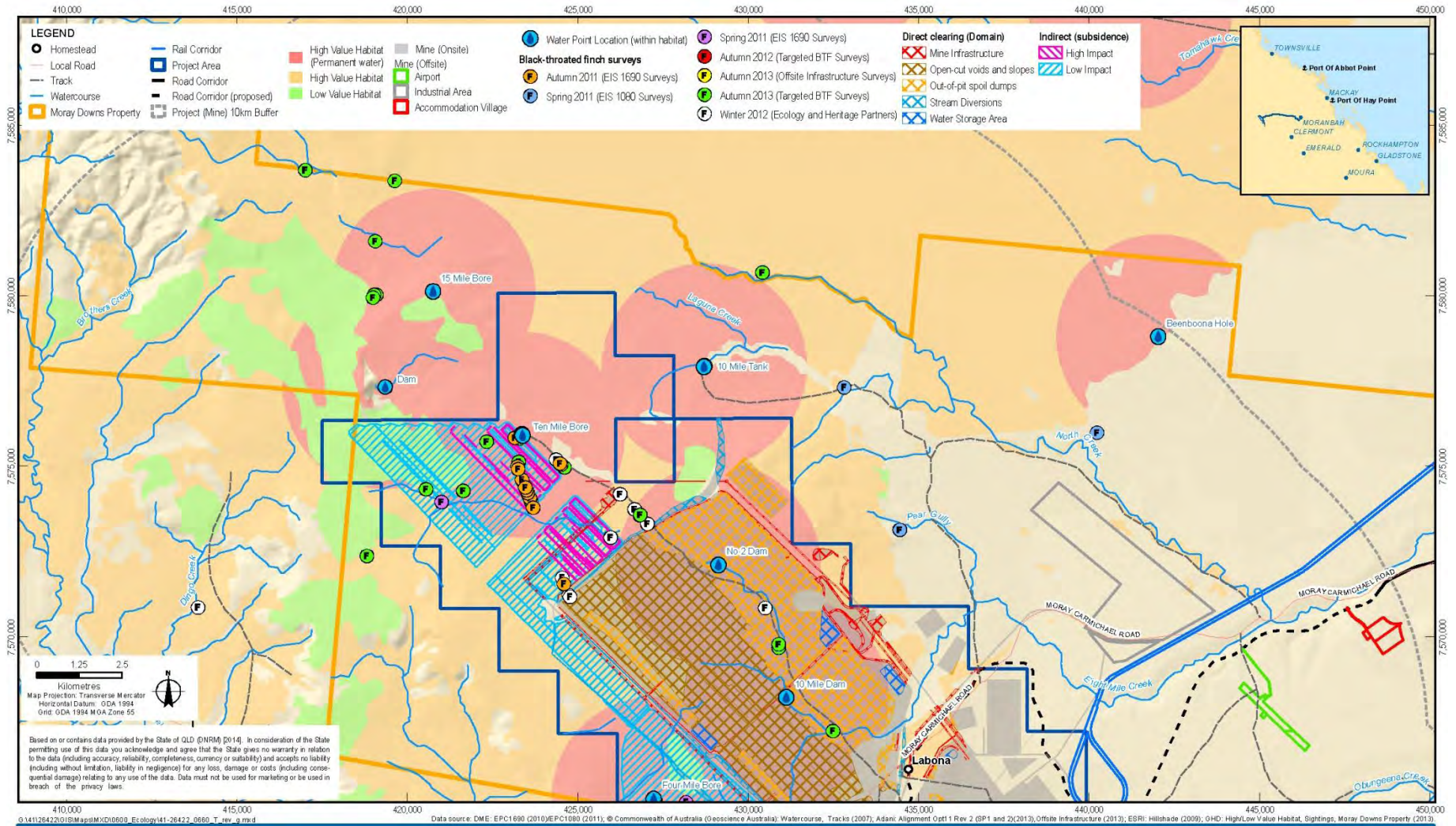


Figure 5.8 Mapped impacts to BTF habitat—northern section of the mine

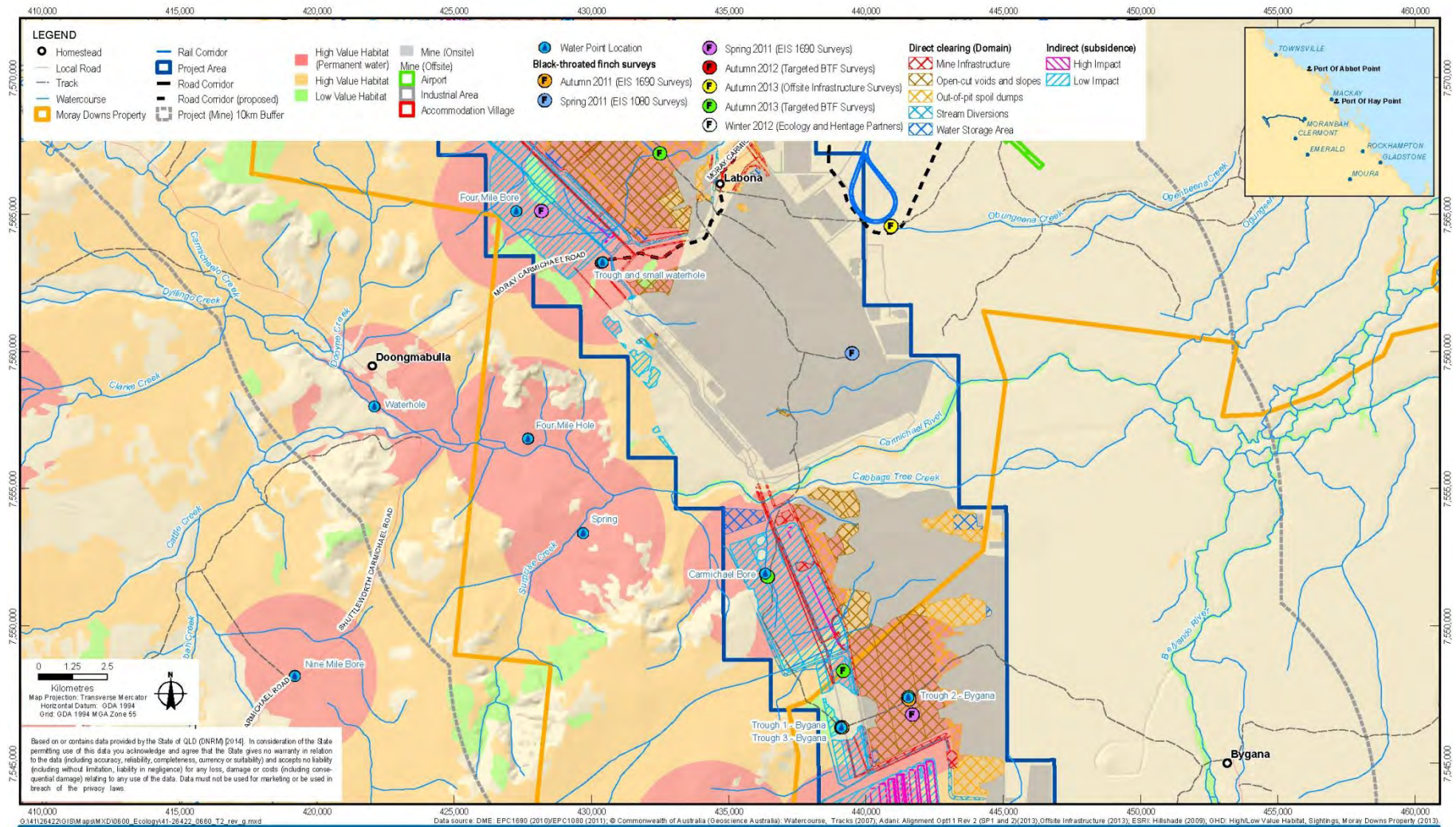


Figure 5.9 Mapped impacts to BTF habitat—central section of the mine

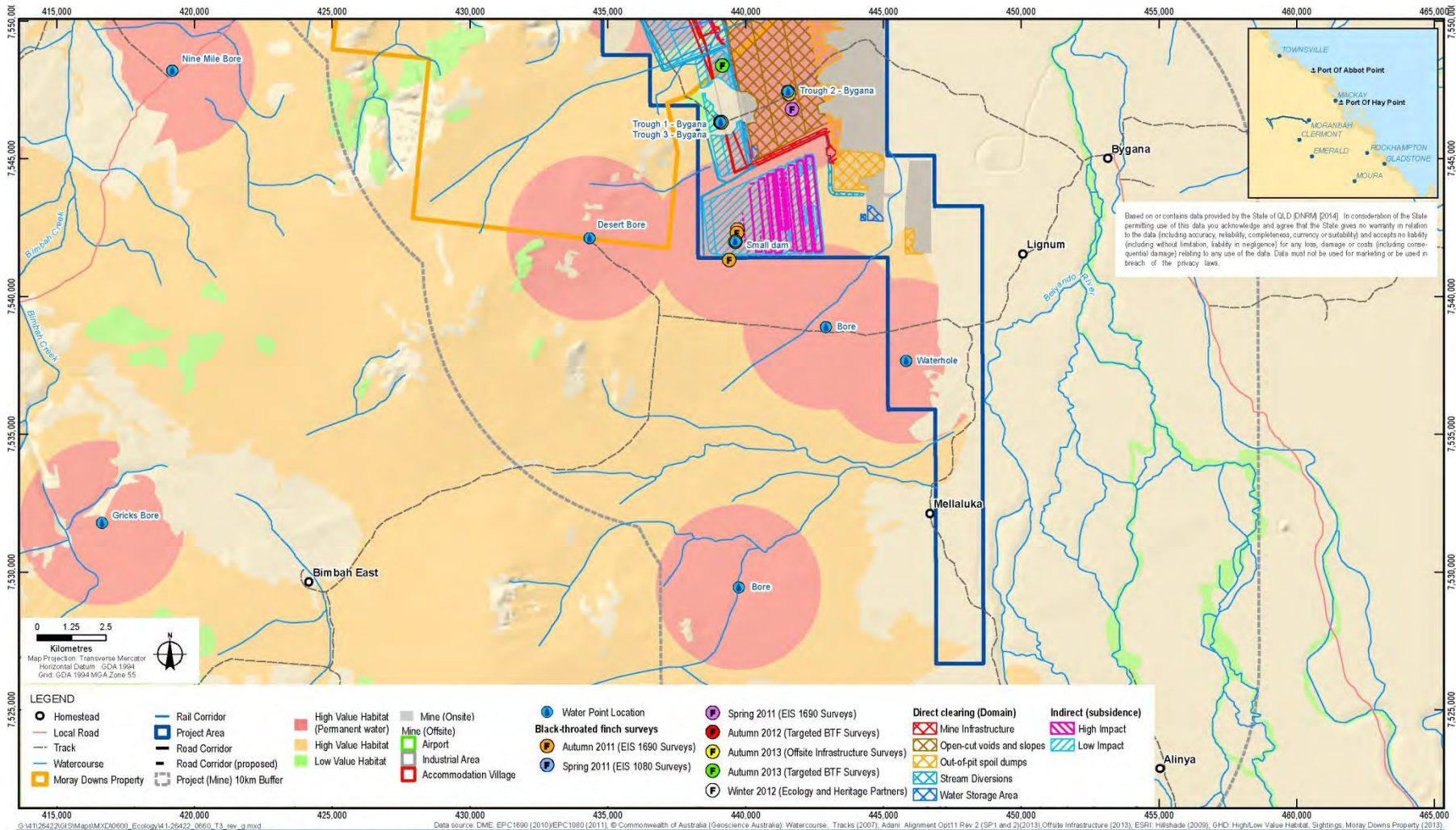


Figure 5.10 Mapped impacts to BTF—southern section of the mine

Assessment findings

Subsidence

In response to comments received on the EIS, the proponent developed an SMP as part of the AEIS (Appendix I2) to quantify subsidence impacts and identify relevant control, mitigation and management measures for subsidence impacts from the underground operations of the mine. The SMP (section 5.1) identifies a maximum subsidence impact of up to 5.5 m, however the proponent notes that as the mine layout for the two coal seams is offset, the final pattern of subsidence will be a series of parallel troughs between 2 and 5 m deep and approximately 400 m wide. The length of the troughs will be variable.

The proponent has quantified residual impacts of subsidence on MNES to only include 'high' impact subsidence areas, which includes a combination of high impacts of subsidence, and/or cracking, and/or ponding and infrastructure. The proponent notes that management and mitigation measures are proposed in regards to 'low' impact areas and hence these areas were not considered as residual impacts.

However, there is a high level of uncertainty concerning the severity of impacts likely to arise from the longwall mining subsidence. Adani have not provided sufficient evidence to support their high and low subsidence impact ratings and have indicated in the documents provided to date that the confidence of subsidence estimations is limited because no comparable mining operations have been undertaken within the Galilee Basin. In light of this, DE advises that all areas subject to subsidence should be considered as impact areas.

As a precautionary measure, I have recommended that in any approval for the project, the Commonwealth Minister for the Environment consider requiring offsets for BTF that reflect the total underground mining area. This will result in the proponent being required to provide suitable staged offsets for subsidence areas that more accurately reflect a precautionary scenario. The proponent has committed to remediation measures following subsidence (commitments P6.52 and P6.55) that could potentially reduce impacts on BTF habitat. To provide the proponent incentive to achieve this, I have stated conditions for the draft EA (Appendix 1, Schedule I) requiring regular reviews of offsets and subsidence management, which would account for this variation and potentially reduce the quantity of offset required.

Mellaluka Springs Complex

As noted above, I consider that the proponent provided insufficient information at this stage to support its conclusion that the Mellaluka Springs Complex provides no potential habitat for the BTF. I have imposed a condition (Appendix 1, Section 3) requiring further baseline research prior to the commencement of activities that impact BTF habitat. The baseline research must, amongst other objectives, determine the extent to which the Mellaluka Springs Complex provides BTF habitat.

In the event that this baseline research determines that the Mellaluka Springs Complex does provide BTF habitat, I have recommended a condition (Appendix 1, Section 2, Part A) for the Commonwealth Minister for the Environment to consider in any approval

for the project, to ensure that impacts to BTF habitat at the Mellaluka Springs Complex are accounted for. This condition would require the approval holder to:

- include management measures to address impacts resulting from drawdown at the Mellaluka Springs Complex in a BTF Management Plan (BTFMP)
- submit revised offsets for impacts to BTF habitat in accordance with the EPBC Act Offsets Policy, including a timetable to implement these offsets
- not commence activities that would impact BTF prior to the Commonwealth Minister for the Environment approving in writing the quantity or the offset required for impacts on BTF habitat and a timetable to implement offsets.

Avoidance, mitigation and management measures

The proponent has made amendments to the project's mine planning during the environmental assessment process which has resulted in lower predicted impacts to the species. Key amendments include:

- changing open-cut Pit A to the north of the mine lease to an underground mine, thereby reducing clearing requirements by around 1500 ha
- relocating topsoil storage locations away from high value habitat areas, realising a reduction of around 400 ha in direct impacts.

Whilst these avoidance measures have resulted in some reduction the predicted impacts on BTF habitat, significant impacts are still predicted to occur.

The proponent has committed to implement a number of avoidance, mitigation and management measures to reduce impacts to the BTF. These measures, as described in AEIS Appendix H and included in the Proponent Commitments Register (Appendix 7), include:

- restricting the extent of vegetation clearing to the minimal amount necessary (commitment M4.17)
- undertaking vegetation clearing in a sequential manner to allow mobile fauna to disperse away from clearing areas (commitment P6.16)
- the use of a fauna spotter on site prior to clearance to inspect habitat trees and relocate any fauna found (commitment P6.2)
- management of fire regimes (commitment P6.75)
- erosion and sediment control (commitment P6.73)
- management of weeds and pests (commitments P6.71 and P6.72)
- rehabilitation (commitment P6.76)
- subsidence management (commitment M3.16)
- improving habitat linkage, in particular east-west connectivity through the Carmichael River buffer area (commitment M4.16).

The proponent has committed to develop and implement a number of management plans to facilitate the implementation of the above measures, including:

- BTFMP (commitment P6.56)

- Project (Mine and Off lease Infrastructure) Bushfire Management Plan (commitment P6.75)
- Project Land Management (Flora and Fauna) Plan (commitment P6.68)
- Project Vegetation Management Plan (commitment P6.69)
- Project Weed and Pest Management Plan (weeds) (commitment P6.71)
- Project Weed and Pest Management Plan (introduced animals) (commitment P6.72)
- Project Erosion and Sediment Management Plan (commitment P6.73)
- SMP (commitment M3.16)
- Closure and Rehabilitation Strategy – Mine and Off lease (commitment P6.76).

BTF Management Plan

Subsequent to the AEIS, the proponent produced a draft BTFMP for the project. The purpose of the plan is to provide a framework for the management of potential impacts and implementation of mitigation and management measures for the BTF and its habitat. This includes BTF habitat located on the mining lease and the adjacent Moray Downs property located off the mining lease.

The draft BTFMP (section 4.1) identifies three core objectives:

- (a) the habitat values for the BTF are maintained, and where possible enhanced, in the local landscape
- (b) the management of areas for biodiversity on site (project areas such as the mine) and off site (other management areas such as mitigation and offset properties) contributes to the recovery actions set out in the BTF Recovery Plan
- (c) the movement of BTF into adjacent properties does not result in increased competition for resources in adjacent properties.

The intention to manage BTF habitat off the mining lease in a mitigation property is reflected in the proponent's commitment (commitment P6.57, Proponent Commitments Register (Appendix 7)) to set aside mitigation areas on the Moray Downs property. Figure 5.11 illustrates the proposed Moray Downs mitigation areas (defined on the map as A, B, C and D) and their adjacency to BTF habitat located on the mining lease. The proponent advises that the combined mitigation areas (A, B, C and D) total 37 600 ha, of which, approximately 29 000 ha comprises BTF habitat.

The BTFMP states that the proponent will seek to develop this mitigation area to achieve a high-value habitat status and provide sources of permanent water to maintain habitat value. The proponent is confident that it should be able to manage the Moray Downs mitigation areas to achieve the stated plan objectives for the following reasons:

- the proponent is the current leaseholder of the Moray Downs property
- BTF have been regularly observed in areas of existing grazing impacts, and hence the proponent can control grazing on these mitigation areas of the property to maintain supporting habitat
- BTF have been observed to utilise natural and artificial water sources and therefore a program of placing artificial water sources on this property will assist in BTF

population support and to increase the carrying capacity in areas with high value habitat that do not have permanent water

- the proponent has an understanding, through repeated field surveys of BTF habitat preferences, of selecting areas that can be either maintained or improved in regards to environmental values and supporting capacity for the BTF
- an integrated mitigation measure in this part of the property will connect with the directly and indirectly impacted areas of the mine. Therefore, during progressive clearing towards the west, over the life of the mine, habitat connectivity and corridors will be maintained for the species and population movement and enhancement can be achieved by connecting supporting permanent water sources
- the approach supports the ongoing monitoring program proposed and the establishment of localised reference sites that are outside the mine disturbance footprint and that can be maintained throughout the life of the project.

Section 8 of the draft BTFMP details the proponent's adaptive monitoring program that will inform management actions, which comprises four key components:

- (d) **regional distribution (species distribution modelling):** desktop assessment involving the review of all records in the region and refining the habitat and distribution model using a combination of expert opinion, and temporal and spatial species models
 - (i) *Timing:* to be completed prior to the commencement of any further local or regional monitoring and then regularly updated
- (e) **regional distribution (surveys):** systematic surveys in the adjacent Desert Uplands, Einasleigh Uplands and perhaps Northern Brigalow Belt regions to understand the regional distribution of the BTF
 - (i) *Timing:* to commence prior to construction and be undertaken bi-annually. I note that it is unclear in the proponent's documentation as to how many surveys would be conducted prior to construction and that no completion date has been identified.
- (f) **local monitoring (observational):** repeated and systematic surveys of the BTF distribution and habitat using the survey locations identified in Figure 5.12 (replicated from Figure 1-1 of the Black-throated finch On-site Monitoring Survey 2 Report dated February 2014, available on the proponent's website). Site-specific data will be collected from within the mine-affected areas, subsidence areas, adjacent properties and offset areas.
 - (i) *Timing:* to commence prior to construction and to be undertaken bi-annually. I note that it is unclear in the proponent's documentation as to how many surveys would be conducted prior to construction and that no completion date has been identified.
- (g) **local monitoring (detailed):** physical capture of birds to enable intensive observations and searching for banded birds and radio tracking to survey BTF habitat use, home range sizes, fine scale distribution changes over seasons, the genetic status of the local population and physiological health of BTF populations over time (especially in times of resource bottlenecks).

-
- (i) *Timing*: the proponent states that detailed local monitoring is not a current priority, such that no commencement date has been identified. Surveys would be conducted over a 1–3 year period.

The draft BTFMP states that monitoring data collected from the project site and surrounding areas (Moray Downs property and offset sites) will help to refine and improve the BTF management actions over time and therefore maximise the effectiveness of the management plan for conservation of the species.

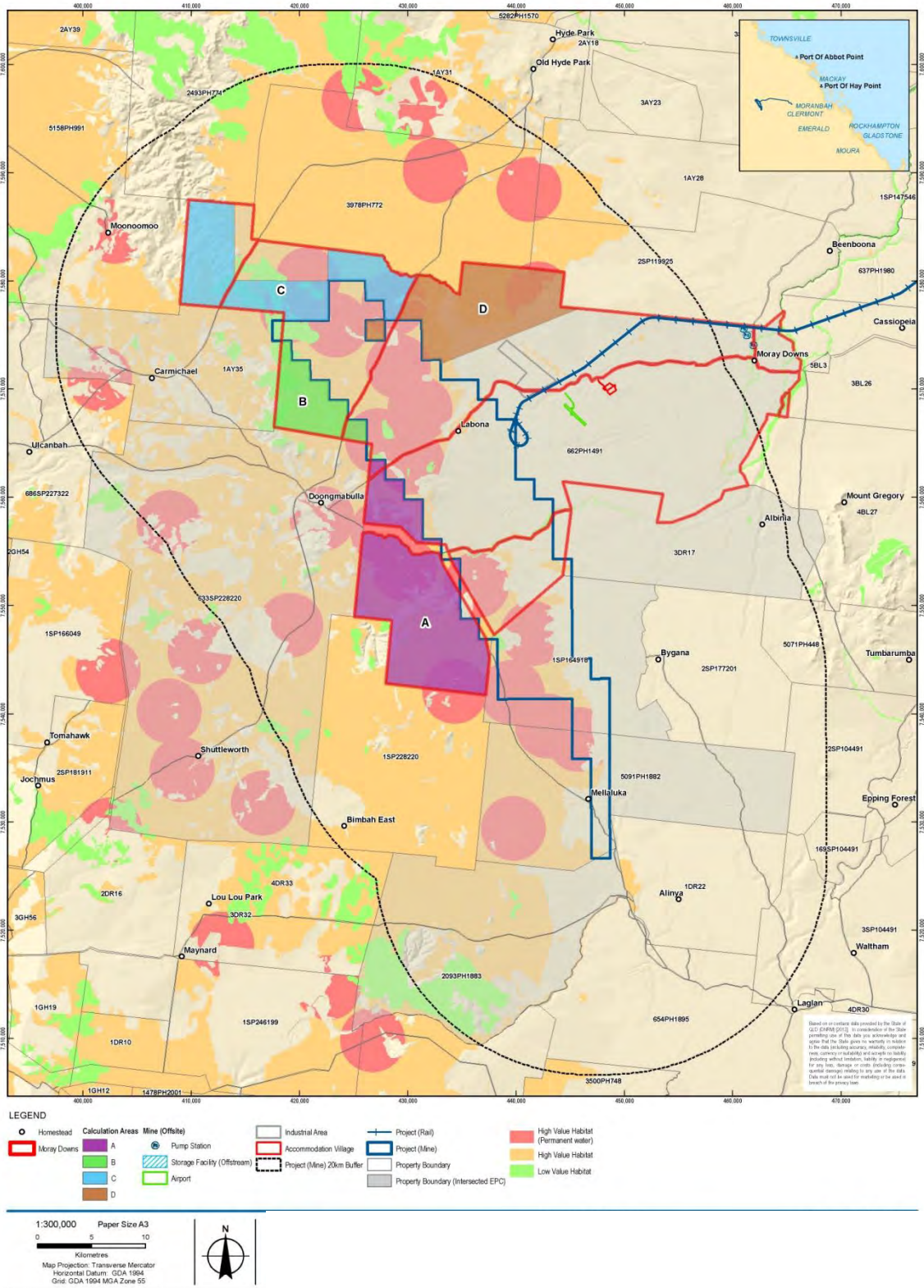


Figure 5.11 Moray Downs property mitigation area

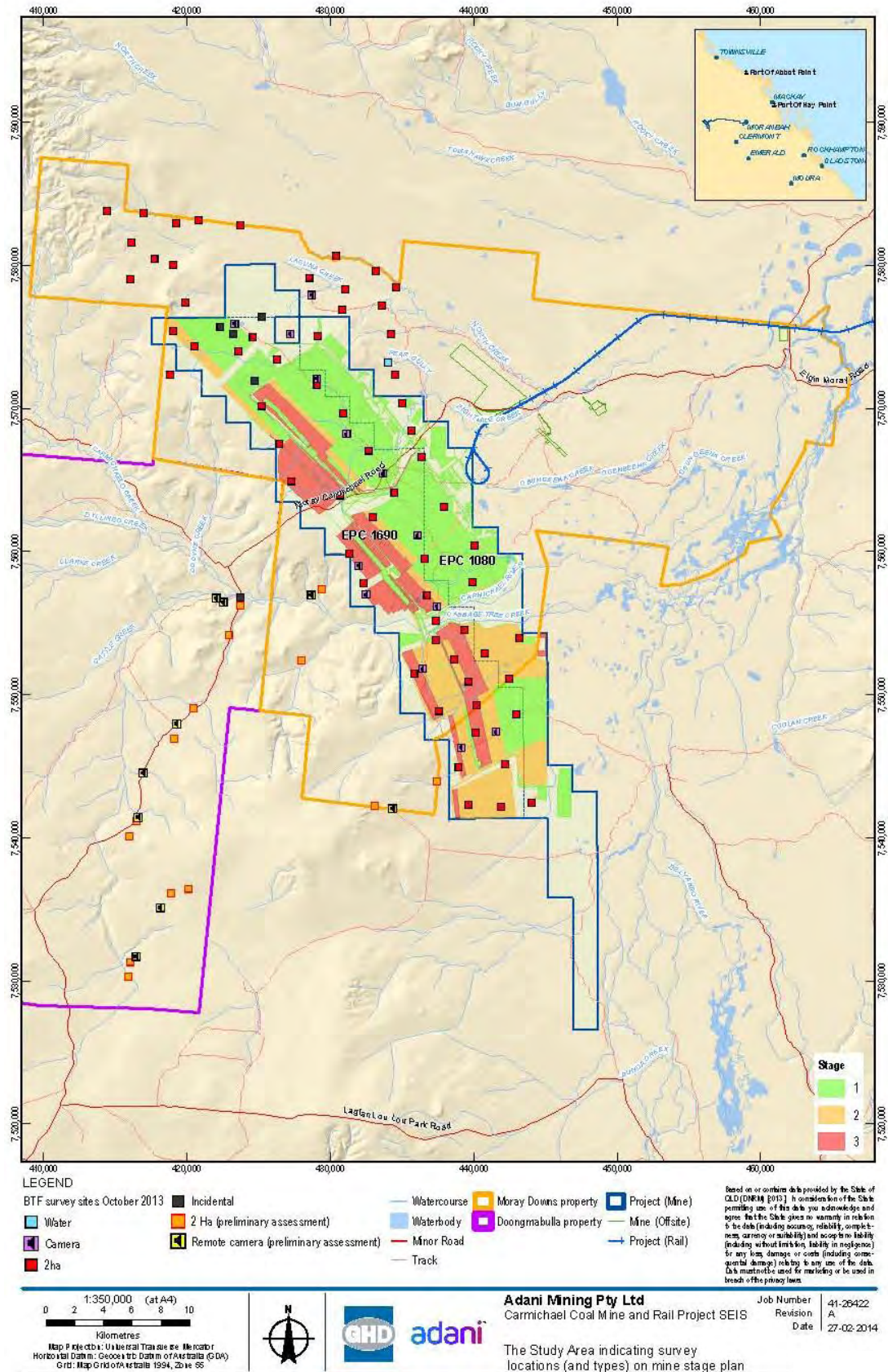


Figure 5.12 Survey locations for BTF ongoing monitoring

The proponent has also made a commitment to contribute to any bioregional management plan that may be established by government to address regional impacts to the BTF (commitment P6.57, Proponent Commitments Register (Appendix 7)) arising from multiple mines proposed for the Galilee Basin. The proponent's proposed contribution would include time and resources to any government-led regional management program, in the order of an in-kind contribution of \$100 000 per year, over a period of 10 years, commencing from mining operations.

Assessment findings

Draft BTFMP

The draft BTFMP dated is a generic and non-site-specific species management plan. Given the significance of the impact on this species, a more detailed and focused species management plan will be required. The final BTFMP must take account of the monitoring and research already undertaken and detail how the species will be managed on the mining lease and adjacent Moray Downs property (directly to the north of the mining lease).

I have accordingly stated a condition to be included in Schedule I of the draft EA (Appendix 1 of this report) requiring the development and implementation of a revised BTF Species Management Plan prior to the commencement of any activities that impact BTF habitat. The BTF Species Management Plan must include:

- a description and map of habitat to be directly and indirectly impacted
- a description of how the results of baseline research are to be used to determine any changes of impact on BTF habitat
- details of specific impact to BTF and habitat from each project stage, including impacts from clearing, subsidence, mine dewatering, ecological function changes, hydrological changes and weed and pest infestation changes
- mitigation and monitoring measures to be undertaken to avoid, mitigate and monitor and adaptively manage impact resulting from each stage of the project, including rehabilitation
- details of how the BTFMP incorporates mitigation and management measures identified by any BTF Bioregional Management Plan over the life of the project.

As the potential impacts of the project are of significant risk to the BTF MNES, the revised BTF Species Management Plan should also be referred to DE for review and approval.

Subsidence Management Plan

As noted above, concerns remain regarding the proponent's assessment of potential impacts to BTF habitat resulting from subsidence.

DE advises that rehabilitation will include re-profiling of subsidence areas to address ponding. While re-profiling may remove areas of ponding, DE considers that this would also involve earthworks, which on balance would result in the loss of additional BTF habitat, rather than mitigating habitat loss.

To ensure the identification of appropriate subsidence mitigation measures that take into account potential impacts to BTF habitat, I have also stated a condition to be included in Schedule J of the draft EA for the project (refer to Appendix 1) requiring the development and implementation of an SMP prior to the commencement of any activity that results in subsidence. The plan must be reviewed and, if necessary, updated annually, with the following key matters to be addressed:

- the inclusion of baseline data and predicted subsidence impacts
- potential impacts of subsidence on any land, watercourse, floodplain and SSBV habitat (which, by definition, includes the BTF)
- options for mitigating any impacts associated with subsidence, how these mitigation measures will be implemented, and the extent to which mitigation measures will impact SSBV habitat
- impacts on watercourses, diversions or catchments
- impacts on groundwater
- contingency procedures for emergencies
- subsidence outcomes and the need for changed offsets
- a program for monitoring and review of the effectiveness of the SMP.

Offsets

Subsequent to the AEIS, the proponent submitted a revised Environmental Offset Package (March 2014) for the project.

Notwithstanding the identified mitigation and management measures and active rehabilitation commitments that will be implemented through the mine's operational life, unavoidable loss of BTF habitat will occur.

The proponent notes that a total of 16 283 561 ha of potential BTF habitat is mapped within the Desert Uplands and Brigalow Belt bioregions within which the project occurs. The area of proposed clearing (15 935 ha) represents less than one per cent of the total potential habitat within these bioregions.

The proponent expects that offset obligations under the EPBC Act are likely to be required for the BTF for all components of the project, as follows:

- Mine: 9771 ha (9608 ha direct and 163 ha high impact subsidence)
- Rail: 16 ha
- Off-lease infrastructure area: 3 ha.

The proponent advises that the total BTF habitat offset requirement for the project should therefore be 9790 ha.

The revised Environmental Offset Package states that residual impacts to the BTF can be offset within the Galilee Basin bioregion and that suitable offset properties can be secured for this purpose. Five offset properties have been identified in the Offsets Package, which reportedly contain 54 082 ha of potential BTF habitat. The proponent considers that the project requirement represents approximately 18 per cent of this available offset resource. Of the five offset properties identified, the BTF has been confirmed present on two of these. The proponent has installed reference monitoring

sites and camera traps to obtain further information on the distribution and population of BTF on this property.

The proponent advises that the identified properties are yet to be comprehensively ground-truthed to determine the actual extent and suitability of environmental values and the figures presented in the package are based on a desktop assessment and spatial analysis.

Nonetheless, the proponent considers that it has an understanding of the key requirements for the species and hence the ability to identify and confirm suitable offset properties based on its understanding of the BTF's habitat preferences gained through its monitoring program.

Assessment findings—offsets

The Environmental Offset Package requires development in the following areas:

- definition of the residual impact areas and characteristics of the offset sites
- identification during underground mining activities of the actual residual impact due to subsidence
- surveys of proposed offset sites to identify presence of BTF and high value BTF habitat

Given the level of uncertainty regarding the predicted impacts of subsidence on biodiversity values including BTF habitat, I have stated a condition for the draft EA (Appendix 1, Schedule J) requiring the development and implementation of an SMP and an annual program of subsidence monitoring and review linked to the provision of offsets. This will include an assessment of actual subsidence impacts against predicted subsidence impacts, the effectiveness of mitigation measures, and the identification of any amendments that must be made to the SMP following the review.

To ensure the provision of offsets for residual impacts on the BTF, I have imposed a condition relating to the finalisation of a Biodiversity Offset Strategy (Appendix 1, Section 3). The strategy must be implemented in accordance with my stated condition in Schedule I of the draft EA (refer to Appendix 1). These conditions allow a staged approach to the provision of offsets for subsidence impacts, including a requirement for five-yearly reporting that must:

- assess the area of biodiversity values proposed to be impacted by underground mining activities
- identify the actual areas of SSBV impacted by the mining activities (based on subsidence monitoring results).

I expect that the proponent will work directly with DE in order to progress DE's assessment of offsets against the Offsets Assessment Guide and to ensure compliance with the EPBC Act Offset Policy.

I have recommended a condition of approval to the Commonwealth Minister for the Environment (Appendix 1, Section 2, Part A) requiring the proponent to develop and implement an Offset Management Plan that includes monitoring and management measures of offset areas for EPBC listed threatened species and communities.

Should the Australian Government require an offset for the additional residual impacts on the BTF in accordance with the EPBC Act Offset Policy, I will not require any additional offsets for impacts on the same SSBV. The conditions stated in Schedule I of the draft EA will provide a mechanism to deliver the EPBC Act's offsets. It will be the proponent's responsibility to demonstrate that the loss of values being offset under the EPBC Act are the same as those identified through state offset requirements. See section 6.1 (Matters of state environmental significance) for an explanation as to how I will deal with any State offset requirements once the EPBC Act offsets have been determined.

Regional impacts

In addition to the likely BTF offset requirements for this project, current approvals under the EPBC Act for three mines have identified the following BTF offset requirements:

- Alpha coal project: 63,5000 ha
- Kevin's Corner project: 3170 ha
- Galilee Coal (Northern Export Facility) project: 10,000 ha

To the north of the mine, the China Stone Project, undergoing assessment as a coordinated project, may also provide core habitat for this species.

A bioregional scale assessment of BTF populations in the Desert Uplands bioregion has not been undertaken. Without comprehensive knowledge about the extent and density of BTF in the bioregion, it may be difficult to:

- gauge the relative significance of populations on individual mining tenements in relation to the whole bioregional extent of the species and therefore the extent of the impact from loss of habitat within mine project areas
- estimate the impact of the loss of connectivity and movement within and across the distribution of the species in the bioregion
- estimate the level of threat to the BTF population in the Desert Uplands bioregion posed by the proposed mining projects in the Galilee Basin
- gauge the validity and direct the prioritisation of offset areas and management actions for BTF habitat within the Desert Uplands bioregion.

The Galilee Basin Offset Strategy (GBOS) produced by the Queensland Government (DEHP) has identified properties with known BTF habitat which would form the initial focus of work. DEHP advised that the GBOS identified priority areas are being used effectively by resource project proponents for offset delivery.

The BTF is a focal species such that the management and protection of its habitat will have flow-on benefits for other key fauna species in the region that share similar habitat requirements, such as the squatter pigeon, koala and yakka skink. In order to minimise impacts on the BTF and its habitat, a bioregional-wide framework should be developed to manage impacts and direct regional scale outcomes.

Accordingly, to maximise the ongoing protection and long-term conservation of BTF and its relevant habitat in the Desert Uplands bioregion, I have recommended a condition requiring the development, by DEHP, of a Bioregional Management Plan for

the BTF and associated threatened species of the Galilee Basin and Desert Uplands Bioregion (Appendix 1, Section 2, Part B), which will need to:

- direct future adaptive management of the BTF population and habitat in the Galilee Basin and Desert Uplands bioregion
- supplement work completed to date by mining proponents, DEHP and the Black-throated Finch Recovery Team (BTFRT)
- inform EA conditions granted for Galilee Basin mining proponents
- allow for the coordination of BTF management measures undertaken by mining proponents, community groups and the State and Australian governments.

I have also imposed conditions to ensure the proponent contributes to the Bioregional Management Plan for the BTF and associated threatened species when it is established, including pro-rata funding (Appendix 1, Section 3).

Conservation advice, recovery plans and threat abatement plans

National Recovery Plan for the Black-throated Finch (southern subspecies)

The National Recovery Plan for the BTF³⁷ lists possible 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; and alteration of habitat by changes in fire regime; invasion of habitat by exotic weed species, including exotic grasses; illegal trapping of birds; predation by introduced predators; and hybridisation with escapees of the northern subspecies.

The national recovery plan identifies that proper management of habitat for the BTF is critical to the survival of the species, including managing overgrazing, clearing and fragmentation appropriately and implementing suitable fire and weed management strategies. As noted above, the proponent has committed to a number of these measures, to be implemented through the proposed BTFMP.

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, management measures, including the careful management of retained BTF habitat on the mining lease and adjacent Moray Downs property in order to protect BTF habitat, will appropriately mitigate the impacts. I also consider that the proposed offsets, when finalised in accordance with the Commonwealth's Offset Assessment Guide, will adequately compensate for residual impacts and result in a conservation gain through securing and managing a large area of high-value habitat for the species.

³⁷ www.environment.gov.au/resource/national-recovery-plan-black-throated-finch-southern-subspecies-poephila-cincta-cincta

Threat abatement plans

There are two relevant TAPs for the BTF:

- Threat Abatement Plan to reduce the impacts on northern Australia's biodiversity by the five listed grasses³⁸ (grasses TAP)
- Threat Abatement Plan for competition and land degradation by rabbits³⁹ (rabbits TAP).

The grasses TAP has been developed to address the key threatening process ecosystem degradation, habitat loss and species decline due to invasion of northern Australia by introduced gamba grass (*Andropogon gayanus*), para grass (*Urochloa mutica*), olive hymenachne (*Hymenachne amplexicaulis*), and mission grass (*Cenchrus pedicellatus* syn. *Pennisetum pedicellatum*). It provides a framework for prioritising investment in threat abatement and identifies management and other actions required to ensure the long-term survival of native species and ecological communities affected by these grasses. Whilst none of these species are currently a threat to habitat in the Galilee Basin, buffel grass (*Cenchrus ciliaris*) is the introduced grass species of most concern at the project site. Buffel grass, like all of the introduced grasses identified in the TAP, are high biomass pasture grasses that out-compete native grasses and increase fuel loads which promote intense, late dry season fires.

The key goal of the grasses TAP is to minimise the adverse impacts of the introduced grasses on affected native species and ecological communities. The majority of the weeds, including buffel grass, at the project site are in the relatively early stages of invasion and still at a level that makes management and control possible and practical.

The threats posed by the introduced grasses in this threatening process can be controlled by preventing further spread into new habitats (in particular BTF habitat identified to the north and west of the mining lease, which is noted for lack of exotic grass invasion), eradicating weeds and rehabilitating the ecosystems where these weeds have invaded.

The proponent will develop and implement a Project Weed and Pest Management Plan (commitment P6.61, Proponent Commitments Register (Appendix 7)) in order to achieve a no net increase in weeds over the life of the project. Key actions include:

- identification of weed infested areas (year 1 of the project life)
- development and implementation of protocols for the eradication of weeds (year 2 of project life)
- implementation of industry accepted measures to minimise the introduction and spread of weeds at the project area (i.e. provision of weed wash-down facilities, requirement for weed-free certification of vehicles entering the project area) throughout the life of the mine
- development and implementation of a weed monitoring program throughout the life of the mine.

³⁸ www.environment.gov.au/resource/threat-abatement-plan-reduce-impacts-northern-australias-biodiversity-five-listed-grasses

³⁹ www.environment.gov.au/resource/competition-and-land-degradation-rabbits

The plan will be prepared prior to the commencement of project operations, with five-yearly revisions and updating of the plan based on the currency of information available. Prior to the commencement of project operations, the proponent will also develop and implement a Project Waste and Resource Management Plan and Project Hazardous Substances Plan which will incorporate protocols for the disposal of vegetation waste (commitment P6.74, Proponent Commitments Register (Appendix 7)).

The proponent's draft BTFMP includes a commitment to manage weeds and exotic pasture plants within areas of high ecological value (i.e. drinking sites, nesting sites and key foraging habitat).

The rabbits TAP establishes a national framework to guide and coordinate Australia's response to the impacts of rabbits on biodiversity. It identifies the research, management and other actions needed to ensure the long-term maintenance of native species and ecological communities affected by competition and land degradation caused by rabbits.

Rabbits have direct impacts on native flora and fauna by grazing on native vegetation and thus preventing regeneration, and by competing with native fauna for food and shelter. They also have indirect and secondary effects, such as supporting populations of introduced cats and foxes, denuding vegetation and thereby exposing fauna species to increased predation, and digging and browsing leading to a loss of vegetation cover and consequent slope instability and soil erosion.

The goal of the rabbits TAP is to minimise the impact of rabbit competition and land degradation on biodiversity in Australia and its territories by protecting affected native species, broad-scale vegetation and ecological communities, and preventing further species and ecological communities from becoming threatened.

Rabbits were recorded in the project area. The proponent will develop and implement a Project Weed and Pest Management Plan (commitment P6.72, Proponent Commitments Register (Appendix 7)) in order to achieve a no net increase in pest animals, including rabbits, over the life of the project. Key actions include development and implementation of:

- species-specific and industry accepted protocols for eradicating/controlling introduced animals (year 1 and 2 of project life)
- an introduced animals monitoring program for the life of the mine.

The plan will be prepared prior to the commencement of project operations, with five yearly revisions and updating of the plan based on the currency of information available.

The proponent's draft BTFMP includes a commitment to manage pest populations that pose a predation threat or undermine habitat quality in areas of high ecological value (i.e. drinking sites, nesting sites and key foraging habitat).

Coordinator-General's conclusion—BTF

Undertaking baseline surveys of the BTF and its habitat will assist in determining: the habitat preferences of the species in the project area; quantifying distribution and

abundance; movement patterns, habitat requirements and population dynamics; and responses to grazing management, fire management and water body arrangements.

Impacts to the BTF and its habitat will be managed through the implementation of the BTFMP which I have stated a condition for as part of the project's draft EA (Appendix 1, Schedule I). This condition will ensure the development of specific mitigation and management measures for the BTF for threats posed by the project, including non-native grasses and feral pests where they represent a threat to the species on-site. The BTFMP must also identify relevant guidelines, policies and plans (e.g. Recovery Plans).

For project areas outside the mining lease, I have recommended a condition in Appendix 2, Section 2 requiring the development and implementation of mitigation measures that maximise the ongoing protection and long-term conservation of threatened species.

My recommended condition for the development of an Offset Management Plan (Appendix 1, Section 2, Part A) for approval by the Commonwealth Minister for the Environment will ensure appropriate monitoring and management measures are implemented in offset areas to protect EPBC listed species and communities, including the BTF.

I have recommended a condition for the development of a Bioregional Management Plan for the BTF and associated threatened species to maximise the ongoing protection and long-term conservation of EPBC listed species and habitat in the Desert Uplands bioregion (Appendix 1, Section 2, Part B). Any priority actions for bioregional research identified as part of the plan must make reference to, and must be consistent with relevant recovery plans, TAPs, and/or conservation advices.

Consistent with the National Recovery Plan, residual impacts of the project will be offset by protecting and enhancing habitat for the BTF in accordance with my conditions stated for the draft EA (Appendix 1, Schedule I) and the EPBC Act Offsets Policy.

My recommended conditions of approval are consistent with the TAPs and National Recovery Plan for the BTF. Considering the above, and assuming effective compliance with my recommending conditions occurs, the project should not have an unacceptable impact on the BTF.

Threatened fauna—squatter pigeon (southern)

Description

The squatter pigeon (southern) (*Geophaps scripta scripta*) is listed as vulnerable under the EPBC Act and Queensland's NC Act. It generally inhabits grassy eucalypt dominant woodland to open forest on the inland slopes of the Great Dividing Range, stretching from the Burdekin-Lynd divide to scattered sites in South East Queensland and west to Longreach. The current population of the subspecies is estimated to be stable at around 40 000 breeding birds, with some locally abundant populations found in the northern part of its current distribution. Considered sedentary or locally nomadic, it is a ground-dwelling pigeon that forages on insects, ticks and seeds. The breeding

season generally occurs from late winter through summer, though may extend throughout the year if conditions are suitable.

Predation, habitat clearing and grazing of remaining habitat are identified as the main threats to the squatter pigeon (southern), with feral cats (*Felis catus*) and foxes (*Vulpes vulpes*) considered the predators having the greatest impact upon the population. Priority actions to support the recovery of the subspecies, identified in the approved conservation advice⁴⁰, include implementing the recommendations identified in the *Threat Abatement Plan for Predation by Feral Cats*⁴¹ and the *Threat Abatement Plan for Predation by the European Red Fox*.⁴²

Extent and condition in project area

Survey effort

Field surveys conducted on the mine, rail and off-lease infrastructure areas included standardised bird surveys at each assessment site involving timed 20-minute searches of 2 ha areas to record the number of birds observed or heard and the presence and composition of any mixed flocks. Where the presence of threatened species such as the squatter pigeon (southern) was known or suspected, the surveys focused on these species. The proponent considers the techniques used to be consistent with *Survey Guidelines for Australia's Threatened Birds*⁴³ which recommends area searches, transect searches or flushing surveys. The guideline recommends a survey effort of 15 hours for every 50 ha of suitable habitat and the proponent considers this to have been met as each assessment site was surveyed more than once. Field surveys conducted for the project with relevance to the squatter pigeon (southern) are shown in Table 5.6.

⁴⁰ Approved Conservation Advice, *Geophaps scripta scripta* (Squatter Pigeon (southern)) 3/7/2008

⁴¹ DEWHA, Threat abatement plan for predation by feral cats, DEWHA, Canberra, 2008.

⁴² DEWHA, Threat abatement plan for predation by the European red fox, DEWHA, Canberra, 2008.

⁴³ DEWHA, Guidelines for detecting birds listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999*, Canberra, 2010.

Table 5.6 Field surveys relevant to the squatter pigeon (southern) assessment

Location	Survey type	Total survey effort	Timing	
Mine	Terrestrial and aquatic fauna surveys	69 terrestrial and 19 aquatic sites (spring)	November 2010 (spring)	
		40 terrestrial and 17 aquatic site (autumn)	November 2011 (spring) April/May 2011 (autumn)	
	Targeted Black-throated Finch surveys	8 water body counts 20 remote camera sites 8 incidental observation sites 52 habitat and survey sites	May 2013 (autumn)	
Rail	Terrestrial and aquatic surveys	2 terrestrial and 3 aquatic sites (autumn)	May 2011 (autumn)	
		22 terrestrial and 1 aquatic site (spring)	September 2011 (spring)	
Quarries	MNES survey	5 sites	January/February 2013 (summer)	
			March 2013 (autumn)	
			July 2013 (winter)	
Off-lease infrastructure	Terrestrial and aquatic habitat rapid assessment	Unstructured, opportunistic survey	June 2012 (winter)	
			Terrestrial ecology survey	38 fauna sites 2 trapping sites 14 remote camera sites 12 aquatic sites
			Targeted black-throated finch surveys	9 water watch sites 31 watch sites 6 remote camera sites

Results of field surveys

The surveys confirmed the presence of the squatter pigeon (southern) in the mine, rail and off-lease study areas as had been indicated by desktop assessments undertaken prior to the surveys. The surveys conducted for the project recorded the subspecies on the following occasions:

- thirty-nine sightings during the November 2010 and November 2011 surveys of the mine
- one sighting during the September 2011 survey of the rail
- five sightings during the 2013 survey of the quarries
- four sightings during the April/May 2013 survey of the off-lease areas
- two sightings during the March/April 2013 surveys of the Doongmabulla wetland and Mellaluka wetland.

Sightings were generally recorded near roads and tracks in open woodland or fringing riparian habitats with a complex grassy understorey. The EIS determined the distribution of the subspecies in the study area is likely to be restricted by the

availability of water sources. Figure 5.13 illustrates potential squatter pigeon (southern) habitat and the location of sightings between November 2010 and July 2013.

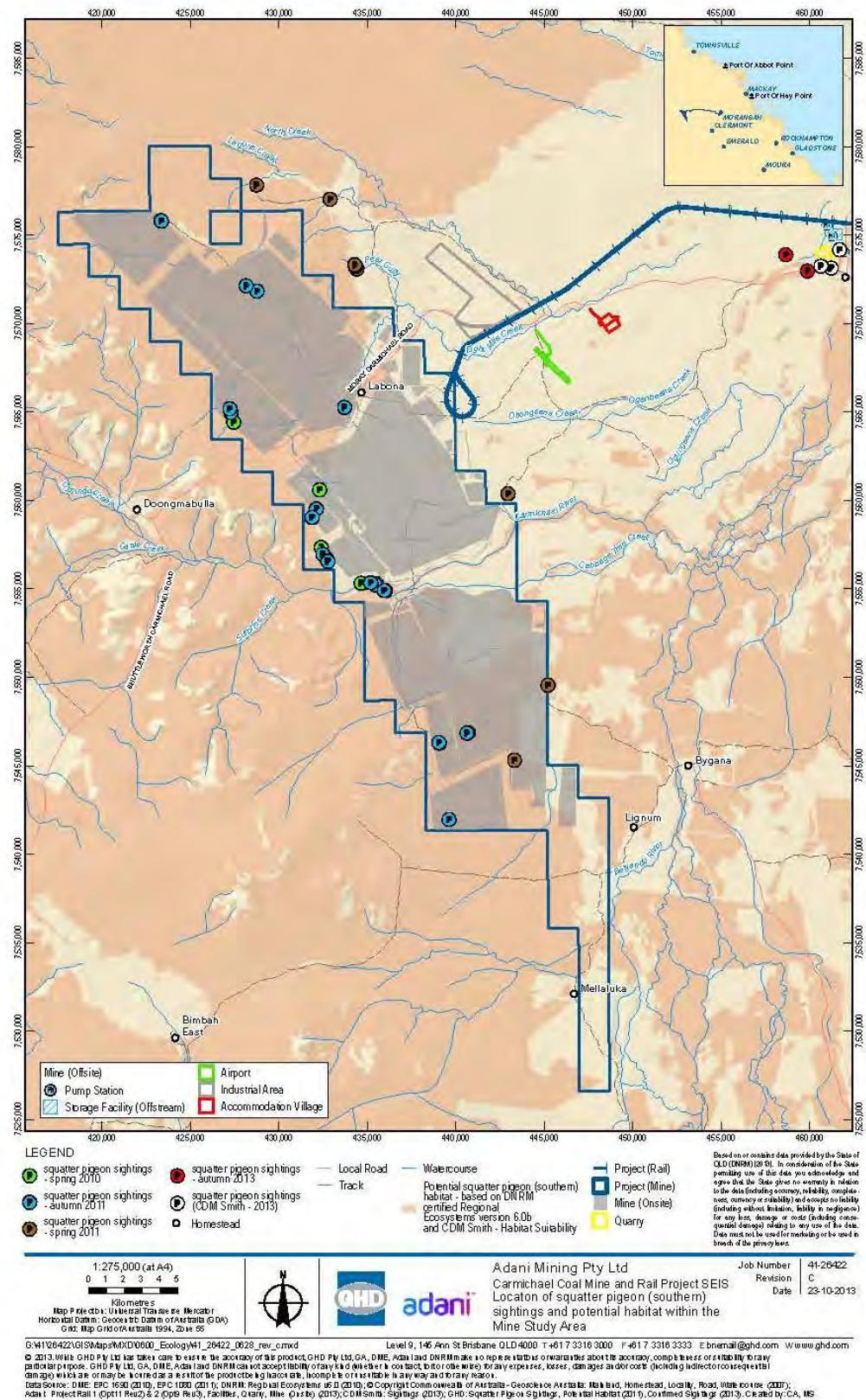


Figure 5.13 Sightings and potential habitat of the squatter pigeon (southern)

Habitat mapping

In mapping potential habitat for the squatter pigeon (southern), as shown in Figure 5.13, the proponent identified REs characterised as open woodland and forest vegetation. The mapping indicates an abundance of potential habitat in the surrounding landscape, however the EIS notes much of this area is fragmented and covered by non-remnant vegetation with tracts of remnant vegetation generally confined to watercourses. Habitat utilisation is also likely to be influenced by factors including predation and water availability. Impacts to the potential habitat mapped by the proponent are outlined in Table 5.7 for the construction and operation phases of each project component.

Table 5.7 Impacts to potential squatter pigeon (southern) habitat

Project component	Impact area (ha)
Rail	337.04
Off-lease	5.02
Mine	10 748.8
Mine subsidence	6913
Total	18 003.86

The proponent considers the squatter pigeon (southern) to be common where suitable habitat exists within the study area and that this is likely to be the case in the surrounding landscape. As the subspecies is thought to occur as a continuous population across its current range, no single population, such as the population affected by the project, is considered important for its long-term survival or recovery. The proponent considers the population located in the project study area does not constitute an ‘important population’ as defined in the Significant Impact Guidelines⁴⁴ for species listed as vulnerable under the EPBC Act. That is, the population is not:

- a key source for either breeding or dispersal
- necessary for maintaining genetic diversity
- near the limit of the subspecies range.

Impacts and mitigation measures

Impacts

Impacts of the project on the squatter pigeon (southern) include the direct clearing of approximately 11 091 ha of habitat and 6913 ha of habitat in areas affected by subsidence. The EIS notes that the potential for an increase in feral animal populations associated with increased human activity in the project areas could lead to increased predation of the subspecies. Vegetation clearing is also identified as a potential cause of mortality as the subspecies may freeze or remain hidden as a defence mechanism and may go undetected by fauna spotter-catchers observing clearing activities.

⁴⁴ Significant Impact Guidelines 1.1 - Matters of National Environmental Significance, Department of the Environment, Water, Heritage and the Arts, 2013.

Mitigation

As there is no recovery plan for the squatter pigeon (southern), mitigation measures have focused on addressing identified threats to the subspecies. These are consistent with the priority actions to establish control measures for feral cat and fox predation as identified in the approved conservation advice. The threat abatement plans for feral cats and foxes discuss a range of control methods including:

- baiting
- shooting
- trapping
- habitat management
- biological control
- fertility control.

Management of these threats will be coordinated through Weed and Pest Management plans specific to each project component. The plans will include details of the management, monitoring and eradication of pest animals where necessary. Proposed management measures have been outlined in the mine, rail and off-lease EMPs and include the monitoring of pest animal occurrence during the construction and operation of the project and the implementation of humane pest controls if increased densities of pest animals are observed. Commitments relevant to pest animal control in the Proponent Commitments Register (Appendix 7) include:

- removing carcasses from the rail corridor to discourage predators and pest fauna (commitment P6.7)
- developing and implementing management plans to control the introduction and spread of weeds and pests (commitments P6.9, P6.46 and P6.72).

The plans will be prepared prior to operations commencing and be subject to five-yearly revisions to include updated information as it becomes available.

The approved conservation advice lists a number of actions to support the recovery of the squatter pigeon (southern); these include actions to manage trampling, grazing and browsing of key habitat sites. With regard to those areas of the project affected by subsidence, the proponent has proposed, in the SMP, to constructing fences to exclude cattle prior to the commencement of underground mining operations. In addition, a commitment (commitment M4.15) regarding the removal of cattle or the implementation of ecologically sensitive grazing strategies in non-remnant areas on the mine site also supports this priority action.

The proponent has proposed developing a species-specific management plan for the squatter pigeon (southern) (AEIS, Volume 4 Appendix Q1). General mitigation measures to address the likely impacts on the subspecies have been developed to manage the impacts associated with habitat loss, habitat fragmentation and degradation, injury and mortality, fire, weeds and pests. The mitigation measures proposed include:

- provision and security of surface water sources
- rehabilitating mined areas in parallel with the development of new mine areas

- sequential clearing of vegetation to allow fauna dispersal
- clearing activities to be undertaken in the presence of a qualified fauna spotter-catcher
- protocols to dispose of food scraps to minimise pest animal access to food wastes
- speed limits and signage for vehicles to minimise road kills
- site inductions to convey protocols about encountering key fauna species
- monitoring and managing pest species in and adjacent to cleared areas.

Offsets

The proponent has determined that, with the implementation of the proposed management and mitigation measures, no significant impacts to the squatter pigeon (southern) are predicted to occur as a result of the project and an offset has not been proposed. This conclusion is based on the prediction that the project will not:

- lead to a long term population decrease
- disrupt the breeding cycle of an important population
- impact habitat critical to the survival of the subspecies
- result in the establishment of invasive species or disease to habitat critical to the survival of the subspecies
- interfere with the recovery of the subspecies.

DE considers that the project may “modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline”, or “interfere substantially with the recovery of the species”. These are two of the significant impact criteria for vulnerable species in the department’s Significant Impact Guidelines 1.1. Therefore an offset will be required under the Australian Government Offsets Assessment Guide. The Environmental Offset Package identifies five properties which have been designated as either priority 1 or priority 3 in the GBOS. The properties were selected to meet the offset obligations of impacts to other MNES from the project; however, all are considered to contain habitat suitable for the squatter pigeon (southern). Offsets for other MNES and MSES are discussed in the relevant sections of this report.

Coordinator-General’s conclusion—squatter pigeon

I am satisfied that the mitigation measures outlined by the proponent can adequately address the potential impacts of the project on the squatter pigeon (southern). To ensure this, I have recommended a condition of approval to the Commonwealth Minister for the Environment regarding the development of an MMP (Appendix 1, Section 2, Part A) requiring the development and implementation of appropriate mitigation and management measures to protect MNES, including the squatter pigeon.

For project areas outside of the mining lease, I have recommended a condition in Appendix 2, Section 2 requiring the development and implementation of mitigation measures that maximise the ongoing protection and long-term conservation of threatened species. For areas within the mining lease, the mine EMP lists the development of a species-specific management plan for the squatter pigeon (southern)

as a control measure, which will be prepared prior to the commencement of mining activities.

My recommended condition for the development of an Offset Management Plan (Appendix 1, Section 2, Part A) for approval by the Commonwealth Minister for the Environment will ensure appropriate monitoring and management measures are implemented in offset areas to protect EPBC listed species and communities consistent with the residual impact areas for the subspecies shown in Table 5.1.

Threatened fauna—yakka skink

Description

The yakka skink (*Egernia rugosa*) is listed as vulnerable under the EPBC Act and Queensland's NC Act. It has been recorded in a range of habitat types, primarily thorough the Brigalow Belt bioregion, though its distribution is highly fragmented. The species grows up to 40 cm long, lives in small colonies and is often associated with rocks, fallen timber, tree stumps, root cavities and abandoned animal burrows. It has been recorded in habitat ranging from sand plains to rocky outcrops in open dry sclerophyll woodland or forest and brigalow forest to open shrubland. The species is known to excavate deep burrow systems and can inhabit cleared environments if suitable shelter structures are available.

Key threats to the yakka skink identified in the draft *Queensland Brigalow Belt Reptile Recovery Plan*⁴⁵ include predation by feral cats (*Felis catus*) and foxes (*Vulpes vulpes*), destruction of burrows by trampling stock and feral pigs and inappropriate fire regimes. Habitat loss and the removal of microhabitat features such as rocks and woody debris are also identified as a key threat in the recovery plan.

Extent and condition in project area

Survey effort

Field surveys conducted for the EIS relevant to the yakka skink assessment are detailed in Table 5.8. The surveys included targeted active searches within suitable habitat consistent with the methods recommended in the *Survey Guidelines for Australia's threatened reptiles*⁴⁶ and the draft referral guidelines for nationally listed Brigalow Belt reptiles⁴⁷ including:

- diurnal searches of suitable microhabitats, turning woody debris and rocks, raking the soil surface and leaf litter beneath trees and peeling bark to look for reptiles or their sloughs
- spotlighting between dusk and midnight, targeting water-inundated gilgais, wetlands, riparian habitats and adjacent suitable environments
- trapping, including pitfalls, funnel trapping and Elliott trapping.

⁴⁵ R Richardson, *Queensland Brigalow Belt Reptile Recovery Plan 2008 – 2012. Report to the Department of the Environment, Water, Heritage and the Arts, Canberra.* WWF-Australia, Brisbane, 2006.

⁴⁶ DSEWPaC, *Survey guidelines for Australia's threatened reptiles. EPBC Act survey guidelines 6.6,* Canberra, 2011.

⁴⁷ DSEWPaC, *Draft Referral guidelines for the nationally listed Brigalow Belt reptiles,* Canberra 2011.

Table 5.8 Field surveys relevant to the yakka skink assessment

Location	Survey type	Total survey effort	Timing
Mine	Terrestrial and aquatic fauna surveys	69 terrestrial and 19 aquatic sites (spring) 40 terrestrial and 17 aquatic site (autumn)	November 2010 (spring) November 2011 (spring) April/May 2011 (autumn)
Rail	Terrestrial and aquatic surveys	2 terrestrial and 3 aquatic sites (autumn) 22 terrestrial and 1 aquatic site (spring)	May 2011 (autumn) September 2011 (spring)
Off-lease infrastructure	Terrestrial and aquatic habitat rapid assessment	Unstructured, opportunistic survey	June 2012 (winter)
	Terrestrial ecology survey	38 fauna sites 2 trapping sites 14 remote camera sites 12 aquatic sites	April/May 2013 (autumn)
Quarries	MNES survey	5 sites	January/February 2013 (summer) March 2013 (autumn) July 2013 (winter)

Results of field surveys

The yakka skink is a cryptic species known to occur in low densities and was not detected during the field surveys. Desktop assessment predicted the species occurrence along the rail alignment and found previous records within 50 km of the mine study area. Based on its known distribution, previous records in the area and available habitat, the species is considered likely to occur in the mine study area and as a species that may occur in the rail study area. An assessment of potential habitat types in the study area determined that, where complexity of ground layer micro habitats is maintained, suitable areas may be present in a range of ecological communities including:

- ironbark and box grassy woodland to open woodland on grey sand plains
- yellow jacket and rough-leaved bloodwood shrubby low open woodland on red sand plains
- eucalypt open woodland with native grass understorey
- gidgee or mixed acacia woodland, on clay and clay loam plains with sparse shrub layer
- open forest and woodland fringing watercourses and relict stream channels, and alluvial plains subject to flooding
- woodland and low open woodland associated with laterised sandstone rises and minor pediments.

Habitat mapping

The proponent has mapped potential habitat for the yakka skink based on RE mapping for the mine and rail alignment. Figure 5.14 illustrates the potential habitat mapped for the mine. The proponent does not consider the project study area to support an 'important population' as defined in the EPBC Significant Impact Guidelines⁴⁸ as:

- targeted surveys did not detect the species
- the study area is not considered to constitute habitat for a source population key to breeding and dispersal
- the study area is not at the limit of the species range.
- In addition, the proponent considers a population occurring in the study area would not be necessary to the species' long-term survival and recovery or for maintaining genetic diversity.

⁴⁸ DSEWPaC, Significant Impact Guidelines 1.1 - Matters of National Environmental Significance, Department of the Environment, Water, Population and Communities, Canberra, 2013

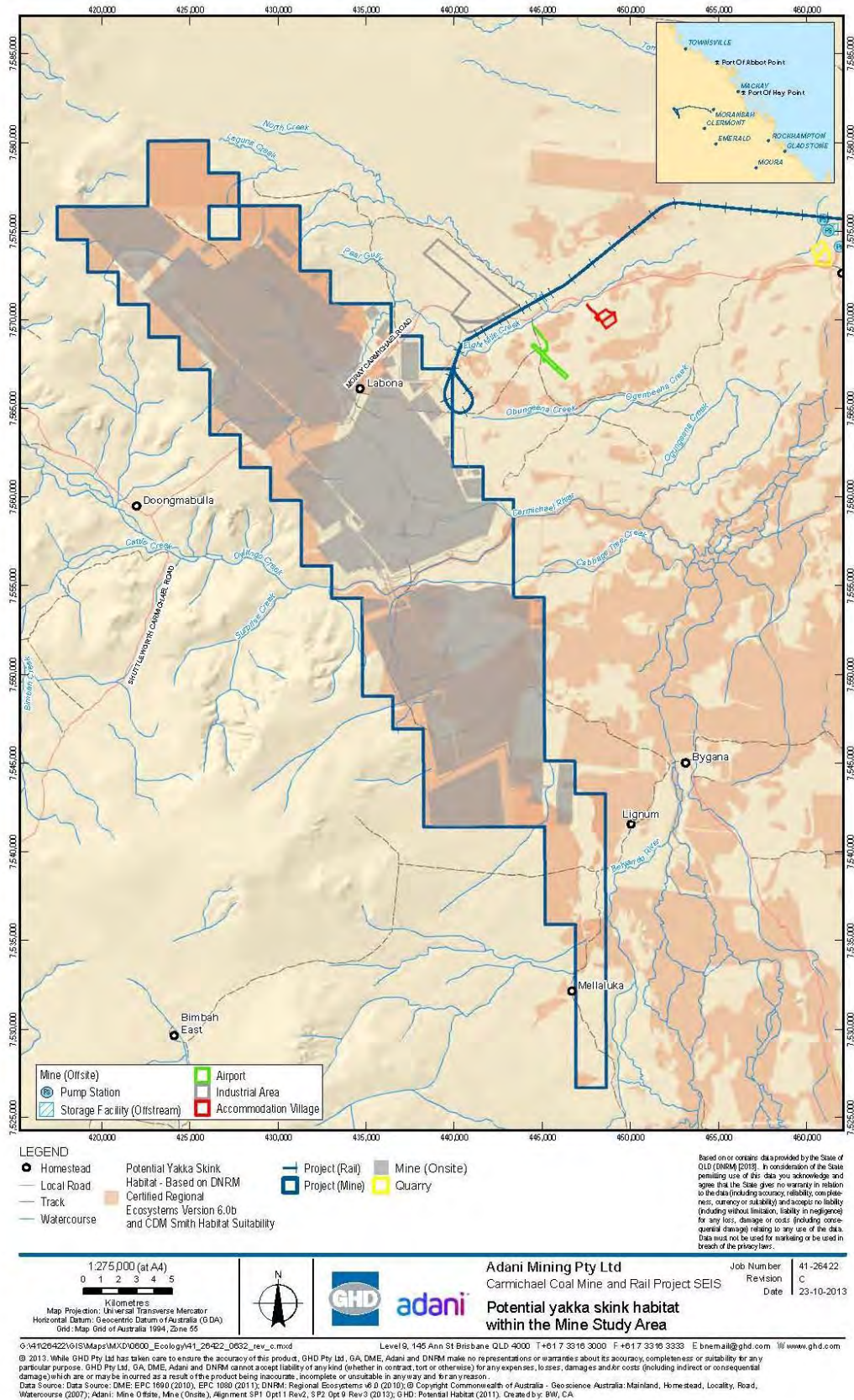


Figure 5.14 Potential habitat for the yakka skink

Impacts and mitigation measures

Impacts

Potential impacts to the yakka skink identified in the EIS include habitat loss during the project's operation phase, habitat fragmentation and injury or mortality during vegetation clearing activities, particularly as the species is cryptic and may not be detected by fauna-spotters. Impacts to potential yakka skink habitat are detailed in Table 5.9.

Table 5.9 Impacts to potential yakka skink habitat

Project component	Impact area (ha)
Rail	0
Off-lease	2.48
Mine	10 363.89
Mine subsidence	6162
Total	16 528.37

Mitigation

The proponent has proposed a species-specific management plan be developed to manage the impacts of the project if the species is detected in the project area. General mitigation measures to be implemented through the plan will have a focus on maintaining or enhancing suitable habitat and minimising predation from pest animal species. More specific measures that may be implemented include:

- establishing microhabitat features preferred by the species in suitable core habitat to enhance the values of existing potential habitat
- identifying locations of suitable microhabitats in actively managed areas to maintain habitat values for the species
- monitoring fox and cat populations and implementing a control program if necessary
- engaging a fauna spotter-catcher to check suitable habitat prior to ground disturbance and relocating any individuals or colonies to suitable habitat in offset areas
- maintaining fauna movement corridors
- implementing fire management controls
- speed limits and signage for vehicles to minimise road kills.

The control methods detailed in the TAPs for feral cats and foxes are also relevant to the long-term survival and recovery of the yakka skink. These control methods will be implemented through the MMP. Other mitigation strategies and environmental controls will be documented in the mine EMP and implemented through relevant sub-plans such as a Fire Management Plan. Recovery actions for the species, identified in the *Queensland Brigalow Belt Reptile Recovery Plan*, address weed and feral predator management, fire management and protection of habitat and are supported by the mitigation measures outlined by the proponent.

Offsets

DE considers that the project may “modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline”, or “interfere substantially with the recovery of the species”. These are two of the significant impact criteria for vulnerable species in the department’s Significant Impact Guidelines 1.1. Therefore an offset will be required under the Australian Government Offsets Assessment Guide. This should be based on the impact areas shown in 0.

Habitat suitable for the yakka skink is considered present on or within a 5 km of all five properties identified in the Environmental Offset Package (March 2014).

Coordinator-General’s conclusion—yakka skink

I am satisfied that the mitigation measures outlined by the proponent can adequately address the potential impacts of the project on the yakka skink.

To ensure this, I have recommended a condition of approval to the Commonwealth Environment Minister for the development of an MMP (Appendix 1, Section 2, Part A) requiring the development and implementation of appropriate mitigation and management measures to protect MNES, including the yakka skink.

My recommended condition for the development of an Offset Management Plan (Appendix 1, Section 2, Part A) for approval by the Commonwealth Minister for the Environment will ensure appropriate monitoring and management measures are implemented in offset areas to protect EPBC listed species and communities.

For project areas outside of the mining lease, I have recommended a condition in Appendix 2, Section 2 requiring the development and implementation of mitigation measures that maximise the ongoing protection and long-term conservation of threatened species. For areas within the mining lease, the mine EMP lists the development of a species-specific management plan for brigalow belt reptiles as a control measure that will be prepared prior to the commencement of mining activities.

Threatened fauna—ornamental snake

Description

The ornamental snake (*Denisonia maculata*) is listed as vulnerable under the EPBC Act and Queensland’s NC Act. The species grows to about 50 cm and is associated with cracking clays in the Brigalow Belt bioregion, preferring habitat also favoured by frogs, its main food source. It is typically found inhabiting moist areas in woodland and open forest of brigalow, gidgee and eucalypt dominant communities although it may also inhabit grassland communities associated with gilgais. Important microhabitat features in which it shelters include fallen timber, rocks, bark and soil cracks. With the exception of cooler months, the species is likely to be active throughout much of the year. A range of threats to the ornamental snake have been identified that may have contributed to its declining abundance, these threats include:

- habitat loss and fragmentation
- habitat degradation by overgrazing, grazing of gilgais, soil compaction and compromised soil structure

- changes in surface hydrology of gilgai environments
- changes to water quality through sedimentation and chemical pollution
- interaction with the cane toad
- predation by feral species
- weed invasion.

Priority actions to support the recovery of the species include implementing the recommendations identified in relevant recovery plans including the *Threat Abatement Plan for predation by Feral Cats*⁴⁹, *Threat Abatement Plan for predation by the European Red Fox*⁵⁰ and the *Threat Abatement Plan for Predation, Habitat Degradation, Competition and Disease Transmission by Feral Pigs*.⁵¹

Extent and condition in project area

Survey effort

Consistent with the methods recommended in the draft *Referral guidelines for nationally listed Brigalow Belt reptiles* and the *Survey Guidelines for Australia's threatened reptiles*⁵², the surveys included targeted searches for reptiles where suitable habitat exists in the study area. Methods deployed at these survey sites included:

- diurnal searches of suitable microhabitats, turning woody debris and rocks, raking the soil surface and leaf litter beneath trees and peeling bark to look for reptiles or their sloughs
- spotlighting between dusk and midnight, targeting water-inundated gilgais, wetlands, riparian habitats and adjacent suitable environments
- trapping, including pitfalls, funnel trapping and Elliott trapping.

Field surveys relevant to the ornamental snake assessment are detailed in Table 5.10.

⁴⁹ DEWHA, *Threat Abatement Plan for predation by feral cats*, DEWHA, Canberra 2008. Available from: <http://www.environment.gov.au/biodiversity/threatened/publications/tap/cats08.html>.

⁵⁰ DEWHA, *Threat Abatement Plan for Predation by the European Red Fox*, DEWHA, Canberra, 2008. Available from: <http://www.environment.gov.au/biodiversity/threatened/publications/tap/foxes08.html>.

⁵¹ AGDEH, *Threat Abatement Plan for Predation, Habitat Degradation, Competition and Disease Transmission by Feral Pigs*, Canberra 2005. Available from: <http://www.environment.gov.au/biodiversity/threatened/publications/tap/pig.html>.

⁵² DSEWPaC, *Survey Guidelines for Australia's threatened reptiles*, Guidelines for detecting reptiles listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999, DSEWPaC, Canberra, 2011.

Table 5.10 Field surveys relevant to the ornamental snake assessment

Location	Survey type	Total survey effort	Timing
Mine	Terrestrial and aquatic fauna surveys	69 terrestrial and 19 aquatic sites (spring) 40 terrestrial and 17 aquatic site (autumn)	November 2010 (spring) November 2011 (spring) April/May 2011 (autumn)
Rail	Terrestrial and aquatic surveys	2 terrestrial and 3 aquatic sites (autumn) 22 terrestrial and 1 aquatic site (spring)	May 2011 (autumn) September 2011 (spring)
Off-lease infrastructure	Terrestrial and aquatic habitat rapid assessment	Unstructured, opportunistic survey	June 2012 (winter)
	Terrestrial ecology survey	38 fauna sites 2 trapping sites 14 remote camera sites 12 aquatic sites	April/May 2013 (autumn)
Quarries	MNES survey	5 sites	January/February 2013 (summer) March 2013 (autumn) July 2013 (winter)

Results of field surveys

The surveys confirmed the presence of the ornamental snake within the off-lease infrastructure component of the project and the Borrow 7 and Moray quarries. Two sightings in separate locations were recorded during the autumn 2013 surveys of the off-lease infrastructure areas, one in a patch of open woodland containing a small amount of brigalow, the other in woody debris in a small isolated patch of higher quality brigalow. The summer 2013 survey of the quarries recorded a sighting of an ornamental snake under fallen timber in a well vegetated drainage line approximately 1.5 km south of the Borrow 7 Quarry site. A sighting was also recorded during the winter 2013 survey of the quarries in partially cleared regrowth brigalow on the Moray-Carmichael Road, 20 km west of Moray Quarry.

Habitat mapping

The ornamental snake prefers seasonally inundated habitat on deep cracking clays. An assessment of suitable habitat across all aspects of the project identified the following vegetation types as potentially suitable:

- eucalypt open woodland with native grassy understorey
- gidgee or mixed acacia woodland, on clay and clay loam plains with sparse shrub layer
- brigalow shrubby woodland to open forest typically on clay and clay loam plains
- eucalypt and acacia mixed woodland to forest often on clay soils

-
- riparian woodland to forest fringing watercourses, and coolabah open woodland on grassy floodplain often with weedy understorey
 - open forest and woodland fringing watercourses and relict stream channels, and alluvial plains subject to flooding
 - natural and artificial water bodies.

A desktop assessment indicated the presence of the species in both the mine and rail study areas. The REs most commonly associated with recordings of the species that have been mapped within the study area include 11.3.3, 11.4.6, 11.4.8 and 11.4.9. Figure 5.15 illustrates potential habitat and sightings of the ornamental snake on the mine and off-lease infrastructure areas.

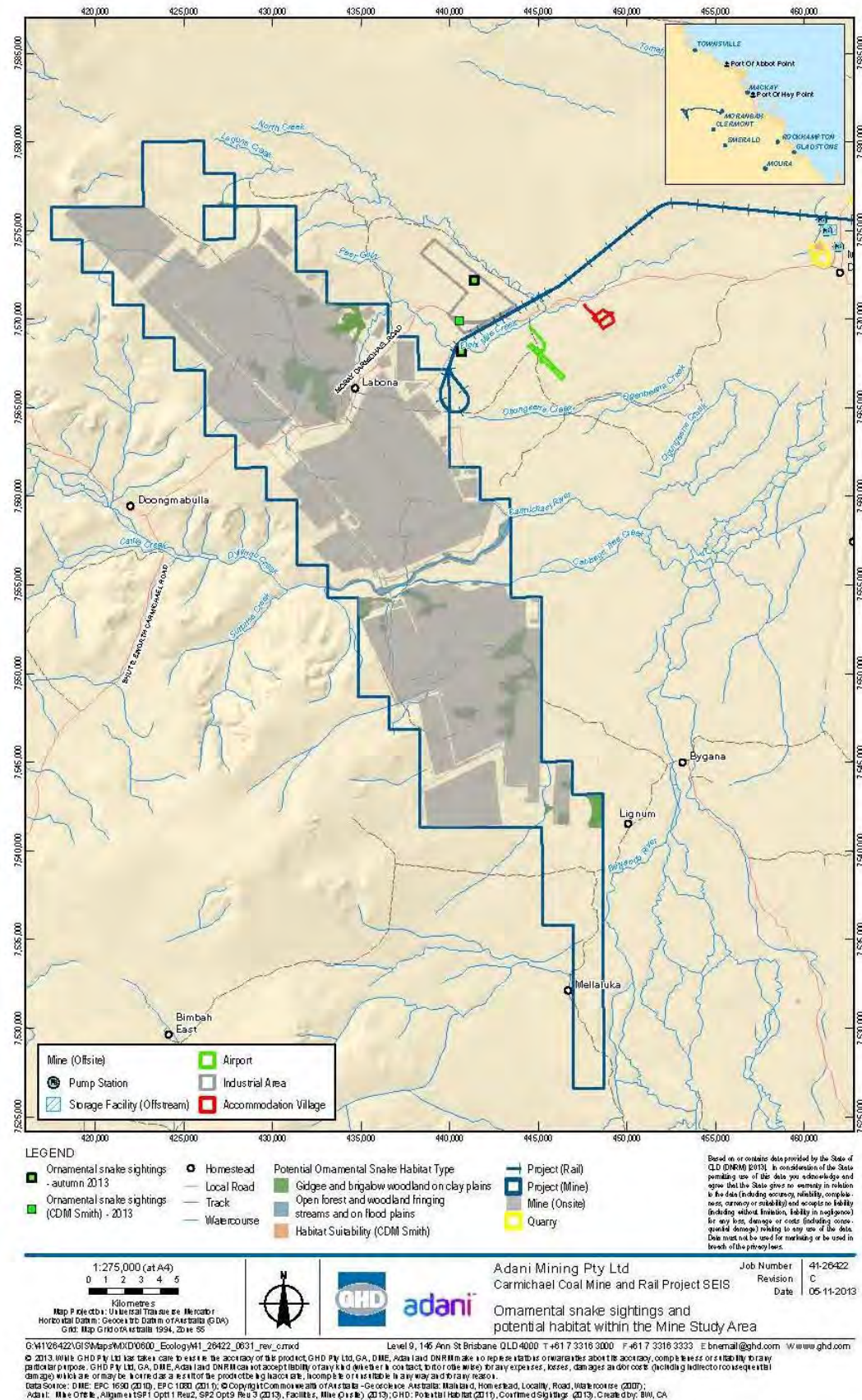


Figure 5.15 Sightings and potential habitat of the ornamental snake on the mine and off-lease infrastructure areas

Impacts and mitigation measures

Impacts

On the ground assessment of potential habitat areas indicated the quality of habitat is likely to be highly variable, with non-remnant vegetation associated with gilgai areas more significantly impacted by cattle grazing and land clearing. A key factor determining habitat utilisation is likely frog abundance, which in turn is influenced by the condition of watercourses and standing water associated with gulgais. Table 5.11 details the impact of the project on potential ornamental snake habitat.

Table 5.11 Impacts to potential ornamental snake habitat

Project component	Impact area (ha)
Rail	349.48
Off-lease	314.06
Mine	951.69
Mine subsidence	3
Total	1618.23

The project is predicted to result in the direct clearing of 1618.23 ha of potential ornamental snake habitat and 3 ha of potential habitat affected by subsidence. The area affected by subsidence is mapped by the proponent as a low impact area, meaning that the landform will subside by less than 5 m (a slope change of less than 2 per cent), any cracking will be less than 100 mm in width and the duration of any ponding will be less than two days.

Other likely impacts identified in the EIS include injury or mortality during vegetation clearing activities, fragmentation of habitat, altered surface hydrology and an increased risk of weeds, pests and fire.

Mitigation

Mitigation and management measures proposed in the EIS have aligned with the recovery actions outlined in the draft *Queensland Brigalow Belt Reptile Recovery Plan* and include:

- developing and implementing a PWPMP
- developing and implementing a Fire Management Plan
- a species specific management plan for brigalow reptiles (southern) (AEIS, Volume 4 Appendix Q1).

The plans will address key actions to control agricultural weeds such buffel grass (*Cenchrus ciliaris*), protect habitat, integrate weed and pest animal management and implement fire management guidelines. The TAPs for feral cats and foxes will need to be considered when developing the PWPMP. These threats are also relevant to the squatter pigeon (southern), the yakka skink and the BTF and have been discussed in my evaluation of these matters. The TAP concerning feral pig control will also need to be considered in developing detailed mitigation measures preserve and protect

ornamental snake habitat in the project area. General mitigation strategies proposed by the proponent to address impacts to the species include:

- the staged loss of habitat
- provision of new water sources
- provision of new microhabitat
- maintenance of fauna movement corridors
- water recycling to supplement base flows into the Carmichael River
- speed limits and signage for vehicles to minimise road kills.

Offsets

The proponent does not consider the ornamental snake population in the project study area to constitute an ‘important population’ necessary for the species’ long-term survival and recovery as defined in the EPBC Significant Impact Guidelines as it is not:

- a key source population for breeding or dispersal
- necessary for maintaining genetic diversity
- near the limit of the species range.

The proponent also determined that the habitat present within the project area does not represent habitat critical to the survival of the species and significant residual impacts are not predicted to arise from the project as it will not:

- disrupt the breeding cycle of the population
- fragment or reduce the species area of occupancy over the long term
- adversely affect the availability of quality habitat
- introduce invasive species or disease
- interfere with the recovery of the species.

DE considers that the project may “modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline”, or “interfere substantially with the recovery of the species”. These are two of the significant impact criteria for vulnerable species in the department’s Significant Impact Guidelines 1.1. Therefore an offset will be required under the Australian Government Offsets Assessment Guide consistent with the residual impact areas shown in 0.

Coordinator-General’s conclusion—ornamental snake

I am satisfied that the mitigation measures outlined by the proponent can adequately address the potential impacts of the project on the ornamental snake. To ensure this, I have recommended a condition of approval to the Commonwealth Environment Minister for the development of an MMP (Appendix 1, Section 2, Part A) requiring the development and implementation of appropriate mitigation and management measures to protect MNES, including the ornamental snake.

For project areas outside of the mining lease, I have recommended a condition in Appendix 2, Section 2 requiring the development and implementation of mitigation measures that maximise the ongoing protection and long-term conservation of threatened species. For areas within the mining lease, the mine EMP lists the

development of a species-specific management plan for brigalow belt reptiles as a control measure that will be prepared prior to the commencement of mining activities.

My recommended condition for the development of an Offset Management Plan (Appendix 1, Section 2, Part A) for approval by the Commonwealth Minister for the Environment will ensure appropriate monitoring and management measures are implemented in offset areas to protect EPBC listed species and communities.

Threatened ecological communities—GAB springs

Description

The ‘community of native species dependent on natural discharge of groundwater from the Great Artesian Basin’ (hereafter ‘GAB spring wetlands’) TEC comprises a community of flora and fauna species including fish, invertebrates and aquatic and terrestrial plants clustered around discharge springs emanating from the GAB.⁵³ The GAB spring wetlands TEC is listed as endangered under the EPBC Act.

Baseline information

Surveys relevant to GAB spring wetlands are outlined in AEIS Appendix H, Table 27. The assessments conducted identified whether EPBC Act protected taxa were present, and whether the constituent REs of TECs were recorded.

Surveys confirmed that this TEC is not present within the project area. However, impacts to regional aquifers as a result of groundwater drawdown have the potential to inadvertently impact GAB spring wetlands TEC in the vicinity of the project area.

The nearest GAB spring wetlands TEC is the Doongmabulla Springs Complex, situated approximately 8 km from the western edge of the western mining lease boundary (refer to Figure 5.3 and Figure 5.16). The Doongmabulla Springs Complex comprises the following three separate springs:

- Moses—a cluster of mounding and non-mounding artesian springs with large wetland areas
- Little Moses—possible emerging mound spring beside the Carmichael River with limited wetland
- Joshua—a large, modified spring, now a ‘turkeys nest’ dam with associated wetland.

The Moses Spring group is included in the Doongmabulla Nature Refuge and comprises at least 65 individual springs which contribute surface water to a series of adjacent wetlands.

The proponent’s groundwater assessment (AEIS Appendix K1) identifies that the Doongmabulla Springs Complex provides base flow to the adjacent Carmichael River. The Doongmabulla Springs Complex contains a comparatively high number of flora and fauna species endemic to GAB spring wetlands.⁵⁴ All listed threatened and near-threatened flora species identified in desktop searches as potentially occurring within the Doongmabulla Springs Complex were observed during field surveys. All

⁵³ www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=26

⁵⁴ RJ Fensham, WF Ponder and RJ Fairfax, *Recovery plan for the community of native species dependent on natural discharge of groundwater from the Great Artesian Basin*, 2010.

species were present in the Moses Spring group, two were found at the Joshua spring, and only one was found at the Little Moses. These species included:

- salt pipewort (*Eriocaulon carsonii*)—a small aquatic herb listed as endangered under the EPBC Act and NC Act
- blue devil (*Eryngium fontanum*)—a herb listed as endangered under the EPBC Act and NC Act
- waxy cabbage palm (*Livistona lanuginosa*)—a tree listed as vulnerable under the EPBC Act and NC Act.

Whilst not listed under the EPBC Act, four additional species were recorded during field surveys which are either listed under the NC Act or are unlisted but considered to be endemic to the Doongmabulla Springs Complex. The National Recovery Plan for GAB spring wetlands assigns the Doongmabulla Spring complex with the highest conservation ranking for a GAB discharge spring wetland (category 1a) based on the presence of these endemic species.

One terrestrial fauna species of conservation significance was recorded during field surveys—namely the squatter pigeon (*Geophaps scripta scripta*) listed as vulnerable under the EPBC Act and NC Act. Whilst not recorded during field surveys, the AEIS identifies that other EPBC listed fauna species are likely to occur within the Doongmabulla Springs Complex, including the:

- black-throated finch (*Poephila cincta cincta*)—endangered
- ornamental snake (*Denisonia maculate*)—vulnerable
- yakka skink (*Egernia rugosa*)—vulnerable
- Australian painted snipe (*Rostratula australis*)—vulnerable
- koala (*Phascolarctos cinereus*)—vulnerable.

The Doongmabulla Springs Complex also provides habitat for a wide range of least-concern species of flora and fauna.

The size of the wetlands appears to vary greatly with the seasons. During the 2012 field survey, the wetlands were extensive and were overflowing into pools in the Cattle Creek channel that were up to 1.5 m deep. However, during the 2013 survey, all of the deep pools observed in 2012 were dry. AEIS Appendix H identifies that seasonal fluctuations appear to be a normal part of the ecology of these wetlands areas.

AEIS Appendix J3 provides further ecological information on the Doongmabulla Springs Complex.

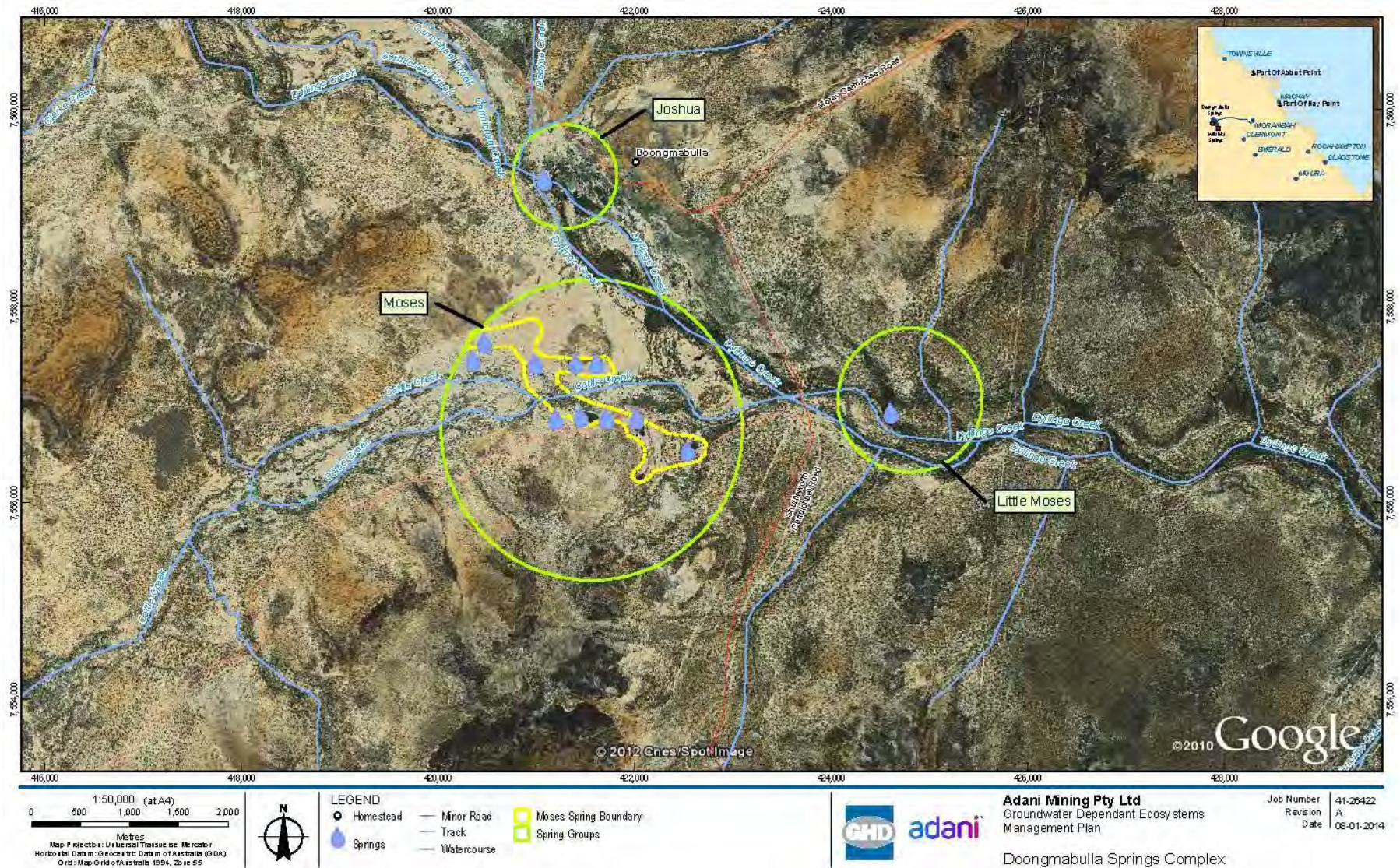


Figure 5.16 Doongmabulla Springs Complex

Evaluation of environmental impacts—project wide
Carmichael Coal Mine and Rail project:

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

Need for further baseline information

The proponent acknowledges that additional baseline information on the Doongmabulla Springs Complex is required in order to identify any future impacts, develop specific mitigation measures and inform ongoing management.

The draft GDEMP, submitted in response to comments received from DE and DEHP on the AEIS, includes the following baseline monitoring commitments:

- flow monitoring of the outlet at Joshua Spring to understand changes in output, and in the Carmichael river immediately adjacent to Joshua Spring, to monitor contributions to surface water flow and seasonal changes (commitment P6.24)
- mapping and measurement of the 'vegetated area' perimeter of the five main wetland areas at the Moses Spring group (commitment P6.25)
- mapping and measurement of selected isolated mound springs at Moses Spring group. This will include a complete species list and relative abundance of the mound vegetation, a photographic record, diameter, height and perimeter measures, and flow measurements (commitment P6.26)
- ecological study of the two threatened species listed under the EPBC Act that occur at Moses Spring—blue devil and salt pipewort (commitment P6.27)
- aquatic invertebrate survey at Moses Spring to determine the presence of endemic species (commitment P6.28)
- establishment of baseline water level at a reference location for the springs (commitment P6.29).

Baseline monitoring of springs will be conducted before mining (at least one year of surveys prior to the commencement of mining operations), and monitoring against the established baseline will continue during mining operations on a quarterly basis and after mining commences (commitments P6.30 and P6.32).

Threatening processes

The National Recovery Plan for GAB spring wetlands considers the greatest threatening process for GAB springs to be drawdown resulting from groundwater extraction for domestic and agricultural use and mining/coal seam gas extraction (Fensham et al., 2010). This threatening process is relevant to the Doongmabulla Springs Complex.

Fairfax and Fensham (2002)⁵⁵ note that extraction has led to the inactivity of the majority of artesian-fed springs, with an estimated 81 per cent of springs currently listed as inactive since their discovery, due to reduced subterranean pressure. Further impacts on the spring-associated ecological communities arise from artificial alterations of the seep points, with some springs being removed altogether, or modified to suit the needs of livestock.⁵⁶ The AEIS identifies that the Doongmabulla springs complex

⁵⁵ RJ Fairfax and RJ Fensham, 'In the Footsteps of J. Alfred Griffiths: a Cataclysmic History of Great Artesian Basin Springs in Queensland', in *Australian Geographical Studies*, vol. 40, pp. 210–230, 2002.

⁵⁶ RJ Fensham, JL Silcock, A Kerezszy and W Ponder, 'Four desert waters: setting arid zone wetland conservation priorities through understanding patterns of endemism', in *Biological Conservation*, vol. 144, no. 10, pp. 2459–2467, 2011.

currently experiences disturbance, with the Joshua Spring modified to a 'turkey nest' dam to service the domestic needs of Doongmabulla Station.

Introduced plants and animals have had significant impacts on the integrity and robustness of both GAB and non-GAB spring communities, with pugging⁵⁷ (from both feral animals and livestock), pig rooting, wallowing and direct and indirect competition for resources all acting to degrade ecological values of springs.⁵⁸ The AEIS notes that the Doongmabulla springs complex currently experiences impacts in the form of pugging from cattle and pigs.

Refer to the later section entitled 'Conservation advice, Recovery Plans and Threat Abatement Plan' for more information on relevant TAPs.

Seasonal variation in spring water levels

The National Recovery Plan for GAB spring wetlands states that interpreting trends in spring flow can be difficult as GAB spring wetlands can have highly variable natural spring flow, even over short timeframes, for no apparent or currently understood reason.

It is unclear whether the seasonal variation in water levels in springs, as reported in the AEIS, is a direct result of variations in incident rainfall, surface flows or groundwater recharge. If recharge, DEHP considers that the lag time between rainfall and the reflection in pressure at the springs would be useful information for determining impact level related to mining activities and subsequent management options. DEHP recommends that this information be obtained before the commencement of mining activities which may affect the springs.

The recovery plan identifies an apparent relationship between wetland area and spring flow and recommends monitoring spring discharge and the environmental impacts of groundwater drawdown by accurate measurements of wetland area. As noted above, the proponent has included baseline monitoring commitments in its draft GDEMP which includes mapping and measuring wetland areas (commitment P6.25).

Duration of baseline data collection

DE considers that one year of monitoring of the Doongmabulla Springs complex prior to the commencement of mining operations is inadequate to establish a baseline. As noted above, the National Recovery Plan for GAB spring wetlands states that spring flows can be highly variable, and this could be expected within and between seasons.

Coordinator-General's conclusions—baseline information

Further information is required to establish a comprehensive set of baseline information at the Doongmabulla Springs complex, and in particular to gain a better understanding of seasonal variation in spring flows and inform impact level and adaptive management options.

To this end, I have stated conditions for the draft EA, which requires the development and implementation of a:

⁵⁷ Defined as 'trampling of the ground into consolidated mud'

⁵⁸ RJ Fensham and RJ Price, 'Ranking spring wetlands in the Great Artesian Basin of Australia using endemism and isolation of plant species', in *Biological Conservation*, vol. 119, no. 1, pp. 41–50, 2004.

- **baseline groundwater monitoring program** (Appendix 1, Schedule E): The proponent must finalise a groundwater monitoring dataset prior to the commencement of any mining activities that will impact on groundwater and which ensures, amongst other objectives, the identification of natural groundwater level trends and groundwater contaminant trigger levels.
- **revised GDEMP** (Appendix 1, Schedule I): In addition to establishing the natural variation of spring flow and consistent with National Recovery Plan recommendations regarding spring flow monitoring, the proponent must establish as part of the GDEMP the extent and ecological composition of the Doongmabulla Spring complex, in accordance with Fensham's *Wetland Monitoring Methodology for Springs in the Great Artesian Basin (2009)*. This work must be completed prior to the commencement of activities that impact groundwater level or quality.

Prior to finalising the groundwater monitoring dataset required as part of the Groundwater Management and Monitoring Program (Appendix 1, Schedule E, Condition E3) and to ensure the adequate detection of impacts to the Doongmabulla Springs Complex, I have also stated a condition (Appendix 1, Schedule E) which requires the proponent to provide to the administering authority for approval a proposed groundwater monitoring network for detecting, amongst other objectives, impacts to GDEs including the Doongmabulla Spring Complex.

Potential impacts

The primary potential impact on the Doongmabulla Springs Complex is a reduction in groundwater pressure as a result of mining operations.

Figure 5.17, a schematic section of the Galilee Basin, GAB and associated discharge springs based on geological modelling developed for the SEIS (refer to AEIS Appendix K1), shows that the project mine footprint does not extend far enough west to intercept the closest GAB aquifers (the Dunda Beds and the Clematis Sandstone—the source of the Doongmabulla Springs Complex).

Potential impacts on the GAB and therefore the Doongmabulla Springs Complex may only arise indirectly from groundwater draining via geological fault structures from the Clematis Sandstone through the Dunda Beds and Rewan Formation (an aquitard defined as the base of the GAB) into the aquifers of the Bandanna Formation and Colinlea Sandstone. This would require a reduction of head in the Colinlea Sandstone significant enough to induce the transfer of water from the Clematis Sandstone through the approximately 250-metre thick Rewan Formation (at the western limit of the mining lease).

'Best estimate' groundwater modelling undertaken for the AEIS indicates that the influence of mine dewatering reaches the location of the Doongmabulla Springs Complex, with a maximum predicted reduction in pressure in the aquifer of between <0.05 and 0.19 m (operation phase) and <0.05 and 0.16 (post-closure) at these springs (refer to Table 28, AEIS, Appendix H). The greatest pressure reduction is predicted to occur at the Joshua Spring which is located geographically closest to the proposed mine area. Modelling predictions suggest that impacts will not occur until around the end of the proposed mine life (60 years). The reduction in pressure and the impacts on the different types of springs are also conceptually presented in Figure 5.18.

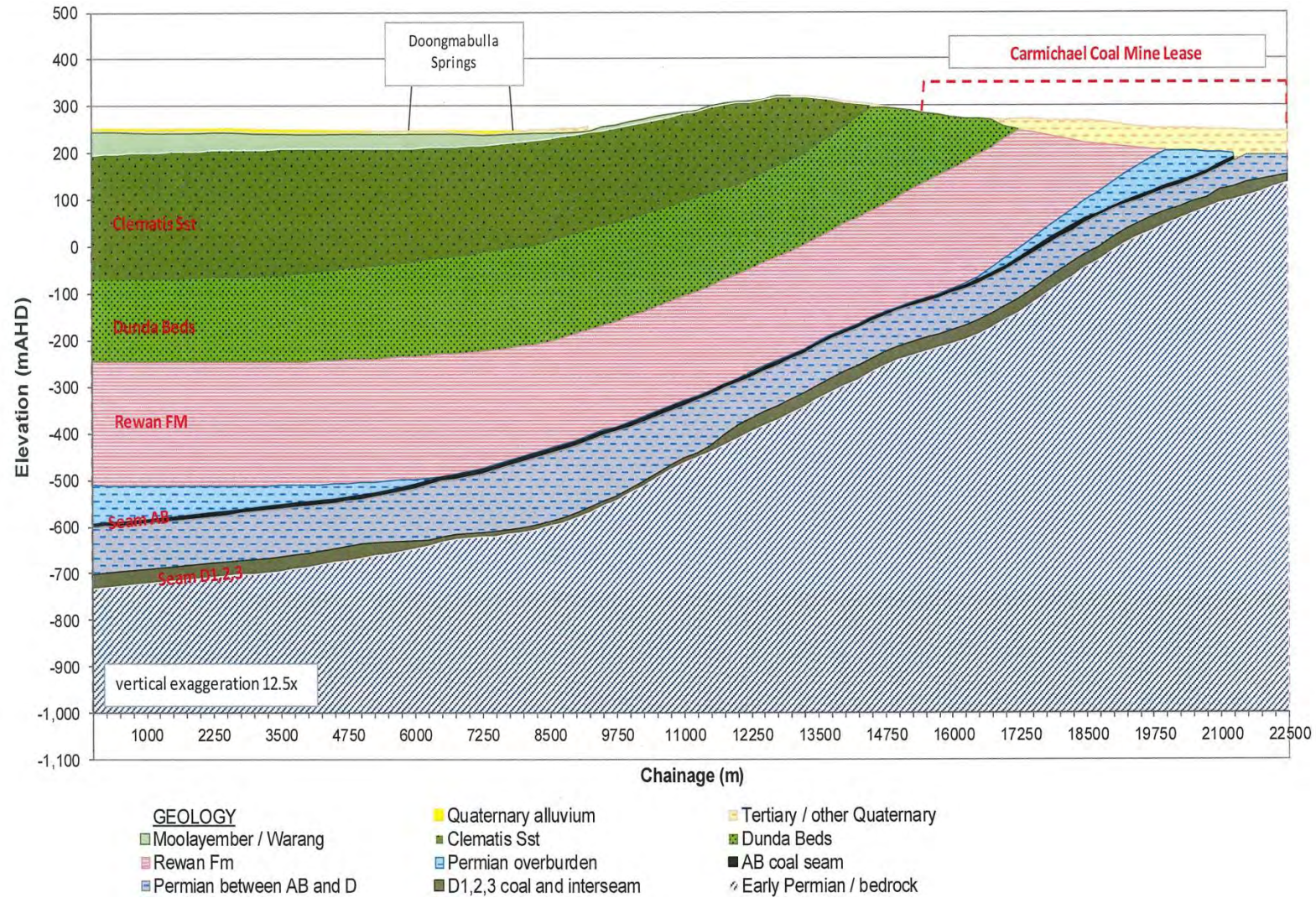
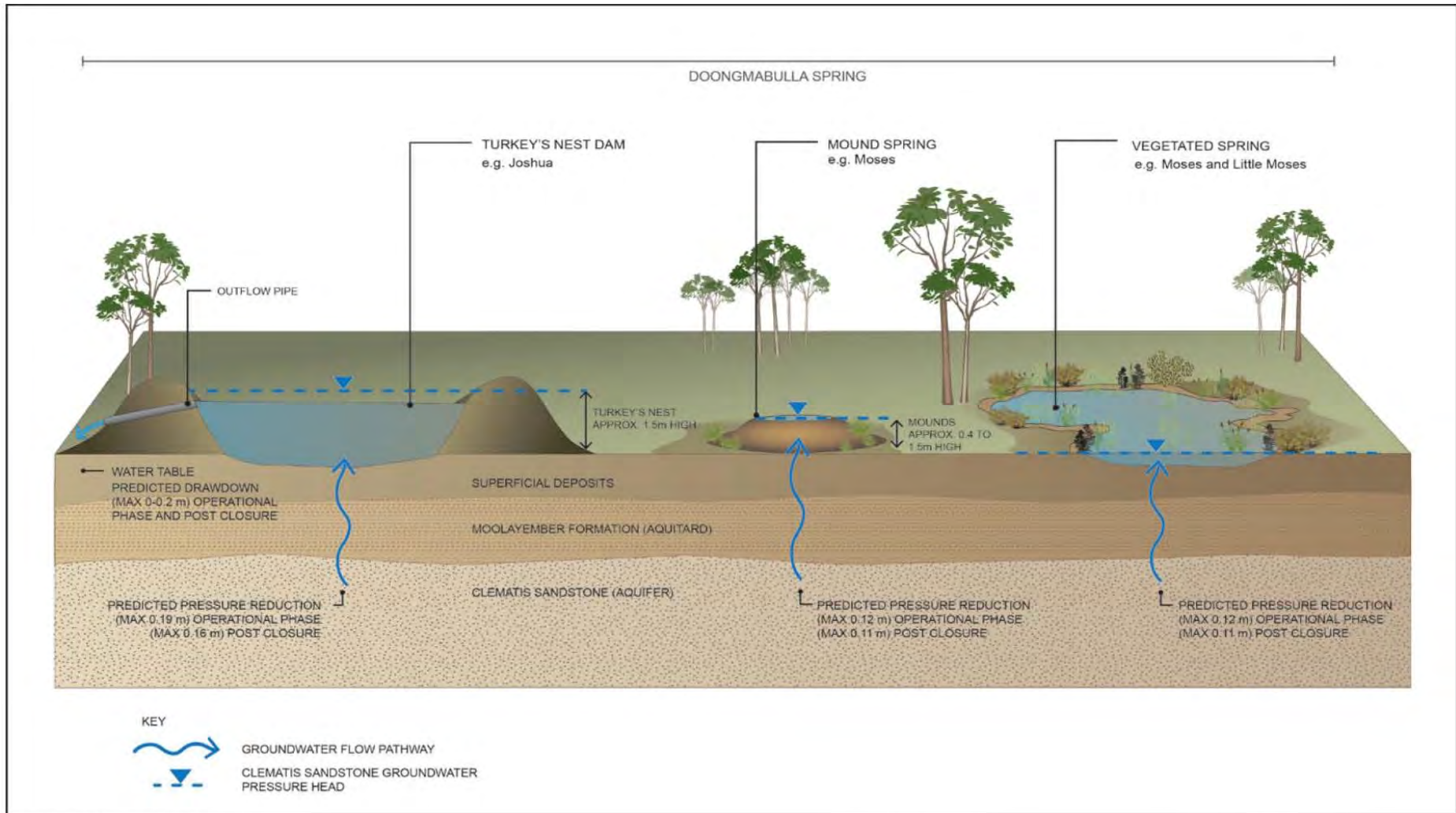


Figure 5.17 Geological cross-section through the project (mine) site



Source: GHD, 2013b

Figure 5.18 Modelled 'best estimate' groundwater pressure reductions in the aquifers at Doongmabulla Springs complex

AEIS Appendix H notes that the predicted reduction in pressure at Joshua Spring of 0.19 m is not expected to constitute more than a minor impact to this spring as it has a strong head of pressure (at least 1 m above the surrounding plain).

A reduction in pressure in the aquifer at Moses Springs is predicted to be between 0.12 m and less than 0.05 m. The presence of mounds up to 1.5 m in height at these springs indicates that the spring has an existing pressure head up to 1.5 m above ground level. These reductions in pressure are expected to have a minor impact on the springs and associated wetlands, falling within the range of seasonal fluctuations to which the springs are already adapted. Therefore the proponent considers that the reduction in flow will be within a tolerable range.

A reduction in pressure in the Little Moses spring is predicted to be less than 0.05 m. The proponent considers that a resultant drop in pond levels by 0.05 m would represent a negligible impact on the ecology of the spring and the sedgeland that fills most of its surface area.

The proponent considers that the predicted levels of reductions (generally less than 5 per cent at Moses Springs and within the range of natural seasonal reductions) are likely to have negligible adverse indirect impacts at Moses Springs and, at most, negligible adverse indirect impacts to Joshua and Little Moses springs.

AEIS Appendix H concludes that no significant impacts are predicted to occur to the GAB spring wetlands TEC, as the project (mine) will not:

- reduce the extent of, fragment, or increase fragmentation of the TEC
- adversely affect habitat critical to the survival of the TEC, or destroy or modify factors necessary for the survival of the TEC
- cause substantial changes or reductions in species compositions, quality or integrity.

Sensitivity analysis

The assessment of potential indirect impacts presented above is based on 'best estimate' groundwater modelling predictions presented in the AEIS. These predictions are based on the calibrated (rather than observed) hydraulic conductivity values for the Rewan Formation (horizontal and vertical hydraulic conductivity of 7.4×10^{-5} and 7.4×10^{-6} m/d, respectively) as the proponent considers that these are the values which result in an optimal fit to the available data.

It is important to note that the calibrated horizontal hydraulic conductivity value (of 7.4×10^{-5} m/d) is lower than the minimum observed value (of 9.5×10^{-5} m/d) recorded from tests undertaken for the project.

The proponent notes that the calibrated values adopted in its assessment fall well within the 5th and 95th percentile range calculated from the regional data set for the Rewan Formation collated for the Surat Cumulative Management Area Underground Water Impact Report (QWC, 2012) and are comparable to the median regional value of 3.6×10^{-4} m/d. The calibrated horizontal hydraulic conductivity value is also within the range of observed data from core test results at other proposed mining sites in the

Galilee Basin⁵⁹ and towards the centre of a typical range for siltstone identified by Domenico and Schwartz (1990).⁶⁰

Nonetheless, given this variation from field data, DNRM advised as part of its comments on the EIS that there was some uncertainty in regards to the base case hydraulic conductivity values for the Rewan Formation used by the proponent. In response, the proponent undertook a sensitivity analysis to quantify groundwater impacts, based on a wider range of possible hydraulic conductivity values for the Rewan Formation. Results of the sensitivity analysis are documented in the AEIS Mine Hydrogeology Report Addendum (AEIS, Appendix K6).

The sensitivity analysis considered very high hydraulic conductivity values for the Rewan Formation, as high as 1×10^{-2} m/d horizontally and 1×10^{-3} m/d vertically, which are towards the upper end of:

- the range of values for the Rewan Formation calculated from regional data sets⁶¹ (QWC, 2012)
- a typical range for sandstone of 2.6×10^{-5} to 5.2×10^{-1} m/d, as identified by Domenico and Schwartz (1990).

Accordingly, under the 'worst-case scenario' considered for the sensitivity analysis, the groundwater modelling assumes that the Rewan Formation will respond uniformly as a fractured sandstone aquifer. This is akin to assuming that the Rewan Formation is heavily faulted and fractured throughout the area, such that it ceases to function as an aquitard. The proponent considers this to be an extreme case since it would require fresh siltstone and mudstone units (identified within the Rewan Formation as part of the proponent's field investigations) to be entirely absent from the Rewan Formation sequence throughout the whole area between the proposed mine area and the GAB.

As reported in section 3.6.1 of AEIS Appendix K6, sensitivity analysis results suggest that maximum drawdown impacts at the Doongmabulla Springs could be up to 1 m in the event that the actual vertical hydraulic conductivity of the Rewan Group was 1×10^{-3} m/d (approximately two orders of magnitude higher than the calibrated value) and close to zero if the lower bound value calibrated in the Surat Cumulative Management Area Underground Water Impact Report model (QWC, 2012) of 1×10^{-7} (approximately two orders of magnitude lower than the calibrated value) was adopted.

DNRM is now satisfied that the sensitivity analysis undertaken by the proponent by varying the hydraulic conductivity addresses the potential variability in the Rewan Formation, based on all currently known information.

Potential impacts—assessment findings

The 'worst-case' sensitivity analysis of potential impacts to the GAB spring wetlands TEC suggests that maximum impacts at the Doongmabulla Springs Complex could be up to around 1 m compared to up to around 0.2 m drawdown based on the calibrated or 'best estimate' parameter set. However, no assessment has been provided on what

⁵⁹ Heritage Computing, *Galilee Coal Project Groundwater Assessment for Waratah Coal Pty Ltd*, 2013.

⁶⁰ PA Domenico and FW Schwartz, *Physical and Chemical Hydrogeology*, John Wiley & Sons Inc, 1990.

⁶¹ Queensland Water Commission, *Underground Water Impact Report for the Surat Cumulative Management Area*, Queensland Water Commission, 2012.

impact a 1 m drawdown would mean for the environmental values of the GAB spring wetlands TEC.

Nonetheless, I consider that the worst case hydraulic conductivity values adopted for the sensitivity analysis are unlikely to represent actual hydraulic conductivity values of the Rewan Formation and I note that maximum impacts will not be reached until year 60 (end of mine life).

The Rewan Formation is generally accepted as a regional aquitard which prevents significant inter-aquifer transmission of water within and between basins). I therefore consider the risk of a significant level of impact to the GAB spring wetlands TEC to be low.

I acknowledge that there is uncertainty in predicting the extent of impacts on the GAB spring wetlands TEC. I therefore consider it necessary for the proponent to develop a comprehensive baseline dataset on the current condition of the springs prior to the commencement of mining activities. Monitoring and review of the collated data should continue throughout all stages of the project life (including post mine rehabilitation) and the predictive groundwater model should be reviewed and updated at regular intervals.

I have stated conditions for the project's draft EA which requires, prior to the commencement of activities that impact groundwater level or quality, the development and implementation of a baseline groundwater monitoring program (baseline groundwater flow monitoring to detect seasonal trends) based on an agreed groundwater monitoring network (Appendix 1, Schedule E) and a GDEMP (baseline ecological monitoring of the springs (Appendix 1, Schedule I). As groundwater related impacts to the project are an area of significant risk to MNES, the baseline groundwater monitoring program should also be referred to DE for review and approval.

To ensure the monitoring and review of collated data for the life of the mine, I have also stated conditions for the project's draft EA (conditions E4 and E5, Schedule E, Appendix 1) which require the development of a Groundwater Management and Monitoring Program for approval by the administering authority within six months of completing the baseline monitoring program (Condition E3, Schedule E, Appendix 1). The Groundwater Management and Monitoring Program must provide for, amongst other objectives:

- validation of the groundwater numerical model (including review of boundary and recharge conditions) to refine and confirm accuracy of predicted groundwater impacts
- groundwater level monitoring in all identified geological units present across and adjacent to the mine site to confirm existing groundwater flow patterns and monitor drawdown impacts
- identification of groundwater drawdown level thresholds for monitoring the impacts to GDEs, including the Doongmabulla Springs Complex
- identification and refinement of potential impacts on groundwater levels in the GAB Clematis Sandstone and Dunda Beds aquifers

- monitoring of geological units throughout all phases of project life, including for the period post closure in accordance with my rehabilitation requirements (refer to Appendix 1, Section 1, Attachment B: Rehabilitation Requirements)
- ensure that all potential groundwater impacts from mine dewatering and mine water and waste storage facilities (artificial recharge) are identified, mitigated and monitored.

I have also stated a condition (Appendix 1, Schedule E) which requires that the Groundwater Management and Monitoring Program be reviewed at five-yearly intervals, with a report provided on the outcome of the review to the administering authority for approval. As groundwater related impacts to the project are an area of significant risk to MNES, the Groundwater Management and Monitoring Program review should also be referred to DE for approval.

To ensure that the predictive groundwater model is reviewed and regularly updated based on the outcomes of the Groundwater Monitoring and Management Program, I have stated a condition for the draft EA (Appendix 1, Schedule E), which requires revision of the numerical groundwater model (referred to in the AEIS Appendix K1 and K6) based on transient calibration methods, including:

- review of the hydrogeological conceptualisation used in the previous model
- an update of the predicted impacts
- revised water balance model
- review of assumptions used in the previous model
- predictions of changes in groundwater levels for a range of scenarios
- information about any changes made since the previous model review, including data changes
- a report outlining the justification for the new model and the outputs of the new model
- an evaluation of the accuracy of the predicted changes in groundwater levels, groundwater flow rates to surface water and recommend actions to improve the accuracy of model predictions.

The review must be conducted within two years of commencement of any mining activities. I have stated a condition (Appendix 1, Schedule E) which requires that a report outlining the findings and any recommendations of the groundwater model review be submitted to the administering authority for approval no later than three months after the commencement of the model review. As groundwater related impacts to the project are an area of significant risk to MNES, the groundwater model review should also be referred to DE for review and approval.

Avoidance, mitigation and management measures

The proponent proposes to manage potential indirect impacts to the Doongmabulla Springs Complex primarily through ongoing investigation and monitoring, which will be implemented through the GDEMP (commitment M4.27). A draft version of this document, dated 11 February 2014, is available on the proponent's website.

The purpose of the GDEMP is to identify and describe actions necessary to prevent or minimise, to the greatest extent possible, impacts to the GDEs associated with the project, including the Doongmabulla Springs Complex. The draft GDEMP notes that monitoring data, collected as part of the groundwater monitoring program, will be used to set groundwater trigger levels. In the event that trigger levels (currently undefined) are exceeded, the draft GDEMP identifies that the following corrective actions would be implemented:

- repeat monitoring immediately on receiving non-compliant results
- if repeat results indicate persistent elevation, raise an incident report and commence incident investigation
- undertake corrective actions as identified in the incident investigation
- implement an adaptive monitoring program
- implement mine planning and rehabilitation mitigation measures.

Avoidance, mitigation and management measures—assessment findings

The draft GDEMP document inadequately describes specific, effective mitigation measures for the GAB spring wetlands TEC.

An adaptive management and monitoring approach, as outlined in the draft GDEMP, is appropriate however it must be supported by impact thresholds which will trigger the implementation of corrective measures for each of the GDEs and/or the provision of offsets. Impact thresholds, such as groundwater drawdown trigger level limits relevant to GDEs, have generally not been defined in the draft GDEMP.

The draft GDEMP fails to state the actions to be taken in the event that predicted impact levels are exceeded. The GDEMP should discuss the potential effectiveness of such measures during mining and post mine closure, taking into consideration the time lag between taking such action and any remedial effect at the Doongmabulla Springs Complex.

Impacts cannot be ‘managed’ by investigation and monitoring—only identified. In the absence of specified limits to change reasonably attributable to mine dewatering, monitoring may have no effect on the final outcome. There remains uncertainty in relation to how the spring communities and species will respond to the lowered groundwater pressure relative to natural variations.

I acknowledge that there is uncertainty in predicting the extent of indirect impacts on the GAB spring wetlands TEC. As noted above, I have stated a number of conditions for the project’s EA, which requires the development of a comprehensive baseline dataset on spring condition and ongoing monitoring and review.

I consider that there is opportunity for the proponent to research and identify specific measures to mitigate indirect impacts on the Doongmabulla Springs Complex based on the monitoring data collected. To ensure the development of appropriate and effective measures to mitigate, to the greatest extent possible, indirect impacts to the Doongmabulla Springs Complex, I have stated a condition for the draft EA which requires the development and implementation of a GDEMP prior to the commencement of activities that impact groundwater level or quality (Appendix 1, Schedule E).

The GDEMP must, amongst other objectives:

- identify specific mitigation measures to be undertaken to avoid, mitigate, manage and offset impacts to GDE environmental values, including the Doongmabulla Springs Complex, resulting from each stage of the project
- include the acquisition of ongoing condition data, the management of threats to defined environmental values and reporting of results and actions for each GDE over the full period of mining activities and a defined period post mining. The environmental values to be monitored must include, but are not limited to, groundwater level, groundwater and surface water quality, ecology, threatened species, and ecosystem function
- include detail on the effectiveness of avoidance, mitigation and management actions in curtailing adverse impacts on GDE ecosystems
- describe any adaptive management initiatives implemented.

To ensure the development of appropriate groundwater drawdown trigger level limits for the implementation of mitigation measures for the Doongmabulla Springs Complex, I have also stated a condition for the draft EA (Schedule E, Appendix 1).

This condition requires:

- the determination of groundwater level thresholds based on investigations required as part of the baseline groundwater monitoring program and groundwater management and monitoring program (conditions E3 and E4, respectively) and the refined groundwater modelling (Condition E6, Schedule E, Appendix 1)
- an investigation into the cause of groundwater level fluctuations in the event that identified groundwater level thresholds are exceeded (for example, to determine if the fluctuations are a result of mining activities authorised under the EA, pumping from licensed bores, seasonal variation or neighbouring land use resulting in groundwater impacts).

If the requisite investigation concludes that the trigger exceedance is the result of mining activities, I have stated a condition for the draft EA (Appendix 1, condition E14) which will require the proponent to notify the administering authority within 28 days of detection to determine:

- whether actual environmental harm has occurred or is likely to occur
- any proposed long-term mitigation measures required to address the affected groundwater resource
- proposed actions to reduce the potential for environmental harm.

My condition (Appendix 1, Schedule E, Condition E14) will also require the proponent to undertake an assessment of the indirect impact to SSBV, including the Doongmabulla Springs Complex.

Offsets

As no significant impacts to the GAB springs wetlands TEC are predicted, the proponent considers that offsets under the EPBC Act will not be required. The proponent notes that offsets may be considered in the event that future monitoring and

modelling suggest that impacts will be significant and mitigation and management measures are not feasible.

Offsets—assessment findings

The timing of the reassessment (of the need for offsets) and the definition of 'significant impact' are relevant to determining offset requirements. Clear timelines should be stated for defining significant impacts in terms of measurable indicators, for validation of the groundwater model, and for refinement of predicted impact. Offsets should be provided if residual impacts will be significant either during operation or post-closure and must be provided as early as possible to ensure that offsets, such as rehabilitation of degraded GAB spring wetlands, can be implemented.

I expect that the proponent will work directly with DE in order to progress its assessment of offsets against the Offsets Assessment Guide and to ensure compliance with the EPBC Act Offset Policy.

To ensure the provision of sufficient offsets for impacts on SSBV (including the Doongmabulla Springs Complex) for the project, I have stated conditions as part of Schedule I of the draft EA (Appendix 1), which will require the proponent to provide supplementary offsets for the impacted GDE, in the event that:

- groundwater fluctuations exceed the defined GDE groundwater drawdown trigger levels (Appendix 1, Schedule E, Condition E13)
- the trigger exceedance is determined to be the result of mining activities and impacts cannot be feasibly mitigated (Appendix 1, Schedule E, Condition E14).

My recommended condition for the development of an Offset Management Plan (Appendix 1, Section 2, Part A) for approval by the Commonwealth Minister for the Environment will ensure appropriate monitoring and management measures are implemented in offset areas to protect EPBC listed species and communities.

Should the Australian Government require an offset for the additional residual impacts on GDEs in accordance with the EPBC Act Offset Policy, I will not require any additional offsets for impacts on the same SSBV. The conditions stated in Schedule I of the draft EA will provide a mechanism to deliver the EPBC Act's offsets. It will be the proponent's responsibility to demonstrate that the loss of values being offset under the EPBC Act are the same as those identified through state offset requirements. See section 6.1 Matters of state environmental significance, for an explanation as to how I will deal with any State offset requirements once the EPBC Act offsets have been determined.

Conservation advice, recovery plans and TAPs

The National Recovery Plan for GAB spring wetlands aims to maintain or enhance groundwater supplies to GAB discharge spring wetlands, maintain or increase habitat area and health, and increase all populations of endemic organisms.

The recovery plan identifies seven key threats to GAB spring wetlands, including:

- (a) aquifer drawdown
- (b) excavation of springs

- (c) exotic plants
- (d) stock and feral animal disturbance
- (e) exotic aquatic animals
- (f) tourist access
- (g) impoundments.

There is one relevant TAP for the GAB spring wetlands TEC:

- *Treat Abatement Plan for predation, habitat degradation, competition and disease transmission by feral pigs*⁶² (feral pigs TAP)

The feral pigs TAP identifies five main objectives to manage the threat by feral pigs, including:

- preventing feral pigs from establishing in key areas
- integrating feral pig management plans into natural resource planning
- increasing awareness and understanding about the damage that feral pigs cause and management options
- quantifying the impacts feral pigs have on biodiversity
- improving the effectiveness, efficiency and humaneness of techniques and strategies for managing environmental damage due to feral pigs.

Feral pigs have been recorded in the project area and are identified by the proponent as a key threatening process to the Doongmabulla Springs Complex.

The national recovery plan identifies a number of actions as being required to recover this TEC, including (but not limited to):

- **spring flows and monitoring:** controlling flow from strategic bores; reviewing historic spring flows; monitoring current spring flows
- **monitoring endemic species in spring wetlands:** studying the interactions between native and exotic fauna; completing an inventory of endemic species in GAB springs; monitoring populations of endemic species.
- **protecting and managing spring wetlands:** fencing appropriate springs to exclude stock; controlling feral animals; preventing further spread of gambusia and other exotic fauna; implementing protocols to avoid transportation of organisms from one location to another; re-establishing the natural values of reactivated springs; and encouraging landholders to responsibly manage springs.

As noted above, the proponent has committed to a number of these measures, to be implemented through the proposed draft GDEMP.

I have stated a number of conditions for the draft EA which will result in the implementation of actions that are consistent with the national recovery plan. These include:

- baseline monitoring (prior to the commencement of mining activities that impact groundwater) and ongoing monitoring of groundwater level, groundwater and surface water quality, ecology, threatened species, and ecosystem function to

⁶² www.environment.gov.au/system/files/resources/eddf958-49e0-4c11-a994-68b113724b3a/files/feral-pig-tap.pdf

ensure that potential indirect impacts of mine dewatering are appropriately identified (Appendix 1, Schedule E)

- development of specific mitigation and management measures for the GAB springs wetland TEC, as part of the GDEMP, for threats posed by the project, including groundwater drawdown from mine dewatering (Appendix 1, Schedule I)
- an adaptive approach to the management of GAB spring wetlands, including the monitoring of groundwater fluctuations in proximity to GAB spring wetlands and the identification of groundwater drawdown trigger levels which will trigger the implementation of mitigation measures (Appendix 1, Schedule E)

To ensure the appropriate management of weeds and pest animals which maximises the ongoing protection and long-term conservation of EPBC listed species and communities within the project area, I have recommended a condition (Appendix 1, Section 2, Part A) for the Commonwealth Minister for the Environment to consider in any approval for the project. This condition would require the approval holder to submit an MMP for approval by the Commonwealth Minister for the Environment prior to the commencement of project construction. The MMP must:

- include a description of habitat and potential specific impacts to MNES and MNES habitat from each Project Stage
- include management measures that will be undertaken to avoid, mitigate and manage impacts from the project
- be consistent with relevant recovery plans, TAPs, conservation advice and project species management plans
- include a monitoring program to determine the success of mitigation and management measures.

Coordinator-General's conclusion—GAB springs

My requirement for the proponent to undertake baseline monitoring (prior to the commencement of activities that impact groundwater) and ongoing monitoring of GAB spring wetlands TEC (Appendix 1, Schedule E and Schedule I) will ensure that any indirect impacts to GAB spring wetlands are appropriately identified.

I have stated conditions (Appendix 1, Schedule E and Schedule I) requiring an adaptive approach to the management of GAB spring wetlands, including the monitoring of groundwater fluctuations in proximity to GAB spring wetlands and the identification of groundwater drawdown trigger levels which will trigger the implementation of corrective measures for each of the GDEs and/or the provision of offsets.

Impacts will be managed through the implementation of the GDEMP for which I have stated a condition as part of the project's draft EA (Appendix 1, Schedule I). This condition will ensure the development of specific mitigation and management measures for the GDE for threats posed by the project, including groundwater drawdown, weeds and feral pests where they represent a threat to the species on-site. The GDEMP must also be in accordance with relevant guidelines, policies and plans (for example, TAPs).

My recommended condition for the development of an MMP for approval by the Commonwealth Minister for the Environment (Appendix 1, Section 2, Part A) will ensure appropriate monitoring and management measures are implemented in order to protect EPBC listed species and communities, including the GAB springs wetland TEC.

In the event that groundwater fluctuations exceed the defined GDE groundwater drawdown trigger levels and the trigger exceedance is determined to be the result of mining activities and impacts cannot be feasibly mitigated, residual impacts of the project will be offset by protecting and enhancing habitat for the GAB spring wetlands TEC in accordance with my conditions stated for the draft EA (Appendix 1, Schedule E) and the EPBC Act Offsets Policy.

I consider that my recommended conditions of approval are consistent with the relevant TAP and national recovery plan for the GAB spring wetlands TEC. Considering the above, and assuming compliance with my recommending conditions, I am of the view that the project will not have an unacceptable impact on the GAB spring wetlands TEC.

I note that another spring group, the Mellaluka Springs Complex, is located near the south-eastern section of the mine area. AEIS Appendix H states that this spring group is not believed to be fed by a GAB aquifer, but rather an aquifer located in Permian strata. As a result, the proponent considers that this spring group cannot meet the criteria for designation as part of the GAB springs TEC and was not considered further by the proponent in its assessment of impacts to TECs. For my assessment of potential impact to the Mellaluka Springs Complex refer to section 5.1.7 of my report.

Threatened ecological communities—Brigalow

Description

The Brigalow TEC is listed as endangered under the EPBC Act. In the project area it corresponds to the REs 11.3.1, 11.4.8 and 11.4.9 which are all listed as endangered under Queensland's VM Act. The short descriptions for the REs are brigalow (*Acacia harpophylla*)/belah (*Casuarina cristata*) open forest, blackbutt (*Eucalyptus cambageana*) woodland to open forest with brigalow or blackwood (*Acacia argyrodendron*) and brigalow shrubby woodland with yellow wood (*Terminalia oblongata*) respectively.

Brigalow communities have been subject to broadscale clearing to create grasslands for grazing. Although clearing in Queensland is now controlled through the VM Act, previously cleared lands now largely support grazing activities and are unlikely to be returned to their former state. The approved conservation advice⁶³ for the Brigalow TEC states the community has become highly fragmented and declined to approximately 10 per cent of its original coverage across Queensland and New South Wales. Other threats listed in the advice include inappropriate fire regimes, weed and pest invasion, inappropriate grazing and climate change.

⁶³ Department of the Environment, Approved Conservation Advice for the Brigalow (*Acacia harpophylla* dominant and co-dominant) ecological community 17/12/2013

Extent and condition in project area

Survey effort

The flora surveys were comprised of a combination of rapid assessment sites and BioCondition assessments in representative areas expected to be cleared for the project. The random meander technique was also employed to target species that may not be sampled in surveyed quadrats or sample sites. The survey methods utilised are standardised ways of describing the floristic environment and detecting the presence of threatened flora species. Field surveys contributing to the assessment of the Brigalow TEC are detailed in Table 5.12.

Table 5.12 Surveys relevant to the assessment of the Brigalow TEC

Location	Survey type	Total survey effort	Timing
Mine	Terrestrial and aquatic flora surveys	60 terrestrial and 19 aquatic sites (spring)	November 2010 (spring)
		168 terrestrial and 17 aquatic site (autumn)	November 2011 (spring) April/May 2011 (autumn)
	Doongmabulla and Mellaluka Springs survey	Unstructured, opportunistic survey	May 2012 (autumn) March/April 2012 (autumn)
Rail	Terrestrial and aquatic flora surveys	24 terrestrial and 3 aquatic sites (autumn)	May 2011 (autumn)
		24 terrestrial and 1 aquatic site (spring)	September 2011 (spring)
	Assessment for Property Maps of Assessable Vegetation	Undisclosed number of sites along the rail corridor	June/July 2012 (winter)
Off-lease infrastructure	Terrestrial and aquatic habitat rapid assessment	Unstructured, opportunistic survey	June 2012 (winter)
	Terrestrial ecology survey	49 flora sites 12 aquatic sites	April/May 2013 (autumn)
	BioCondition assessment	10 sites	April/May 2013 (autumn)
	Assessment for Property Maps of Assessable Vegetation and Property Vegetation Management Plan	49 flora sites	April/May 2013 (autumn)
Quarries	MNES survey	5 sites	January/February 2013 (summer)
			March 2013 (autumn)
			July 2013 (winter)

Results of field surveys

The surveys determined the REs corresponding to the Brigalow TEC are present within the rail study area, the mine study area and in small patches in the off-lease infrastructure area. Most of the Brigalow TEC along the rail alignment is located between the mine and the Gregory Development Road with several patches occurring near Diamond Creek, Mistake Creek and the Belyando River. On the mine site, the majority of the Brigalow TEC is in good condition and located south of the Carmichael River within a generally contiguous tract of vegetation. The proponent considers this tract likely to be comprised of a number of REs mapped in mixed polygons, rather than a continuous tract of the Brigalow TEC. Highly fragmented patches in poorer condition

are also present north of the Carmichael River. Small patches in mixed polygons with eucalypt woodland REs were mapped and noted to be in a moderate condition due to clearing, weed invasion and cattle disturbances. The distribution of the Brigalow TEC on the mine site is illustrated in Figure 5.19.

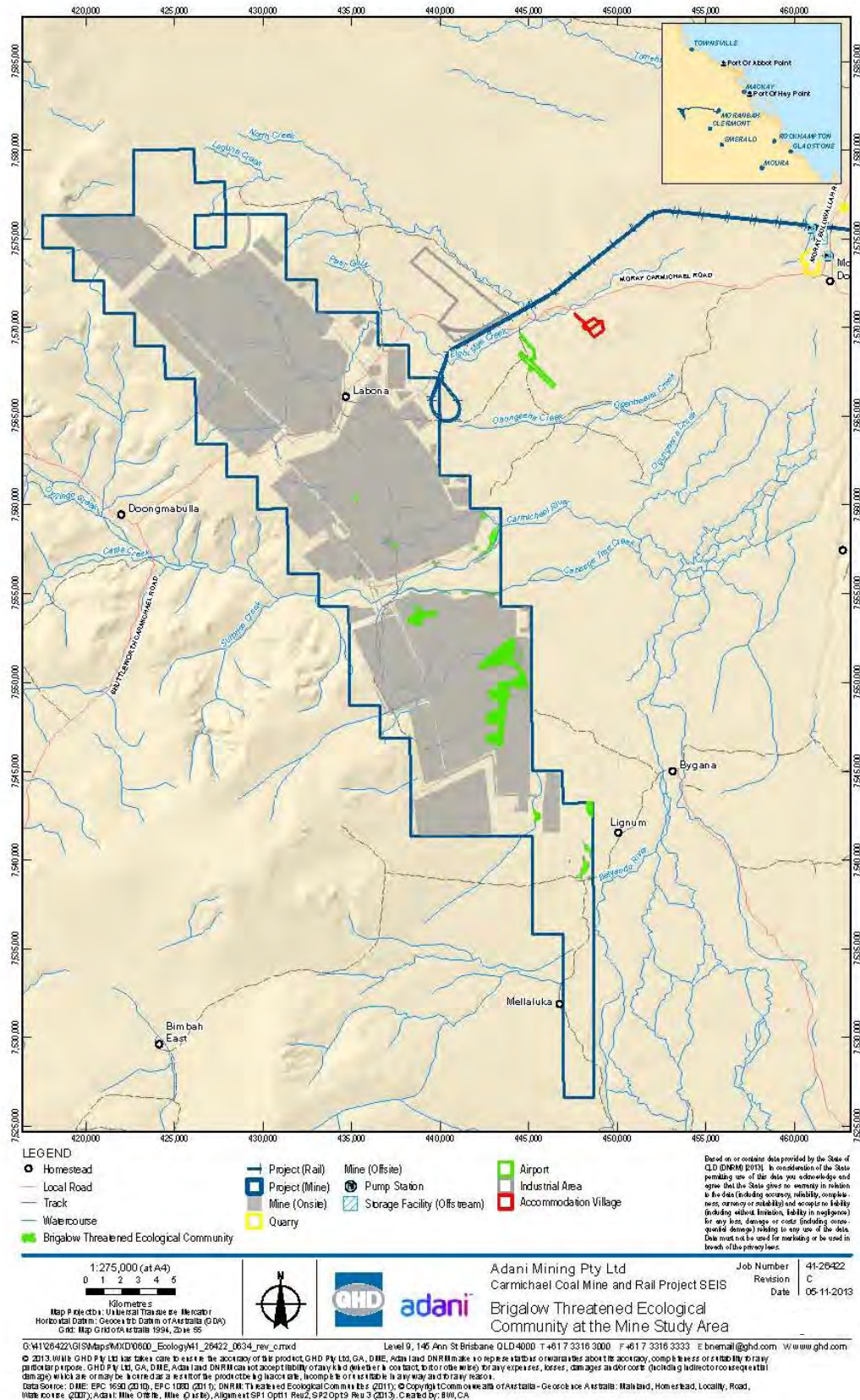


Figure 5.19 Brigalow TEC on the mine site

Impacts and mitigation measures

Impacts

Clearing requirements for each project component are detailed in Table 5.13. The Brigalow TEC along the rail alignment is highly fragmented and generally confined to waterways; approximately 27 ha of the community will be cleared within the rail corridor. The large patch located south of the Carmichael River on the mine site will account for the majority of the clearing to facilitate mining and stockpiling works. In addition, approximately 3 ha will be affected by subsidence. The affected area is mapped by the proponent as a low impact area, meaning that the landform will subside by less than 5 m (the change in slope will be less than 2 per cent), any cracking will be less than 100 mm in width and the duration of any ponding will be less than 2 days. Clearing of this community is scheduled to occur late in the operational phase of the project, several decades after operations commence.

Table 5.13 Impacts to the Brigalow TEC

Project component	Impact area (ha)
Rail	26.66
Off-lease	0
Mine	249.19
Mine subsidence	3
Total	278.85

Mitigation

Vegetation clearing is an unavoidable impact of the project. Where possible, the project footprint has been located in areas already cleared to minimise impacts to native vegetation and the Brigalow TEC. Unavoidable impacts to matters protected under the EPBC Act, such as the Brigalow TC, will require an offset. Mitigation measures addressing the recovery actions proposed in the recovery plan for the Brigalow endangered ecological community⁶⁴ include:

- facilitating the restoration of degraded remnants
- establishing regional benchmarks for habitat condition
- establishing and implementing pest plans for key areas of the ecological community
- establishing and implementing fire reduction plans for key areas of the ecological community.

General mitigation measures have been proposed by the proponent to preserve ecological integrity and to address priority threat abatement actions listed in the approved conservation advice. These measures will also address impacts to other MNES and MSES and include:

- management of weeds and pests (commitments P6.71 and P6.72)

⁶⁴ DW Butler, *Recovery plan for the "Brigalow (Acacia harpophylla dominant and co-dominant" endangered ecological community* (draft of 1 May 2007). Report to the Department of the Environment and Water Resources, Canberra. Queensland National Parks and Wildlife Service, Brisbane, 2007.

- management of fire regimes (commitment P6.75)
- restricting the extent of vegetation clearing to the minimal amount necessary (commitment M4.17)
- subsidence management (commitment M3.16)
- removal of cattle or the implementation of ecologically sensitive grazing strategies to return non-remnant areas to remnant (commitment M4.15)
- implementing sediment and erosion controls (commitment 6.73)
- pollution controls (commitment P6.6).

Localised impacts to the community will be realised with the project's construction and operation; however, with the implementation of mitigation measures and offsets, significant impacts at the subregional scale are not anticipated.

Offsets

The total offset requirement for the project will be 275.85 ha, comprising 249.19 ha on the mine and 26.66 ha for the rail. An offset is not proposed for the 3 ha affected by low impact subsidence. The availability of suitable offset areas is estimated at 5077 ha; the proponent considers direct land-based offsets can be delivered for this community.

Coordinator-General's conclusion

I am satisfied that the mitigation measures outlined by the proponent can adequately address the potential impacts of the project to the Brigalow TEC. To ensure this, I have recommended a condition of approval to the Commonwealth Environment Minister for the development of an MMP (Appendix 1, Section 2, Part A) requiring the development and implementation of appropriate mitigation and management measures to protect MNES, including the Brigalow TEC.

My recommended condition for the development of an Offset Management Plan (Appendix 1, Section 2, Part A) for approval by the Commonwealth Minister for the Environment will ensure appropriate monitoring and management measures are implemented in offset areas to protect EPBC listed species and communities consistent with the residual impact areas for the subspecies shown in 0.

I note that the revised Environmental Offset Package (March 2014) indicates the five offset properties contain approximately 5077 ha of potential offset areas for the Brigalow TEC.

5.1.2 Listed migratory species (sections 20 & 20A)

An assessment of migratory species potentially occurring within the project area was undertaken encompassing the mine and rail study areas (AEIS, Volume 4, Appendix H). The assessment comprised desktop searches, field surveys and a likelihood of occurrence analysis, based on species habitat preferences, distribution, relative abundance and previous records from the region. Migratory species that were either confirmed present during field surveys or determined likely to occur are detailed in Table 5.14. The status of the listed migratory species under the Bonn Convention, the Japan–Australia Migratory Bird Agreement (JAMBA), the China–Australia Migratory

Bird Agreement (CAMBA) and the Republic of Korea–Australia Migratory Bird Agreement (ROKAMBA) is also listed in Table 5.14.

Table 5.14 Listed migratory species confirmed present or likely to occur

Common name	Scientific name	EPBC Act status	Likelihood of occurrence	
			Mine	Rail
Eastern great egret	<i>Ardea modesta</i>	migratory (CAMBA, JAMBA, ROKAMBA), marine	Confirmed present	Confirmed present
Satin flycatcher	<i>Myiagra cyanoleuca</i>	migratory (Bonn), marine	Confirmed present	Likely
Rainbow bee-eater	<i>Merops ornatus</i>	migratory (JAMBA), marine	Confirmed present	Confirmed present
White-bellied sea-eagle	<i>Haliaeetus leucogaster</i>	migratory (CAMBA), marine	Likely	Confirmed present during quarry surveys
Common sandpiper	<i>Actitis hypoleucos</i>	migratory (Bonn, CAMBA, JAMBA, ROKAMBA), marine	Likely	Unlikely
Fork-tailed swift	<i>Apus pacificus</i>	migratory (CAMBA, JAMBA, ROKAMBA), marine	Likely	May occur
Curlew sandpiper	<i>Calidris ferruginea</i>	migratory (Bonn, CAMBA, JAMBA, ROKAMBA), marine	Likely	Unlikely
Latham's snipe	<i>Gallinago hardwickii</i>	migratory (Bonn, CAMBA, JAMBA, ROKAMBA), marine	Likely	May occur
White-throated needletail	<i>Hirundapus caudacutus</i>	migratory (CAMBA, JAMBA, ROKAMBA), marine	Likely	Likely
Caspian tern	<i>Hydroprogne caspia</i>	migratory (CAMBA, JAMBA), marine	Likely	Unlikely
Black-tailed godwit	<i>Limosa limosa</i>	migratory (Bonn, CAMBA, JAMBA, ROKAMBA), marine	Likely	Unlikely
Glossy ibis	<i>Plegadis falcinellus</i>	migratory (Bonn, CAMBA), marine	Likely	Likely
Common greenshank	<i>Tringa nebularia</i>	migratory (Bonn, CAMBA, JAMBA, ROKAMBA), marine	Likely	Unlikely
Marsh sandpiper	<i>Tringa stagnatilis</i>	migratory (Bonn, CAMBA, JAMBA, ROKAMBA), marine	Likely	Unlikely

Species confirmed present

Eastern great egret

The eastern great egret (*Ardea modesta*) was confirmed present on both the mine and rail study areas. It was recorded on four occasions during three different surveys of the mine site and once during the September 2011 survey of the rail alignment. It was generally observed at farm dams from sightings of a single bird to groups of 10 birds. Suitable habitat in the study area, such as fringing open forest or woodland habitat and natural and artificial water bodies, is likely to be used on a temporary to permanent basis by the species and is also considered likely to occur over much of the surrounding landscape. The eastern great egret is common and widespread throughout Australia and southern and eastern Asia. The breeding season is influenced by rainfall and generally occurs in timbered and shrubby swamps. Threatening processes include the loss and degradation of habitat through alteration of water flows, burning of wetland vegetation used as nest sites and weed invasion. Land clearing for the project will result in the loss of approximately 20 ha of habitat and 12 permanent dams in the mine area. Approximately 300 ha of habitat will be lost in the rail corridor.

Rainbow bee-eater

The rainbow bee-eater (*Merops ornatus*) was recorded on both the mine and rail study areas. It was recorded on seven occasions during three surveys of the mine area and on one occasion during the September 2011 survey of the rail alignment and at the North Creek, Back Creek and Disney Quarries. The species was typically observed within open woodland and riparian habitats in groups ranging from a single bird up to approximately 60 birds. It is commonly observed in disturbed habitats and all habitat types in the study area are considered to provide suitable habitat for the species on a temporary to permanent basis. Several burrows, likely to be nesting sites of the rainbow bee-eater, were observed in an artificial soil mound at North Creek Quarry. This species is widespread throughout Australia, eastern Indonesia, eastern Papua New Guinea and the Bismarck Archipelago. Its breeding season in Australia occurs from August to January. The only identified threat to the species is the cane toad which feeds on eggs and nestlings. Land clearing for the project will result in the progressive loss of approximately 10 756 ha of habitat for the species in the mine area and 2703 ha in the rail corridor.

Satin flycatcher

Satin flycatchers (*Myiagra cyanoleuca*) were recorded on two occasions during the November 2010 and November 2011 surveys of the mine site. Two individuals were observed within open woodland and farm dam habitats during each survey. Satin flycatchers are an insectivorous woodland bird and return to the same location to breed each year, during summer months. They are widespread in eastern Australia and vagrant to New Zealand. In central Queensland, the species is most common in coastal areas but can be found across the Great Dividing Range and occasionally further west. Habitat favoured by the species includes heavily vegetated gullies in forests, tall woodlands and tall trees in open country along eastern Australia. The main threat to the species is the loss of mature forests in south-eastern Australia. Land clearing for

the project will result in the loss of approximately 5 ha of habitat on the mine and 361 ha in the rail corridor.

White-bellied sea eagle

An incidental recording of a white-bellied sea eagle (*Haliaeetus leucogaster*) was made during the July 2013 survey of the quarries. It was recorded in habitat close to the Belyando River. The EIS noted no suitable habitat for the species is present in the quarry areas. It generally occurs in coastal areas but can range further inland along larger rivers and may be restricted to large waterholes in the region where it can forage for fish, its primary food source. Approximately 20 ha of habitat and at least 12 permanent dams will be lost on the mine site and an addition 61 ha and two dams will be lost in the rail corridor.

Species likely to occur

Suitable habitat types for listed migratory species considered likely to occur in the study area are located across the project study areas. The proponent has identified habitat most likely to support the highest diversity of migratory species as:

- fringing open forest and woodland
- natural and artificial water bodies
- eucalypt open woodland.

Approximately 10 514 ha of habitat for the fork-tailed swift (*Apus pacificus*) and white-throated needle tail (*Hirundapus caudacutus*) will be progressively cleared with an additional 2703 ha of white-throated needle tail habitat cleared for the railway. For all other species listed in Table 5.14 that are likely to occur in the project area, between 20 and 27 ha of habitat will be cleared on the mine site including the loss of at least 12 permanent dams. An additional 143 ha of habitat suitable for Latham's snipe (*Gallinago hardwickii*) will also be cleared in the rail corridor.

Threatening processes common to these species include loss of habitat, habitat fragmentation and degradation, alteration of surface water flows, invasion of weeds and predation by feral animals.

Impacts

Potential impacts of the project on listed migratory species identified in the EIS include:

- habitat loss, including the loss of Brigalow Dam within the mine infrastructure footprint
- habitat fragmentation and degradation
- changes to surface water flows, aquatic habitat and terrestrial habitat from groundwater drawdown
- erosion and sedimentation
- weed and pest invasion
- altered fire regimes
- disturbance and displacement through operational impacts such as noise, light and dust

- injury or mortality.

Mitigation measures

Impacts to potential habitat for migratory species in the project area will be managed through a range of measures identified in the AEIS (Volume 4, Appendix H) including:

- construction of new water storage dams (AEIS Volume 4, Appendix H, Section 5.1.2.3)
- progressive rehabilitation of disturbed areas (commitments R1.2, R3.4 and M3.30)
- limiting lighting of the rail corridor—only the balloon loop and maintenance facility will be lit (commitment R3.2 and AEIS Volume 4, Appendix H, Section 5.1.2.2)
- sequential clearing of habitat (commitment P6.16)
- the use of a fauna-spotter during clearing activities (commitment P6.2)
- waste management (commitment P6.6)
- fire management (commitment P6.75)
- weed and pest management to reduce predation and degradation of foraging and breeding areas (commitments P6.71 and P6.72)
- erosion and sediment controls (commitment P6.73)
- selecting watercourse crossing locations to minimise disturbance (AEIS Volume 4, Appendix H, Section 5.1.2.3)
- targeted management of riparian habitat adjacent to the clearing footprint (AEIS Volume 4, Appendix H, Section 5.2.8).

The mitigation measures will be implemented through a number of management plans including:

- Project Weed and Pest Management Plan (weeds) (commitment P6.71)
- Project Weed and Pest Management Plan (introduced animals) (commitment P6.72)
- Project Land Management (Flora and Fauna) Plan (commitment P6.68)
- Project Vegetation Management Plan (commitment P6.69)
- SMP (commitment M3.16)
- Project Erosion and Sediment Management Plan (commitment P6.73)
- Closure and Rehabilitation Strategy – Mine and Off lease (commitment P6.76)
- Project (Mine and Off-lease Infrastructure) Bushfire Management Plan (commitment P6.75).

For those species confirmed present, namely the eastern great egret, rainbow bee-eater, satin flycatcher and the white-bellied sea eagle, the proponent has determined that the habitat in the project area does not constitute ‘important habitat’ as defined in the Significant Impact Guidelines as it is not:

- utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of a species
- of critical importance to the species at particular life-cycle stages
- utilised by a migratory species which is at the limit of the species’ range

- within an area where the species is declining
- disruptive to a significant proportion of the total populations.

For the species assessed as likely to occur but were not recorded during the field surveys, the proponent also considers that the project area does not constitute 'important habitat' as defined in the Significant Impact Guidelines.

I note the proponent has determined that the project will not have a significant impact on migratory species and has proposed not to offset the habitat that will be cleared or affected by subsidence. However, the properties described in the revised Environmental Offset Package (March 2014) contain approximately 16 028 ha of potential habitat suitable for the species.

Coordinator-General's conclusion

I am satisfied that the mitigation measures outlined by the proponent can adequately address the potential impacts of the project on migratory species that may utilise the project area. To ensure this, I have recommended a condition of approval to the Commonwealth Minister for the Environment for the development of an MMP (Appendix 1, Section 2, Part A) requiring the development and implementation of appropriate mitigation and management measures to protect MNES, including migratory species.

Predicted residual impacts on migratory species are listed in Table 5.1. This information will be applied by DE to the EPBC Offsets Guide to determine offset requirements.

5.1.3 World heritage properties (sections 12 & 15A)

As part of the MNES assessment, the proponent undertook a search on the former SEWPaC's Protected Matters Search Tool which identified the two closest world heritage properties to the project area:

- the Wet Tropics World Heritage Area (WTWHA), located approximately 272 km north of the project
- the Great Barrier Reef World Heritage Area (GBRWHA), located over 200 km east and approximately 320 km upstream of the project.

Based on the distance between the WTWHA and the project site as well as the proponent's determination of the lack of direct terrestrial or aquatic links between the two areas, the WTWHA has been excluded from my evaluation of impacts to world heritage properties.

Great Barrier Reef World Heritage Area

The GBRWHA spans more than 348 000 km² of the continental shelf of Queensland, from the tip of Cape York to just north of Bundaberg. The area was inscribed on the World Heritage List in 1981 for its management regime, ecological integrity and capacity to meet all four of the natural criteria specified in the Operational Guidelines

for the Implementation of the World Heritage Convention⁶⁵ for Outstanding Universal Value⁶⁶ (OUV):

- criterion vii: contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance
- criterion viii: be outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features
- criterion ix: be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals
- criterion x: contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation.

Impacts and mitigation measures

Mine site

The Carmichael River, which transects the mining lease, joins a network of river systems within the Belyando River catchment. This catchment forms part of the Burdekin River Basin which discharges through the Burdekin Falls Dam to the coast at Upstart Bay within the GBRWHA. The proponent has determined that due to the significant distance between the mining lease area and the coast, the construction and operation of the mine is unlikely to have a direct impact on the OUV of the GBRWHA. However, there are three potential sources of indirect impacts that could occur via the approximately 320 km river pathway:

- release of MAW from the site—this could reduce quality of downstream waters through contamination by hydrocarbons, metals and waste materials
- stormwater run-off and increased flow velocity across disturbed areas—this could mobilise sediments leading to higher levels of sedimentation, turbidity and contamination in downstream waters
- reduction in downstream flow from extraction of water resources and loss of catchment area—this could potentially increase concentrations of existing contaminants in downstream waters.

Release of mine affected water

The proponent has considered that all drainage run-off from the disturbed areas of the mine site will be treated as MAW. To ensure no adverse impacts occur in surrounding waterways as a result of MAW contamination, the proponent will establish the following water management structures and systems as a priority during project construction:

⁶⁵ United Nations Educational, Scientific and Cultural Organisation, *Operational Guidelines for the Implementation of the World Heritage Convention*, UNESCO World Heritage Centre, Paris, 2012.

⁶⁶ For the Statement of Outstanding Universal Value for the GBRWHA, refer to www.environment.gov.au/topics/heritage/heritage-places/world-heritage-list/gbr/world-heritage-values

- diversion drains (to a 100-year ARI standard) with flood protection levees to divert clean water from upstream catchments around the mine site to downstream waterways, installed with appropriate erosion and scour controls
- dams for storage of MAW and release as necessary in accordance with EA conditions
- sediment ponds where sediment affected stormwater will be captured and left to evaporate or pumped to MAW storage dams.

The proponent has completed an assessment of the proposed regulated structures, including MAW storages, against the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures.⁶⁷ This assessment has informed the conditioning of regulated structures as part of the draft EA (Appendix 1, Schedule K) which ensures that the structures are designed to accommodate extreme weather events and no inundation and/or overflow occurs. The conditions specify the design requirements and hydraulic performance criteria that must be addressed as part of the detailed design, construction and operation of regulated structures as well as mandatory reporting levels and inspection requirements. This will ensure all MAW storages are of sufficient capacity so that no downstream impacts occur either immediately adjacent to the mine site or in the GBRWHA.

The proponent has committed to minimise overflow risk in extreme inundation events through moving of water between dams, treatment of MAW and installation of a spillway discharge diversion separate to the clean water system for controlled discharge into streams (commitment M5.32). Diversion drains and discharge points to downstream waters will be monitored during the wet season to identify scouring, instability or erosion and corrective actions will be implemented (commitment P6.69). All discharge and overflow events will be undertaken in controlled circumstances in accordance with the provisions of my stated conditions for surface water (Appendix 1, Schedule F), as discussed below.

Release to internal water management infrastructure

I note that the proponent's water balance model (February 2014) indicates the proponent's preference for stored MAW to be reused in the CHPP and for dust suppression and other management activities as part of the Mine Water Management System.

The conditions in Appendix 1, Schedule F permit the release of MAW to internal water management infrastructure, provided it is undertaken in accordance with a Water Management Plan developed by an appropriately qualified person. MAW may be transferred, stored and utilised so long as this does not contravene any draft EA conditions. I note that sewage effluent from the mine site will not be released into surrounding waters and will be treated on site with package STPs to Class A+ standard (commitment M3.26). The conditions of the draft EA (Appendix 1, Schedule G) permit this to be released into MAW storages in compliance with specified release limits and monitoring requirements. Chemicals and flammable or combustible liquids will also be regulated under the draft EA (Appendix 1, Schedule H) and will be contained within an

⁶⁷ Department of Environment and Heritage Protection, *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures*, State of Queensland – Department of Environment and Heritage Protection, Brisbane, 2013.

on-site containment system and controlled in accordance with *AS 1940 – Storage and Handling of Flammable and Combustible Liquids*. These conditions and proponent commitments will ensure any contaminated water leaving the mine site will not affect water quality values and not impact the GBRWHA.

Release to external waters

For release of MAW to external waters, the conditions (Appendix 1, Schedule F) provide specific sources, release points, maximum release rates, receiving waters, monitoring points and trigger levels. The proponent must always notify the administering authority prior to, and at the cease of, water release events.

Monitoring of released MAW quantity and various water quality characteristics must be undertaken by an appropriately qualified person in accordance with specified frequencies and trigger investigation levels. In the event that a release trigger level exceedance is identified, the proponent must compare downstream waters against specified trigger levels. Where these are greater than baseline monitoring, the proponent must notify the administering authority and provide an investigation report outlining details of investigations and associated corrective actions.

The conditions require the proponent to develop and implement a Receiving Environment Monitoring Program for the Carmichael River and surrounding waters within 12 km downstream (including the Belyando River). This will be used to monitor, identify and describe any adverse impacts to surface water environmental values, quality and flows as a result of the authorised mining activity. The findings of this plan, including background water quality, downstream water quality and suitability of discharge limits, must be reported and provided to the administering authority annually.

The conditions also ensure that releases of MAW are undertaken in a manner that does not cause erosion of the bed and banks of receiving waters or cause increased sedimentation.

Stormwater run-off across disturbed areas

Inflow of freshwater and sediments into the GBRWHA is naturally occurring through seasonal rainfall events and is important in the area's biogeochemical cycles. However, anthropogenic land-based activities can increase the amount of sedimentation, turbidity and contamination if this run-off occurs across disturbed areas. Given the extent of disturbance proposed, there is potential for stormwater to become contaminated with higher levels of suspended sediment as it crosses the mine site and travels downstream to the GBRWHA.

The proponent's MNES report (AEIS, Volume 4, Appendix H) states that the Burdekin River Basin is the largest contributor of sediment to the GBRWHA. Over 80 per cent of sediment run-off from the Burdekin River Basin is intercepted by the Burdekin Falls Dam (Lake Dalrymple). The Belyando River catchment contributes up to 11 per cent of sediments deposited in the Burdekin Falls Dam.

Given that the mine area catchment makes up only 1.4 per cent of the Belyando River catchment, it is unlikely that any potential changes to sedimentation, turbidity and contamination levels in the mine area will be detectable in the GBRWHA as a result of mining activities.

Nevertheless, the proponent has provided mitigation measures to limit any potential degradation of downstream aquatic habitat from stormwater run-off across the mine disturbance areas as part of the Proponent Commitments Register (Appendix 7) and the project EMPs (March 2014). These measures relate predominantly to reducing mobilisation of sediments and pollutants and diverting stormwater flows and include, but are not limited to:

- ensuring construction of stormwater flow paths and dams does not commence until suitable diversion and management of watercourse flows is achieved (commitment P6.18)
- installing stormwater collection systems at the mine infrastructure area, MWAV, industrial precinct and airport (commitments M1.8 and M4.7)
- constructing sediment basins prior to operations to treat stormwater run-off (commitment M1.31)
- establishing diversion drains to prevent water from undisturbed areas entering the sediment basins (commitment M1.31)
- installing sediment fences and other erosion control measures, particularly in areas near earthworks, watercourses and key stormwater flow paths (commitment M4.6)
- ensuring contaminated materials are placed so that the likelihood of contact with run-off is be reduced (commitment M3.23)
- ensuring vegetation is not cleared during overland flow events or wet conditions (commitment M4.6)
- ensuring stockpiles of soil and mulch are located away from stormwater paths and watercourses (commitment M4.6)
- incorporating monitoring requirements into a Water Quality Management Plan including checks of:
 - erosion and sediment control devices
 - fuel, chemical and waste storage areas
 - local meteorology conditions
 - streams for scouring and sediment deposition
 - water quality (commitments P6.17, P6.21 and M4.14)
- developing and implementing a spill response plan and ensuring spill kits are readily available across the project area (commitments R11.17-R11.21, M4.6 and M11.16)
- ensuring appropriate management of all wastes through a Waste and Resource Management Plan (commitment P6.64).

The above mitigation measures will reduce the likelihood of exacerbated levels of contaminants or suspended solids entering in the mine area catchment which will also decrease sedimentation entering the Carmichael and Belyando river catchments and subsequently the Burdekin River Basin and Burdekin Falls Dam, thereby preventing any potential impacts to the waters entering the GBRWHA through Upstart Bay.

In order to supplement that proponent's proposed mitigation measures, I have stated conditions relating to stormwater and sediment controls. The conditions, as outlined in Appendix 1, Schedule F, will limit contamination of stormwater run-off from erosion and

release of sediment through an Erosion and Sediment Control Plan. The conditions permit the release of stormwater from erosion and sediment control structures in accordance with the Erosion and Sediment Control Plan, and from water management infrastructure in accordance with the Water Management Plan, so long as it is not MAW.

Reduction in downstream flow from extraction of water resources

Water required for the project will be predominantly sourced from pit dewatering in accordance with the statutory requirements of a water licence. I note that the proponent's MNES assessment (AEIS, Volume 4, Appendix H) states that extraction of groundwater will not have a notable impact on the GBRWHA hydrogeological regime or values as there are significant groundwater recharge systems between the project site and the coast which are not dependent on the groundwater systems surrounding the mine site.

The proponent's groundwater model (AEIS, Volume 4, appendices K1 and K6) concluded that groundwater drawdown will decrease base flow in the Carmichael River across the mine area by 33 per cent at the end of the mine life. This could potentially increase concentrations of existing contaminants in aquatic habitats downstream which connect to the GBRWHA. Similarly, the proponent's MNES report (AEIS, Volume 4, Appendix H) states that the construction and operation of the mine will progressively reduce the size of the mine area catchment by 25 per cent. However, given that this catchment makes up only 0.44 per cent of the Burdekin Basin, it is likely that water from other catchments will provide a significant dilution factor and therefore concentrations of contaminants in the GBRWHA would not likely increase as a result of the project.

For further information on impacts to water resources, refer to section 5.1.7 of this report.

Off-lease infrastructure and rail

The construction and operation of the off-lease infrastructure area and rail components of the project are unlikely to result in a direct impact to the OUV of the GBRWHA due to the significant distance between the project location and the coast. Activities which could potentially result in an indirect impact of water contamination in the GBRWHA via an extensive river pathway include:

- release of sewage effluent—this could result in decreased water quality of downstream waters
- release of chemicals, flammable or combustible liquids—this could result in decreased water quality of downstream waters
- run-off of stormwater across disturbed areas—this could mobilise sediments leading to higher levels of sedimentation, turbidity and contamination in downstream waters.

These activities will be regulated in a controlled environment in accordance with my conditions for the off-lease area and the rail (Appendix 2) through an MCU or development approval conditions.

Release of sewage effluent

As discussed for the mine site, the proponent has committed to treat sewage effluent to Class A+ standard (commitment P6.23). The treatment of sewage in the off-lease and rail components is managed under ERA 63 of the EP Act which requires an EA. Conditions stated for these sewage treatment activities are included in Appendix 2, Section 1, Part B and outline requirements that the proponent must operate under to ensure no water contamination occurs in adjacent waters or in the GBRWHA. This includes appropriate storage and release methods so that no infiltration to groundwater and subsurface flows of contaminants to surface waters will occur.

Release of chemicals, flammable or combustible liquids

The proponent will ensure that all activities throughout the off-lease area and railway are carried out in accordance with the WHS Act, which provides for the regulation of dangerous goods in Queensland. The proponent has committed to develop and implement a project-wide Hazardous Substances Management Plan which will outline the storage and handling requirements for hazardous materials in order to minimise accidental release of contaminants to the greatest extent possible (commitment P6.64). In the unlikely event of a spillage, a Spill Response Plan for both the off-lease and rail components will be implemented and emergency services and DEHP will be notified (commitments R11.17, R11.18, M11.13 and M11.14). All substances will be prevented from entering drains and/or watercourses through the use of absorbent materials which a licensed contractor will remove and dispose of (commitments R11.21, R11.20 and M11.16).

To supplement these measures, my conditions (Appendix 2, Section 1, Part A) ensure that all chemicals and flammable or combustible liquids are contained on site within a containment system and controlled in a manner in accordance with the relevant Australian Standards. This will prevent water contamination adjacent to the mine site and in the GBRWHA.

Run-off of stormwater across disturbed areas

To reduce potential sedimentation of waters resulting from stormwater run-off across disturbed areas at the off-lease infrastructure area, the proponent has committed to develop and implement an Erosion and Sediment Control Plan (commitment P6.63). This will include a range of mitigation measures including the implementation of sediment fences and, for larger areas, sediment basins (commitment M3.12). Stormwater monitoring will be undertaken and include checks of erosion and sediment control devices prior to rain events, inspections of streams for sediment deposition and ongoing water quality monitoring (commitment M4.14).

For the rail component, the proponent has committed to develop and implement a detailed Erosion and Sediment Control Plan prior to earthworks, to minimise erosion and avoid sedimentation of watercourses and existing water storages (commitment R3.8). This will identify control practices for all project phases as well as performance criteria, monitoring and corrective actions. Control measures include, but are not limited to sediment fences, wing walls on embankments, shotcrete and rip-rap or gabion bed protection in watercourses (commitment R5.2).

The conditions and recommendations I have included in Appendix 2, Section 1 and Appendix 2, Section 2 require the proponent to prepare and document environmental protection measures which will be applied throughout the construction and operations phases. This includes:

- measures to minimise stormwater entry onto significantly disturbed land and sediment
- erosion control measures to prevent soil loss and deposition beyond significantly disturbed land
- management of contaminated stormwater so no environmental harm occurs.

Coordinator-General's conclusion—world heritage properties

Based on the mitigation measures committed to by the proponent, the comprehensive conditions I have stated to protect water quality leaving the mine site (Appendix 1, Schedule F), conditions and recommendations I have set for appropriate environmental management of the off-lease infrastructure area and rail (Appendix 2, Section 1 and Appendix 2, Section 2) and the significant distance between the mining lease and the GBRWHA, I consider that the project will not have an unacceptable impact on the OUV of the GBRWHA, as defined below.

Criterion vii

Given the expanses of terrestrial and aquatic habitat that disconnect the project area with the GBRWHA physically, hydrologically, hydrogeologically and visually, I consider that the visual amenity (above and below ocean surface), seabirds, dugongs, whales, dolphins or marine turtles will unlikely be affected.

Therefore, I consider that based on the statement of OUV for the GBRWHA adopted by the UNESCO World Heritage Committee, I am satisfied that no unacceptable impacts to the OUV for criterion vii will occur as a result of the project.

Criterion viii

The mine, off-lease and rail components of the project do not propose shipping, anchoring of vessels, dredging or sediment movement and thus the project is unlikely to impact on coral or marine hydrodynamic processes within the GBRWHA. Proponent commitments and my conditions, as discussed above, will provide for effective sediment control and contaminant levels to ensure no adverse impacts occur as a result of the project. Consequential project impacts associated with dredging and/or shipping at the Port of Abbot Point Coal Terminal⁶⁸ have been assessed as a separate project proposal under the EPBC Act.

Therefore, I consider that based on the statement of OUV for the GBRWHA adopted by the UNESCO World Heritage Committee, I am satisfied that the no unacceptable impacts to the OUV for criterion viii will occur as a result of the project.

⁶⁸ This project was granted conditional approval in November 2013. For a copy of Commonwealth Minister for the Environment's decision notice, conditions, recommendation report and other assessment documentation, refer to www.environment.gov.au/cgi-bin/epbc/epbc_ap.pl?name=current_referral_detail&proposal_id=6194

Criterion ix

The mine, off-lease and rail components do not propose shipping, anchoring of vessels, dredging or sediment movement and thus the project is unlikely to impact on coral reef diversity, Indigenous heritage, seagrass meadows or migratory species within the GBRWHA. Proponent commitments and my conditions, as discussed above, will provide for effective sediment control and contaminant levels to ensure no adverse impacts occur as a result of the project. Consequential project impacts associated with dredging and/or shipping at the Port of Abbot Point Coal Terminal 0 have been assessed as a separate project proposal under the EPBC Act.

Therefore, I consider that based on the statement of OUV for the GBRWHA adopted by the UNESCO World Heritage Committee, I am satisfied that no unacceptable impacts to the OUV for criterion ix will occur as a result of the project.

Criterion x

Due to the mitigation measures proposed by the proponent and the draft EA conditions I have stated, I am of the view that there is unlikely to be impacts to threatened species within the GBRWHA relevant to the OUV from the point of view of science and conservation. Proponent commitments and my conditions, as discussed above, will provide for effective sediment control and contaminant levels to ensure no adverse impacts occur as a result of the project. For my detailed assessment of impacts to threatened species and migratory species, refer to sections 5.1.1 and 5.1.2, respectively.

I consider that based on the statement of OUV for the GBRWHA adopted by the UNESCO World Heritage Committee, I am satisfied that no unacceptable impacts to the OUV for criterion x will occur as a result of the project.

5.1.4 National Heritage Places (sections 15 B and 15C)

The proponent's assessment of National Heritage Places (AEIS, Volume 4, Appendix H) identified the Tree of Knowledge site in Barcaldine as the closest, located approximately 200 km south-west of the project site. The proponent has determined that there will be no direct or indirect impacts on the site and therefore, I have excluded it from my evaluation. The Great Barrier Reef National Heritage Place (GBRNHP) is located over 200 km east and approximately 320 km upstream of the project area. As discussed in section 5.1.2 above, although there are no predicted direct impacts to the GBR, I have considered potential indirect impacts as part of my evaluation of the project.

Great Barrier Reef National Heritage Place

The GBRNHP was included in the National Heritage List in 2007 according to the following criteria:

- the place has outstanding heritage value to the nation because of the place's importance in the course, or pattern, of Australia's natural or cultural history

- the place has outstanding heritage value to the nation because of the place's possession of uncommon, rare or endangered aspects of Australia's natural or cultural history
- the place has outstanding heritage value to the nation because of the place's potential to yield information that will contribute to an understanding of Australia's natural or cultural history
- the place has outstanding heritage value to the nation because of the place's importance in demonstrating the principal characteristics of:
 - a class of Australia's natural or cultural places; or
 - a class of Australia's natural or cultural environments
- the place has outstanding heritage value to the nation because of the place's importance in exhibiting particular aesthetic characteristics valued by a community or cultural group.

Coordinator-General's conclusion—national heritage places

The heritage values that cause the GBRNHP to meet the above criteria (its national heritage values), are similar to the values which meet the world heritage criteria identified in section 5.1.3 above. Therefore, the impacts to the GBRNHP are commensurate to the impacts from the project on the GBRWHA. Mitigation measures and conditions equally apply to the GBRNHP. Consistent with the discussion on world heritage above, I am of the view that the project will not have an unacceptable impact on the GBRNHP.

5.1.5 Great Barrier Reef Marine Park (sections 24B and 24C)

Description

The GBRMP was designated in 1975 prior to the GBRWHA and GBRNHP being declared. It covers more than 344 400 km² along the Queensland coastline and excludes operational port environments which are part of the GBRWHA.

Coordinator-General's conclusion—GBRMP

As discussed in sections 5.1.3 and 5.1.4, there is unlikely to be any direct impacts to the GBRMP as a result of the project due to the significant distance between the two areas. It is due to this, and my expectation that the proponent will implement all proposed mitigation measures and comply with conditions (as discussed in section 5.1.3), that I am of the view that the project will not have an unacceptable impact on the GBRMP.

5.1.6 Wetlands of international importance (sections 16 and 17B)

Description

The proponent's assessment of wetlands of international importance considered the following RAMSAR wetlands as identified using the former SEWPac Protected Matters Search Tool:

-
- Bowling Green Bay wetland—located approximately 236 km north-east of the project area at the mouth of Haughton and Ross rivers
 - Shoalwater and Corio Bays Area—located approximately 380 km south-west of the project area at the mouth of Water Park Creek
 - Coongie Lakes Ramsar site—located approximately 800 km south-west of the project area in the Cooper Creek catchment, South Australia.

The Coongie Lakes Ramsar site has been excluded from my evaluation as the proponent has determined that there is no potential for direct or indirect impacts to occur as there are no hydrological connections between the two sites. Refer to Figure 5.20 for the locality of each of the wetlands in relation to the project area.

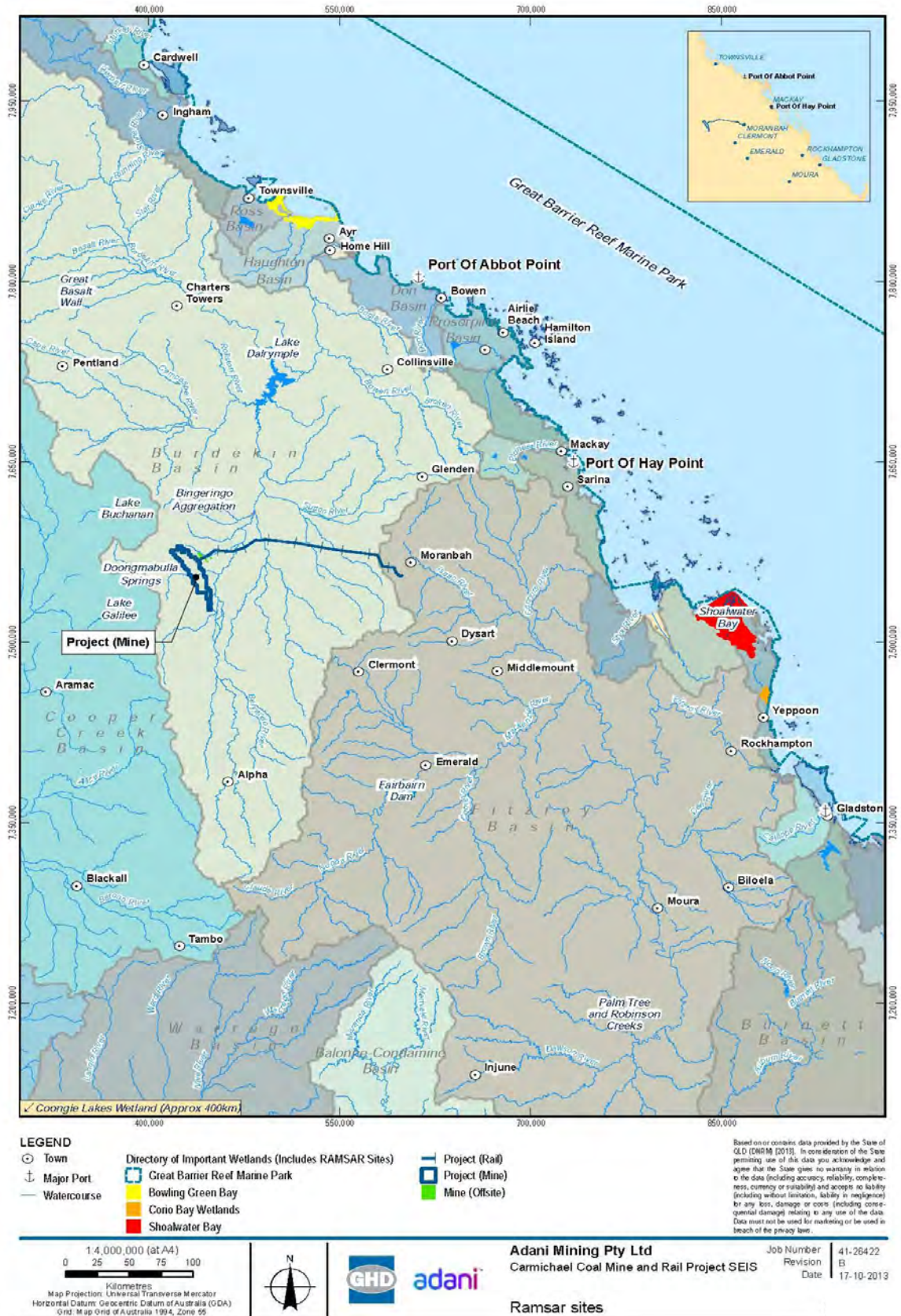


Figure 5.20 Wetlands of international importance relevant to the project

Potential impacts and mitigation

As is the case for the GBRWHA, GBRNP and GBRMP, due to the significance distance between the project area and Bowling Green Bay wetland and the Shoalwater and Corio Bays Area, it is unlikely that direct impacts will occur as a result of project activities.

Given that the project is hydrologically connected to the Burdekin River which discharges at Upstart Bay, the proponent conducted an assessment to determine whether any indirect impacts are likely to occur (refer to AEIS, Volume 4, Appendix H, section 3.3). The study involved determining potential impacts from terrestrially derived sediment plumes on the wetland sites as a result of inundation events. This was completed using data obtained from the Queensland December 2010 and January 2011 floods in which rivers transported large sediment loads to the coast. This assessment concluded that sediment loads from the Burdekin Basin do not reach either the Bowling Green Bay or the Shoalwater and Corio Bays Area wetlands.

As such, no specific mitigation is proposed; however, the measures and conditions for protecting the GBRWHA, as discussed in section 5.1.3, will equally apply to protecting wetlands of international importance. I am satisfied that these measures will suffice as it is unlikely that any impacts would occur on these sites due to the oceanic nature of the wetlands and the extensive distance from the mine site.

Coordinator-General's conclusion—wetlands of international importance

Based on the proponent's assessment of the potential impacts of the project on identified wetlands of international importance, I am satisfied that no specific mitigation measures are required as there is unlikely to be any direct or indirect impacts. I am satisfied that the management approaches and conditions discussed in section 5.1.3 for the GBRWHA will equally apply to these wetlands and reduce any potential impacts in the unlikely event they occur. Consistent with the discussions above, I am of the view that the project will not have an unacceptable impact on wetlands of international importance.

5.1.7 A water resource, in relation to coal seam gas development and large coal mining development (sections 24D and 24E)

IESC advice

Queensland is a signatory to the Council of Australian Governments (COAG) National Partnership Agreement on Coal Seam Gas and Large Coal Mining Development (NPA). 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 Independent Expert Scientific Committee (IESC).

Prior to the inauguration of the statutory committee in November 2012, an interim committee (IIESC) provided advice to SEWPaC (now DE) on proposed projects. A request for advice was submitted to the IIESC for the project on 23 May 2012, to which final advice was provided on 29 June 2012. This was subsequently provided to my office on 15 January 2013, which informed my determination on the scope of additional information to the EIS I required (refer to section 3.6 of this report).

On 6 November 2013, I submitted to the IESC a joint request for advice (with DE) for the project. The IESC provided final advice to myself and DE on 16 December 2013.

The IESC raised issues regarding the following matters as part of its advice on the Carmichael Coal Mine and Rail project:

- groundwater flow conceptualisation
- numerical groundwater model boundaries
- hydraulic conductivity of the Rewan Formation
- impacts to GDEs
- cumulative impacts
- final voids
- flooding
- mine discharge to surface waters.

I have responded to each of these matters in the groundwater and surface water sections of this report (within section 5.1.7).

Given concerns identified by the IESC regarding the proponent's groundwater flow conceptualisation and numerical modelling, I commissioned Dr Noel Merrick to undertake an independent targeted peer review of the proponent's groundwater modelling. The peer review report is included at Appendix 4 of this report and is also discussed in relevant sections of this report.

Mine—groundwater

The EIS outlined how mining would occur below the regional water table and that it would be necessary to conduct dewatering (i.e. remove groundwater) in order for mining to occur safely. The AEIS provides the most up to date assessment of potential impacts resulting from mine dewatering. Key AEIS documents include:

- **AEIS Appendix K1 - Mine Hydrogeology Report:** presents a numerical groundwater model, based on available site specific hydrogeological data, to enable the identification and assessment of the potential impacts of mine dewatering on regional confined groundwater resources
- **AEIS Appendix K7:** an independent peer review of the numerical groundwater model by URS, commissioned by the proponent in accordance with IESC advice
- **AEIS Appendix K8:** includes the proponent's response to URS's peer review.
- **AEIS Appendix K6:** an addendum to the AEIS Appendix K1 and was developed in response to comments received from URS and agencies consulted on the draft AEIS including DNRM, DEHP and DE. This document provides more detailed information to supplement Appendix K1 including:
 - the hydraulic properties of the Rewan Formation and potential connectivity to the adjacent GAB
 - groundwater flow directions
 - key hydrogeological processes understood to be operating at the mine site (i.e. an overview of the conceptual model)
 - groundwater model validation and sensitivity analysis.

Submissions received on the EIS and AEIS raised a number of issues in relation to potential groundwater impacts, including:

- inadequate groundwater modelling
- mine dewatering impacts on the GAB
- mine dewatering impacts on groundwater security
- mine dewatering impacts on GDEs
- impacts on groundwater quality from tailings discharge and subsidence
- cumulative groundwater impacts.

I have considered each of the submissions and how the AEIS and subsequent information received from the proponent has responded to submitter issues as part of my evaluation of the environmental impacts of the project.

Groundwater assessment methodology

Given the limited publicly available groundwater level and quality data available for the site, the proponent progressively established a groundwater monitoring network within and the near vicinity of the mine area during 2011, 2012 and 2013 to collect hydrogeological data for the purposes of the groundwater assessment, comprising:

- 57 standpipe piezometers at 33 sites (mine area)
- 24 nested vibrating wire piezometers (VWP) at 8 sites (mine area)
- 3 standpipe piezometers at 2 sites (between mine area and the Doongmabulla Springs Complex)
- 2 standpipe piezometers at 2 sites (west of mine area).

Figure 5.21 identifies the monitoring bore and VWP locations. Table 1 of AEIS Appendix K1 summarises the groundwater monitoring network, including monitored geological units and monitoring purpose.

Hydrogeological data collected over a two-year period (2011–13) was used to establish the baseline groundwater conditions. A conceptual hydrogeological model was developed based on the current understanding of the distribution of the various geological formations, aquifer testing (packer, slug and pumping tests) and groundwater monitoring results. Key elements of the conceptual model include:

- extent and hydraulic properties of the aquifers and aquitards
- groundwater flow directions
- groundwater recharge and discharge processes.

The hydrogeological conceptual model, geological model surfaces and aquifer test data have been used to develop a MODFLOW-SURFACT groundwater model for the site. A geological cross section from the groundwater model is presented in Figure 5.17. Calibration of the groundwater flow model was undertaken in steady state through comparison of observed and modelled groundwater levels at 88 borehole locations (43 bores within the mine lease area, 6 DNRM State Observation bores with transient historical water level records, and 39 bores with time of drilling water levels recorded in the DNRM Bore Database). Time series data from the mining lease bores and the DNRM State Observation bores were averaged for the purposes of the steady state model calibration.

Post (mine) closure impacts have been assessed based on a final post rehabilitation land surface which, for the most part, will be at or above the current ground level (mine rehabilitation is discussed in section 6.6). Six final void areas (1 per operational pit) are identified in the proponent's final landform, with voids typically situated towards the west of the proposed open cut mining area.

Without backfilling, the final ground surface within these voids would be substantially below the pre-development ground surface and below current groundwater level elevations. Hence once dewatering operations have ceased in each pit, there would be potential for groundwater to flow into the pits and create permanent lakes. These lakes would evaporate, leading to an ongoing loss of groundwater from the affected aquifer.

However, the proponent has agreed to partially backfill the final voids to the top of the coal seams as follows:

- Pit B, D and G to the top of Seam D
- Pit C, E and F to the top of Seam AB.

This backfilling will raise the final ground surface within the voids to above the current groundwater levels, minimising the likelihood of permanent lakes forming, and significantly reducing groundwater loss from evaporation.

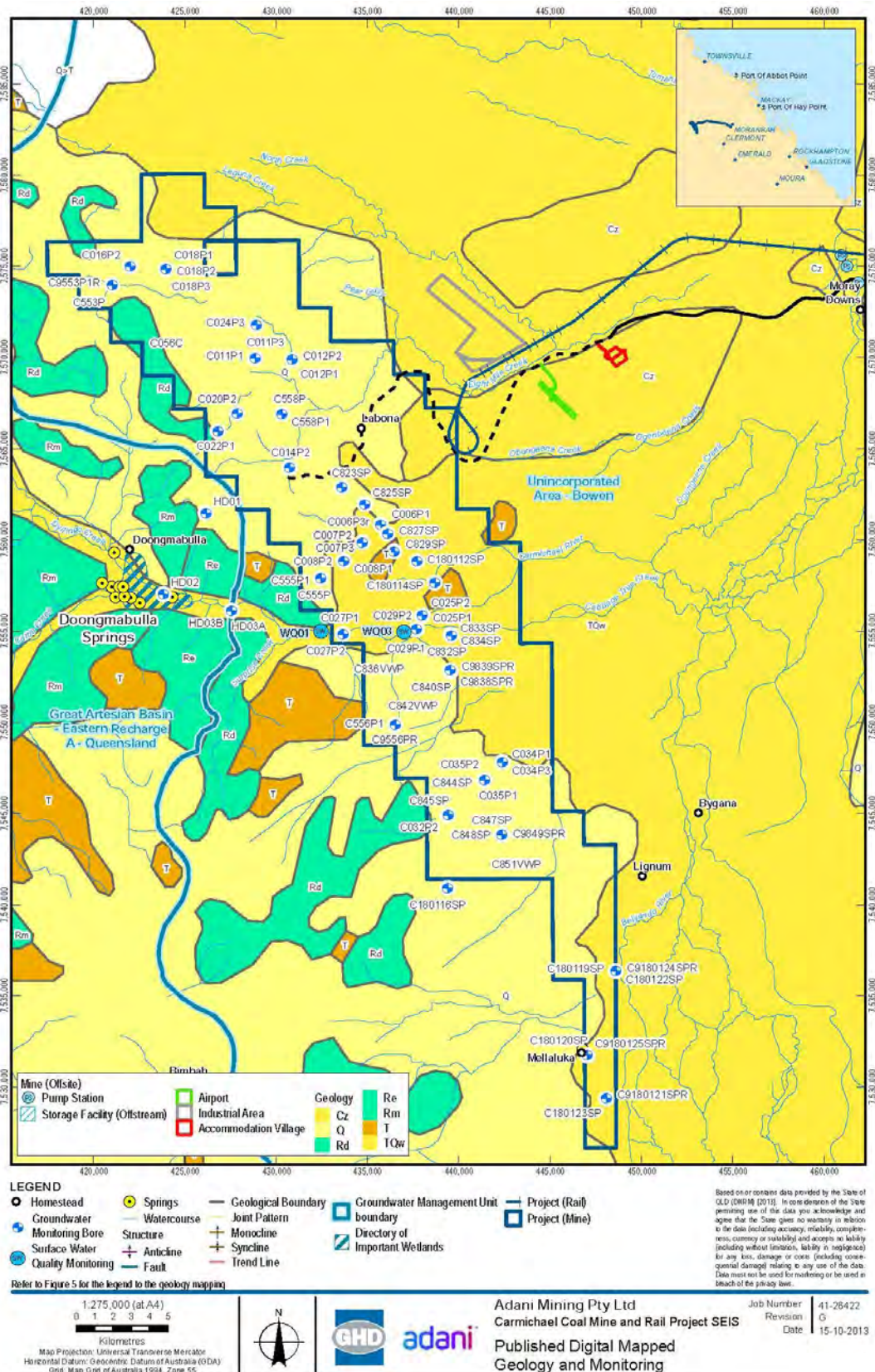


Figure 5.21 Baseline groundwater monitoring network—bore and WVP locations

Groundwater flow conceptualisation

The AEIS has conceptualised the flow direction to be:

- west to east in the centre of the mine area
- north-west to south-east in the northern part of the mine area
- south to north in the southern part of the mine area.

The IESC believes that insufficient data has been provided to substantiate the proponent's groundwater flow conceptualisation and that the flow direction is contrary to what is expected in the GAB. However, the IESC advice fails to substantiate this assertion with references to the EIS documentation or published references.

The proponent notes that the majority, if not all, of the available groundwater level data for the project area suggest that groundwater flow, in both the Triassic aged GAB units and the underlying Permian age strata, is toward the Carmichael and/or the Belyando River (in line with the topography) (refer to AEIS Appendix K6). Furthermore, the proponent advises that there is no evidence of groundwater flow towards the south-west (from the mine site west towards the GAB units).

To develop an understanding of groundwater flow direction in the Clematis Sandstone (GAB) aquifer, the proponent constructed a monitoring bore in the Clematis Sandstone west of the mining lease (monitoring bore HD02—refer to Figure 5.21) and utilised water levels in three private bores considered to be accessing the Clematis Sandstone. DNRM considers that this data provides acceptable evidence to support the proponent's conceptualisation of existing groundwater flow direction.

I note that URS, in its peer review of the numerical groundwater model (refer to AEIS Appendix K7), suggested that additional consideration of groundwater flow patterns outside of the mine area be included as flow within the Galilee Basin sediments (west to east) is contrary to the dip of the geology. To address this item, the proponent presented additional groundwater level data and refined groundwater contours across the mine area in the AEIS Mine Hydrogeology Report Addendum (AEIS, Appendix K6, section 2.3). This additional information has subsequently been reviewed by URS (refer to Attachment 2 of the proponent's response to the IESC advice), which concluded that:

The groundwater flow patterns presented in the SEIS [AEIS] report, based on site specific data, provide an accurate depiction of groundwater flow across the site, which has been simulated in the numerical groundwater model. Groundwater flow patterns are recognised to be contrary (perpendicular) to geological dip due to a combination of factors including geological setting (pinching-out of units), topography, aquifer hydraulic parameters, recharge and extraction.

Dr Merrick considers that the proponent's groundwater flow conceptualisation is an acceptable assessment of groundwater flow, based on groundwater data available to the proponent at the current time. With regards to the IESC's concerns that the flow direction is contrary to the dip of the geology (which is towards the west) Dr Merrick states that:

- Darcy's Law which underpins hydrogeology shows conclusively that groundwater flow follows the hydraulic gradient

- this perception of ‘downhill flow’ is a common misconception that has its origin in familiarity with surface water flow
- groundwater flows from a region of higher pressure to a region of lower pressure, not from high elevation to lower elevation as occurs with surface flow
- the proponent’s conceptualisation of recharge in the hills and discharge of deep groundwater in the vicinity of the Carmichael River (where springs are observed) is fully consistent with Darcy’s Law and with the well-established pattern of regional flow paths first promulgated by Toth (1963).

To provide a more definitive understanding of the Colinlea Sandstone groundwater flow directions in this part of the Galilee Basin (an area covering 160 km east-west by 250 km north-south), DNRM combined drill stem head data from petroleum and coal seam gas exploration wells with data acquired at other mining projects in the Galilee Basin. Figure 5.22 presents the findings of DNRM’s assessment of hydraulic gradients in the Colinlea Sandstone, Galilee Basin. DNRM’s assessment is provided in Appendix 3 of this report.

This figure illustrates that the dominant flow direction near the proposed Carmichael mining lease is west to east. There is a groundwater divide approximately 40 km to the west, in line with the adopted boundary in the proponent’s model. On the other side of the groundwater divide, flow is east to west as expected in the GAB away from the recharge beds. Accordingly, DNRM’s assessment supports the proponent’s groundwater flow conceptualisation.

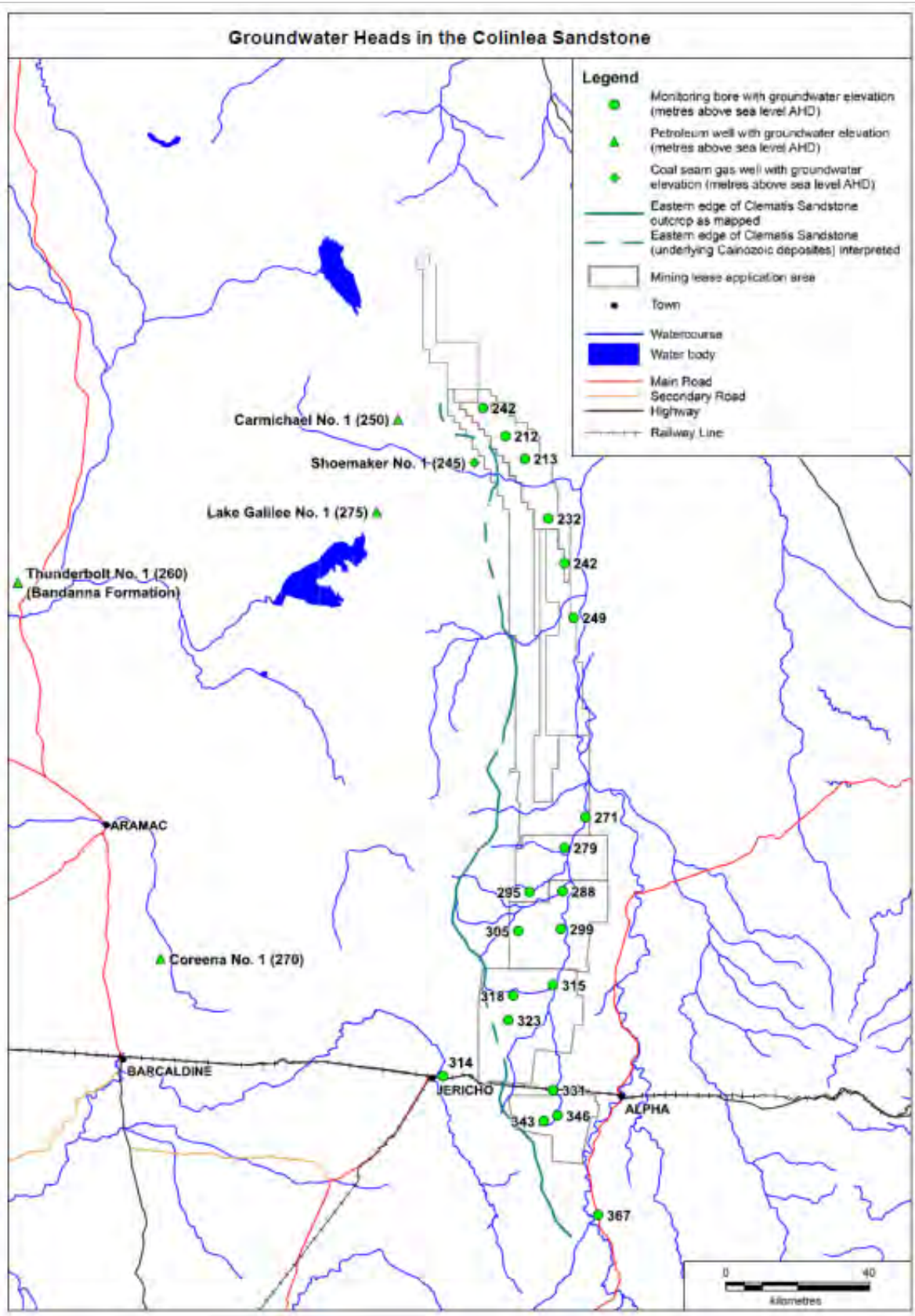


Figure 5.22 Hydraulic gradients in the Colinlea Sandstone—Galilee Basin

While I accept the conceptualisation of groundwater flow direction, ongoing monitoring is required to validate the conceptualisation. A draft groundwater monitoring program (available on the proponent's website) includes commitments to construct additional bores west of the mining lease area to monitor the Clematis Sandstone, Rewan Formation and Dunda Beds to validate the groundwater flow conceptualisation. The draft program will need to be further developed, assessed and approved before mining can commence.

To this end, I have stated conditions for the project's draft EA (Appendix 1, Schedule E) which requires the development of a Groundwater Management and Monitoring Program for approval by the administering authority. The Groundwater Management and Monitoring Program must provide for, amongst other objectives:

- validation of groundwater numerical model (including review of boundary and recharge conditions) to refine and confirm accuracy of predicted groundwater impacts
- groundwater level monitoring in all identified geological units present across and adjacent to the mine site to confirm existing groundwater flow patterns and monitor drawdown impacts
- identification and refinement of potential impacts on groundwater levels in the GAB Clematis Sandstone and Dunda Beds aquifers
- monitoring of geological units throughout all phases of project life, including for the period post closure in accordance with my rehabilitation requirements (refer to Appendix 1, Section 1, Attachment B: Rehabilitation Requirements)
- ensure that all potential groundwater impacts from mine dewatering and mine water and waste storage facilities (artificial recharge) are identified, mitigated and monitored.

I have also stated a condition (Appendix 1, Schedule E) which requires that the Groundwater Management and Monitoring Program be reviewed at five-yearly intervals, with a report provided on the outcome of the review to the administering authority for approval.

To ensure that the predictive groundwater model is reviewed and regularly updated based on the outcomes of the Groundwater Monitoring and Management Program, I have stated a condition for the draft EA (Appendix 1, Schedule E) which requires the revision of the numerical groundwater model (referred to in the AEIS Appendix K1 and K6) based on transient calibration methods, including:

- review of the hydrogeological conceptualisation used in the previous model
- an update of the predicted impacts
- revised water balance model
- review of assumptions used in the previous model
- predictions of changes in groundwater levels for a range of scenarios
- information about any changes made since the previous model review, including data changes
- a report outlining the justification for the new model and the outputs of the new model

- an evaluation of the accuracy of the predicted changes in groundwater levels, groundwater flow rates to surface water and recommended actions to improve the accuracy of model predictions.

I have also stated a condition (Appendix 1, Schedule E) which requires, no later than 3 months after commencement of the model review, that a report outlining the findings and any recommendations of the groundwater model review be submitted to the administering authority for approval.

I consider that my requirements are consistent with the IESC's recommendation (item 25) for the development of a groundwater monitoring plan in order to address groundwater modelling uncertainties and monitor the drawdown in the GAB units.

Numerical groundwater model boundaries

The setting of model boundaries in the proponent's groundwater model has been guided by the locations of surface water divides (topographic ridges), including:

- inflow general head boundaries (GHBs) to the north, west and south in the more permeable Triassic and Permian model layers
- outflow GHBs to the east in Tertiary strata and basement.

The IESC advice on this issue was based on the assumption that the proponent had included the use of no flow boundaries and had truncated the Clematis Sandstone (and other geological formations) on the western side in the numerical model.

Model boundaries and extent

Section 5.4.2 of the AEIS Mine Hydrogeology Report (Appendix K1) documents that MODFLOW GHB conditions (rather than no-flow boundary conditions) have been applied around the outer edge of the active model area, in all areas where significant lateral flow into and out of the model area is considered likely. The proponent notes that GHB conditions have not been applied to low permeability aquitard units such as the Rewan Formation since lateral flow into and out of such units is typically expected to be minimal. Further information showing the GHB cells in each model layer, in the form of screen shots from the actual groundwater model, are provided in Attachment 4 of the proponent's response to the IESC advice.

Attachment 4 shows that GHB conditions have been applied in the south-western boundaries of the model area along the edge of the Belyando River catchment in the Clematis Sandstone, Dunda Beds and the more permeable parts of the Permian-aged units. The proponent concludes that this allows for flow in the Clematis Sandstone and the other main aquifer units present in this area to leave the model domain to the south-west, although reference to modelled groundwater level contours in this area suggest limited flow across this boundary. The proponent therefore asserts in its response to the IESC advice that the modelled groundwater flow directions have not been 'forced' to comply with the conceptual model of topographically controlled flow.

In addition, sensitivity analysis of model predictions to GHB conductance is reported in section 3.6.3 of the AEIS Mine Hydrogeology Report Addendum (AEIS Appendix K6). Given the distance of the model boundaries from the proposed mine area, sensitivity

analysis results suggest that the predicted impacts are not sensitive to the conductance or elevation of the defined general head boundary cells.

I note that the IESC advice on this matter does not include any references to the AEIS documentation. The source of IESC's confusion regarding boundary conditions is therefore not known.

Truncation of the Clematis Sandstone

Given that the Clematis Sandstone and other GAB units to the south of the mine area potentially extend to the Queensland state border and approximately 200 km to the west, the proponent considered it impractical to produce a groundwater model which includes the full extent of the Clematis Sandstone whilst retaining sufficient detail in and around the mine area to accurately quantify impacts on local surface watercourses. Truncation of the GAB units to the south and west of the mine area is therefore considered appropriate and necessary. The proponent advises that in this case the active model area extends to the hydrological divide between the catchments of the Belyando River and Lake Galilee catchments.

DNRM and peer reviewer advice

DNRM is satisfied the proponent has addressed the IESC's concerns regarding model boundaries and the truncation of the Clematis Sandstone. DNRM considers that there has been a misconception by the IESC on the application of no-flow boundaries, except for aquitard layers where the lateral flow across a boundary would be extremely low, and supports the proponent's explanation rather than the IESC's concern.

As indicated in his independent peer review (Appendix 4), Dr Noel Merrick concurs with DNRM's advice and notes that the application of GHBs is standard practice in controlling the size of a groundwater model while still accounting for fluxes at a distance unlikely to have an effect on groundwater responses to mining.

Dr Merrick also supports the proponent's inclusion of a boundary on the western side of the model noting that this boundary is 30 km away from the mine site, well beyond the extent of the predicted drawdown. Dr Merrick notes that there are real and pragmatic limits to the areal size of groundwater models, due to hardware and software limitations, and that the IESC should be aware of this aspect of practical modelling. Dr Merrick considers an accepted hydrogeological rule of thumb is to limit the number of model cells to about one million. Dr Merrick notes that the proponent's model is well beyond that (at 4 million cells) and should definitely not be made any larger.

Based on advice from DNRM and the independent peer reviewer, I am satisfied that the model boundaries, and in particular the western model boundaries, are appropriate.

Coordinator-General's conclusion—groundwater assessment methodology

I consider that the proponent has undertaken sufficient groundwater modelling for the project, as presented in AEIS Appendix K1 and Appendix K6. I am satisfied that the proponent has adequately responded to the IESC's concerns regarding numerical model boundaries and the conceptualisation of groundwater flow. Based on advice received from DNRM and Dr Merrick and all currently known information, I consider

that the proponent's groundwater assessment methodology adequately allows for the identification and assessment of potential groundwater impacts.

I note that the absence of references by the IESC to EIS documentation or other external documentation makes the IESC's advice difficult to substantiate. However, I recognise the need for more site-specific groundwater information at the next stage of the project in order to validate the groundwater numerical model (including review of boundary and recharge conditions) and confirm existing groundwater flow patterns. I have therefore stated a number of conditions for the project's draft EA, which include requirements for:

- the development and implementation of a Groundwater Management and Monitoring Program
- a five-yearly review of the effectiveness of the Groundwater Management and Monitoring Program, including (but not limited to) the adequacy of monitoring locations, frequencies and groundwater quality triggers
- a five-yearly review of the proponent's groundwater model, based on a transient calibration and the outcomes of the Groundwater Management and Monitoring Program.

Mine dewatering impacts on the GAB

Figure 5.17, a schematic cross-section of the Galilee Basin, GAB and associated discharge springs based on geological modelling developed for the AEIS (refer to AEIS Appendix K1), shows that the project mine footprint does not extend far enough west to intercept the closest GAB aquifers (the Dunda Beds and Clematis Sandstone).

Potential impacts on the GAB and therefore the Doongmabulla Springs Complex may only arise indirectly from groundwater draining via geological fault structures from the Clematis Sandstone through the Dunda Beds and the Rewan Formation (an aquitard defined as the base of the GAB) into the aquifers of the Bandanna Formation and Colinlea Sandstone. This would require a reduction in head in the Colinlea Sandstone significant enough to induce the transfer of water from the Clematis Sandstone through the approximately 250-metre thick Rewan Formation (at the western limit of the mining lease).

Based on published geological maps for the area and advice from DNRM, I accept that the Rewan Formation is a regional aquitard that prevents significant inter-aquifer transmission of water within and between basins.

Section 7 of AEIS Appendix K1 identifies a possible net leakage through the base of the Rewan Formation to the underlying Permian-age strata could be increased from around 100 m³/day to around 2200 m³/day by the end of the mining operational phase. An increase in net vertical leakage through the Rewan Formation to the adjacent Permian-age units of up to around 2100 m³/day is therefore predicted. Model predictions suggest that around 73 per cent or 1600 m³/day of this additional induced leakage will be derived from the Clematis Sandstone and Dunda Beds with the remaining 600 m³/day from the Rewan Formation. The hydrological extraction of up to around 2.1 ML/day from the Clematis Sandstone/Dunda Beds on GDEs is discussed later in this report.

Post closure of the mine, AEIS Appendix K1 identifies potential for groundwater levels to remain lower than pre-development levels after cessation of mining activities and for a permanent reduction in the availability of recharge to the GAB in this area. Model results suggest that net leakage through the base of the Rewan Formation to the underlying Permian-age strata will be increased from around 100 m³/day pre-development to around 1000 m³/day post closure. A long-term increase in net vertical leakage through the Rewan Formation to the adjacent Permian-age units of up to 900 m³/day is therefore predicted. Model predictions suggest that all of this additional induced leakage will be derived from the Clematis Sandstone and Dunda Beds.

In the event that significant impacts to regional groundwater are observed due to the presence of final voids, the proponent has made a commitment (commitment M1.2, Proponent Commitments Register (Appendix 7)) to take any further steps necessary to reduce post closure impacts on groundwater levels and/or flows to acceptable levels, including:

- reviewing and revising the extent, location and/or timing of the proposed mine workings
- reviewing the backfilling level of final voids in order to minimise or prevent ongoing losses due to evaporation.

Impact predictions presented in AEIS Appendix K1 and summarised above have taken into account potential impacts related to longwall mining, including potentially significant increases in vertical hydraulic conductivity in free-draining fracture zones (estimated to have a maximum height of approximately 150 metres) above each of the mined seams (refer to Figure 5.23). However, section 7.5 of AEIS Appendix K1 states that additional runs of the predictive groundwater model carried out with and without inclusion of a free draining fracture zone suggest only a relatively minor component (less than 4 per cent) of the predicted total impact can be attributed to longwall mining induced fracturing of the overlying strata.

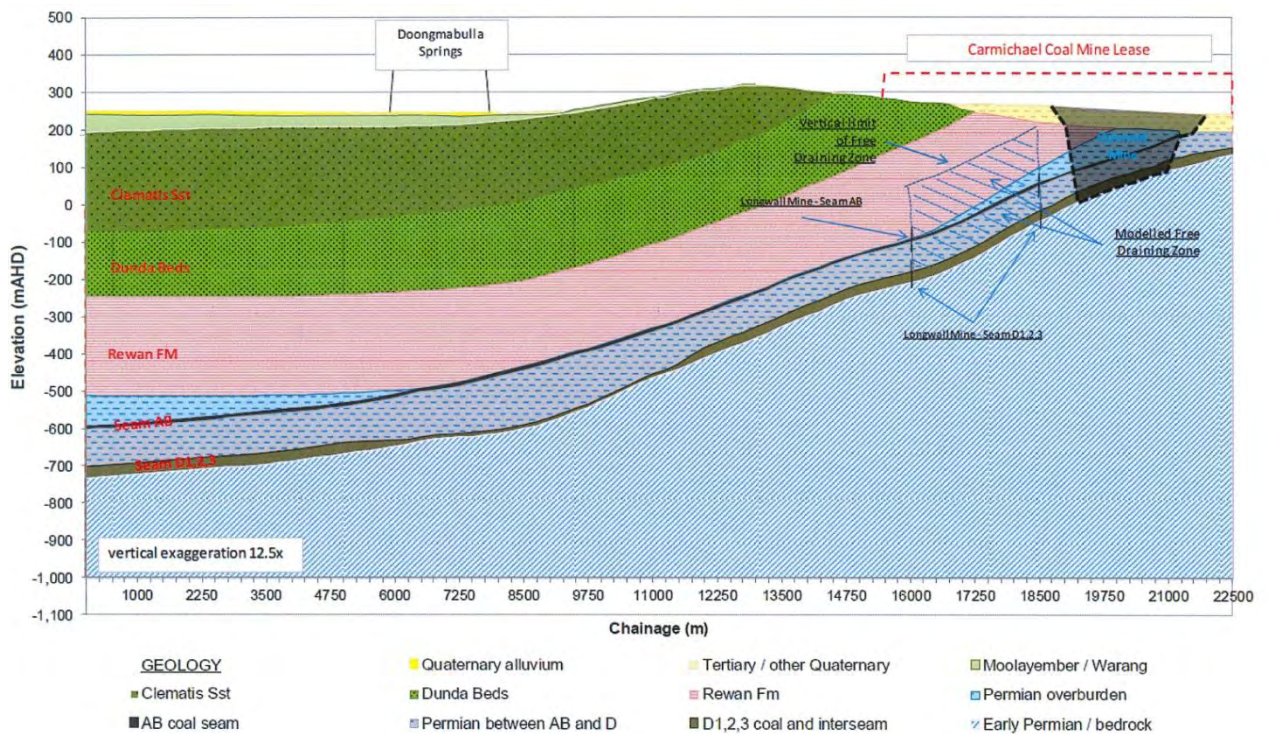


Figure 5.23 Geological cross-section and the extent of the free draining fracture zone

GAB impacts

The IESC has raised concerns regarding the potential variability of hydraulic conductivity of the Rewan Formation, noting that the integrity of the Rewan Formation as an aquitard is critical to the impacts of mining and dewatering activities on the GAB. The IESC's concerns on this issue are based on variable conductivity data available in published reports, the potential for subsidence-induced fracturing and existing faulting within the Rewan Formation.

Hydraulic conductivity values in the Rewan Formation

The proponent's assessment of potential indirect impacts presented in AEIS Appendix K1 is based on 'best estimate' groundwater modelling predictions. These predictions are based on the calibrated (rather than observed) hydraulic conductivity values for the Rewan Formation (horizontal and vertical hydraulic conductivity of 7.4×10^{-5} and 7.4×10^{-6} m/d, respectively) as the proponent considers that these are the values which result in an optimal fit to the available data (refer to AEIS, Appendix K1).

I note, however that the calibrated horizontal hydraulic conductivity value (of 7.4×10^{-5} m/d) is lower than the minimum observed value (of 9.5×10^{-5} m/d) recorded from tests undertaken for the project. I also note that the calibrated values adopted in its assessment fall well within the 5th and 95th percentile range calculated from the regional data set for the Rewan Formation collated for the Surat Cumulative Management Area Underground Water Impact Report (QWC, 2012) and are comparable to the median regional value of 3.6×10^{-4} m/d. The calibrated horizontal hydraulic conductivity value is also within the range of observed data from core test results at other proposed mining

sites in the Galilee Basin⁶⁹ and towards the centre of a typical range for siltstone identified by Domenico and Schwartz (1990).⁷⁰

Nonetheless, given this variation from field data, DNRM advised as part of its comments on the EIS that there was some uncertainty in regards to the base case hydraulic conductivity values for the Rewan Formation used by the proponent. In response to my direction, the proponent undertook a sensitivity analysis to quantify groundwater impacts, based on a wider range of possible hydraulic conductivity values for the Rewan Formation. Results of the sensitivity analysis are documented in the AEIS Mine Hydrogeology Report Addendum (AEIS Appendix K6)), which was provided to the IESC as part of my referral of the project.

The sensitivity analysis considered very high hydraulic conductivity values for the Rewan Formation, as high as 1×10^{-2} m/d horizontally and 1×10^{-3} m/d vertically, which are towards the upper end of:

- the range of values for the Rewan Formation calculated from regional data sets⁷¹ (QWC, 2012)
- a typical range for sandstone of 2.6×10^{-5} to 5.2×10^{-1} m/d, as identified by Domenico and Schwartz (1990).

Accordingly, under the 'worst-case scenario' considered for the sensitivity analysis, the groundwater modelling assumes that the Rewan Formation will respond uniformly as a fractured sandstone aquifer. This is similar to assuming that the Rewan Formation is heavily faulted and fractured throughout the area, such that it ceases to function as an aquitard. I consider this to be an extreme case since it would require fresh siltstone and mudstone units (identified within the Rewan Formation as part of the proponent's field investigations) to be entirely absent from the Rewan Formation sequence throughout the whole area between the proposed mine area and the GAB.

As reported in section 3.6 of AEIS Appendix K6, sensitivity analysis results suggest that the maximum life of mine impacts could be up to around 4300 m³/day in the event that the actual vertical hydraulic conductivity of the Rewan Group was 1×10^{-3} m/d (approximately two orders of magnitude higher than the calibrated value) and around 70 m³/day if the lower bound value calibrated in the Surat Cumulative Management Area Underground Water Impact Report model (QWC, 2012) of 1×10^{-7} (approximately two orders of magnitude lower than the calibrated value) was adopted.

I am satisfied that the sensitivity analysis undertaken by the proponent by varying the hydraulic conductivity addresses the potential variability in the Rewan Formation, based on all currently known information.

Possible faulting and subsidence-induced fracturing in the Rewan Formation

The proponent examined the potential for faulting within the Rewan Formation by adopting the 'worst-case' scenario hydraulic conductivity values considered in the sensitivity analysis described above, which assumes that the Rewan Formation will respond uniformly as a fractured sandstone aquifer, not an aquitard.

⁶⁹ Heritage Computing, *Galilee Coal Project Groundwater Assessment for Waratah Coal Pty Ltd*, 2013.

⁷⁰ PA Domenico and FW Schwartz, *Physical and Chemical Hydrogeology*, John Wiley & Sons Inc, 1990.

⁷¹ Queensland Water Commission, *Underground Water Impact Report for the Surat Cumulative Management Area*, Queensland Water Commission 2012.

Accordingly, the proponent considers that the value of further data collection to predict the effect of faulting and potential subsidence induced fracturing in the Rewan Formation on leakage rates from the GAB to the coal seam would be negligible since the impacts of extreme values for the hydraulic conductivity of the Rewan Formation have already been addressed.

DNRM agreed with the IESC's advice that the integrity of the Rewan Formation as an aquitard is critical to the impacts of mining and dewatering activities in this area. DNRM advised that it would therefore support the requirement for the development of a Rewan Formation Connectivity Research Plan for the Carmichael project as was required of Kevin's Corner in the approval by the Commonwealth Minister for the Environment.

I have therefore recommended to the Commonwealth Minister for the Environment that a condition requiring the development of a Rewan Formation Connectivity Research Plan be imposed as part of any future approval of this project (Appendix 1, Section 2, Part A).

Coordinator-General's conclusion—GAB impacts

I note the results of the proponent's groundwater modelling which predicts an increase in net vertical leakage through the Rewan Formation to the adjacent Permian-age units of up to around 2100 m³/day during the life of the mine, with a vertical leakage of around 1000 m³/day post mine closure. I also note that the proponent's sensitivity analysis, undertaken by varying the hydraulic conductivity values in the Rewan Formation, predicts that, under a worst-case hydraulic conductivity scenario (which assumes that the Rewan Formation will respond uniformly as a fractured sandstone aquifer, not an aquitard), the maximum life of the mine impacts could be at least two times greater (4300 m³/day) than the predicted operational impact of 2100 m³/day.

I have determined that the sensitivity analysis undertaken by the proponent by varying the hydraulic conductivity addresses the potential variability in the Rewan Formation, based on all currently known information.

Given the regional importance of the Rewan Formation as an aquitard in predicting impacts of mining and dewatering activities in this area, I have also recommended to the Commonwealth Minister for the Environment a condition requiring the development of a Rewan Formation Connectivity Research Plan to be imposed as part of any future approval of this project (Appendix 1, Section 2, Part A).

As identified above, to ensure confirmation of existing groundwater flow patterns I have stated conditions for the project's EA requiring the implementation of a Groundwater Management and Monitoring Program, including requirements for the systematic review of program effectiveness and groundwater model updates, based on a transient calibration and the outcomes of the Groundwater Management and Monitoring Program.

I have recommended a condition for inclusion in the appropriate Water Act approval (Appendix 1, Section 2, Part A) for the proponent to provide to DNRM an assessment of:

- the baseline level (natural groundwater level) in each monitoring bore constructed within the Clematis Sandstone and Dundas Beds (GAB formations)
- appropriate trigger levels (lower and upper impact levels) for the early detection of induced flow from GAB aquifers.

In accordance with my recommendations, in the event that the low impact trigger level is reached in any Rewan Formation or Clematis Sandstone bore, the proponent must notify DNRM within 30 days and conduct an investigation into the causes of the lower water levels.

If the high impact trigger level is reached, the proponent must complete an independent investigation to determine the cause and provide a written report to DNRM within 30 days. If found to be caused by the proponent operations, the proponent would be required to contract an independent consultant to fully investigate and model the potential impact upon the GAB and offset any take of water from the GAB as determined by DNRM.

To meet this offset requirement, the proponent will need to request DNRM to reserve a volume of groundwater equivalent to the assessed average annual take over the life of the project from GAB aquifers identified in the EIS, from the *Water Resource (Great Artesian Basin) Plan 2006* and the *Great Artesian Basin Water Resource Operations Plan 2007* State reserve. The proponent has access to this State reserve as the project is a Coordinated Project under the SDPWO Act. The average annual take across the life of the project identified in the EIS is approximately 766ML. While this is DNRM's preferred method of managing the GAB groundwater offset, alternative proposals may be acceptable that will offset an equivalent volume of water. Any alternative would need to apply to water to which the *Water Resource (Great Artesian Basin) Plan 2006* applies and be within the Plan's area.

As groundwater related impacts to the GAB are an area of significant risk to MNES, the appropriate trigger levels determined through the relevant Water Act approval should also be referred to DE for review and approval.

Mine dewatering impacts on groundwater security

The main groundwater use within the vicinity of the MLA is domestic use and stock watering. AEIS Appendix K1 presents groundwater drawdown predictions from mine dewatering at licensed extraction bores (Table 20) and other registered bores (Table 21). The proponent's modelling predicts that 36 property owners in the vicinity of the mine could be affected by the full extent of groundwater impacts.

Potentially significant impacts on groundwater levels (which the proponent considers to be a predicted drop in water levels of greater than 1 m) during the life of the mine are predicted at 11 registered bores. Potentially significant post closure impacts are predicted at 15 registered bores. A further 24 bores have been determined to be not affected.

The significantly impacted bores are located on a total of four properties, including Mellaluka, Bimbah East, Lingnum and Moray Downs. Table 5.15 presents the list of registered bores likely to be 'significantly' impacted and the corresponding property.

Figure 5.24 and Figure 5.25 present the predicted water table drawdowns for life of the mine and post-closure.

Table 5.15 Registered bores and properties likely to be significantly impacted by groundwater drawdown associated with the project

Registered bore ID	Property name	Formation targeted	Maximum drawdown in target formation (m) – Life of Mine	Maximum drawdown in target formation (m)—post-closure
RN 44440	Mellaluka	Unconsolidated Quaternary /Tertiary Units	3.0	42.3
RN 44486	Bimbah East	Dunda Beds	3.1	4.7
RN 44489	Mellaluka	Unconsolidated Quaternary /Tertiary Units	1.1	39.8
RN 62625	Bimbah East	Dunda Beds	1.1	3.7
RN 67627	Lignum	Permian Sandstone	3.3	51.1
RN 90256	Moray Downs	Permian Sandstone	1.3	3.7
RN 90259	Moray Downs	Permian Sandstone	1.3	13.6
RN 103229	Mellaluka	Permian Sandstone	8.6	75.1
RN 103231	Mellaluka	Permian Sandstone	4.5	38.8
RN 103249	Lignum	Permian Sandstone	8.2	85.9
RN 103565	Bimbah East	Dunda Beds	1.7	2.6
RN 44441	Mellaluka	Permian Sandstone	N/A	28.6
RN 103230	Mellaluka	Permian Sandstone	N/A	28.6
RN 62781	Mellaluka	Unconsolidated Tertiary Units	N/A	<0.05
RN 103559	Mellaluka	Permian Sandstone	N/A	4.5

Source: AEIS Appendix K1 and information subsequently provided by the proponent on 31 March 2014.

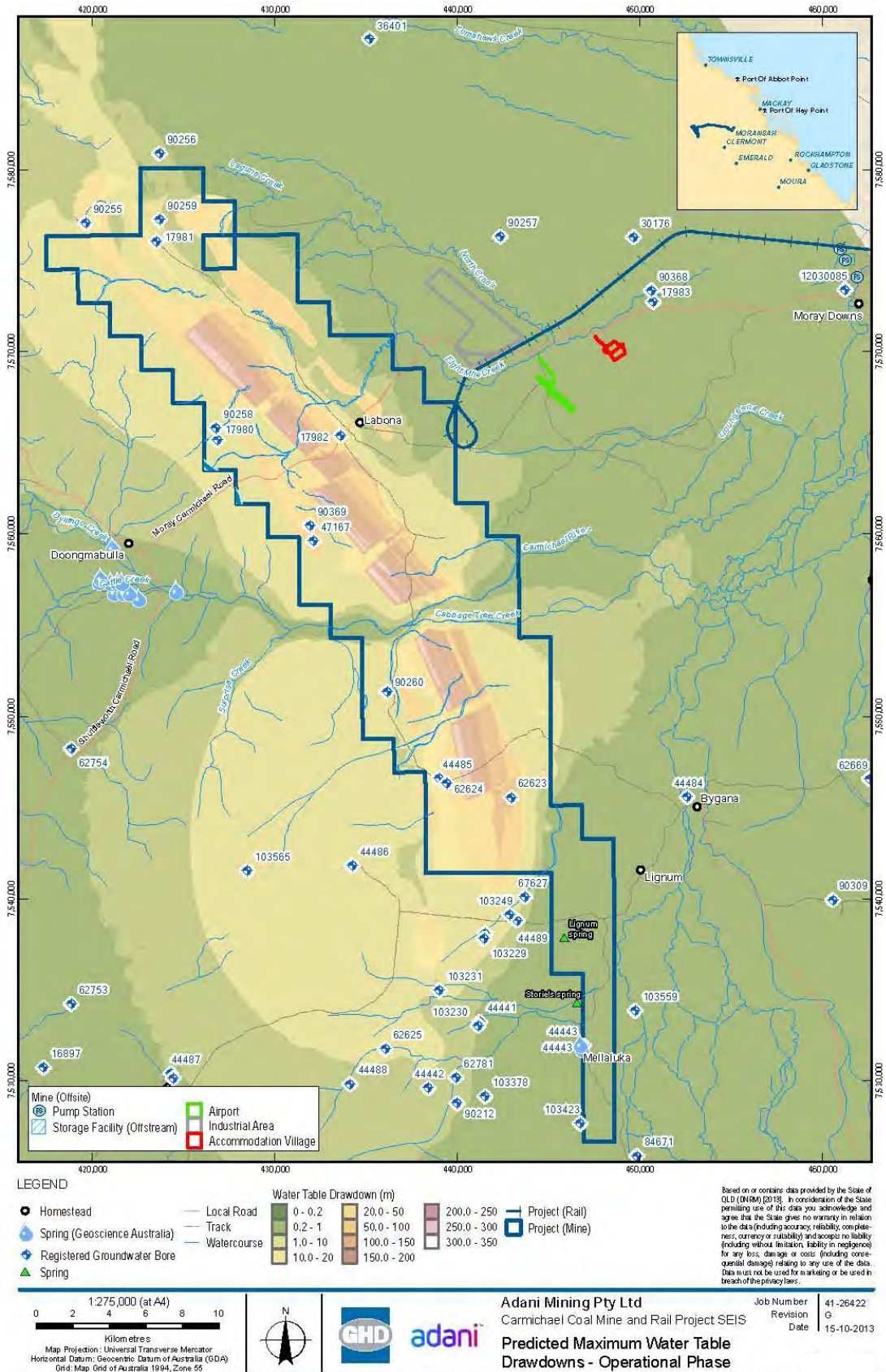


Figure 5.24 Predicted water table drawdown—life of mine

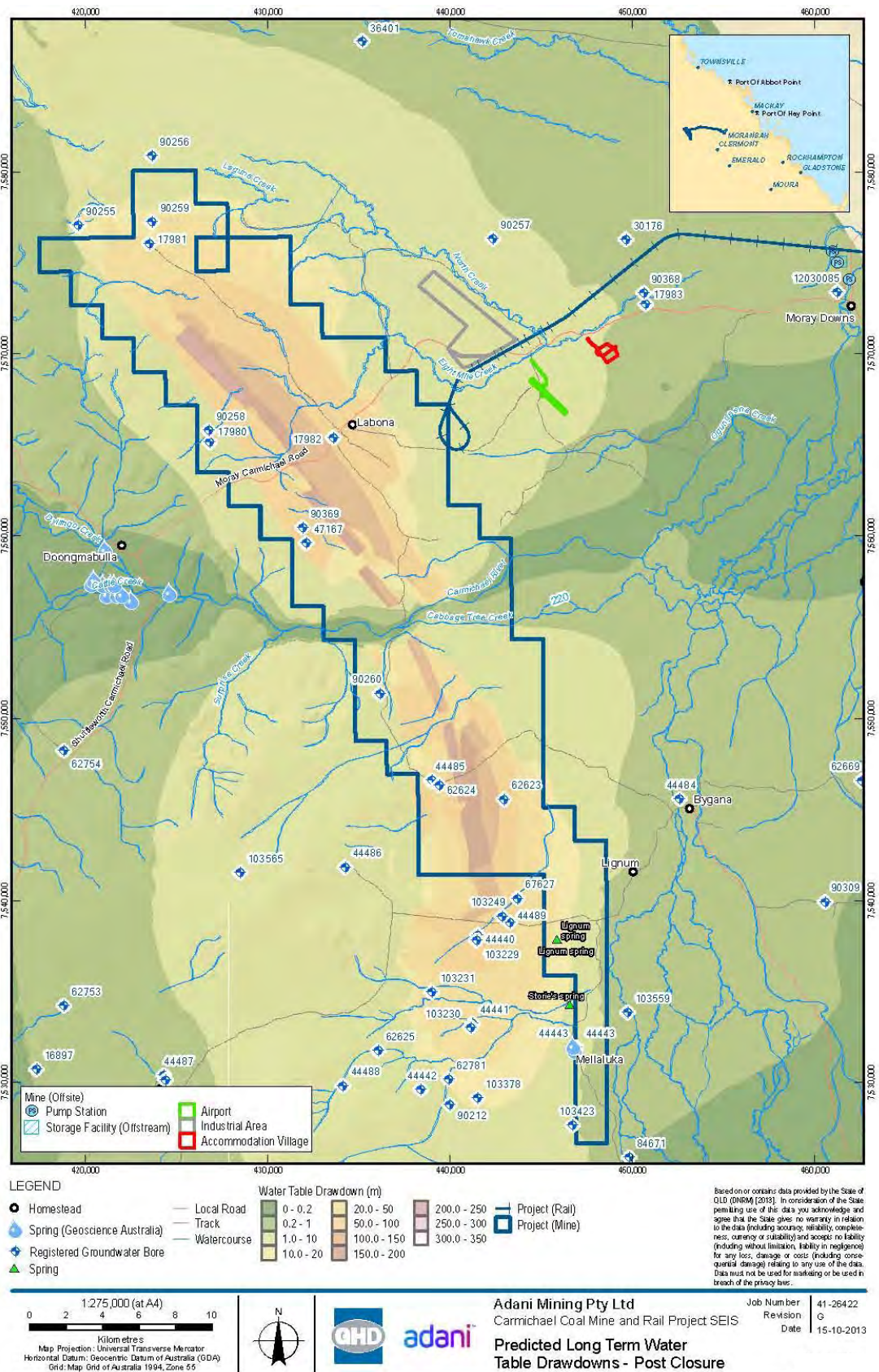


Figure 5.25 Predicted water table drawdown—post mine closure

AEIS Appendix K1 section 7.1.3 states that the actual significance of these predicted drawdowns will depend on a range of factors including bore status, bore depth, rest water level and pump and screen elevations.

I note that the proponent owns the Moray Downs property, which includes 7 of the 15 registered bores predicted by the proponent to be significantly impacted.

Due to safety requirements, the Carmichael Coal Mine project will require the removal of water from mine workings for the life of the mines. Accordingly there is very little in terms of avoidance measures that the proponent could adopt to reduce the potential impacts of drawdown.

The proponent considers that it may be possible to maintain water production rates and the quality of property bores through additional or modified bores and commits to undertaking a detailed assessment of individual bores prior to development and in consultation with landholders (commitment M5.4, Proponent Commitments Register (Appendix 7)). This assessment would include:

- confirmation of the operational status, purpose of the use of the bore and bore yield
- measurement of pumping and rest water levels and pumping rates
- sampling and laboratory analysis of water samples from each bore.

Under the Water Act, DNRM has authority to ensure that any water licence issued for mine dewatering contains 'make good' provisions so that all impacts on landowner groundwater supplies are addressed in a negotiated process with the affected landowners. In assessing approvals under the Act DNRM considers that all bores within the predicted drawdown area are potentially affected by the mining activity. There is no accepted "significance" level. While the proponent has proposed significant impact level of one metre drawdown for the project, it will be up to the proponent to determine whether each potentially affected bore is unduly affected (see definition in Appendix 5).

The proponent has advised me that discussions have commenced with all landholders predicted to be impacted by mine dewatering regarding future 'make good' water supply agreements.⁷² I note, however, that at this time the proponent has not identified any specific alternative water supply strategies.

Coordinator-General's conclusions—groundwater security

I note the proponent's commitment to 'make good' all impacts on landowner water supplies, and that the proponent has already commenced discussions with affected landowners.

The proponent's 'make good' provisions, including the identification and provision of alternative water supply strategies, must be addressed in detail as part of conditions attached to any approval for a licence under the Water Act, including:

- existing water supplies to be protected
- unduly affected water supplies to be restored

⁷² Pers. Comm. 31 March 2014.

- agreements with bore owners on appropriate restoration measures (including the licensee bearing the cost of restoration measures)
- urgent restoration, monitoring and assessment, reporting and mine closure requirements.

Appendix 5 of this report contains an example of draft conditions that would be attached to any approval for a licence under the Water Act.

Nevertheless, to ensure that local landholders are compensated for any impacts caused by mine dewatering, I have recommended that, prior to the commencement of mining activities, the proponent develop to the satisfaction of DNRM a detailed plan to guarantee the long-term security of water for all current groundwater users predicted to be affected by the project (Appendix 1, Section 2, Part A).

As noted above, to ensure all potential groundwater impacts are appropriately identified, mitigated and monitored, I have also stated conditions for the project's draft EA (Appendix 1, Schedule E) which require the development and implementation of a Groundwater Management and Monitoring Program. This program must, amongst other objectives, include groundwater level monitoring in all identified geological units present across and adjacent to the mine site to confirm existing groundwater flow patterns and monitor drawdown impacts, and include monitoring in any identified source aquifers for alternative water supplies, relevant to any approval issued under the Water Act for the project.

I note that the source of the project's water supply would be supplemented from groundwater during the first couple of years of mine construction and operation and that an external water supply would not be required until year 3 (i.e. the construction and operation of the proposed flood harvesting system on the Belyando River). Whilst groundwater modelling indicates that sufficient groundwater resources would be available for mine purposes, the proponent would need to obtain a water licence issued under the Water Act prior to commencing any mining activities, which would include conditions to address the interception, availability and use of groundwater.

Based on the proponent's assessment of potential groundwater impacts and commitment to enter into 'make good' agreements with affected landowners prior to the commencement of mining activities, future approvals required under the Water Act and the recommendations included in my report, I am satisfied that impacts to groundwater security caused by mine dewatering will be appropriately mitigated.

Mine dewatering impacts to GDEs

The AEIS identifies the potential impacts (direct and indirect) to GDEs:

- Doongmabulla Springs Complex
- Mellaluka Springs Complex
- Waxy cabbage palm
- Carmichael River riparian zone.

For my assessment of potential impacts to the Doongmabulla Springs Complex and WCP, please refer to section 5.1.1 of this report. For information on the ecological

values of the Mellaluka Springs Complex and Carmichael River riparian zone, please refer to section 6.1 of this report.

Mellaluka Springs Complex

The Mellaluka Springs Complex is located near the south-eastern section of the mine area (refer to Figure 5.26) and consists of three separate springs:

- Mellaluka spring—a large mound spring with several vents
- Stories spring—a discrete non-mounding artesian spring
- Lignum spring—a discrete non-mounding artesian spring.

All three springs have bores installed which provide water for domestic use (the Mellaluka spring), and water for livestock (Stories and Lignum springs). The Mellaluka spring is the largest spring which supports a wetland and a dam.

AEIS Appendix K1 notes that relatively little is known about the Mellaluka Springs Complex and geological data is generally more limited towards the southern limit of the proposed mining area. The geology in this general location typically comprises shallow near surface Quaternary and Tertiary age strata overlying older Permian-age units.

AEIS Appendix K6 states that the most likely source aquifer for the Mellaluka Springs Complex is the underlying Permian-age units of the Colinlea Sandstone. Groundwater quality data collected for the project is consistent with this hypothesis.

Drawdown impacts at these springs for both life of mine and post closure are presented in Table 5.16, based on Permian source aquifer scenario. Drawdown impacts are predicted to be realised after around 40–50 years of mining operations, with significant impacts not occurring until year 60.

Table 5.16 Predicted groundwater drawdown at the Mellaluka Springs Complex

Spring	Maximum drawdown (m) during life of mine	Maximum drawdown (m) post closure
Mellaluka springs	1.11	9.07
Stories spring	2.3	13.4
Lignum spring	8.2	26

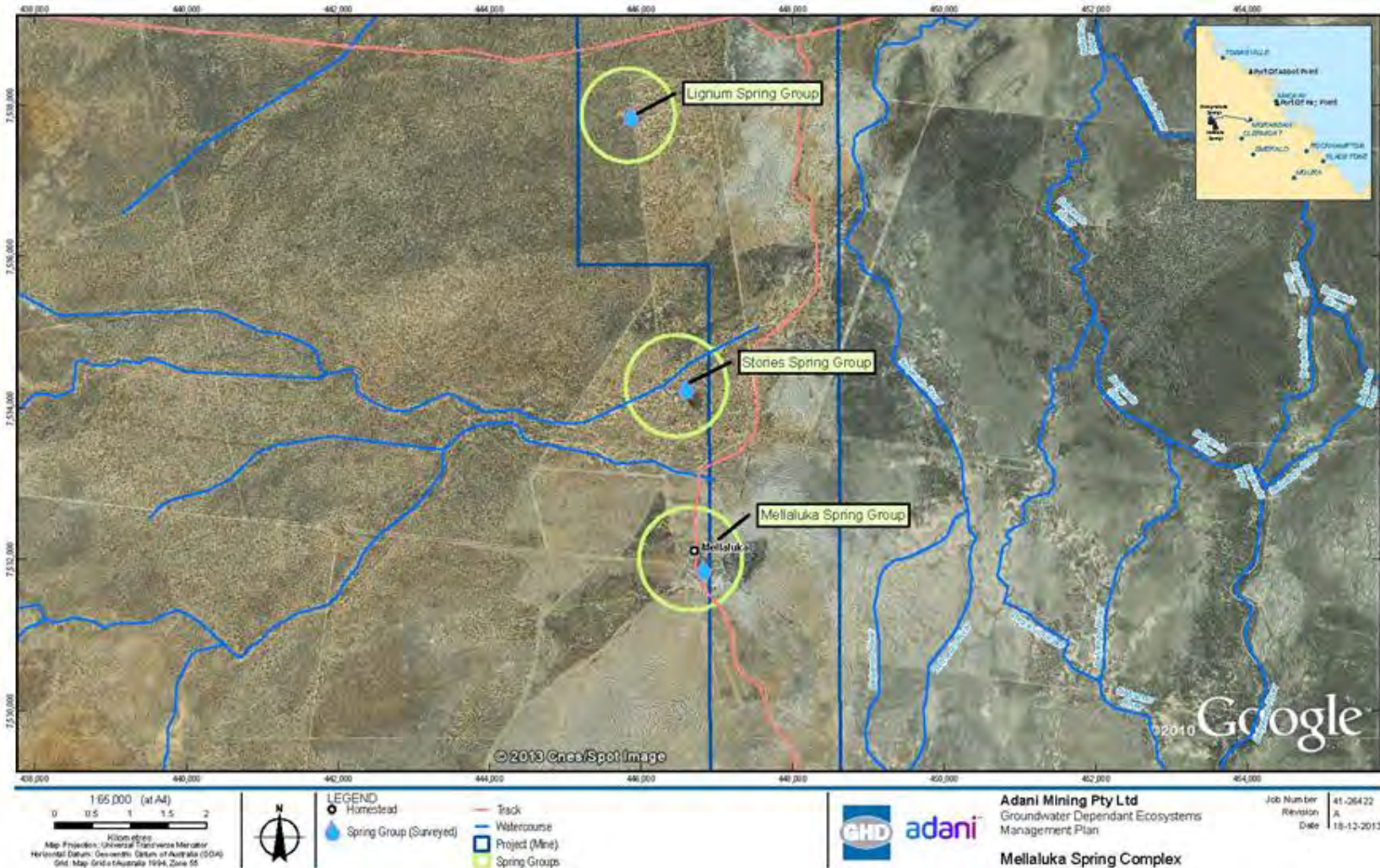


Figure 5.26 Location of the Mellaluka Springs Complex

Evaluation of environmental impacts—project wide
 Carmichael Coal Mine and Rail project:
 Coordinator-General’s evaluation report on the environmental impact statement

The draft GDEMP for the project (available on the proponent's website) states that the predicted reduction in pressure at the aquifers will have significant impacts on the Mellaluka Springs Complex, which will essentially dry up at the surface.

The post-closure predicted reduction in pressure could result in a loss of ecological function for all springs in the Mellaluka Springs Complex. This impact would occur around 2070, based on currently planning for the mine.

The draft GDEMP states that an assessment of potential impacts to the Mellaluka Springs Complex indicates that no offset is required. The proponent states offsets may be considered in the event that future monitoring and modelling suggest that impacts will be significant and mitigation and management measures are not feasible.

Key issue—source aquifer

AEIS Appendix H states that this spring group is not believed to be fed by a GAB aquifer, but rather an aquifer located in Permian or quaternary and tertiary strata. As a result, the proponent considers that this spring group cannot meet the criteria for designation as part of the GAB springs TEC and was not considered further by the proponent in its assessment of impacts to TECs.

The IESC raised concerns that the source aquifer for the Mellaluka Springs Complex has not been determined, and as such consider that it is not possible to accurately predict impacts from mining on these springs. The IESC states that there is insufficient information on ecology and water chemistry, particularly in relation to potential seasonal variability, to design scientifically appropriate management and mitigation strategies.

DNRM also believes the source for the Mellaluka Springs Complex should be clarified although DNRM does not consider the source to be from the GAB. DNRM supports the proponent's hypothesis that the base of the Colinlea Sandstone is the most likely source of the Mellaluka Springs Complex but has recommended that the proponent undertake additional investigation, including the installation of drilling bore lines west to east, to confirm this source. DNRM has also recommended an adjustment to the layering of the groundwater model in its next revision to include a layer for the Colinlea Sandstone below the D seam, which is where it is anticipated that the springs are being sourced from.

While additional information gathering is recommended, I consider that the proponent has provided an appropriate understanding and estimation of the likely impacts to the Mellaluka Springs Complex for this report, which will be improved by future groundwater model updates.

I note the proponent's commitment P6.34 (Proponent Commitments Register (Appendix 7)) that the source aquifer for the Mellaluka Springs Complex will be further investigated and a report provided to the administering authority for the Water Act outlining the hydrogeological conceptual model for the spring and a description of the associated hydrogeology.

To ensure the determination of the source aquifer for the Mellaluka Springs Complex I have stated a condition for the project's draft EA (Appendix 1, Schedule E) which requires, prior to the commencement of activities that impact groundwater level or

quality, the determination of the source aquifer(s) for groundwater supply to GDEs, including the Mellaluka springs complex.

Key issue—Baseline information, mitigation measures and offsets

Impacts to the springs may be such that they will permanently disappear prior to mine closure. Permanent arrangements to maintain the springs post mine closure have not been proposed. As such both DE and DEHP advise that the proponent should provide further information on the Mellaluka Springs Complex to:

- establish a comprehensive set of baseline information, in particular to confirm the presence of species (including the black-throated finch—refer to section 5.1 of this report) and to gain a better understanding of seasonal variation in spring flows and inform impact level and adaptive management options
- develop specific, effective mitigation and management measures
- develop a monitoring program to develop trigger levels requiring mitigation
- based on the baseline information collected, proposed mitigation and management measures and in the event that trigger levels are reached; identify suitable offsets for significant residual impact that would require an offset under the EPBC Act or any State requirements.

I consider that further information is required to establish a comprehensive set of baseline information at the Mellaluka Springs Complex and inform impact trigger level and adaptive management options. To this end, I have stated conditions for the project's draft EA which requires the development and implementation of a:

- **baseline groundwater monitoring program** (Appendix 1, Schedule E): The proponent must finalise a groundwater monitoring dataset prior to the commencement of mining activities which ensures, amongst other objectives, the identification of natural groundwater level trends and groundwater contaminant trigger levels
- **revised GDEMP** (Appendix 1, Schedule I): In addition to establishing the natural variation of spring flow, the proponent must establish as part of the GDEMP the extent and ecological composition of the Mellaluka Springs Complex, in accordance with Fensham's *Wetland Monitoring Methodology for Springs in the Great Artesian Basin (2009)*. This work must be completed prior to the commencement of activities that impact groundwater level or quality.

Prior to finalising the groundwater monitoring dataset required as part of the Groundwater Management and Monitoring Program (Appendix 1, Schedule E) and to ensure the adequate detection of impacts to the Mellaluka Springs Complex, I have also stated a condition (Appendix 1, Schedule E) which requires the proponent to provide to the administering authority for approval a proposed groundwater monitoring network for detecting, amongst other objectives, impacts to GDEs including the Mellaluka Springs Complex.

As noted in section 5.1 of my report, I have also imposed a condition (Appendix 1, Section 3) requiring additional baseline ecological research prior to the commencement of activities that impact BTF habitat, including two dry season surveys of the Mellaluka

Springs Complex to determine the extent to which this GDE provides BTF habitat—particularly as a refuge during the dry season.

In order to address DE and DEHP concerns regarding the identification of impacts, I have stated conditions (Appendix 1, Schedule E) requiring an adaptive approach to the management of the Mellaluka Springs Complex, including the monitoring of groundwater fluctuations in proximity to the Mellaluka Springs Complex and the identification of groundwater drawdown trigger levels which will trigger the implementation of corrective measures for each of the GDEs and/or the provision of offsets.

To ensure the development of specific mitigation and management measures for the GDE for threats posed by the project, including principally groundwater drawdown but also weeds and feral pests where they represent a threat on-site, I have stated a condition as part of the project's draft EA requiring the approval and implementation of a GDEMP (Appendix 1, Schedule I).

In the event that groundwater fluctuations exceed the defined groundwater drawdown trigger levels (Appendix 1, Schedule E, Condition E13), the trigger exceedance is determined to be the result of mining activities and impacts cannot be feasibly mitigated (Appendix 1, Schedule E, Condition E14), significant residual impacts of the project may need to be offset in accordance with my conditions stated for the draft EA and the EPBC Act Offsets Policy. This is reflected in the recommended approval conditions (Appendix 1, Section 2, Part A).

Carmichael River riparian zone

The Carmichael River is the major surface water resource which runs through the project (mine) area. The flow regime of the Carmichael River is subject to seasonal variability as wet season overland flow drains from the catchment. Late in the dry season the Carmichael River is reduced to a low flow environment, interspersed with deeper pools. The Carmichael River is characterised by a well-established riparian zone that provides extensive shading of the water.

Information presented in the AEIS on observed surface water flows, groundwater levels and a comparison of groundwater and surface water quality data for the Carmichael River suggests that flows and/or water levels are at least partly supported by direct groundwater flow from the underlying units and/or by discharge from the Doongmabulla Springs Complex. This suggests that the Carmichael River and the associated remnant riparian vegetation are groundwater dependent. Fauna which are attracted to these areas are consequently also likely to be indirectly dependent on groundwater.

The sclerophyll community fringing the Carmichael River is dominated by river red gum (*E. camaldulensis* var. *obtusa*), weeping paperbark (*M. leucadendra*) and narrow-leaved paperbark (*M. fluviatilis*), often with waxy cabbage palm present (refer to section 5.1.1 for more information on the waxy cabbage palm).

Groundwater drawdown from mine dewatering of between 1 to 4 metres is predicted to occur in the vicinity of the Carmichael River (AEIS Appendix H). Groundwater modelling results suggest that:

- near the western boundary of the mining lease, drawdown will be approximately 1 m and zero flow periods will increase to approximately 5 per cent of the time, from zero per cent currently
- in general, drawdown of the water table along the Carmichael River could be greatest near the middle of the mine area, at approximately 4 m, and decrease gradually towards both the western and eastern boundaries
- at the eastern mining lease boundary, base flow could be reduced by around 1000 m³/day (33 per cent of pre-development base flow) during the operational phase, falling to approximately 950 m³/day (31 per cent of pre-development base flow) post mine closure
- zero flow periods at the eastern mining lease boundary will increase by 30 per cent to 60 per cent of the time during operation and post mine closure.

Drawdown of the water table is predicted to reduce the volume of base flow to the Carmichael River. These base flow reductions are predicted to cause the point at which base flow in the Carmichael River is reduced to zero (through leakage to the ground in 'losing' sections of the river) to migrate 10 km upstream, from 25 km downstream of the eastern mining lease boundary pre-development, to 15 km downstream post-development.

The draft GDEMP states that reduced baseflow to riparian vegetation may result in reductions in health, leading to stress and mortality of dominant riparian species (river red gums and paperbarks)—in particular within the eastern half of the project mine area where drawdown is predicted to be up to 4 m. 6.1 of this report provides more information on the potential impacts of predicted groundwater drawdown on the Carmichael River.

The proponent has committed to implementing a number of mitigation and management measures to minimise impacts to the Carmichael River riparian zone. These measures, as described in AEIS Appendix H and included in the Proponent Commitments Register (Appendix 7), include:

- restricting the extent of vegetation clearing to the minimal amount necessary (commitment M4.17)
- management of fire regimes (commitment P6.75)
- erosion and sediment control (commitment P6.73)
- management of weeds and pests (commitments P6.71 and P6.72).

The proponent has committed to develop and implement a number of management plans to facilitate the implementation of the above measures, including:

- GDEMP (commitment M4.27)
- Project (Mine and Off lease Infrastructure) Bushfire Management Plan (commitment P6.75)
- Project Land Management (Flora and Fauna) Plan (commitment P6.68)
- Project Vegetation Management Plan (commitment P6.69)
- Project Weed and Pest Management Plan (weeds) (commitment P6.71)
- Project Weed and Pest Management Plan (introduced animals) (commitment P6.72)

- Project Erosion and Sediment Management Plan (commitment P6.73).

GDE Management Plan

Subsequent to the AEIS, I directed the proponent to submit a draft GDE Management Plan (GDEMP)⁷³ for the project.

The purpose of the GDEMP is to identify and describe actions necessary to prevent or minimise, to the greatest extent possible, impacts to the GDEs associated with the project, including the WCP. WCP mitigation and management measures identified in the GDEMP focus on ameliorating weed and pest impacts through removal and management. This includes the removal of rubber vine and the implementation of ongoing management measures to monitor resurgence, and the control of the existing feral pig population which is damaging WCP habitat and seedlings (commitment P6.39).

Section 9.4 of the GDEMP notes that consideration was given in the AEIS to supplementing base flows in the Carmichael River during dry periods through controlled releases from the mine site, at a point in the river where there is a natural inflow from groundwater. However the GDEMP states that this mitigation measure is unlikely to be achievable from mine-related discharges, as excess water is planned to be reused on the mine site.

Section 9.9 of the draft GDEMP details a monitoring program to increase the level of information available for the Carmichael River GDEs and inform the development of management measures. Monitoring would be focused on providing for adaptive management in addressing the inevitable indirect impacts of groundwater drawdown—in particular on the riparian vegetation and WCP population in the western section of the mine site where the proponent expects these species to persist. Key monitoring commitments, as identified in the Proponent Commitments Register (Appendix 7), include:

- **Development of a detailed ‘ecological features’ map for the Carmichael River:** to assist in vegetation and river health monitoring, identifying priority management areas including the locations of WCPs, rubber vine infestations, riparian composition and health, areas of connectivity/disconnection with the groundwater based on the modelling, gaining/losing areas of the river relative to the groundwater (commitment P6.37).
- **Establishment of permanent CORVEG primary monitoring transects at regular intervals along the river:** for the purpose of establishing a riparian community health baseline. In the initial development/operational phases of the mine, monitoring of the plots will be seasonal, reflecting high flow/low flow variability in the Carmichael River (twice annually). This monitoring will continue into the mid operational life of the mine, and increase to a quarterly frequency when drawdown is at its maximum. If possible, depth to groundwater data will be incorporated (commitment P6.39).

⁷³ This document, dated 11 February 2014, is available on the proponent's website: http://adanimining.com/Australia_Carmichael_coal.aspx

- **Vegetation monitoring with regard to groundwater monitoring/base flow monitoring:** Locations for monitoring bores will be chosen with respect to selected environmental features along the Carmichael River (such as deep pools, particular riparian communities, areas with WCP) to enable more meaningful interpretation of potential direct interactions between these features and the groundwater (commitment P6.42).
- **Monitoring the base river flow, including the establishment of gauging stations, in areas of particular ecological interest:** Flow data will be monitored on an ongoing basis prior to construction, during operation and post operation upstream, downstream and within the mine area (commitment P6.43).
- **Detailed monitoring of groundwater levels and surface water flows at the Carmichael and Belyando Rivers:** to be undertaken prior to construction, during operation and post operation upstream, downstream and within the mine area will be undertaken to measure changes to groundwater and surface flows (commitment P6.44).

The proponent's assessment of potential impacts on the Carmichael River (refer to section 8.4 of the draft GDEMP) identifies that an offset is required where unavoidable impacts to WCP are predicted to occur. Refer to section 5.1.1 for my assessment of impacts to the WCP.

Key issue—baseline information, mitigation measures and offsets

Further information is required on the following:

- **Identification of potential impacts:** establishment of a comprehensive set of baseline information at the Carmichael River riparian zone—in particular the relationship between groundwater level, base flow and the health of riparian communities—in order to gain a better understanding of seasonal variation in base flows and inform impact level and adaptive management options
- **Mitigation and management measures:** identification of specific, effective mitigation measures for the Carmichael River riparian zone
- **Offsets:** impacts on riparian vegetation at the Carmichael River that are likely to be more extensive than just the clearing impact on WCPs. The proponent has not committed to provide offsets for significantly impacted riparian vegetation, nor established a means by which to determine significant impacts (e.g. through the establishment of drawdown trigger levels to trigger the implementation of corrective measures and/or the provision of offsets).

The IESC advises that there is a need for more specific mitigation measures, noting that the proponent has provided limited management measures in the event that the health of riparian vegetation declines as a result of the permanent reduction in groundwater discharge to the Carmichael River.

To ensure the establishment of a comprehensive set of baseline information on riparian ecosystems/species present in the Carmichael River riparian zone in order to inform impact level and adaptive management options, I have stated conditions for the project's draft EA which requires the development and implementation of a:

- **baseline groundwater monitoring program** (Appendix 1, Schedule E): The proponent must finalise a groundwater monitoring dataset prior to the commencement of mining activities which ensures, amongst other objectives, the identification of natural groundwater level trends and groundwater contaminant trigger levels
- **revised Groundwater Dependent Ecosystem Management Plan** (Appendix 1, Schedule I): the proponent must establish the extent and ecological composition of the Carmichael River riparian zone (ecosystems associated with the Carmichael River between Doongmabulla Springs and the Belyando River), the natural variation of groundwater level/pressure, and GDE ecosystem pressure response to groundwater level/pressure fluctuation. This work must be completed prior to the commencement of activities that impact groundwater level or quality.

Prior to finalising the groundwater monitoring dataset required as part of the Groundwater Management and Monitoring Program (Schedule E) and to ensure the adequate detection of impacts, I have also stated a condition (Appendix 1, Schedule E, Condition E8) which requires the proponent to provide to the administering authority, for approval, a proposed groundwater monitoring network for detecting, amongst other objectives, impacts to GDEs including the Carmichael River riparian zone.

In regard to the identification of impacts, I have stated conditions (Appendix 1, Schedule E and Schedule I) requiring an adaptive approach to the management of the Carmichael River riparian zone, including the monitoring of groundwater fluctuations in proximity to the Carmichael River riparian zone and the identification of groundwater drawdown trigger levels which will trigger the implementation of corrective measures for each of the GDEs and/or the provision of offsets.

To ensure the development of specific mitigation and management measures for the GDE for threats posed by the project, including principally groundwater drawdown but also weeds and feral pests where they represent a threat on-site, I have stated a condition as part of the project's draft EA requiring the approval and implementation of a GDEMP (Appendix 1, Schedule I).

In the event that groundwater fluctuations exceed the defined groundwater drawdown trigger levels (Appendix 1, Schedule E) and the trigger exceedance is determined to be the result of mining activities and impacts cannot be feasibly mitigated (Appendix 1, Schedule E), significant residual impacts of the project will need to be offset in accordance with my conditions stated for the draft EA (Appendix 1, Schedule I) and the EPBC Act Offsets Policy (Appendix 1, Section 2, Part A). This is reflected in the recommended approval conditions

Coordinator-General's conclusion – mine dewatering impacts to GDEs

My requirement for the proponent to undertake baseline monitoring (prior to the commencement of activities that impact groundwater) and ongoing monitoring of GDEs (Appendix 1, Schedule I) will ensure that potential indirect impacts to GDEs are appropriately identified.

I have stated conditions (Appendix 1, Schedule I) requiring an adaptive approach to the management of affected GDEs, including the monitoring of groundwater fluctuations in

proximity to GDEs and the identification of groundwater drawdown trigger levels which will trigger the implementation of corrective measures for each of the GDEs and/or the provision of offsets.

Impacts will be managed through the implementation of the GDEMP which I have stated a condition for as part of the project's draft EA (Appendix 1, Schedule I). This condition will ensure the development of specific mitigation and management measures for the GDE for threats posed by the project, including groundwater drawdown, weeds and feral pests where they represent a threat to the species on-site. The GDEMP must also be in accordance with relevant guidelines, policies and plans (e.g. Threat Abatement Plans). As groundwater related impacts to the project are an area of significant risk to MNES, the GDEMP should also be referred to DE for review and approval.

My recommended condition for the development of an MMP for approval by the Commonwealth Minister for the Environment (Appendix 1, Section 2, Part A) should ensure appropriate monitoring and management measures are implemented in order to protect GDEs.

In the event that groundwater fluctuations exceed the defined GDE groundwater drawdown trigger levels (Appendix 1, Schedule E) and the trigger exceedance is determined to be the result of mining activities and impacts cannot be feasibly mitigated (Appendix 1, Schedule E), significant residual impacts of the project will need to be offset in accordance with my conditions stated for the draft EA and the EPBC Act Offsets Policy. This is reflected in the recommended approval conditions (Appendix 1, Section 2, Part A).

Considering the above, and assuming compliance with my recommending conditions, the project should not have an unacceptable impact on GDEs.

Groundwater quality impacts

Based on the proponent's AEIS documentation (AEIS Appendices K1, K6, K7 and K8), I consider that prior to the implementation of mitigation measures, the key potential impacts to groundwater quality associated with the project include:

- increased aquifer connectivity associated with subsidence
- contamination from spoil and tailings management
- degraded water quality in final voids.

Increased aquifer connectivity associated with subsidence

Any cracks created during longwall mining could allow for the direct interconnection between units of differing hydrochemistry. The resultant blending of fresh, brackish, and saline water could result in an alteration of groundwater quality.

Mine dewatering would reduce the impacts of this alteration on hydrochemistry as the composite groundwater would be collected and used on site and would not result in aquifer through flow from the site. Post-mine closure model results indicate that groundwater will flow towards the final voids and not into regional aquifers or surface water systems.

I have stated draft EA conditions (Appendix 1, Schedule E) requiring the comprehensive monitoring of groundwater hydrochemistry for 36 chemical and physical water quality parameters (including major anions and cations, dissolved metals, nutrients, hydrocarbons and physio-chemical parameters) for comparison with contaminant trigger values for underlying aquifers (including Alluvium, Tertiary, Bandanna Formation, Colinlea Sandstone, Rewan Formation, Dunda Beds, Clematis Sandstone and Early Permian). If groundwater quality characteristics exceed any of the stated trigger values, the proponent must investigate the potential for environmental harm.

Spoil and tailings management

The majority of mining waste generated by the project would be overburden/interburden from the open-cut mining operations (approximately 13.1 billion bcm over the life of mine (LOM)), supplemented by a relatively small quantity of coarse rejects and fine rejects (10.60 mtpa and 3.46 mtpa LOM, respectively) from the CHPP.

Tailings and any Potentially Acid Forming (PAF) materials would be placed into clay-lined encapsulation cells within waste rock dumps (commitments M9.13 and M9.20). Appendix O1 of the AEIS presents a geochemical assessment of coal and mining waste materials associated with the project. The results of the geochemical assessment indicate that the majority of overburden/interburden waste from all lithological groups is likely to be Non Acid Forming (NAF) in the long term and most of these materials are not expected to be an immediate source of salinity.

To protect water resources, I have stated a number of draft EA conditions to ensure the effective assessment and management of mining waste (Appendix 1, Schedule H). Under these conditions, the proponent must develop and implement a Waste Rock, Spoil and Rejects Disposal Plan which includes a detailed mining waste assessment program for the progressive characterisation of all mining waste prior to disposal. This will include the characterisation of net acid producing potential, salinity, physical properties and a number of key contaminants (iron, aluminium, copper, magnesium, manganese, calcium, sodium and sulphate) as well as the quantity of run-off and seepage. The plan must also include information on how PAF and NAF materials will be placed to reduce acid metalliferous drainage (AMD) and a sampling program to verify these placements.

I have also stated conditions (Appendix 1, Schedule C) that require the proponent to manage tailings in accordance with procedures contained within the plan of operations, including (but not limited to) provisions for:

- containment of tailings
- the management of seepage and leachates both during operation and the foreseeable future
- a program of progressive sampling and characterisation to identify acid producing potential and metal concentrations of tailings
- maintaining records of the relative locations of any other waste stored within tailings
- implementing the rehabilitation strategy

- 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.

The IESC suggested that mining waste management should take into consideration the management and handling of overburden material, soil testing to characterise overburden and a robust monitoring network for migration of AMD. Stated conditions in Appendix 1, Schedule H address this issue.

Refer to section 6.4 of this report for more information on mining waste.

Water quality in final voids

The AEIS Appendix K1 identifies that the six post-mining voids are expected to remain dry (assuming that any evaporation will exceed groundwater inflow) following closure of the mine. The IESC considers that there is still potential for the partially backfilled voids to gradually fill with water, particularly after prolonged heavy rainfall events, and as such there could be potential risks to nearby surface water and groundwater resources as a result of degraded water quality.

In the event that significant impacts to regional groundwater is observed due to the presence of final voids, the proponent has made a commitment (commitment M1.2) to take any further steps necessary to reduce post closure impacts on groundwater levels and/or flows to acceptable levels, including:

- reviewing and revising the extent, location and/or timing of the proposed mine workings
- reviewing the backfilling level of final voids in order to minimise or prevent ongoing losses due to evaporation.

Assessment of final void water levels

I note the proponent's commitment to minimise post closure impacts on groundwater levels/flows. However I consider that the proponent must undertake additional monitoring to confirm the potential groundwater quality impacts resulting from final voids, including the validation of groundwater inflows and surface water ingress to groundwater from flooding events, in order to inform any mitigation and management options.

To this end, I have stated conditions for the project's draft EA (Appendix 1, Schedule E) requiring (as part of a Groundwater Management and Monitoring Program) an assessment of groundwater inflow into mine workings and surface water ingress to groundwater from flooding events based on groundwater level data and groundwater modelling. This will provide information on the likely final void water levels and the likelihood of the final voids discharging water to surface water and groundwater systems.

I have also stated a condition (Appendix 1, Schedule E) which requires that the Groundwater Management and Monitoring Program be reviewed at 5 yearly intervals, with a report provided on the outcome of the review to the administering authority for approval. To ensure that the predictive groundwater model is reviewed and regularly

updated based on the outcomes of the Groundwater Monitoring and Management Program, I have stated a condition for the draft EA (Appendix 1, Schedule E) which requires the revision of the numerical groundwater model (referred to in the AEIS Appendix K1 and K6) based on transient calibration methods, including but not limited to:

- Predictions of changes in groundwater levels for a range of scenarios
- Information about any changes made since the previous model review, including data changes
- A report outlining the justification for the revised model and the outputs of the revised model
- An evaluation of the accuracy of the predicted changes in groundwater levels, groundwater flow rates to surface water and recommend actions to improve the accuracy of model predictions.

I have also stated a condition (Appendix 1, Schedule E) which requires, no later than 3 months after commencement of the model review, that a report outlining the findings and any recommendations of the groundwater model review be submitted to the administering authority for approval. As groundwater related impacts to the project are an area of significant risk to MNES, the Groundwater Monitoring and Management Program should also be referred to DE for review and approval.

Mine void management

I have noted the IESC's advice regarding residual mine void management and the potential long term impacts on groundwater. In response and in accordance with standard management provisions for mining in Queensland, I have stated conditions relating to the management of residual voids. Under condition H6 of the project's EA (Appendix 1, Schedule H), the proponent must ensure that residual voids do 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 residual void itself and subject to any other condition within the EA.

In addition, I have stated a condition for the project's draft EA (Appendix 1, Schedule H) that will ensure, as a minimum, the partial backfilling of all residual voids to the top of the coal seams, as follows:

- Pit B, D and G to the top of Seam D
- Pit C, E and F to the top of Seam AB.

This condition will minimise groundwater inflow into the voids, avoiding loss through evaporation and concentration of salts and other contaminants. Confirmation of this outcome will be determined through the Groundwater Management and Maintenance Program referred to above.

Coordinator-General's conclusion—groundwater quality impacts

Based on the proponent's assessment of groundwater quality impacts and the comprehensive requirements of the EA conditions, I am satisfied that the proponent would minimise and manage any potential impacts on groundwater quality.

Mine—surface water

Introduction

The Carmichael River, which transects the mining lease, joins a network of river systems within the Belyando River catchment. The mine area catchment represents 1.4 per cent of the total Belyando River catchment area. The Belyando River catchment forms part of the Burdekin River Basin which discharges through the Burdekin Falls Dam to the coast at Upstart Bay.

Submissions on the EIS and AEIS raised a number of issues in relation to potential surface water impacts from the mine, including:

- impacts to flooding
- changes to the duration of flood inundation
- impacts to flows in the Carmichael River
- impacts to geomorphology in waterways
- impacts to water quality
- subsidence impacts to surface water, including ponding.

I have considered each of the submissions and how the AEIS and subsequent information received from the proponent has responded to submitter issues as part of my evaluation of the environmental impacts of the project.

Assessment methodology

A number of assessment studies were undertaken to determine the potential impacts to surface water associated mine throughout the EIS, AEIS and subsequently to respond to submitter issues, including:

- EIS Volume 2, section 6
- Hydrology Report (EIS, Volume 4, Appendix P1)
- Preliminary Water Balance Report (EIS, Volume 4, Appendix P2)
- Water Quality Report (EIS, Volume 4, Appendix Q)
- AEIS Volume 2, section 6
- Revised Subsidence Assessment Report (AEIS, Volume 4, Appendix I1)
- Draft SMP (AEIS, Volume 4, Appendix I2)
- Water Balance Report (AEIS, Volume 4, Appendix K2)
- Mine Water Quality Report (AEIS, Volume 4, Appendix K3)
- Flood Mitigation and Creek Diversion Design (AEIS, Volume 4, Appendix K4)
- Revised Mine Hydrology Report (AEIS, Volume 4, Appendix K5)
- SMP (January 2014)⁷⁴
- Mine Flood Inundation Duration Report (January 2014)⁷⁴
- Water Balance Modelling Review (February 2014)⁷⁴
- Surface Water Monitoring Program (March 2014)⁷⁴

⁷⁴ This was provided by the proponent at my direction to respond to submissions received on the AEIS. For a copy, refer to the proponent's website at http://adanimining.com/Australia_Carmichael_coal.aspx

- Dam Hazard Assessment (March 2014).⁷⁴

I consider that these documents provide a comprehensive analysis of water management issues for the mine site. Potential impacts have been identified and appropriate avoidance and mitigation measures proposed in related environmental management plans and proponent commitments (Appendix 7). Key issues are addressed in the following sections.

Flooding

Baseline studies presented in AEIS Appendix K5 indicate that the mine site could become inundated during relatively frequent flood events. Therefore the mine site requires flood protection in order to operate and management of stormwater on site to minimise the impact of the site on overland flow.

Proposed flood protection and stormwater management infrastructure includes:

- levees to protect the adjacent pits from flooding by the Carmichael River
- a bridge across the Carmichael River to allow passage of haul vehicles and the conveyor from the south to the north of the mine during flood events
- diversion drains to allow local waterways to pass through the site without causing flooding and also redirect overland flow around operational areas
- water storages to manage contaminated run-off on site.

AEIS (Appendix K5) identifies the following general design criteria adopted for proposed flood protection and stormwater management infrastructure:

- all mine infrastructure is to be contained within the mine area
- 1000-year ARI flood immunity for open-cut pits
- 100-year ARI flood immunity for overburden areas
- 100-year ARI diversion drain capacity
- 50-year ARI flood immunity for haul road crossings
- 600 mm minimum freeboard above the design immunity water level.

Hydraulic modelling of the mine site hydrology under post-development conditions predicts changes to the flood flows in the Carmichael River due to the loss of and changes to the catchment areas by the proposed mine and diversion drain areas. Flood inundation maps indicating the depth of flooding pre and post development are presented in AEIS Appendix K4, including the predicted change in flood level (afflux) for the 10, 50, 100 and 1000-year ARI design events under post-development site conditions (figures 2, 3, 4 and 5).

With the establishment of the mine site and accompanying flood mitigation infrastructure, the Carmichael River will be confined to the corridor between the flood levees with no run-off being received from the area behind the flood levee. The modelling of the Carmichael River corridor with the flood protection levees and other drainage infrastructure in place predicts that the mine site should be protected from large flood events. Refer to the Water quality impacts section below for more information about water storage capacities and ability to withstand extreme weather events in the context of MAW water release.

AEIS Appendix K5 identifies that the most significant afflux would be confined to the mine area, due to the combined effect of minor increased inflows from some of the diverted waterways, reduced run-off coming from the developed mine internal areas and hydraulic constriction by the flood protection levees, haul road and conveyor crossing.

Upstream of the haul road crossing, afflux is modelled to peak at 0.98 m for the 1-in-1000-year ARI event, but at the downstream mining lease boundary this is reduced to peak at 0.09 m adjacent to the Carmichael River and 0.27 m downstream of Cabbage Tree Creek. These values are reduced in smaller flooding events, with afflux at the mining lease boundaries generally being relatively insignificant (0 to 0.09 m, with the higher values being confined to the eastern boundary downstream of Cabbage Tree Creek). AEIS Appendix K5 states that the significant reduction in afflux values predicted over this short distance indicates that neighbouring properties are likely to experience minimal increase in flood extents both downstream and upstream of the mine area.

The IESC considers there is a degree of uncertainty in the flood model predictions due to the paucity of temporal and spatial gauging data. Given the significant seasonal and climatic variability in the region, the IESC considers that the flood model should be updated prior to the final design of the flood levees to ensure that the planned height remains sufficient to protect mining areas from a 1:1000 ARI event.

I have stated a number of conditions for the draft EA in order to protect surface water hydrology and geomorphology values on the mine site (Appendix 1, Schedule K). The conditions specify the comprehensive design requirements and hydraulic performance criteria that must be met as part of the detailed design phase of the project to ensure that regulated structures (dams and levees) protect mining areas under extreme weather events and prevent non-compliant discharge and environmental impacts on downstream receiving waters, ecosystems and landholders.

In accordance with these conditions, regulated structures must be designed and constructed to ensure that the design integrity would not be compromised on account of:

- flood waters from entering regulated dams from any watercourse or drainage line
- wall failure due to erosion by floodwaters arising from any watercourse or drainage line.

Assuming compliance with my stated conditions, I am of the view that the design and construction of regulated structures will provide for the adequate protection of mining areas from flooding under extreme weather events.

Changes in the duration of flood inundation

To respond to submissions received in the public and agency comment period, the proponent submitted at my direction a Mine Flood Inundation Duration Report⁷⁵ which provides an assessment of the ecological impacts resulting from inundation duration

⁷⁵ For a copy of the report, refer to the proponent's website at http://adanimining.com/Australia_Carmichael_coal.aspx

associated with the following flooding events—10-year ARI, 50-year ARI, 100-year ARI and 1000-year ARI.

This assessment concludes that a change in the duration of flood inundation has the potential to impact riparian vegetation and WCPs along the Carmichael River and Cabbage Tree Creek. Inundation duration changes include:

- increased inundation duration of flooding upstream and a decreased inundation duration downstream of the proposed road bridge across the Carmichael River. This has the potential to impact on riparian vegetation and WCPs
- reduction in Cabbage Tree Creek channel flood duration which may impact on riparian vegetation
- increased flood inundation duration on the floodplain north of Cabbage Tree Creek may cause a change in vegetation species composition to species with greater tolerance to inundation.

The impact to riparian vegetation may lead to a reduction in the health and mortality of riparian vegetation. The primary cause of these potential impacts is due to the proposed haul road bridge crossing the Carmichael River. The final design of the bridge crossing needs to minimise the increase inundation duration upstream of the bridge and any disturbance to WCPs. The proponent has committed to ensuring that the bridge will span the main channel of the Carmichael River, with no pylons or supports within the low flow channel (commitment M1.25). The final design of the bridge crossing will be consistent with appropriate guidelines.

The proponent has also committed to ensuring a corridor, at a minimum of 500 m will be retained either side of the centre line of the Carmichael River to protect it and the riparian zone from mining operations (commitment M1.4).

The proponent has made a commitment to undertake further modelling prior to construction of the final levee location and the final bridge design to demonstrate that the impact due to increased flood inundation duration is minimised to protect riparian vegetation and waxy cabbage palms (commitments R2.3, R2.4).

Areas of prolonged inundation associated with subsidence from proposed underground mining are also predicted (surface water ponding). For further information on acceptable thresholds and proposed measures to mitigate subsidence impacts to surface water, refer to the subsidence impacts section below.

Impacts on the Carmichael River surface flow

As discussed in section 5.1.7 of this report, the reduction in groundwater flows has been estimated to reduce the Carmichael River base flow by 33 per cent (1000 m³/day) on a long-term daily average for the operating life of the mine and by 31 per cent (950 m³/day) post mine closure.

Given the potential for a reduction in surface water flows in the Carmichael River, as predicted through numerical modelling, the proponent has committed to undertaking continued detailed monitoring of groundwater levels and flows in the Carmichael River corridor (commitment M5.11). In particular, further manual gauging will be undertaken

at upstream and downstream level monitoring sites so that a reliable pre-development flow record can be developed for these gauges.

AEIS Appendix K5 identifies that the proposed change to catchment areas decreases the flow to Carmichael River by 1.9 per cent of the total Carmichael River flow at the site (based on 2133 km² of upstream catchment used in the flood modelling) or around 5000 ML per year (based on MUSIC modelling). The total site discharges from the MAW storages into the Carmichael River is expected to 641 ML per year (maximum).

While the discharges from the site storages may contribute to mitigating a small percentage of the surface flow losses, they would not be sufficient to mitigate against the long-term loss of base flows in the Carmichael River associated with mine dewatering. However, given that this catchment makes up only 0.44 per cent of the Burdekin Basin, I consider that it is likely that water from other catchments will provide sufficient inflows such that flows in downstream waters in the Burdekin catchment would not significantly decrease as a result of the project. For further information on the impacts of groundwater drawdown from requisite mine dewatering, refer to section 5.1.7.

Water required for the project will be sourced from pit dewatering and floodwater harvesting in the Belyando River. I note that the proponent's hydrology modelling (AEIS, Volume 4, Appendix K5) indicated that proposed floodwater extractions from the Belyando River for project activities would have minimal impacts against the environmental flow objectives defined in the Water Resource (Burdekin Basin) Plan 2007. The proponent committed to operating the Belyando River Flood harvesting station according to operating rules developed using the IQQM to limit impacts to downstream users (commitment M5.8).

The IESC considers that the proposed floodwater harvesting in the Belyando River together with the predicted reduction of base flows in the Carmichael River has the potential to contribute to downstream impacts.

I note that the proponent will be required to follow a range of statutory approval processes under the Water Act in order to interfere with, divert and/or source water which will ensure the protection and appropriate allocation of surface water resources.

Given that the Carmichael River provides only a small proportion of the flow of the Belyando/Burdekin River System and the approval provisions of the Water Act, I do not consider there is potential for significant downstream impacts on surface water resources.

Geomorphology impacts

The potential key components of the project (mine) that could impact on the geomorphology of waterways include construction of infrastructure within the waterways or floodplains and the subsidence impacts of underground mining. The geomorphology assessment presented in the AEIS (Volume 4, Appendix K5, section 3.12) determines that the on-site and downstream significance of these potential impacts will be negligible with the implementation of proposed mitigation measures, including (but not limited to) the management of erosion and sedimentation in

accordance with a Project Erosion and Sediment Management Plan (commitment P6.20).

I note that this plan will identify all practices to be implemented prior to, during, and post-construction to minimise the potential for erosion to occur, including timing of clearing activities, sediment and erosion control measures to be implemented, performance criteria and corrective actions. Monitoring and reporting protocols will also be detailed within this plan, and responsible parties for implementing the plan's actions will be identified (commitment P6.20).

The proponent has committed to regularly inspecting diversion drains, floodplains and discharge points to downstream waterways during the wet season and after any flow event to identify scouring, instability or erosion and undertake prompt corrective action (commitment P6.69).

To ensure that erosion and release of sediment in surrounding waters is minimised, I have included stated a condition for the draft EA requiring the development of an Erosion and Sediment Control Plan (Appendix 1, Schedule F).

Based on the assessment presented in the AEIS, the proponent's commitments to mitigate impacts and assuming compliance with my stated condition, I consider that the project will not result in unacceptable impacts to the geomorphology of waterways.

Water quality impacts

Potential impacts to water quality are consistent with those defined for the world heritage properties, national heritage places, GBRMP and wetlands of international importance controlling provisions and thus, there are significant overlaps between this section and sections 5.1.3, 5.1.4, 5.1.5 and 5.1.6. As discussed in section 5.1.7, potential impacts on surface water quality as a result of the mine may arise from:

- release of MAW—this could reduce quality of downstream waters through contamination by hydrocarbons, metals and waste materials
- stormwater run-off and increased flow velocity across disturbed areas—this could mobilise sediments leading to higher levels of sedimentation, turbidity and contamination in downstream waters
- reduction in downstream flow from extraction of water resources and loss of catchment area—this could potentially increase concentrations of existing contaminants in downstream waters.

The proponent's water management strategy for the mine focuses on reusing water on site as much as possible and on minimising volumes of MAW on site. As noted above, the total site discharge from the MAW storages is expected to 641 ML per year (maximum).

Release of MAW

To address any uncertainty regarding the contamination of water by construction and mining activities, the proponent has determined that all drainage run-off from the disturbed areas of the mine site will be treated as MAW. To ensure no adverse impacts occur in surrounding waterways as a result of MAW contamination, the proponent will

establish the following water management structures and systems as a priority during project construction:

- diversion drains (to a 100-year ARI standard) with flood protection levees to divert clean water from upstream catchments around the mine site to downstream waterways, installed with appropriate erosion and scour controls (commitment M5.27)
- dams for storage of MAW and release as necessary in accordance with EA conditions (commitment M5.23)
- sediment ponds where sediment affected stormwater will be captured and left to evaporate or pumped to MAW storage dams (commitment M1.31).

Following the public and agency comment period, the proponent provided at my direction an updated assessment of the proposed regulated structures⁷⁶, including MAW storages, against the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures*⁷⁷. This assessment has informed the conditioning of regulated structures as part of the draft EA (Appendix 1, Schedule K). These conditions will satisfy submitter concerns associated with water storage capacities and ability to withstand extreme weather events. For further detail on conditions associated with regulated structures and proponent commitment to ensure no downstream impacts occur, refer to section 5.1.3.

All discharge and overflow events to both internal water management infrastructure and external waters, as well as management of hazardous substances and sewage effluent, will be undertaken in controlled circumstances in accordance with the provisions of my stated conditions for surface water (Appendix 1, Schedule F), as discussed in section 5.1.3.

The IESC considers that the project could permanently change water quality and noted that a discharge strategy containing sufficient information to understand the risks to aquatic ecology and surface water had not been provided. The IESC advises that the site specific water quality objectives for the sub catchment be revised with additional seasonal data to develop trigger values that represent dry and wet seasonal periods.

DEHP advised that the proponent's assessment documentation, including updated documents submitted post the AEIS, describing the surface water monitoring program (available on the proponent's website), provides an adequate program for assessing potential surface water quality impacts. The Department of Science, Information Technology, Innovation and the Arts (DSITIA) reviewed the proponent's discharge strategy and advised on the development of draft EA conditions stated in Appendix 1, Section 1. DSITIA considers that the strategy would protect receiving water environmental values in accordance with the *Environmental Protection (Water) Policy 2009* and the development of local water quality objectives (WQOs) to protect these values. The WQOs will need to be reviewed as further local monitoring data becomes available (refer to EA condition F22, Appendix 1, Schedule F).

⁷⁶ For a copy of the report, refer to the proponent's website at http://adanimining.com/Australia_Carmichael_coal.aspx

⁷⁷ Department of Environment and Heritage Protection, *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures*, State of Queensland – Department of Environment and Heritage Protection, Brisbane, 2013.

I note that assessment of background water quality monitoring data collected by the proponent since 2012 was used by the proponent as a basis for proposed release contaminant trigger levels for metals above the default guideline levels.⁷⁸ I consider this variation acceptable in areas where the natural mineralogy elevates the concentration of toxicants, but this needs to be demonstrated for each parameter. In this circumstance, both site water quality data and criteria indicated in section 4 of the *Queensland Water Quality Guidelines*⁷⁹ need to be considered in the derivation of local WQOs. Consistent with the IESC's recommendation, modified trigger levels have been developed (and included in Schedule F of the draft EA, Tables F3 and F5) using data collected by the proponent.

Based on the advice from DEHP, DSITIA and conditions I have stated in Schedule F of the EA, including modified trigger levels based on background water quality data, I am satisfied that potential impacts on surface water quality would be manageable.

Stormwater run-off across disturbed areas

Given the extent of disturbance proposed, there is potential for stormwater to become contaminated with higher levels of suspended sediment as it crosses the mine site and travels downstream. Given that the mine area catchment makes up only 1.4 per cent of the Belyando River catchment, I consider it is unlikely that any potential changes to sedimentation, turbidity and contamination levels in the mine area will be detectable in the downstream waters as a result of mining activities.

Nevertheless, the proponent has provided mitigation measures to limit any potential degradation of downstream aquatic habitat from stormwater run-off across the mine disturbance areas (refer to section 5.1.3). To supplement these, I have also stated conditions relating to stormwater and sediment controls (Appendix 1, Schedule F).

Reduction in downstream flow from extraction of water resources

As discussed in section 5.1.3, the proponent's groundwater model (AEIS, Volume 4, appendices K1 and K6) concluded that groundwater drawdown will have consequential impacts on surface water and decrease base flow in the Carmichael River across the mine area by 33 per cent at the end of the mine life. This could potentially increase concentrations of existing contaminants in aquatic habitats downstream. However, given that this catchment makes up only 0.44 per cent of the Burdekin Basin, I consider it is likely that water from other catchments will provide a significant dilution factor and therefore concentrations of any contaminants in downstream waters would not likely increase as a result of the project.

For further information on the impacts of groundwater drawdown from requisite mine dewatering, refer to section 5.1.7.

Subsidence impacts

Potential impacts on surface water resources from subsidence, as identified in the proponent's Revised Subsidence Assessment (AEIS, Appendix I1), include:

⁷⁸ ANZECC and ARMCANZ trigger values for Slightly or Moderately Disturbed Systems; or limits of report (LOR) where analytical methods are not sufficiently sensitive

⁷⁹ Queensland Water Quality Guidelines 2009 (www.ehp.qld.gov.au/water/guidelines/queensland_water_quality_guidelines_2009.html)

- altered topography—this could result in alteration of drainage patterns and overland flow which can have consequent impacts to riparian vegetation (through either desiccation or inundation) and increase erosion rates
- surface tension cracking—this could result in reduced downstream flows and interference with vegetation root health
- ponding—this could result in reduced downstream flows due to capture of water in subsidence troughs or increased sedimentation from overtopping pools.

For my assessment of potential impacts on groundwater resources from subsidence, refer to section 5.1.7. For my assessment of potential impacts on threatened species and communities from subsidence, refer to section 5.1.1.

AEIS Appendix I1 reports that the maximum predicted total subsidence for the proposed longwall panels after extraction in the AB1 seam is 2.62 m and 5.55 m after extraction in the AB1 and D1 seams. The assessment also predicts cracking widths of 10 mm to 280 mm and that ponding is likely occur at a rate of 50 mm/hr and last for durations of between less than a day to several months.

Table 5.17 quantifies the areas likely to be impacted for each subsidence type (subsidence, cracking, ponding and surface infrastructure), based on high and low impact thresholds identified in Table 5.18.

Table 5.17 Total areas likely to be impacted by subsidence

Impacts	Area (ha)		
	High impact	Low impact	Total
Subsidence	25.99	7,896.32	7,922.32
Cracking	140.42	4,085.01	4,225.43
Ponding	0	851.02	851.02
Surface infrastructure (direct habitat clearing)	30.02	1,197.30	1,227.32

Source: Table 7, AEIS Appendix I2

As noted above, the mine plan for the project has been designed to avoid mining impacts, including subsidence, within a 500 m buffer either side of the Carmichael River. The proponent has determined that there is a low risk of direct hydraulic connection between ponding surfaces and the coal seams. Areas in which ponding is predicted are located predominantly under compression zones at the bottom of the subsidence trough where no large cracks are anticipated.

To manage potential impacts associated with subsidence, the proponent provided a draft SMP as part of the AEIS (Volume 4, Appendix I2). In response to submissions received during the public and agency comment period, I directed that an updated SMP⁸⁰ be prepared. This was provided to my office on 31 January.

The proponent has proposed mitigation measures relevant to surface water protection from subsidence, as outlined in the abovementioned updated SMP (January 2014) as

⁸⁰ For a copy of the updated plan, refer to the proponent's website at http://adanimining.com/Australia_Carmichael_coal.aspx

well as the mine EMP (March 2014), Proponent Commitments Register (April 2014) (Appendix 7), including:

- undertaking a subsidence baseline monitoring program including in-stream monitoring points immediately upstream, mid-point and immediately downstream of underground mine footprint on each mapped watercourse (commitment M3.18)
- baseline monitoring of bed forms and existing bed and bank scour points
- designing creek diversions around the open-cut areas to remain functional after subsidence
- inspecting subsided areas for new and existing tension cracks annually
- monitoring the extent of ponding in subsidence troughs
- monitoring stream diversions adjacent to subsided areas
- implementing actions specific to managing 'high' and 'low' impacts during operations, as detailed in Table 5.19.

Subsidence—key issues

The IESC considers that the project would benefit from additional consideration of ponding impacts to watercourses and proposed management responses. DE and DEHP consider that the updated SMP⁸⁰ should provide more specific and detailed measures in order to mitigate potential impacts.

To ensure the more comprehensive identification of all potential subsidence impacts (including ponding) and the development of effective mitigation measures, I have stated conditions to be included in Schedule J of the draft EA for the project (refer to Appendix 1) requiring the development and implementation of a revised SMP, prior to the commencement of activities that result in subsidence. The plan must be reviewed and, if necessary, updated annually, with the following key matters to be addressed:

- the inclusion of baseline monitoring data and predicted subsidence impacts on, but not limited to:
 - **physical condition of surface drainage:** erosion; areas susceptible to higher levels of erosion such as watercourse confluences; incision processes; stream widening; tension cracking; lowering of bed and banks; creation of in-stream waterholes; changes to local drainage patterns; and BTF habitat
 - **overland flow:** capture of overland flow by subsided longwall panels; increased overbank flows due to lowering of high bank watercourses; the portion of local and large-scale catchment likely to be captured by subsided longwall panels and the associated impacts on downstream users
 - **water quality:** surface water and groundwater
 - **land condition:** current land condition to be impacted by subsidence
 - **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
- options for mitigating any impacts associated with subsidence, how these mitigation methods will be implemented, and the extent to which these measures will impact habitat of threatened species and communities

- impacts on watercourses, diversions or catchments
- contingency procedures for emergencies
- subsidence outcomes and the need for changed offsets
- a program for monitoring and review of the effectiveness of the SMP.

I have also stated a condition for the draft EA which requires the annual inspection of each subsided longwall panel, including assessments of the structural, geotechnical and hydraulic adequacy of the subsided longwall panel and the adequacy of the works with respect to the SMP.

Conditions which I have stated for the draft EA to manage erosion and release of sediment as part of the surface water schedule (Appendix 1, Schedule F), including the development of an Erosion and Sediment Control Plan, will equally apply to subsidence impacts to surface water.

Coordinator-General's conclusion—mine surface water impacts

Consistent with advice received from the IESC, DE and DEHP, I support the need for further information on the potential impacts of subsidence on water resources and the development of effective mitigation measures. To this end, I have stated conditions to be included in Schedule J of the draft EA for the project (refer to Appendix 1) requiring the development and implementation of an SMP, prior to the commencement of activities that result in subsidence, and the annual inspection of subsided longwall panels to assess structural, geotechnical and hydraulic adequacy.

I have stated a number of conditions for the draft EA in order to protect surface water hydrology and geomorphology values on the mine site (Appendix 1, Schedule K).

The conditions specify the comprehensive design requirements and hydraulic performance criteria that must be addressed as part of the detailed design phase of the project in order to ensure regulated structures (dams and levees) protect mining areas under extreme weather events and prevent non-compliant discharge and environmental impacts on downstream receiving waters, ecosystems and landholders.

The conditions set receiving environment monitoring and contaminant trigger levels at upstream (background) and downstream monitoring locations. If quality characteristics of the receiving water at the downstream monitoring points exceed any specified trigger level during a release event, the proponent must compare the downstream results to upstream results in the receiving waters and, where project initiated exceedances are identified, investigate the potential for environmental harm, including actions taken to prevent environmental harm and correct the problem.

Appropriate monitoring timeframes have been included in the EA conditions, including two forms of monitoring: compliance monitoring and the Receiving Environment Monitoring Program. Monitoring frequencies related to discharge and compliance monitoring have been defined including daily monitoring for discharges, trigger investigation levels and receiving waters contaminant levels.

I have also included a condition requiring the development of an Erosion and Sediment Control Plan (Appendix 1, Schedule F) to minimise erosion and release of sediment in surrounding waters.

I note that the proponent must obtain a water licence under the Water Act, administered by DNRM for the taking, interfering and/or diverting of surface water, as discussed in section 4 of this report.

I am satisfied that the comprehensive conditions I have stated in Appendix 1, particularly the water, subsidence and regulated structures schedules (Schedule F, Schedule J and Schedule K) will ensure that there are no unacceptable impacts to surface water resources as a result of mine construction and operations.

Table 5.18 **Thresholds for high and low impacts of subsidence, cracking and ponding**

Impacts	Ranking of impacts
Subsidence	<ul style="list-style-type: none"> • high: slope change of more than 2% (greater than 5 m) • low: slope change of less than 2% (less than 5 m)
Cracking	<ul style="list-style-type: none"> • high: width greater than 100 mm • low: width less than 100 mm
Ponding	<ul style="list-style-type: none"> • high: duration of ponding greater than 2 days • low: duration of ponding less than 2 days

Table 5.19 **Operational subsidence controls**

Level of impact	Possible impacts	Management actions
Low	<ul style="list-style-type: none"> • small cracks naturally filled in • minor alterations to water flows • short periods of inundation • signs of vegetation stress and up to 5% tree death (compared to reference site). 	<ul style="list-style-type: none"> • implement minor diversion works upstream of ponding zones • erosion controls should be put in place to prevent topsoil leaving the site • if greater than 5% of trees die, the level of impact should be increased to 'high' and a program of revegetation immediately instigated.
High	<ul style="list-style-type: none"> • larger cracks requiring major amelioration works • significant impacts from amelioration works • complete subversion of surface flows • ponding inundation greater than 2 days • more than 10% tree death. 	<ul style="list-style-type: none"> • amelioration of cracks should be undertaken with either small machinery to avoid further impacts to remnant vegetation, or infill with impermeable bentonite clays/ environmentally friendly sealing agents • implement minor diversion works upstream of ponding zones • implement low flow connection channels where required to allow ponded areas to drain • all impacted remnant vegetation in these areas should be stabilised and revegetated using nominated native species • weed control • all dead tree material should be left on site and used in rehabilitation as habitat • erosion controls should be put in place to prevent topsoil leaving the site.

Note: Tables adapted from the proponent's SMP (January 2014) tables 6 & 14.

Off-lease infrastructure and rail—surface water

Introduction

As is the case for the mine site, the off-lease infrastructure area is located in the Carmichael River catchment which feeds into the Belyando River catchment. The majority of the rail alignment lies within the Belyando River/Suttor River sub-catchment with the eastern section, approximately 27 km, situated in the Isaac River catchment. The alignment crosses minor waterways and overland flow paths at 76 locations and major waterways at 12 locations. Significant floodplains are crossed at North Creek, Belyando River, Mistake Creek/Gowrie Creek, Logan Creek, Diamond Creek and Grosvenor Creek.

Submissions on the EIS and AEIS raised a number of issues in relation to potential surface water impacts from the off-lease infrastructure area and rail line, including:

- flooding impacts on landholders adjacent to the railway
- adequacy of flood modelling, mitigation, immunity and acceptance criteria
- impacts of sewage effluent contamination and associated human health impacts.

I have considered each of the submissions and how the AEIS and subsequent information received from the proponent has responded to submitter issues as part of my evaluation of the environmental impacts of the project.

Assessment methodology

Off-lease surface water impacts were assessed as part of the mine documentation throughout the EIS, AEIS and post-AEIS, as detailed in section 5.1.7. Studies completed by the proponent to assess surface water impacts for the rail component include:

- EIS Volume 3, section 6
- Rail Hydrology Report (EIS Volume 4, Appendix AB)
- AEIS Volume 3, section 6
- Updated Rail Hydrology Report (AEIS Volume 4, appendices S1a, S1b and S1c)
- Rail flood inundation duration assessment.⁸¹

Impacts

Potential impacts to surface water resources arising from the off-lease infrastructure area and rail line include:

- increased extent, depth and periods of flooding—this could result in loss of grazing land, increased risk of weed invasion, changes to geomorphology and damage to landholders' property
- release of sewage effluent—this could result in decreased water quality for downstream waters
- release of chemicals, flammable or combustible liquids—this could result in decreased water quality of downstream waters

⁸¹ This was received after the release of the AEIS for public and agency comment. For a copy of this report, please refer to the proponent's website at http://adanimining.com/Australia_Carmichael_coal.aspx

- run-off of stormwater across disturbed areas—this could mobilise sediments leading to higher levels of sedimentation, turbidity and contamination in downstream waters.

The activities that could lead to impacts will be regulated through an MCU or development approval conditions, including my conditions for the off-lease area and the rail (Appendix 2).

Mitigation

Flooding

To mitigate impacts associated with flooding along the rail line, I require the proponent to implement the following measures:

- ongoing flood modelling throughout the design process to minimise impacts of crossing structures (commitment R2.4)
- implementation of appropriate erosion and sediment control measures (commitments R3.8 and R5.2)
- preferential use of bridges rather than causeways as temporary structures during construction (commitment R5.7)
- where temporary causeways are necessary, ensuring they have sufficient capacity to allow flows with a minimal increase in velocity or afflux (commitment R2.1)
- selectively raising farms roads with fill material (commitment R2.7)
- where appropriate, compensation will be negotiated with land and asset owners affected by excessive afflux from the railway (commitment R2.8)
- consultation with landholders and public agencies.

Refer to section 7.2 of this report for details on the proponent's design criteria for flood immunity, cross drainage structures, longitudinal drainage and inundation duration. These design criteria are consistent with limits for afflux, culvert velocities and extended inundation times that I have conditioned for previously assessed Galilee Basin proposals under the SDPWO Act, including the Alpha and Galilee Coal projects. I require all Galilee rail proposals to adhere to consistent drainage design criteria and have therefore imposed conditions (Appendix 2, Section 3) setting the same limits for afflux, culvert exit velocities and inundation times.

I have set a condition in Appendix 2, Section 3 requiring the proponent to consult with land and asset owners, including government agencies, regarding the potential impacts and management of railway flooding. This consultation will occur after completion of detailed design work for the rail, when flood modelling will be reviewed and updated (commitment R2.6). I encourage landholders to seek independent professional advice regarding any negotiations they have with the proponent.

Release of sewage effluent

The proponent has committed to treat sewage effluent to Class A+ standard (commitment P6.23). The treatment of sewage in the off-lease and rail components is managed under ERA 63 of the EP Act which requires an EA. Conditions stated for these sewage treatment activities are included in Appendix 2, Section 1, Part B and outline requirements that the proponent must operate under to ensure no water contamination occurs in adjacent or

downstream waters. This includes appropriate storage and release methods so that no infiltration to groundwater and subsurface flows of contaminants to surface waters will occur.

Release of chemicals, flammable or combustible liquids

The proponent's activities throughout the off-lease area and railway must be carried out in accordance with the WHS Act, which provides for the regulation of dangerous goods in Queensland. The proponent has committed to develop and implement a project-wide Hazardous Substances Management Plan which will outline the storage and handling requirements for hazardous materials in order to minimise accidental release of contaminants to the greatest extent possible (commitment P6.64). In the unlikely event of a spillage, a Spill Response Plan for both the off-lease and rail components will be implemented and emergency services and DEHP will be notified (commitments R11.17, R11.18, M11.13 and M11.14). Contaminants will be prevented from entering drains and/or watercourses through the use of absorbent materials which a licensed contractor will remove and dispose of (commitments R11.21, R11.20 and M11.16).

To supplement these measures, my conditions (Appendix 1, Schedule H and Appendix 2, Section 1, Part A) ensure that all chemicals and flammable or combustible liquids are contained on site within a containment system in accordance with the relevant Australian Standards. This will prevent water contamination adjacent to the off-lease and rail areas and in downstream waters.

Run-off of stormwater across disturbed areas

To reduce potential sedimentation of waters resulting from stormwater run-off across disturbed areas at the off-lease infrastructure area, the proponent has committed to develop and implement an Erosion and Sediment Control Plan (commitment P6.63). This will include a range of mitigation measures including the implementation of sediment fences and for larger areas, sediment basins (commitment M3.11). Stormwater monitoring will be undertaken and include checks of erosion and sediment control devices prior to rain events, inspections of streams for sediment deposition and ongoing water quality monitoring (commitment M4.14).

For the rail component, the proponent has committed to develop and implement a detailed Erosion and Sediment Control Plan prior to earthworks to minimise erosion and avoid sedimentation of watercourses and existing water storages (commitment R3.8). This will identify control practices for all project phases as well as performance criteria, monitoring and corrective actions. Control measures include, but are not limited to sediment fences, wing walls on embankments, shotcrete and rip-rap or gabion bed protection in watercourses (commitment R5.2).

The conditions and recommendations I have included in Appendix 2, Section 1 and Appendix 2, Section 2 require the proponent to prepare and document environmental protection measures which will be applied throughout the construction and operations phases. This includes:

- measures to minimise stormwater entry onto significantly disturbed land and sediment
- erosion control measures to prevent soil loss and deposition beyond significantly disturbed land
- management of contaminated stormwater so no environmental harm occurs.

Conclusion—off-lease infrastructure and rail

Based on the proponent's assessment of surface water impacts for the off-lease and rail components, the implementation of the proposed management measures as outlined in the Proponent Commitments Register (Appendix 7) and the off-lease and rail EMPs (March 2014), as well as compliance with the conditions and recommendations I have included in Appendix 2 as discussed above, I am satisfied that no unacceptable impacts to water resources will occur as a result of the off-lease and rail project components.

Regional water impacts

Proponent assessment

The proponent provided an assessment of regional water impacts in EIS Volume 1, section 9. In response to submissions received on the EIS and the availability of new project information, I directed that the proponent provide a revised assessment of regional water impacts, including on water resources (AEIS Appendix H: MNES Report). These assessments considered the following projects proposed in the Galilee Basin:

- Alpha Coal Project (EPBC 2008/4648, 2008/4647): Mine and rail element
- Kevin's Corner Project (EPBC 2009/5033)
- China First Coal Project (also known as Galilee Coal Project (Northern Export Facility)) (EPBC 2009/4737): Mine and rail element
- South Galilee Coal Project (EPBC 2010/5496)
- Goonyella to Abbot Point Rail project (EPBC 2011/6082)
- North Galilee Basin Rail (Adani Mining Pty Ltd): Located from Mistake Creek west of Moranbah to the Port of Abbot Point (near Bowen) (EPBC 2013/6885)
- Abbot Point Terminal 0 Project (EPBC 2011/6194)
- Port of Hay Point (Dudgeon Point Coal Terminals) (EPBC 2012/6240).

Figure 5.27 identifies the footprint of each project included in the proponent's assessment of regional water impacts. The closest project to the Carmichael Coal Mine project is the China Stone Coal project. This project involves the development of two open-cut and two underground mines with ultimate production for export of 60 mtpa.

The China Stone Coal project has not been included in the assessment given the limited information relating to this development in the public domain (at the time of finalising this report an EIS for the project had not been released for public consultation).

Given the geographical separation that exists between the Carmichael Coal Mine project and other projects included in the assessment (in particular, the four mining projects located in the southern section of the Galilee Basin), there is a low risk of other projects in the region contributing to the project's surface water and groundwater impacts.

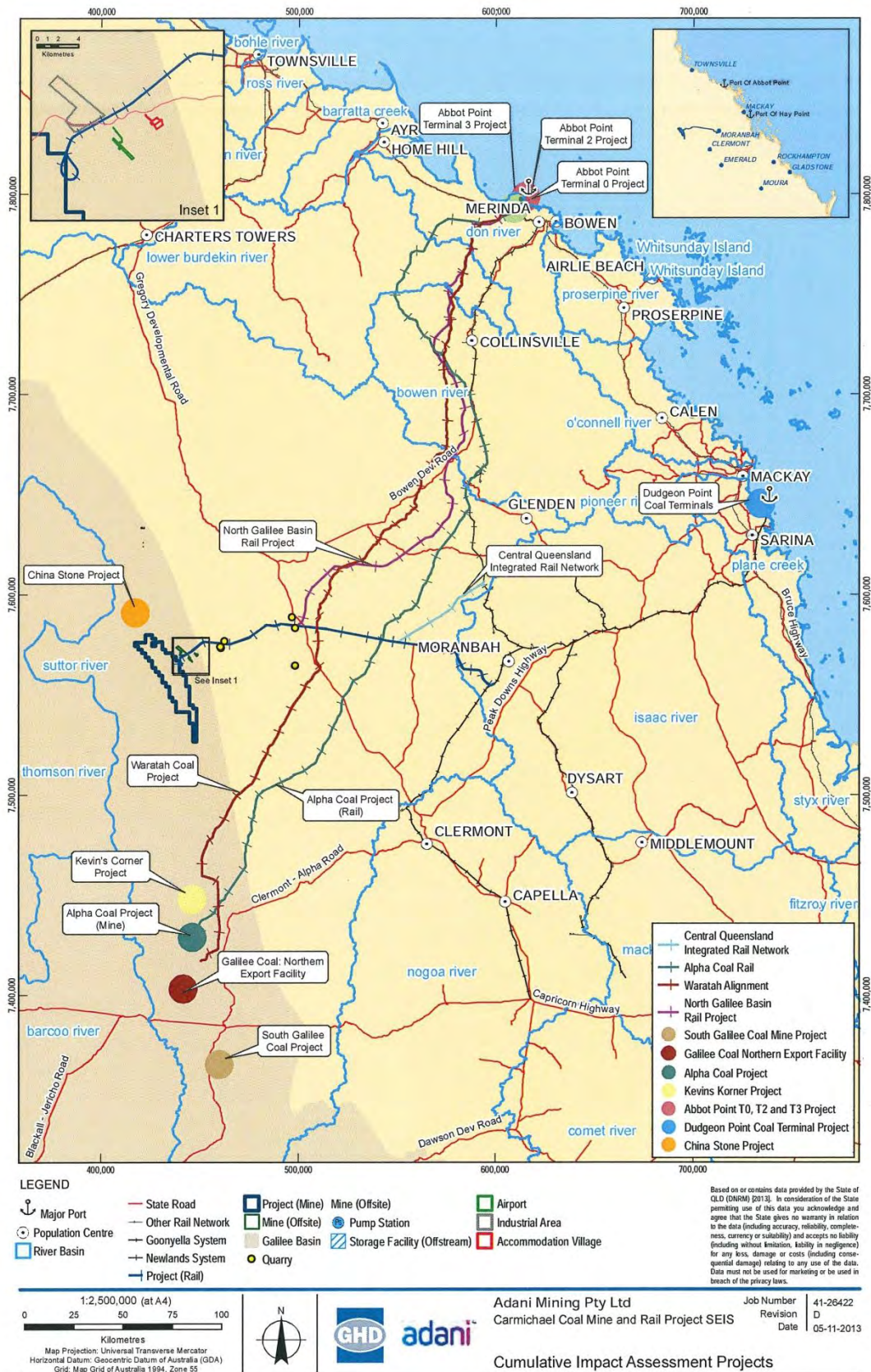


Figure 5.27 Projects included in the proponent's assessment of regional impacts

State assessment

The IESC advises that an appropriately scaled regional groundwater model and water balance, commensurate to the size of the development, should be developed in order to reduce uncertainty in regard to cumulative impacts.

DNRM is preparing a preliminary regional water balance assessment of the Galilee Basin to inform DNRM's consideration of potentially multiple water licence applications for mine dewatering in the Galilee Basin. I expect this report to be published in the near future.

DNRM's assessment will consider the cumulative impacts of five currently proposed coal mines on the Galilee Basin's groundwater budget and environmental assets, by comparing estimated groundwater use by the mines to the calculated long-term groundwater extraction limit that the Galilee Basin is capable of supporting. Proposed coal mines being considered in the assessment include:

- Carmichael Coal project
- Alpha Coal Project
- Kevin's Corner Project
- China First Coal Mine
- South Galilee Coal project.

In relation to the development of a regional model, I have made several recommendations for DNRM and DEHP to ensure the monitoring and assessment of regional water resources, including recommendations for the development of a regional water balance model (RWBM), local water quality objectives and a regional water monitoring and assessment program (see Appendix 1, Section 2, Part B). These recommendations and conditions have been included in other evaluation reports I have completed for mining projects in the Galilee Basin, including the Kevin's Corner and Galilee Coal projects.

Regional water balance model

While DNRM's preliminary regional water balance assessment is likely to provide some understanding of the risk to adjoining water entitlement holders and regional impacts on groundwater resources, estimates of mine impacts would be further enhanced as more data becomes available through the operational stages of these mines. This data would progressively improve the basis for more comprehensive numerical modelling which would, in turn, enable more robust assessment of impacts on specific water resources and environmental assets.

I consider that the development of a RWBM would complement work undertaken by each Galilee Basin mining proponent and contribute to the ongoing adaptive management of water resources in the region. Accordingly, I have recommended that DNRM develop and maintain a RWBM (Appendix 1, Section 2, Part B) which will:

- identify linkages between hydrogeological formations, the likely extent of aquifer connectivity and groundwater/surface water interactions, and characteristics of aquifer recharge
- use baseline monitoring and site water balance model data provided by project proponents

- have regard to relevant key deliverables expected from the Australian Government's proposed Bioregional Assessment for the Lake Eyre Basin
- determine potential impacts on groundwater resources and surface water flow conditions, environmental values and existing surface water users.

DNRM is currently in the process of engaging an external party to carry out a data review, develop a hydrogeological conceptualisation and provide recommendations on the design of a regional numerical groundwater flow model for the eastern Galilee Basin to assess impacts of water extraction associated with coal mining activities. DNRM advises that initial work on this project is expected to be finalised by mid-2014. The report produced will provide a basis for consultation between DNRM, DEHP, Office of the Coordinator-General and mining proponents in regard to proposed modelling in the Galilee Basin.

Regional water monitoring and assessment program

To more fully address any regional impacts on water resources, including groundwater resources, I have recommended the development of a regional groundwater and surface water monitoring and assessment program (Appendix 1, Section 2, Part B) that will utilise the results of the RWBM. The program, to be developed and maintained by DNRM in consultation with DEHP and Galilee Basin mine proponents, will:

- establish a protocol with mine proponents for the collation and delivery of surface water and groundwater monitoring data
- collate and overview surface water and groundwater monitoring data recorded by project proponents in accordance with project approval requirements
- have regard to relevant key deliverables expected from the Australian Government's proposed bioregional assessment for the Lake Eyre Basin
- adopt a risk-based assessment of regional impacts based on data provided and impact assessment reports prepared by project proponents, including potential impacts on existing water users, aquatic habitat loss and impacts on ecological systems. Regional impacts include the impacts of proposed mining project activities, including but not limited to:
 - open-cut and underground mining operations
 - mine dewatering
 - mine waste management
 - stream diversions and flood levees
 - subsidence
- report on the success of water management measures and inform the ongoing adaptive management of water resources in the region
- periodically publish data and reports with reference to monitoring and assessment program outcomes.

I have also imposed conditions to ensure the proponent contributes to the regional groundwater and surface water monitoring and assessment program when it is established, including pro-rata funding (Appendix 1, Section 3).

DNRM is currently developing a proposed regional groundwater monitoring network for the eastern Galilee Basin which will inform the regional water monitoring and assessment

program. The report produced will examine existing groundwater monitoring networks in the eastern Galilee Basin and additional monitoring bores either proposed by mining proponents or recommended by the Coordinator-General (for example, in evaluation reports). The report will outline the status of the current network and make recommendations for future monitoring requirements necessary for the development of a RWBM. This report will be subject to review by a contracted party external to DNRM and the review is expected to be completed mid-2014.

Water quality objectives

To address potential regional impacts on water quality, I have also recommended the development of Belyando-Suttor sub-catchment environmental values (EVs) and WQOs pursuant to the provisions of the *Environmental Protection (Water) Policy 2009* (Appendix 1, Section 2, Part B). WQO development must have regard to the baseline monitoring and site water balance model data provided by project proponents, relevant key deliverables expected from the Australian Government's proposed bioregional assessment for the Lake Eyre Basin and the ongoing regional surface water and groundwater monitoring and assessment program.

DEHP advises that draft EVs and WQOs are scheduled to be developed by July 2014 across the Burdekin Basin including Suttor sub-basin (and Belyando and Campaspe catchments), Houghton and Don Basins. Subject to approval, final consultation would be undertaken during September/October 2014. Also subject to approval, final EVs/WQOs included in *Environmental Protection (Water) Policy 2009* by March 2015.

5.1.8 Ecologically sustainable development

Principles

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 my evaluation of project impacts. Based on the completion of a comprehensive environmental assessment process, proponent commitments and management plans, my conditions for the mine (Appendix 1) and the off-lease infrastructure and rail (Appendix 2), I am satisfied that the project complies with the provisions of Part 1, section 3A of the EPBC Act in accordance with the following criteria.

The integration principle

This report is the culmination of a three-year assessment process addressing economic, environmental, social and equitable considerations. Three stages of this process have involved public consultation and all submissions received have been considered.

All long- and short-term impacts for the mine will be managed through an EA which will be administered by DEHP (conditions to be applied are in Appendix 1, Section 1). Impacts associated with the off-lease and rail areas will be managed through an MCU under either the SP Act with IRC as the administering authority or, if the GBSDA is declared, the SDPWO Act, in which case the Coordinator-General would assess any approval applications (conditions to be applied are in Appendix 2).

I consider that through compliance with my conditions (Appendix 1 and Appendix 2) and implementation of all proposed management measures, the long- and short-term economic, environmental and social impacts of the project are equitable and acceptable.

The precautionary principle

Based on the proponent's EIS documentation, submissions made on this documentation and advice received from advisory agencies, I am satisfied that there is sufficient scientific information to conclude that there will not be an unacceptable impact to the controlling provisions of the project.

Where I consider there is insufficient information to support the proponent's assessment conclusions, I have taken a conservative approach to documenting impact estimates. For example, in the absence of any practical examples of mine subsidence in the Galilee Basin, I have not accepted the proponent's classification of low and high subsidence impacts. Rather I have adopted a worst-case scenario for assessing potential impacts to BTF habitat and assessed impacts for the whole underground mining area.

I have adopted a precautionary approach to conditioning to supplement the proponent's proposed management measures and provide upfront and ongoing monitoring to increase the scientific understanding of potential impacts to MNES, particularly the BTF, WCP and water resources. These include, but are not limited to:

- conditions for the proponent to complete a Groundwater Baseline Monitoring Program to ensure adequate scientific understanding and to inform conditioning of thresholds for groundwater level and quality fluctuations in the final EA (Appendix 1, Schedule E)
- recommendations to identify unforeseen impacts to groundwater requiring groundwater level monitoring in the Clematis, Dunda and Rewan formations, appropriate trigger levels for the early detection of induced flow from GAB aquifers, and investigations if upper or lower limits are met (Appendix 1, Section 2, Part A)
- a recommendation for the development and maintenance of a numerical regional water balance model for the Galilee Basin in order to identify linkages between hydrogeological formations, the likely extent of aquifer connectivity and groundwater/surface water interactions, the characteristics of aquifer recharge and potential impacts on groundwater resources and surface water flow conditions (Appendix 1, Section 2, Part B)
- recommendations for the development of a regional groundwater and surface water monitoring and assessment program for the Galilee Basin and associated proponent contribution requirements including data collection and analysis and pro-rata funding (Appendix 1, Section 2, Part B and Appendix 1, Section 3)
- conditions requiring the proponent to develop and implement a GDMP prior to the commencement of operational project stages to monitor, identify and manage adverse impacts to GDEs (Appendix 1, Schedule I)
- conditions for the development of a Receiving Environment Monitoring Program to identify, manage and monitor adverse impacts to receiving surface waters (Appendix 1, Schedule F)
- conditions requiring the development of an MNES Management Plan prior to the commencement of project stages with significant MNES impacts, consistent with relevant recovery plans, threat abatement plans and conservation advice to

maximise ongoing protection and long-term conservation of EPBC listed species and communities on the project site (Appendix 1, Section 2, Part A)

- conditions requiring the proponent to complete baseline research for the BTF and submit a BTF Species Management Plan prior to the commencement of operational project stages to gain a deeper scientific understanding of specific nesting and feeding requirements, movement patterns, classification of habitat as well as identification and management of potential impacts (Appendix 1, Schedule I)
- conditions for a Bioregional Management Plan for the BTF and associated species and a BTF Monitoring Program for the Galilee Basin and Desert Uplands bioregion to provide baseline data on movement patterns, habitat requirements and condition and population dynamics and identify bioregional impacts and performance indicators for adaptive management. This will also include a requirement for apportionment of pro-rata funding by the proponent (Appendix 1, Section 2, Part B).

The intergenerational principle

I am satisfied that the intergenerational principle has been adequately applied throughout my evaluation of the project. I consider that the EIS process has sufficiently enabled submitters to raise concerns on the project in a fair and equitable manner. Three public comment periods were facilitated throughout my assessment of the project at the TOR, EIS and AEIS stages in which members of the public, NGOs and advisory agencies provided submissions. I have considered these issues in my evaluation of the project to ensure the interests of all stakeholders were considered. For further information of the number of submissions received and key issues raised, refer to section 3 of this report.

I am also satisfied that the intergenerational principle has been adequately applied throughout my conditioning. I consider that the conditions for the mine (Appendix 1) and off-lease and rail (Appendix 2) will allow for the project to be constructed and operated in sustainable matter so as to protect MNES and the environment generally for future generations.

The biodiversity principle

The TOR that I developed for the project⁸² outlined the requirements for the proponent's EIS, including considerations of biodiversity conservation and ecological integrity. The biodiversity principle has been carried throughout all stages of the three-year EIS process in both the proponent's assessment documentation and my evaluation.

I am satisfied that this principle has been adequately incorporated into my conditions for an EA for the mine (Appendix 1, Section 1) and for an MCU or development approval for the off-lease and rail components (Appendix 2). Biodiversity conservation and ecological integrity considerations have been woven throughout the various proponent commitments which will mitigate and offset any residual impacts to the controlling provisions for the project.

⁸² For a copy of the TOR and other assessment documentation, refer to www.dsdip.qld.gov.au/carmichaelcoal

The valuation principle

I am satisfied that potential impacts of the project will be suitably compensated through offsets for all unavoidable residual significant impacts (refer to the 6.1 of this report, the proponent's updated Offsets Strategy (March 2014) and my conditions in Appendix 1, Schedule I for information on offsets). I consider that the cost of both direct and indirect offsets will be commensurate with the potential impacts on MNES and the environment generally.

5.1.9 Economic and social matters

Economic benefit

The proponent has undertaken an economic impact assessment for the project as part of the AEIS (Volume 4, Appendix E). The project requires approximately \$16.5 billion in capital investment and will generate an estimated 2475 construction jobs (1075 for the mine and 1400 for the rail and quarries) and 3920 during the operations phase (3800 for the mine and 120 for the rail). Construction of the rail and mine is currently estimated to begin in late 2014 and late 2015, respectively, subject to obtaining the relevant approvals. The proponent anticipates that the first coal will be shipped from the open-cut pits in 2016 and the longwall operations in 2019.

In addition to the mine and rail, the proponent is also proposing the construction of utilities infrastructure or upgrade of existing facilities including the upgrade and realignment of Moray-Carmichael Road, and construction of an airport and water supply infrastructure.

The Adani Group's Galilee Transmission Pty Ltd is investigating a 250 km transmission line linking Powerlink Queensland's Strathmore substation near Collinsville to the new Galilee substation to be located on the Moray Downs property, owned by the proponent and located approximately 10 km east of the proposed mine site. The proposed transmission line would provide an electrical supply to the mine and connect emerging and existing customers in the Northern Galilee Basin. Should the power line proceed, it would be assessed as a separate project.

The project meets Queensland Government objectives in realising the timely development of the Galilee Basin while ensuring the community benefits and environmental objectives are supported.

The proponent's economic assessment (AEIS, Volume 4, Appendix E) presented the following benefits:

- construction of the mine and rail is expected to generate an average of \$176.3 million annually (\$31.3 million from the mine and \$145 million from the rail) in direct and indirect benefits on the Mackay Region's Gross Regional Product (GRP)
- construction of the mine and rail is expected to generate an average of \$537 million annually (\$308 million from the mine and \$229 million from the rail) in direct and indirect benefits to Queensland
- at full export capacity of 60 mtpa, positive benefits to the Mackay Region's GRP for that year will be approximately \$929.6 million (\$753 million from the mine and

\$176.6 from the rail) and \$2.97 billion of benefits to Queensland (\$2.70 billion from the mine and \$274.1 million from the rail)

- benefits to household incomes within the region are likely to total \$107.2 million and \$157.9 million at a state level.

Social impact assessment

In accordance with the TOR, the proponent completed a social impact assessment for the project (AEIS, Volume 4, Appendix D1). Key matters considered in the assessment include defining the social and cultural area of influence, community engagement, a social baseline study, a workforce profile, potential social impacts, proposed mitigation and management. Table 76 in Appendix D1 of the AEIS provided a summary of the potential positive and negative impacts, a rating of the significance of each impact derived from an impact assessment framework, an overview of the proponent's strategies for enhancing, mitigating and managing the impacts, and a revised significance rating taking into account the predicted effectiveness of these strategies.

Positive impacts identified by the proponent included:

- direct and indirect local, regional and Indigenous employment and training opportunities
- local and regional contracting and supply opportunities for individuals and businesses
- enhanced economic development opportunities throughout the region.

Potential negative impacts requiring mitigation, management or monitoring include:

- rising living costs in Clermont associated with increases in house prices and rents as workers in industries supporting the project reside in the local community
- labour market drain from other sectors into the mining industry
- traffic disruption and road safety issues along the Gregory Development Road, Flinders Highway and Peak Downs Highway during construction of the mine and rail components of the project
- disruption to cattle operations, increased labour requirements and reduced amenity for landholders
- increased demand on emergency and community services arising from the temporary accommodation camps and permanent workforce accommodation.

Given the difficulty in predicting impacts with certainty over an extended period, the proponent has committed to an adaptive approach by which social impact mitigation and management strategies will be reviewed, monitored and updated on a regular basis for the life of the project.

Mitigation measures, as identified in Table 76 of Appendix D1 (AEIS, Volume 4), will be supported by a number of plans, procedures and policies that address specific issues or impacts of both the mine and proposed railway alignment in greater detail including:

- Stakeholder Engagement Strategy incorporating land access protocols for impacted landholders

- Workforce Management Strategy incorporating workforce health and safety plans, an employee induction program and code of conduct for employees and contractors regulating behaviour, alcohol and drug use, cultural awareness and safety
- recruitment and training programs to sustainably maintain a reliable, skilled workforce and addressing potential hurdles to the employment of groups typically under-represented in the mining industry
- Local Industry Participation Strategy giving effect to the Queensland Resource and Energy Sector Code of Practice for Local Content, and the proponent's Australian Industry Participation Plan and Local Buying Policy
- Integrated Housing Strategy to manage short- and long-term project impacts on local and regional housing supply and affordability
- Emergency Management Plan
- Community Development Plan outlining the proponent's voluntary contributions to the wellbeing of the region
- cultural heritage management plans
- traffic management plans.

Further engagement with stakeholders is required to finalise the baseline data, targets and indicators needed to ensure that the actions and supporting documents listed above are further developed and implemented prior to the commencement of construction.

Based on the proponent's assessment and proposed mitigation strategies as well as my imposed condition (Appendix 1, Section 3), I am satisfied that economic and social impacts can be appropriately managed over the life of the project. My condition requires the proponent to provide an annual report to the Coordinator-General from the commencement of construction up to and including the peak construction workforce period, and for two years following the commencement of mining operations. This report must describe:

- the actions to inform the community about project impacts and show that community concerns about project impacts have been taken into account when reaching decisions
- the actions to enhance local and regional employment, training and development opportunities
- the actions to avoid, manage or mitigate project-related impacts on local community services, social infrastructure and community safety and wellbeing.

Refer to section 5.5 of this report for a more detailed social and local economic assessment which outlines specific mitigation measures in accordance with the Queensland Government's social impact assessment guideline⁸³ components; community and stakeholder engagement, workforce management, housing and accommodation, local business and industry content and health and community wellbeing. The proponent's responses to the potential impacts identified through

⁸³ For a copy of the guideline, refer to <http://www.dsdip.qld.gov.au/resources/guideline/social-impact-assessment-guideline.pdf>

consultation during and after the EIS processes are summarised in Appendix 6 of this report, based on the above criteria.

5.1.10 Coordinator-General's overall conclusions

I have reviewed all of the provided assessment documentation and am satisfied that the proponent has adequately assessed any potential impacts on the controlling provisions under the EPBC Act as a result of the project. The proponent has provided a variety of management and monitoring measures throughout the project EMPs and Proponent Commitments Register (April 2014) (Appendix 7) to ensure any potential impacts are appropriately managed. My conditions and recommendations outlined in Appendix 1 and Appendix 2 will supplement these measures to ensure the requirements of the EPBC Act are met.

I consider that the requirements of the bilateral agreement have been satisfied.

Based on my conclusions for each of the respective controlling provisions as discussed above, I am satisfied that the project would not result in unacceptable impacts on MNES.

5.2 Transport

5.2.1 Introduction

The project's transport impacts were presented in the EIS (Volume 2, Section 11; Volume 3, Section 11; Volume 4, Appendix W (mine) and Appendix AG (rail)), the AEIS (Appendix P) and in a Road Impact Assessment (RIA) developed subsequent to the AEIS. The RIA can be found on the proponent's website at:

http://adanimining.com/Australia_Carmichael_coal.aspx. The proponent's response to submissions on the EIS relating to transport matters was presented within Section 11, Volume 2 and Volume 4, Appendix A of the AEIS.

5.2.2 Context

The project will impact on road, rail and air transport in the locality of the project and regionally. Construction of the mine and rail and operation of the mine will generate traffic relating to the delivery of items such as sleepers, rail, girders, culverts, concrete, mining equipment, plant and equipment, fuel and consumables.

Due to the project's remote location in central Queensland, the roads expected to be used by the project range from unsealed, one-way rural roads to SCRs stretching from the project to Emerald, Clermont, Mackay, Townsville and Brisbane. The assessment of the impacts of project-related traffic is therefore vital to understanding whether additional traffic, especially in the form of heavy vehicles and wide-load deliveries, have the potential to impact on existing transport infrastructure.

The proposed rail alignment will impact on local roads, private tracks, stock routes and one SCR and each crossing will require treatment via grade separation or level crossing. The impacts of the rail line on private tracks and stock routes and proposed treatment are detailed in section 7.4. The proponent has not assessed additional capacity requirements on existing rail networks in the assessment as this was not considered to be within the scope of the project's TOR.

A proposed on-site airport will facilitate the direct transportation of staff to the site from major population centres as an alternative to employees travelling on the regional road network.

DTMR advised that the traffic impact assessment (TIA) provided in the AEIS was not undertaken in accordance with the DTMR *Guidelines for Assessment of Road Impacts of Development* (GARID) and did not provide sufficient information for DTMR to assess the extent of the impacts of the project at a local and regional level. At my direction, the proponent consulted with DTMR and provided a road impact assessment (RIA) on 28 February 2014 with updated information and commitments which addressed the outstanding issues that were identified in DTMR's response to the AEIS. In addition, the proponent agreed to provide further information to DTMR as detailed design work is completed as referred to in section 5.2.3.

I note other issues raised in submissions including:

- concern about impacts on local roads raised by IRC and landholders
- the need for measures to address safety issues suggested by QPS, including:

- park-up rest areas to address driver fatigue issues
- additional signage to prevent people from becoming lost
- consultation about proposed emergency response routes and the impacts the design of level crossings and infrastructure upgrades may have for emergency response vehicles.

I have considered each submission and how the AEIS and subsequent information received from the proponent responded to submitter issues as part of my evaluation.

5.2.3 Road transport impacts and mitigation

Description of the existing road network

Roads impacted by the project include SCR managed by DTMR and local roads managed by IRC. Key roads impacted by the project and assessed in the RIA are identified in Table 5.20.

Table 5.20 Key roads impacted by the project

Road name	Type of road	Description
Peak Downs Highway	SCR	Fully sealed, two-way, state strategic road, maximum speed limit of 100 km per hour
Gregory Developmental Road	SCR	Fully sealed, two-way, state strategic road, maximum speed limit of 100 km per hour
Flinders Highway	SCR	Fully sealed, two-way, state strategic road, maximum speed limit of 100 km per hour
Kilcummin-Diamond Downs Road	IRC local road north of the project SCR south of the project	Partly sealed district road, speed limit up to 100 km on sealed sections
Elgin-Moray Road	IRC local road	Unsealed road, only trafficable in dry conditions
Moray-Bulliwallah Road	IRC local road	Unsealed road, only trafficable in dry conditions
Moray-Carmichael Road	IRC local road	Unsealed road, only trafficable in dry conditions

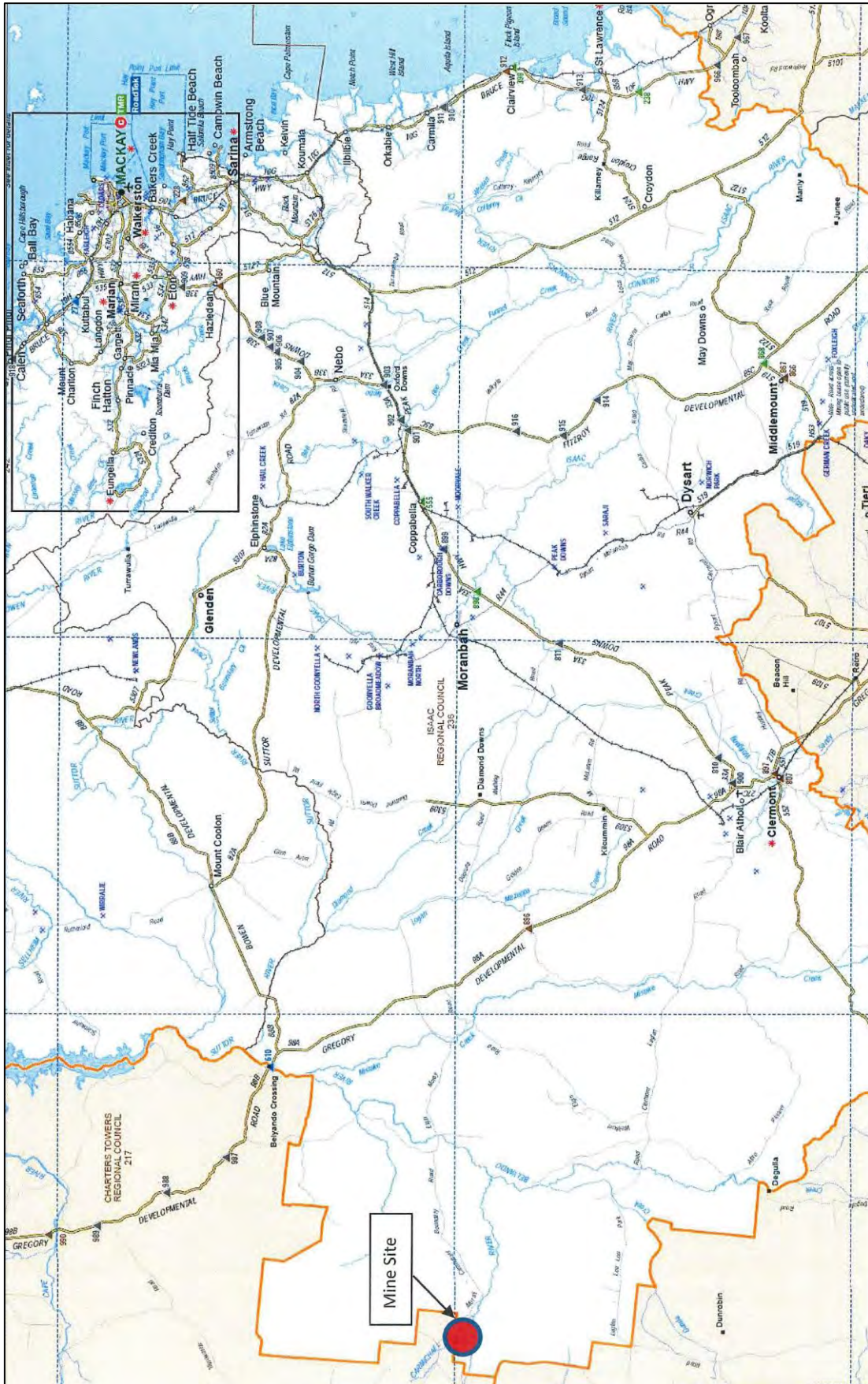


Figure 5.29 Regional transport network

Evaluation of environmental impacts—project wide
Carmichael Coal Mine and Rail project:
Coordinator-General's evaluation report on the environmental impact statement

Project impacts and proposed mitigation measures

The RIA assessed the impacts of the project on intersection, road link, pavement and infrastructure capacity. In accordance with the GARID, roads with a predicted increase in traffic of more than five per cent were assessed to determine if the impacts were acceptable or whether mitigation would be required.

Intersection assessment

Modelling in the RIA indicated that the project would potentially affect three intersections on the Gregory Developmental Road—the intersections with Elgin-Moray Road, Kilcummin-Diamond Downs Road and the Peak Downs Highway. The proponent has committed to upgrade the Gregory Developmental Road/Elgin-Moray Road intersection as part of the Elgin-Moray/Moray-Carmichael Road upgrade, undertake improvements at the other two intersections and upgrade site access off Kilcummin-Diamond Downs Road to the Rail Camp 1 (commitments M10.9-M10.13). I have recommended that these upgrades be included in a revised RIA (Appendix 1, Section 2, Part A).

Road link capacity

Modelling in the RIA indicated that while the project could generate more than a five per cent increase in traffic on three road links—the Gregory Developmental Road (between the Peak Downs Highway and Flinders Highway at Charters Towers); Elgin-Moray Road (from the Gregory Developmental Road to the mine site); and Kilcummin Diamond Downs Road (from the Gregory Developmental Road to the rail camp 1 turnout)—it would have no impact on the level of service of these road links. I am satisfied that the capacity of these roads is sufficient to accommodate the anticipated increase in traffic.

Pavement impact assessment

A pavement impact assessment was completed for the SCR network and is presented in section 5 of the RIA. The assessment determined that the project would have a significant impact on the pavement life of sections of the Gregory Developmental Road. I support DTMR's recommendation that for these pavement areas, the proponent is to upgrade them or enter into an agreement with DTMR to do so as part of a joint project. This agreement will be a matter that is dealt with in the final RIA as I have recommended in (Appendix 1, Section 2, Part A).

Impacts on infrastructure

Section 5.3 of the RIA assessed the impact of the project on road structures and found that two bridges on the Gregory Developmental Road may present a potential safety risk without remedial action including the:

- Miclere Bridge which requires traffic to give way along a relatively high-speed section of road and may be unsuitable for increased heavy or oversize vehicle traffic
- Cape River Bridge and causeway as the crossing may not have all-weather reliability.

I agree that further assessment is required to determine the adequacy of the current structures and approaches to safely accommodate project traffic increases and that alterations to the current structures, delineation and signage may be required. This assessment and agreement will be a matter that is dealt with in the final RIA as recommended in my conditions in Appendix 1, Section 2, Part A.

Impacts on local roads

In response to concerns about the impact of the project on local roads, the proponent has committed to work with the IRC and state agencies to develop an infrastructure agreement for the upgrade and maintenance of local roads (commitment R10.10) and to provide advance notice of road/lane closures and advice on alternative routes to local users (commitment R10.5).

The infrastructure agreement will include specific details about the works and financial contributions required to upgrade impacted road infrastructure and vehicular access to project sites, and contributions towards the cost of maintenance and rehabilitation to mitigate impacts on pavements or other infrastructure. The need for infrastructure agreements is included in my recommended conditions at Appendix 1, Section 2, Part A.

School bus routes and public transport routes

The RIA identified school bus services that traverse the Gregory Developmental Road and Peak Downs Highway which have the potential to overlap with haulage routes. There are no public transport services in the local communities surrounding the project. I note that potential impacts posed by the project will be managed through measures proposed in a Road-use Management Plan (RMP) and a construction Traffic Management Plan (TMP) that the proponent has committed to prepare and implement (commitments R10.1 and M10.1).

Emergency response concerns

I note that concerns raised by the QPS about issues to address driver safety and emergency response have been addressed by the proponent with the following commitments to:

- use logistics technology to plan heavy vehicle movements and the loading of equipment on these vehicles to address the appropriate QPS and pilot support when delivering equipment (commitment M10.3)
- consult with DTMR, QPS and other proponents (where applicable) regarding the need for additional park-up rest areas and road signage and provide management and mitigation measures regarding fatigue management into the revised TMPs for the project (commitments R10.8 and M10.6)
- continue consultation and enter into agreements with IRC, QPS and DTMR in regards to impacts on road infrastructure on the local and SCR network (commitments R10.9 and M10.7)
- address traffic management issues through the preparation and implementation of a construction TMP, which will be developed during the detailed design phase and

propose management and mitigation procedures outlining emergency response times for emergency (commitments R10.1 and M10.1).

I am satisfied that these measures will address the concerns raised by QPS.

Further issues to be addressed in consultation with DTMR

I note that DTMR has advised that while sufficient information has been provided to indicate that road impacts can be suitably managed, further assessment of project impacts on the transport network and the development of a range of mitigation measures during detailed project design is required, including:

- finalising the RIA
- finalising a mitigation program which should include the construction of required roadworks, payment of any contributions towards the cost of works, rehabilitation or maintenance and/or completing actions or payments specified in an infrastructure agreement with DTMR and IRC
- finalising and implementing an RMP and TMP
- submitting detailed drawings of works to DTMR and IRC for approval
- obtaining all relevant licences and permits.

I support this view and have recommended conditions for the finalisation and implementation of these measures in Appendix 1, Section 2, Part A.

5.2.4 Rail transport

Impacts of the new railway line on existing roads and traffic

The proposed rail alignment crosses one SCR and five local roads controlled by the IRC and the treatments proposed in the EIS (Volume 3, Section 11) are provided in Table 5.21.

Table 5.21 Roads intersecting the rail corridor

Road name	Chainage	Proposed treatment type	Type of road
Eaglefield Road/ Kilcummin Diamond Downs Road	51.2	At grade active crossing	IRC local road (becomes SCR south of the project)
Amaroo Road	82.1	Grade separated (rail over road)	IRC local road
Avon Road	88.7	Grade separated (rail over road)	IRC local road
Gregory Developmental Road	107.4	Grade separated (rail under road)	SCR
Moray Bulliwallah Road	151.6	At grade active crossing	IRC local road
Moray Carmichael Road	173.1	Realigned to run parallel on the southern side of the Project (Rail). No crossing treatment required.	IRC local road

The proponent has committed to develop final treatment options of grade-separated crossings in the detailed design phase in accordance with DTMR and IRC specifications (commitment R10.2). Further to this, the proponent has committed to:

- grade separate the Gregory Development Road and the Carmichael Coal rail corridor, subject to an infrastructure agreement which will be reached prior to the commencement of construction (commitment R10.18)
- reach agreement with DTMR regarding access and crossing prior to the commencement of construction at the road crossing of the Gregory Development Road for the purposes of rail construction traffic (commitment R10.19).

I note that the AEIS (Volume 3, section 11.3.5) advised that the construction of level crossings along the route could result in potential conflicts between rail and road traffic that will need to be managed by installing appropriate safety warning measures. The AEIS states that the proponent will consult with DTMR to establish how these impacts should be managed and to identify agreed mitigation measures.

Coal dust impacts on rail transport

I am aware of DTMR's concerns about the need for the proponent to commit to measures that reduce coal dust emissions from coal wagons in transit. Coal dust settling on the track can lead to ballast fouling which requires expensive cleaning during track maintenance and results in loss of rail capacity due to increased derailments and track availability during ballast cleaning. Veneering of coal trains across the Queensland coal rail network is becoming standard practice to address these maintenance issues and air quality effects. DTMR has requested that the proponent commit to veneering or fully covering coal wagons to maintain consistency with the measures being undertaken by other operators on the Queensland coal network.

The air quality impacts and impacts of coal dust emissions from coal wagons in transit are discussed in section 7.4.4 and I have stated a condition in Appendix 2, Section 1, Part A and made a recommendation in Appendix 2, Section 2 to ensure the proponent addresses these issues. The recommendation is consistent with the requirements in the QR Network Coal Dust Management Plan (2010) and the requirements stipulated for the other Galilee Basin rail proponents to minimise the impact of coal dust emissions on sensitive receptors, ecological values and rail safety and maximise economic efficiency.

Conclusions

I consider that potential impacts on rail and rail crossing safety have been adequately addressed given the proponent's commitments to:

- assess new road/rail crossings using the ALCAM assessment model during the detailed design stage
- identify the appropriate treatment of road/rail crossings in consultation with DTMR
- prevent the impacts of ballast fouling from coal dust emissions through adopting best practice control measures.

5.2.5 Air transport

Due to the project's remote location, the proponent proposes to use FIFO as the predominant means of transporting workers to and from the project site. FIFO employees will primarily be transported by air from major population centres on the Queensland coast directly to the proposed airstrip adjacent to the mine site, as described in the RIA (p. 55). During construction, workers will be flown to the existing airport at Doongmabulla and some FIFO may occur via Moranbah for construction of the eastern section of the rail component. Further information about the proponent's intention to use FIFO as a mechanism to source the project's workforce can be found in section 5.5.

The AEIS (Volume 4, Appendix C4) advised that the airport will be designed to accommodate aircraft with a maximum capacity of 150 people and that it is expected that there will be up to 12 flights per week during construction and operation.

Aerodrome certification for the new airport will be sought from CASA as part of a subsequent approval process. The airport and associated facilities will be designed to adhere to the Civil Aviation Safety Regulation 139.050.

The airport will be located within the proposed GBSDA and be subject to an MCU approval or be approved by IRC. The application material for a development permit for the airport and associated environmentally relevant activities and operational works aspects is addressed in the AEIS (Volume 4, Appendix C4) and the impacts of the airport on sensitive receptors are addressed in the AEIS (Volume 4, Appendix N).

I have included conditions that are applicable to the construction and operation of all off-lease infrastructure in Appendix 2.

5.2.6 Coordinator-General's conclusions

I am satisfied that the EIS process has adequately investigated the impacts of the project on the local and state-controlled road networks.

The proponent must update the RIA as more detailed information becomes available during the detailed design phase as I have recommended in my conditions (Appendix 1, Section 2, Part A). The proponent must also implement a mitigation program developed in consultation with DTMR and IRC that includes the development and implementation of any required RMP, TMPs, infrastructure agreements, construction of any works or contributions towards the cost of works, prior to the commencement of significant project traffic. The outcome sought with my recommended conditions is the mitigation of the road network impacts caused by the additional traffic generated by the project.

I have recommend conditions requiring the proponent to address these and related matters (Appendix 1, Section 2, Part A). I am confident that the recommended conditions will address the requirements to manage and mitigate impacts resulting from the project as they relate to road and rail transport.

5.3 Greenhouse gas emissions and climate change

5.3.1 Introduction

This section of the report evaluates the proponent's assessment of greenhouse gas (GHG) emissions and the potential impacts of climate change on the project. GHG emissions will be generated as a result of a number of project activities, such as electricity and fuel consumption in machinery, emissions of coal seam gas from mining, and explosives combustion as a result of blasting.

A number of submissions received on the EIS raised issues in relation to the proponent's assessment of GHG emissions, including:

- the adequacy of GHG emissions analysis and the lack of consideration of scope 3 emissions
- the associated effects of GHG emissions, including global warming and climate change impacts.

I have considered each submission and how the proponent's additional information has responded to these issues as part of my evaluation of the environmental effects⁸⁴ of the project.

5.3.2 Context

The proponent is required to report on GHG emissions under the provisions of the *National Greenhouse and Energy Reporting Act 2008* (Cwlth) (NGER Act). The NGER Act prescribes an accounting methodology and requires the publication of results.

Under the NGER Act, boundaries have been established to assist in determining emissions attributable to a project. In terms of emissions boundaries, three scopes have been identified:

- **Scope 1 (direct) emissions**—includes the release of GHG emissions as a direct result of activities undertaken at a facility. They are emissions over which the entity has a high level of control.
- **Scope 2 (energy direct) emissions**—includes the release of GHG emissions from the generation of purchased electricity, steam, heating or cooling consumed by a facility, but do not form part of the facility. Scope 2 emissions are indirect emissions that entities can easily measure and significantly influence through energy efficiency measures.
- **Scope 3 (indirect) emissions**—includes all indirect emissions that are not included in Scope 2. They are a consequence of the activities of the facility, but occur at sources or facilities not owned or controlled by the entity. Scope 3 emissions are not defined in the NGER Act because reporting them is not mandatory.

In accordance with the NGER Act accounting methodology framework and the TOR for the project, the proponent did not include Scope 3 emissions in the assessment of GHG emissions.

⁸⁴ For a definition, refer to the glossary on page 583

Pursuant to the provisions of the *Energy Efficiency Opportunities Act 2006* (Cwth) (EEO Act), the proponent is required to identify, evaluate and publicly report on cost-effective energy saving opportunities that the project is anticipated to use over 0.5 petajoules of energy per annum (pa). This is governed by the Australian Government Department of Industry.

5.3.3 Potential impacts and mitigation

Greenhouse gas emissions

A GHG assessment was provided in Volume 2, section 8 of the EIS for the mine and Volume 3, section 8 for the rail component. During the course of the EIS process, the proponent amended the mine plan to reduce the mine life from 90 to 60 years. Due to this reduction, an updated GHG report for the mine was provided in Volume 4, Appendix M of the AEIS.

The AEIS reported that the mine's annual GHG emissions will equate to approximately 0.3 per cent of Australia's 2010/2011 GHG emissions levels. GHG emissions will be generated as a result of the following activities:

- electricity consumption imported from the grid (Scope 2)
- fuel consumption from construction and operation of the mine (Scope 1)
- explosives combustion (Scope 1)
- wastewater treatment (Scope 1)
- fugitive emissions of coal seam gas from mining (Scope 1)
- vegetation clearance (Scope 1).

Electricity imported from the grid will be the largest contributor to GHG emissions for the mine (approximately 57 per cent), followed by fuel consumption (approximately 38 per cent).

GHG emissions for the rail will be generated from three sources:

- (4) diesel consumption for coal haulage during operations (99.5 per cent)
- (5) vegetation clearing (0.3 per cent)
- (6) diesel consumption during construction (0.2 per cent).

The rail component of the project is not expected to contribute to Scope 2 emissions as no grid-sourced electricity is proposed to be utilised during construction or operations. In the event that electrification of the track is implemented during operations, emissions and associated impacts will be assessed at that time.

The mine, off-lease and rail EMPs (March 2014) and the Proponent Commitments Register (Appendix 7) (April 2014) propose various control strategies relating to energy consumption and efficiency, including:

- developing site offices and accommodation buildings in accordance with the Building Code of Australia and including a range of energy/water efficient technologies (commitments M7.2 and M7.3)
- incorporating fuel and material efficiency requirements for vehicles, machinery and equipment, including the potential use of biodiesel

- undertaking training for vehicle/machinery operators and the wider workforce to ensure efficient operation
- conducting regular servicing and calibration checks of vehicles/machinery to ensure fuel consumptions comply with manufacturers' specifications
- implementing a Traffic Management Plan and a Fuel Management Strategy to minimise vehicle numbers/size and transport distances (commitment M7.5)
- implementing measures such as on-site material re-use and use of teleconferencing/video conferencing equipment to avoid excessive travel and fuel consumption
- monitoring all GHG emissions and fuel consumption
- developing a GHG emissions inventory (commitment M7.4)
- identifying significant energy consuming equipment and applying technical efficiencies (commitment R7.1)
- registering the project with the National Greenhouse and Energy Report scheme and the Liable Entities Database.

Commitments to energy management will be further refined in a detailed energy efficiency assessment, as required under the EEO Act, and through regular energy audits (commitment R7.3).

Climate change

An assessment of adaptation measures to mitigate climate change impacts for the mine was provided in Volume 2, section 3 of the EIS for the mine and off-lease components and Volume 3, section 3 for the rail component. Table 3-1 in each of the respective EIS documents provides adaptation options to alleviate impacts associated with climate change according to the following climatic parameters:

- higher temperature extremes
- increased severity of flooding
- reduced rainfall and increased evaporation
- intense rainfall events
- increased wind speed due to inland tracking of cyclones
- increased risk of bushfire
- humidity.

The measures identified in the tables were developed to account for findings of the former Department of Environment and Resource Management (DERM) and Queensland Government Scientific Advisory Group (SAG). The SAG guidelines recommend adopting a 4°C increase in temperature by 2100 and predict a five per cent increase or decrease in rainfall per degree of global warming. Given that the project will have a life of 60 years, the proponent has estimated a 10–15 per cent increase or decrease in rainfall intensity over the project life. Under the scenario of an increase, an estimated 20 per cent increase in runoff would occur.

5.3.4 Coordinator-General's conclusion

Consideration of Scope 3 emissions is not a requirement of either Australian Government or state government legislation or policy. I am satisfied that the GHG emissions and climate change assessments provided in the EIS and AEIS adequately quantify impacts as a result of the project. I note that the TOR for the EIS does not require Scope 3 emissions to be included in the proponent's assessment of GHG emissions.

I am satisfied that the control strategies provided in the mine, off-lease and rail EMPs and the Proponent Commitments Register (Appendix 7) will minimise GHG emissions and provide for the effective management of climate change impacts.

5.4 Cultural heritage

5.4.1 Introduction

This section of the report evaluates potential impacts on ICH and non-Indigenous cultural heritage (NICH) sites and items. Submissions received on the EIS and AEIS raised the following issues:

- native title requirements
- ICH and NICH surveys, impacts, protection and management.

I have considered the submissions and how the subsequent information submitted by the proponent has responded to these issues as part of my evaluation of the environmental impacts of the project.

For information on Indigenous issues in relation to the broader social and economic opportunities and impacts for the local community and region, refer to section 5.5 of this report.

5.4.2 Indigenous cultural heritage

Context

ICH in Queensland is protected under the ACH Act. To comply with the duty of care provision under section 23 of the ACH Act, a proponent of a project which requires an EIS must prepare a CHMP. The CHMP is an agreement between the proponent and the native title claimants and provides for the identification and management of ICH.

In accordance with the ACH Act, the proponent has developed and registered CHMPs with the following native title claimants:

- the Wangan and Jagalingou People (QUD85/04, QC04/6)—this covers the mine site and the first 17 km of the rail component and was established and approved by the Chief Executive of the former DERM in November 2011
- the Jangga People (QUD6230/98, QC98/10)—this covers approximately 145 km of the rail line and was established and approved by the Chief Executive of the former DERM in November 2011
- the Barna Kabalbara & Yetimarla People #4 (former registered native title claim QUD6023/01, QC01/25)—this covers approximately 17 km of the eastern component of the rail and was approved by the Chief Executive of DATSIMA in November 2012
- the Barada Barna People (QUD380/08, QC08/11)—this covers approximately 3 km of the eastern component of the rail and was approved by the Chief Executive of DATSIMA in October 2012.

Figure 5.30 provides an overview of the abovementioned native title claims areas.

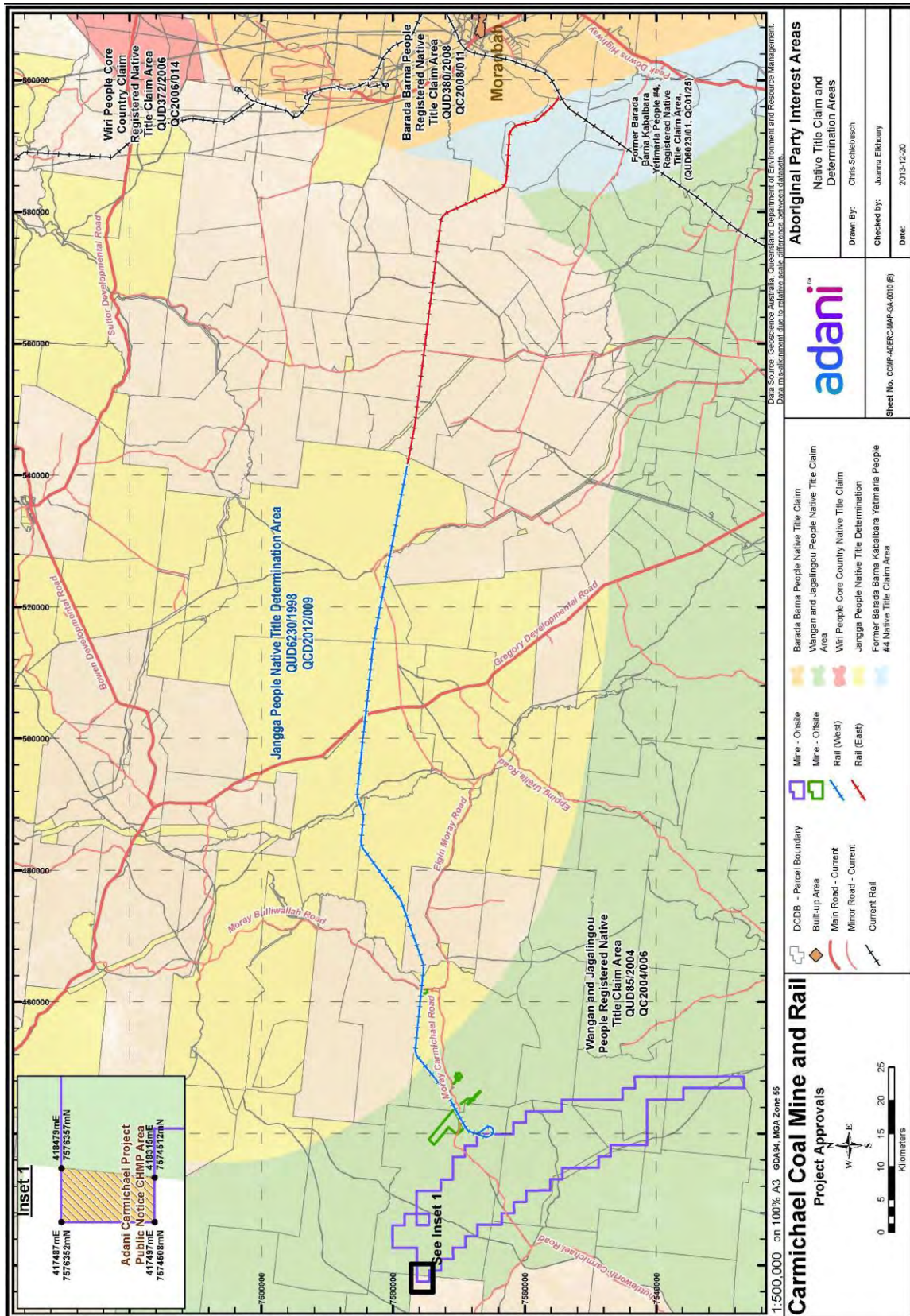


Figure 5.30 Aboriginal party interest areas

The notification provisions under section 29 of the Commonwealth *Native Title Act 1993* (NT Act) trigger the 'Right to Negotiate' (RTN) process, a procedure between the proponent and native title claimants to negotiate over proposed future acts and management of land and waters. Under this duty of care requirement, four confidential Indigenous Land Use Agreements (ILUAs) and extinguishment assessments are being progressed with relevant parties. The Queensland Government supports the use of ILUAs as the process provides a framework for resolving native title issues through negotiation rather than costly and time-consuming litigation.

Potential impacts and mitigation

Impacts on ICH were addressed in Volume 1, section 5 of the EIS.

Field surveys have been undertaken by representatives of the Indigenous parties, which will be expanded on prior to construction in accordance with the provisions of the CHMPs. These surveys identified the Carmichael River, Cabbage Tree Creek and the network of northern creek systems as being sites of cultural significance as they were generally identified as seasonal camping areas. A variety of culturally significant items/artefacts were identified in these areas as well as throughout the remainder of the project area. These areas were predominantly of low scatter density however several scatters demonstrated medium to high densities. Identified items included:

- scarred trees associated with vessel manufacture
- flakes, retouched flakes, debitage and grinding grooves associated with stone tools manufacture
- mullers and pounders associated with starch-based food production
- grinding and hammer stones
- choppers and burren adzes
- single and multiplatform cores
- wasted axes and axe blanks
- glass artefacts, plates and reduced pebbles
- raw materials utilised in artefact production.

Potential impacts on items/sites of ICH as a result of the project may arise from vegetation clearing and ground disturbance undertaken to accommodate project components, erosion on stream banks and drainage lines, spoil placement and subsidence in underground mining areas.

No project activities will commence within the project area until the agreed ICH assessments, as detailed in the CHMP, have been undertaken to ensure the appropriate management of ICH. In the event that an item or area of ICH is found, the proponent would implement the mitigation measures identified in the ICH EIS chapter, the EMPs and CHMP, including:

- avoidance and footprint alteration, depending on the cultural significance
- removal, recording and management of ICH items
- stop-work arrangements and the establishment of buffer zones
- notification to the relevant Indigenous parties

- inspections, audits, monitoring and reporting to ensure project activities are undertaken in accordance with the agreed CHMPs
- cultural awareness training for employees to ensure knowledge of the duty of care requirements under the CHMPs
- establishment of committees with Indigenous parties to oversee the assessment and management of cultural heritage.

Coordinator-General's conclusions

Based on the measures provided in the EIS/AEIS, the registered CHMPs, proposed ILUAs and the legislative requirements of the ACH Act and NT Act, I am satisfied that the impacts on ICH would be appropriately managed throughout the life of the project.

I consider that the implementation of these measures would satisfy the duty of care requirements under the ACH Act and NT Act, and would ensure the adequate identification and management of ICH places and objects by the proponent and the native title claimants as custodians of their cultural heritage.

5.4.3 Non-Indigenous cultural heritage

Potential impacts and mitigation

Impacts on NICH were addressed in Volume 1, section 5 of the EIS.

The project area does not contain any sites listed on the national, state or local government NICH registers. The GBR, listed on the national and world heritage lists, has been identified as having the potential to be impacted by the project via downstream effects. For details on the impacts to the GBR, refer to section 5.1.5 of this report.

Preliminary 'walkover' field surveys of the mine area identified cattle yards, watering troughs and dams, which are currently utilised for cattle grazing. To date, no field surveys have been completed for the rail component, due to limited land access. However, the proponent has committed to work with landholders to ensure impacts on any identified NICH are reduced (commitment P3.2).

Due to the lack of likely places of NICH, the proponent has determined that the potential for inadvertently discovering items of NICH is low. Potential impacts associated with inadvertent discovery of items of NICH relate to vegetation clearing and ground disturbance.

Due to the improbability of NICH identification, no specific mitigation measures have been proposed. However, I have made a recommendation requiring the proponent to prepare and document measures and procedures for identifying and managing impacts on NICH for the construction and operations phases in any application for an MCU or development approval (Appendix 2, Section 2).

The proponent has also committed to ongoing cultural awareness training for personnel, including training in the avoidance, protection and management of items of cultural significance (commitment P2.3). In the event that an item is identified, the proponent may need to develop monitoring requirements, as per the EMPs (March 2014).

Coordinator-General's conclusions

Based on measures identified in the Proponent Commitments Register (Appendix 7) and EMPs, legislative requirements of the *Queensland Heritage Act 1992* and my recommendation (Appendix 2, Section 2), I am satisfied that impacts to NICH would be appropriately managed throughout the life of the project.

5.5 Social and local economic impacts

5.5.1 Overview

The project is located approximately 160 km north-west of the town of Clermont in the IRC LGA. At the time of the 2011 Census, Clermont had a resident population of 2177 persons. It is located 110 km from Emerald, the closest major regional centre with a population of almost 13 000 people.

A social impact assessment (SIA) was completed in accordance with the TOR for the EIS. Matters considered in the SIA included the social and cultural area of influence, community engagement, a social baseline study, a workforce profile, potential impacts and mitigation measures and management strategies. Refer to section 3 of this report for details of the consultation undertaken during the EIS process.

The mine and rail components of the project span a large area in Central Queensland, and the potential social impacts mainly relate to local economic change for individuals and communities. The EIS found that the project will not impose significant adverse impacts on local and regional communities.

Positive impacts identified in the EIS included:

- direct and indirect local, regional and Indigenous employment and training opportunities
- local and regional contracting and supply opportunities for individuals and businesses
- enhanced economic development opportunities throughout the region

Given the difficulty in predicting impacts with certainty over an extended period, the proponent has committed to an adaptive approach by which social impact mitigation and management strategies will be reviewed, monitored and updated on a regular basis for the life of the project.

This section of the report is concerned with the broader opportunities and impacts for the local community and region arising from the project. For a more detailed assessment of transport issues and cultural heritage issues, including Indigenous and non-Indigenous heritage sites, refer to sections 5.2 and 5.4 of this report.

The subsections below provide more detail on the potential impacts that the EIS identified for enhancement or mitigation; the proponent's strategies to enhance, mitigate and manage the potential impacts arising from the project; along with my analysis, reporting requirements and conclusions.

5.5.2 Government policy

The Queensland Government has committed to streamlining regulatory and approval processes, including the cost and complexity of the EIS process for coordinated projects, as a means of reducing costs to industry—clearly identifying specific outcomes and helping to grow a four-pillar economy.

In pursuing these objectives, the Queensland Government will work with industry and local government through the *Managing the impacts of major projects in resource communities* framework⁸⁵ to:

- streamline processes to provide greater certainty for proponents and reduce costs. SIA mitigation measures will focus on impacts identified through better social impact assessment
- deliver better outcomes for resource communities through clear roles for state and local government, working closely with proponents.

The framework includes a SIA guideline⁸⁵ to assist proponents to effectively identify, assess and propose measures to mitigate the social impacts of coordinated projects. Under the guideline, the requirement to complete a SIA as part of the EIS process remains unchanged. The components of a SIA include:

- community and stakeholder engagement
- workforce management
- housing and accommodation
- local business and industry content
- health and community wellbeing.

Proponents were previously required to develop and implement a Social Impact Management Plan (SIMP) for major resource development projects requiring an EIS, with associated imposed conditions from the Coordinator-General. As the project EIS was initiated under these arrangements, the proponent provided a draft SIMP as Appendix D2 of the AEIS outlining the potential impacts arising from the project and the proposed responses.

The proposed mitigation strategies and actions remain entirely relevant and have been assessed against the components of an SIA and are summarised below.

The Queensland Government supports economic growth and infrastructure provision across regional communities through its Royalties for the Regions initiative. Royalties for the Regions has been designed to ensure regional communities receive genuine long-term royalty benefits through better planning and targeted infrastructure investment. The program provides support to local governments in responding to critical needs arising from resources sector growth, and will help regional communities better manage the consequences of resource sector development, seize economic opportunities and encourage growth.

5.5.3 Social impact assessment

A SIA was conducted by the proponent in relation to the two major components of the project—the mine and rail component. The off-lease accommodation for the mining and railway construction and operational workforces, three temporary accommodation camps along the proposed railway alignment for construction contractors, and the quarries to support the railway construction were also considered in the SIA.

⁸⁵ Available from the DSDIP website at: www.dsdip.qld.gov.au

The study area established for the SIA was defined as the locations at which the construction, operation and decommissioning of the project may have a social and cultural influence at a scale that can be attributed to the project. This designation incorporates:

- a local study area including landholders directly affected by the mine and rail corridor together with the nearby centres of Clermont and Moranbah
- a regional study area comprising the LGAs of Isaac, Charters Towers, Townsville, Whitsunday, Mackay and Central Highlands.

During completion of the SIA the proponent:

- clearly defined and engaged with stakeholders and impacted communities of interest
- established a local and regional social baseline for these communities
- outlined the planning and policy context surrounding the project
- identified the potential direct social and local economic issues arising from the project
- developed and proposed measures to enhance or mitigate these impacts
- proposed a monitoring and reporting framework to monitor the effectiveness of the enhancement and mitigation measures during all stages of the project.

Table 76 in Appendix D1 of the AEIS provided a summary of the potential impacts, a rating of the significance of each impact derived from an impact assessment framework, an overview of the proponent's strategies for enhancing, mitigating and managing the impacts, and a revised significance rating taking into account the effectiveness of these strategies.

Potential negative impacts requiring mitigation, management or monitoring include:

- rising living costs in Clermont associated with increases in house prices and rents as workers in industries supporting the project reside in the local community
- labour market drain from other sectors into the mining industry
- traffic disruption and road safety issues along the Gregory Development Road, Flinders Highway and Peak Downs Highway during construction of the mine and rail components of the project
- disruption to cattle operations, increased labour requirements and reduced amenity for landholders
- increased demand on emergency and community services arising from the temporary accommodation camps and permanent workforce accommodation.

The proponent's responses to the potential impacts identified through consultation during and after the EIS processes are summarised in Appendix 6 of this report, based on the criteria that I have used in my assessment.

These actions will be supported by a number of plans, procedures and policies that address specific issues or impacts of both the mine and proposed railway alignment in greater detail including:

- Stakeholder Engagement Strategy incorporating land access protocols for impacted landholders
- Workforce Management Strategy incorporating workforce health and safety plans, an employee induction program and code of conduct for employees and contractors regulating behaviour, alcohol and drug use, cultural awareness and safety
- recruitment and training programs to sustainably maintain a reliable, skilled workforce and addressing potential hurdles to the employment of groups typically under-represented in the mining industry
- Local Industry Participation Strategy giving effect to the Queensland Resource and Energy Sector Code of Practice for Local Content, and the proponent's Australian Industry Participation Plan and Local Buying Policy
- Integrated Housing Strategy to manage short- and long-term project impacts on local and regional housing supply and affordability
- Emergency Management Plan
- Community Development Plan outlining the proponent's voluntary contributions to the wellbeing of the region
- cultural heritage management plans
- traffic management plans.

Further engagement with stakeholders is required to finalise the baseline data, targets and indicators needed to ensure that the actions and supporting documents listed above are further developed and implemented prior to the commencement of construction.

The following sections of this report consider the extent to which the actions and supporting documents enhance, avoid, mitigate and manage the impacts of the project.

5.5.4 Project-specific impacts

Community and stakeholder engagement

Engagement between the proponent and project stakeholders to inform the SIA was undertaken as a component of the broader EIS public consultation process. Key stakeholders included impacted landholders, local and regional communities, traditional owners, local government, service providers and state agencies.

Section 2.10 of the SIA (Appendix D1 of the AEIS) provided an overview of the proponent's initial consultation activities. Mechanisms adopted by the proponent included public meetings, workshops, one-on-one meetings with individuals and organisations, and telephone interviews. These consultation activities identified the issues and concerns of different stakeholders, and informed the development of the local and regional social baseline studies in the SIA.

The consultation undertaken by the proponent identified a range of community attitudes towards mining in the region. The recent downturn in coal mining, including the closure of the Blair Athol Mine near Clermont in 2012, has had a significant impact on employment and business opportunities throughout the region. As the housing and workforce impacts associated with previous mining activities recede, local stakeholders

are generally positive about the commencement of new projects to restore and enhance economic growth and development.

The attitudes of many landholders were shaped by the potential impacts on their ongoing use of land in proximity to the mine and rail corridor. Particular concerns included:

- potential changes to the living environment from increased noise and dust and reduced visual amenity
- potential changes to the natural environment from changes to overland flow paths with potential for increased ponding/flooding
- restriction of stock movements and increased labour requirements to manage cattle operations
- impacts on drinking water supplies, water bores and groundwater
- increased fire risk along the rail corridor.

The Clermont community indicated a strong preference for mining proponents to establish a local presence within the town, with provision for workers to reside locally. The remote location of the Carmichael mine site and rail corridor will necessitate the use of temporary and permanent accommodation camps and facilities for all employees. However, despite this there is an expectation that the proponent will continue to work collaboratively with local stakeholders to ensure the project contributes to the social and economic wellbeing of the local community.

Key issues identified at the community level, including the capacity of emergency and health services and the ability of local businesses to attract and retain staff, are addressed in the sections below.

Coordinator-General's conclusions

My requirement is that the proponent will:

- continue to engage with local and regional stakeholders openly and transparently, ensuring that they are informed about the project's impacts and their concerns are considered in reaching decisions about mitigation measures
- equitably manage land access and acquisition processes
- collaborate with other proponents, local authorities, state agencies and other stakeholders as required to maximise opportunities, address impacts and promote agreed regional outcomes.
- I acknowledge the proponent's efforts during the EIS process to engage with stakeholder groups, and I consider these efforts sufficient to identify potential impacts arising from the project. The proponent has committed, prior to the commencement of construction, to finalising an overarching Stakeholder Engagement Strategy with a focus on developing and maintaining critical partnerships during all stages of the project.

Section 4 of the draft SIMP (Appendix D2 of the AEIS) provides an outline of the proposed strategy including the establishment of a full-time community and landholder liaison position to be based within the region. I also note that the proponent has committed to developing an Indigenous Participation Plan prior to the commencement

of construction, and to ongoing engagement with DATSIMA during the development of the plan. My expectation is that consultation with landholders and traditional owners impacted by the mine and rail alignment will continue as the project moves into the detailed design phase.

The proponent became a member of the Clermont Preferred Futures Group during the consultation process. Established by IRC, Rio Tinto Coal Australia and the Clermont community as a collaborative forum to manage growth for the benefit of the region, the group will provide an important forum for the proponent to continue to engage with the local community over the life of the project. The proponent has also committed to collaborating with the group, the council and other representative bodies to identify community development priorities, and to provide financial support for agreed initiatives through a community fund.

I expect the proponent to continue to engage as required with all project stakeholders to complete their commitments, actions and supporting documents, and that the baseline data, targets and indicators that will demonstrate the effectiveness of these actions will be made publicly available.

For this reason, I have imposed a condition (Appendix 1, Section 3) requiring the proponent to provide an annual report to the Coordinator-General from the commencement of construction up to and including the peak construction workforce period, and for two years following the commencement of mining operations. The report must describe the actions to inform the community about project impacts and show that community concerns about project impacts have been taken into account when reaching decisions.

Workforce management

The mine will be developed over three years commencing with a pre-construction workforce of 395 workers and rising to a peak of 1075 workers during the second year. There will be an overlap between construction and operational workforce at the mine site from the second year until all stages are constructed, and a requirement for a small permanent construction workforce to meet ongoing infrastructure requirements. The mine's operational workforce will increase to a peak of approximately 3800 workers over ten years, and is expected to remain above 3400 workers for an extended period.

The proponent has stated that the remoteness of the site and the short-term nature of most positions will limit opportunities for local recruitment during the construction phase. The proponent states that the construction workforce will be predominantly FIFO, with drive-in drive-out (DIDO) and bus-in bus-out (BIBO) from local centres at the end of each shift rotation constrained by the lack of an all-weather access road between the Gregory Development Road and the mine site.

During the early construction phase, the workforce will be housed in the existing temporary accommodation on the mine site, before moving to a purpose-built 3500-bed facility located approximately 15 km east of the mine site that will also accommodate the mine's operational workforce. The proponent has stated that during the operational phase there may be opportunities to recruit workers from local and regional communities such as Clermont, Emerald and Charters Towers, provided these workers could be transported to the mine site on a BIBO basis.

The railway will be constructed over the same three-year period and require approximately 1400 workers. To reduce daily travel distances, three temporary 400-person capacity camps will be developed at 60 km intervals along the corridor to accommodate rail construction and quarry workers, while workers at the western end will utilise the mine accommodation facility.

The proponent expects the rail construction to be predominantly FIFO, but there may be short-term employment opportunities for local workers in labouring, equipment operation and transport roles. The operational workforce including maintenance crews for the railway is predicted to peak at 120 workers based in Bowen or Mackay.

The proponent has identified a number of key objectives to guide the development of workforce management strategies:

- establishment of a positive, tolerant and safety-oriented culture
- recruiting and training to address skills shortages and sustainably maintain a reliable, skilled workforce
- addressing potential hurdles preventing under-represented groups from joining the mining industry
- recognising worker health, safety and wellbeing as being fundamental to successful operations.

DETE has identified the need for key performance indicators and targets to underpin the proponent's workforce management strategies. Further consideration should also be given to the identification of under-represented groups in the mining industry, to inform the development of indicators and targets and facilitate effective monitoring and reporting during the construction and operational phases of the project. DATSIMA can provide further assistance to the proponent to develop detailed strategies that promote Indigenous training and employment outcomes.

Coordinator-General's conclusions

I require the proponent to:

- maximise local employment opportunities over the life of the project, including opportunities for local Indigenous people and other disadvantaged groups
- provide training and development opportunities for people locally and regionally to increase their skills and gain employment in the mining sector
- facilitate positive interaction between the workforce and local community on and off the project site.

The SIA provides indicative construction and operation workforce estimates for the mine and rail components of the project. The proponent has stated that any changes to workforce requirements during the detailed design phase are unlikely to affect the overall conclusions of the SIA, but that the magnitude of some impacts may change with increases or decreases in workforce numbers.

The proponent's workforce commitments include the following initiatives to be developed prior to the commencement of construction:

- a structured apprentice and trainee program in conjunction with local and regional training providers
- specific training targets for proponent and contractor workforces
- a comprehensive employee induction program and code of conduct for employees and contractors
- an Indigenous Participation Plan with specific training initiatives and performance indicators
- Where appropriate, the proponent should work closely with DETE and DATSIMA to develop and implement workforce management strategies, and to ensure that the outcomes of these strategies can be effectively monitored and reported.

These measures represent a satisfactory response to local and regional workforce issues. However, as the workforce requirements of the project will change over time, I have imposed a condition (Appendix 1, Section 3) requiring the proponent to provide an annual report to the Coordinator-General from the commencement of construction up to and including the peak construction workforce period, and for two years following the commencement of mining operations. The report must describe the actions to enhance local and regional employment, training and development opportunities.

Housing and accommodation

Large-scale projects have the potential to increase demand in housing markets where supply is limited, resulting in purchase price and rent increases that can be beyond the means of many households not employed in the mining industry. While these impacts can occur when projects commence, they may also begin much earlier as a result of speculative investment in local housing markets.

Consultation revealed that stakeholders in the local study area attribute housing affordability pressures in Moranbah and Clermont to the accommodation demands of the mining industry, including the practices of some mining companies to subsidise employee housing costs in the private market. The SIA identified the rising costs of living in Clermont resulting from higher rents and property prices as a potential impact requiring mitigation.

IRC expressed the need for strategies to mitigate the impact of the project on housing affordability in Clermont and Moranbah, and QPS noted that the availability and cost of housing are important considerations when seeking to recruit officers in the region.

The remote location of the project coupled with the proponent's reliance on accommodation camps for the mine and railway construction workforces, and the mine operation workforce, should limit any direct impacts on local housing markets in Clermont and Moranbah. Both housing markets have been affected by recent mine closures, and lower median rents, higher rental vacancy rates and the significant amount of property on the market suggest that both towns currently have some capacity to accommodate growth that may occur if local businesses expand to service the needs of the project.

DHPW noted that a reliance on FIFO workforce strategies could give rise to housing market impacts in regional centres throughout Queensland if employees chose to move closer to nominated collection points. A number of centres in the project's regional

study area including Mackay, Emerald and Bowen have experienced housing shortages and declining affordability related to resource projects in surrounding areas. While these pressures appear to have moderated in recent months, careful monitoring of local and regional housing markets will form a critical part of the proponent's impact mitigation strategies.

Coordinator-General's conclusions

I require the proponent to effectively meet the housing and accommodation needs of the project's workforce during the construction and operation phases, while avoiding, managing or mitigating project-related impacts on housing supply and affordability in Clermont, Moranbah and other centres in the region.

The proponent has committed to developing a Housing and Accommodation Strategy prior to the commencement of construction. Key elements of the strategy will include:

- constructing sufficient housing adjacent to the mine site for the life of the project to accommodate the entire mine construction and operation workforce, along with some railway construction workers
- accommodating the balance of the railway construction workforce in temporary camps along the proposed railway alignment
- collaborating with state agencies, local governments, and community stakeholders to actively monitor demographic and housing market trends throughout the region
- adopting additional mitigation and management strategies if impacts attributable to the project are identified.

This approach should limit any direct impacts from the project on local and regional housing markets. I expect the proponent's monitoring regime to include the regional centres potentially impacted by the commuting patterns of the project's FIFO workforces (particularly if workers choose to move into the region for the term of their employment or permanently) and the location of the railway operational workforce.

I have imposed a condition (Appendix 1, Section 3) requiring the proponent to provide an annual report to the Coordinator-General from the commencement of construction up to and including the peak construction workforce period, and for two years following the commencement of mining operations. The report must describe the actions and adaptive management strategies to avoid, manage or mitigate project-related impacts on local and regional housing markets.

Local business and industry content

The IRC area has a long history of mining activity, commencing in the Clermont area in the late nineteenth century. Open-cut coal mining began in 1924 and has increased significantly since the early 1970s when the first coal was exported from the Blair Athol mine 24 km north-west of Clermont. Moranbah was established in 1971 to service the Goonyella and Peak Downs mines.

Both Clermont and Moranbah have benefited from mining activity over a prolonged period, leading to population growth, high employment and income levels, and improved infrastructure and services. There are strong local preferences for mining

companies to continue to allow workers to reside locally and FIFO arrangements for mines in remote locations is a key issue.

Beef cattle grazing and agriculture are also important local industries that continue to employ significant numbers of residents. The SIA revealed that local employers have previously experienced difficulty in retaining staff, with workers leaving to pursue better paid opportunities in the resources sector. Competition between mines and other large-scale activities has also reduced the availability of critical services, such as transportation, to other sectors. Recent consultation between the proponent and local stakeholders indicates that these issues have become less of a problem as operations at a number of mines in the region have been consolidated.

Coordinator-General's conclusions

I require the proponent to be a signatory to the Queensland Resources and Energy Sector Code of Practice for Local Content 2013⁸⁶ (QRC Code) and ensure that Queensland suppliers, contractors and manufacturers are given full, fair and reasonable opportunity to tender for project-related business activities.

I note the community's continued support for mining activity in the region, along with the challenges that large-scale projects may pose for local communities and businesses including attracting and retaining qualified staff and the availability of critical services. While these pressures appear to have eased recently throughout the region, I am pleased to note that the proponent has made the following commitments to maximise the local and regional benefits of the project:

- developing a Local Industry Participation Strategy that complies with the QRC Code and the company's existing Local Buy Policy
- developing an Indigenous Participation Plan in consultation with DATSIMA and the local Indigenous community to maximise employment and business opportunities
- appointing an Industry Opportunity Officer to facilitate engagement with local and regional businesses.

Proponents adopting the QRC Code will submit an annual Code Industry Report to the Queensland Resources Council (QRC) demonstrating how the principles and framework of the code have been applied. My expectation is that the commitments listed above along with any other initiatives adopted as a result of ongoing engagement with local and regional businesses will be reflected in these reports.

Health and community wellbeing

The communities in the local study area regard mining as a critical factor supporting the continued prosperity and growth of the region. Consultation undertaken for the SIA identified three broad areas where the project can generate economic benefits:

- provision of goods and services to the project from local businesses
- new employment opportunities, apprenticeships and training resulting in long-term career pathways for local residents

⁸⁶ Queensland Resources Council, *Queensland Resources and Energy Sector Code of Practice for Local Content 2013*, Queensland Resources Council, Brisbane, 2013, viewed 10 March 2014, https://www.qrc.org.au/01_cms/details.asp?ID=3209

- flow-on increases in employment and business activity at the regional level.

Notwithstanding the benefits arising from existing and proposed mining activity in the region, the communities of Clermont and Moranbah have identified the importance of further diversifying their local economies. Both communities have cited the importance of maintaining and enhancing the region's liveability as the basis for attracting tourists, new residents and a wider range of industries to support greater economic resilience and sustainability.

The mine site is located just off the Moray-Carmichael Road with access via the Gregory Developmental Road—a significant tourist route for the Isaac region. Increased traffic movements along this route are anticipated, particularly during the construction phase for the mine and rail components as equipment and supplies are transported by heavy vehicle from regional centres in the north and south.

The rail corridor will also require the construction of level crossings along the route, resulting in potential conflicts between rail and road traffic. While the predominantly FIFO workforce will reduce local traffic impacts in the vicinity of the mine and railway alignment, there will be a higher number of personnel movements by road between accommodation camps and worksites during the construction phase.

The hazard and risk assessment conducted for the EIS identified that accidents involving person or vehicle interactions with the proposed rail corridor were a significant risk, as were accidents involving construction traffic. QPS also noted the potential for additional road safety and traffic policing demands to arise during all phases of the project.

While the proponent intends to be as self-sufficient as possible in relation to the human service requirements of the mine, there may be instances where the external support of services based in surrounding communities will be required. During SIA consultations in Clermont, stakeholders expressed concern that the project workforce could impose a burden on the limited base of community infrastructure throughout the region—particularly health, police and emergency services.

Coordinator-General's conclusions

I require the proponent to:

- avoid, manage or mitigate project-related impacts on local community services, social infrastructure and community safety and wellbeing
- minimise the impact on emergency services in the region during the life of the project and optimise the safety of the mine and its employees.

FIFO workforce arrangements and the provision of on-site accommodation, medical and recreational facilities will reduce local traffic impacts around the proposed mine and railway alignment, and limit the project's impact on local and regional services and infrastructure. I note, however, the potential for significant traffic impacts on regional routes during the construction of the mine and railway, and that on- or off-site accident and emergency situations arising from the project may impact on the delivery of existing emergency services, and compromise the safety and amenity of other road network users.

The proponent has committed to develop and implement a Construction Traffic Management Plan during the detailed design phase of the project. The plan will include a range of management and mitigation strategies to address the potential impacts of the project on road safety, emergency response times and other matters, and is discussed in more detail in section 5.2 of this report.

All stages of the project will be subject to an Emergency Management Plan that will be developed in collaboration with the relevant emergency service providers prior to construction, and overseen by an Emergency Services Consultative Committee with appropriate representation from those providers.

I have imposed a condition (Appendix 1, Section 3) requiring the proponent to provide an annual report to the Coordinator-General from the commencement of construction up to and including the peak construction workforce period, and for two years following the commencement of mining operations. The report must describe the actions to avoid, manage or mitigate project-related impacts on local community services, social infrastructure and community safety and wellbeing.

5.5.5 Regional impacts

The TOR for the EIS required the regional impacts of the project to be considered and assessed, in combination with other existing or proposed projects in the region. Impacts can occur in proximity to the project site, in surrounding communities, along supply chain corridors and in regional centres that serve as hubs for FIFO workforces.

Maximising the benefits for local and regional communities, and mitigating the negative impacts of this and other projects will require cooperation between proponents, regional councils and state agencies. Local and regional stakeholders, including IRC and state agencies, identified the potential social impacts arising from this and other projects in the region, particularly an increased demand on services, as an issue requiring consideration.

The EIS included an assessment of potential regional impacts (Volume 1, section 8), including housing and accommodation demand, landholder amenity, and social services and infrastructure. The assessment found that multiple projects in the region could impact on local and regional markets and service delivery networks, and that the regional social impacts of the Carmichael project have a medium significance requiring mitigation measures and targeted monitoring.

Coordinator-General's conclusions

Proponents are only responsible for the direct impacts arising from individual projects. I note, however, the commitment by the proponent to work collaboratively with IRC and other stakeholders, including the Clermont Preferred Futures Group, to monitor local and regional demographic and housing market trends, and to develop or modify mitigation and management strategies as required.

The pilot Local Area Infrastructure Program (LAIP) is an initiative that is proposed under the Queensland Government's *Managing the impacts of major projects in resource communities framework* to address emerging issues and impacts on a broader scale. LAIPs will improve infrastructure planning and investment decisions

and support the development of robust business cases for infrastructure projects. The process is intended to bring together industry, local government and state agencies to identify and prioritise strategic infrastructure needs, address timing issues and explore how funding of projects can be aligned. LAIPs will link closely to the Royalties for the Regions program and Australian Government funding programs.

The Queensland Government's *Galilee Basin Development Strategy* notes that DSDIP will chair a Galilee Basin Development Roundtable series during 2014 to focus on innovative approaches to joint infrastructure arrangements. Where appropriate, these roundtables may also include peak bodies and relevant government agencies and may also address potential community benefits.

The roundtable may be tasked with developing short, medium and long term strategies for responding to regional impacts on infrastructure and services that are beyond the scope of individual project assessments. These strategies may be delivered through partnerships between industry, communities, and local governments and state agencies, and will inform and align with regional planning priorities.

6. Evaluation of environmental impacts—mine and off-lease infrastructure area

6.1 Matters of state environmental significance

This section addresses impacts to biodiversity values associated with the mine and off-lease infrastructure area that are not also protected under the EPBC Act. Impacts to MNES are discussed in section 5.1. The assessment of ecological impacts relevant to this section has been provided in EIS and AEIS documents including:

- AEIS Volume 2—Mine
- AEIS Volume 4, Appendix J1—Report for Updated Mine Ecology
- AEIS Volume 4, Appendix J3—Report for Doongmabulla and Mellaluka Springs
- AEIS Volume 4, Appendix J5—Report for Offsite Infrastructure Ecological Assessment
- AEIS Volume 4, Appendix J6—Offsite Infrastructure Project BioCondition Assessment
- Environmental Management Plan—Mine (March 2014)
- Environmental Management Plan—Offsite (March 2014)
- Groundwater-Dependent Ecosystems Management Plan (February 2014)
- Environmental Offset Package (March 2014)
- EIS Volume 2, Section 5—Nature Conservation
- EIS Volume 4, Appendix N1—Mine Terrestrial Ecology Report
- EIS Volume 4, Appendix O1—Mine Aquatic Ecology Report.

A number of submissions regarding impacts to biodiversity were raised during the EIS and AEIS submission periods. The submissions questioned the adequacy of surveys and addressed the proponent's assessment of:

- habitat loss and degradation
- impacts to threatened species and communities
- impacts of subsidence
- the proposed loss of the Bygana Nature Refuge
- an area subject to a restoration order under the VM Act
- weed, pest and fire management
- offsets.

I have considered each submission and how the additional information provided responded to these issues as part of my evaluation of the environmental impacts of the project. My evaluation of the potential ecological impacts and mitigation associated with the rail is discussed in section 7.1.

6.1.1 Overview

The assessment of terrestrial and aquatic ecological values was comprised of desktop assessment, field surveys and a likelihood of occurrence assessment for flora and fauna species of conservation significance. The desktop assessment and ecological survey effort is detailed in section 5.1.

At my direction, additional survey work was undertaken on the mine and off-lease infrastructure area following the EIS submission period, to respond to comments on the EIS and to address changes to the mine plan and off-lease infrastructure area. The surveys, undertaken between November 2010 and December 2013, included baseline terrestrial and aquatic flora and fauna surveys, a BioCondition assessment and a series of targeted surveys. The targeted surveys were undertaken for waxy cabbage palm (*Livistonia lanuginosa*), black-throated finch, stygofauna, ecological equivalence assessment, Doongmabulla and Mellaluka Springs, Great Barrier Reef Wetland Protection Areas (GBR WPA) and Property Vegetation Management Plans (PVMP).

The likelihood of occurrence assessment considered factors including species habitat preferences, known distribution, relative abundance, previous records from the region, occurrence of habitat in the study area and field observations. Species were then categorised as:

- ‘unlikely to occur’ species that had either not been recorded in the region, the study area was outside their known distribution or suitable habitat was unavailable in the study area
- ‘may occur’ species that had not previously been recorded in the region but the study area contains suitable habitat and was within the species known distribution
- ‘likely to occur’ species that had previously been recorded in the region and suitable habitat is present in the study area
- ‘confirmed present’ species that were recorded in the field surveys undertaken in the study area for the EIS assessment.

6.1.2 Issues

Vegetation communities and flora species

Searches of the species records databases Wildlife Online and HEBRECS identified 962 and 701 flora species occurring within the broader study area respectively. The desktop assessment also identified 13 threatened flora species from the region; however, the likelihood of occurrence assessment indicated that none of these are likely to occur within the project area. Field surveys recorded 342 plant species, including 22 non-native species on EPC 1690 and 120 plant species, including 10 non-native species on EPC 1080. The difference in species diversity of the two areas is largely considered a result of survey timing and weather conditions prior to the surveys.

Two threatened flora species listed under the NC Act that are not also protected under the EPBC Act were revealed through the desktop assessment and are listed in Table 6.1. Neither was recorded during field surveys and the likelihood of assessment analysis indicated they ‘may occur’ within the project site. Suitable habitat is likely to be available on the mine site and will be subject to sequential clearing during the

operations phase. The proponent has committed to conduct pre-clearance surveys in areas identified as potential habitat for threatened species (commitment M4.1).

Table 6.1 Threatened flora species previously recorded in the region

Scientific name	Status		Likelihood of occurrence
	EPBC Act	NC Act	
<i>Nesaea robertsii</i>	–	Endangered	May occur
<i>Peripleura scabra</i>	–	Near Threatened	May occur

A total of 36 REs were verified by field surveys of the mine study area (EIS Volume 2, Section 5). Residual impacts to REs listed as endangered or of concern under the VM Act are estimated at approximately 410 ha. The project will also potentially have a residual impact of approximately 56 ha on the threshold RE 11.3.5. Potential impacts to REs are detailed in Table 6.2, which has been adapted from a revised Environmental Offset Package provided after the AEIS submission period. The revised Environmental Offset Package is available from the proponent’s website.

Table 6.2 Potential impacts to REs of conservation significance

RE	Status			Residual impact (ha)
	EPBC Act	VM Act	Biodiversity	
11.3.1	Endangered	Endangered	Endangered	49.41
11.4.9	Endangered	Endangered	Endangered	199.78
11.3.3	–	Of concern	Of concern	12.45
11.4.6	–	Of concern	Endangered	148.01
11.3.5	–	Threshold least concern	Of concern	56.02

Note: Impact areas sourced from the revised Environmental Offsets Package

Total clearing for the project will potentially result in the loss of 1324 ha of remnant and 1308 ha of non-remnant vegetation during the construction phase and an additional 9123 ha of remnant and 8482 ha of non-remnant vegetation during the operation phase. Clearing undertaken during the operational phase will be staged, with some cleared areas being rehabilitated prior to others being cleared.

Disturbance footprints for biodiversity values not addressed as residual impacts for offsetting purposes are detailed in the AEIS (Volume 4, Appendix J1).

VM Act restoration area

Illegal clearing of remnant and endangered vegetation on Moray Downs by a previous landowner resulted in a portion of the property being declared a Category A area under the VM Act subject to restoration. In accordance with the compliance notice issued for the clearing by the Rockhampton Magistrates Court, the area is to be restored until it reaches remnant status or until 2044. The components of the restoration areas located on the mining lease are Restoration Area 3 covering 1377.83 ha and part of Restoration Area 2, covering 225.27 ha.

I note that the five REs listed as endangered or of concern that occur within the Category A areas have been included with the RE data in the calculation of residual impacts for offsetting purposes. As these areas are the subject of a successful court action by the Queensland Government, I expect that the revised Biodiversity Offset Strategy will contain offsets for all Category A areas regardless of the status of the RE under the VM Act. To ensure this outcome I have imposed a condition in Appendix 1, Section 3 requiring the proponent to offset all Category A areas disturbed by the project.

Fauna

A desktop assessment indicated 19 threatened fauna species listed under the NC Act were either predicted to occur or had been previously recorded in the region. Those species confirmed present during field surveys or determined likely to occur are detailed in Table 6.3. The AEIS (Volume 4, Appendix J1) and the Environmental Offset Package identified that vegetation clearing and operation of the mine would have unavoidable impacts on eight fauna species listed under the NC Act. The potential impact areas have been revised since the AEIS submission period and are detailed in the Environmental Offset Package (March 2014). Threatened fauna species that are listed under both the NC Act and the EPBC Act have been assessed as MNES and are discussed in section 5.1.

Table 6.3 Threatened fauna species previously recorded in the region

Scientific name	Common name	EPBC Act	NC Act	Likelihood of occurrence	Impact area (ha)
<i>Ephippiorhynchus asiaticus</i>	Black-necked stork	–	NT	Confirmed present	20.45
<i>Nettapus coromandelianus</i>	Cotton pygmy-goose	–	NT	Confirmed present	20.45
<i>Chalinolobus picatus</i>	Little pied bat	–	NT	Confirmed present	10 656.79
<i>Melithreptus gularis</i>	Black-chinned honeyeater	–	NT	Likely	8746.24
<i>Lophoictinia isura</i>	Square-tailed kite	–	NT	Likely	8746.24
<i>Paradelma orientalis</i>	Brigalow scaly-foot	–	V	Likely	6402.57
<i>Phascolarctos cinereus</i>	Koala	V	SLC	Confirmed present	10 141.02
<i>Tachyglossus aculeatus</i>	Echidna	–	SLC	Confirmed present	10 053.67

V = Vulnerable, NT = Near-threatened, SLC = Special least concern
 Note: Impact areas sourced from the revised Environmental Offsets Package

While some of the project area has been cleared for grazing, much of the remaining habitat in the mine area is described as relatively disturbance-free in the EIS (Volume 4, Appendix N1). The proponent has described broad fauna habitat types located in the project area based on vegetation communities (RE mapping), land forms and fauna habitat characteristics. These have been mapped and quantified in the EIS (Volume 2,

Section 5). Potential impacts to fauna habitat in the mine area are presented in Table 6.4.

Table 6.4 Potential impacts to fauna habitat types

Habitat type	Clearing impact (ha)	Subsidence impact (ha)	No direct impact (ha)
Ironbark-box woodland	7461	5109	7881
Shrubby low woodland	159	848	1518
Tall mixed shrubland	56	782	716
Gidgee/brigalow shrubland	1350	22	744
Fringing open forest/woodland	0	3	298
Low woodland	92	179	116
Open cleared land	8475	619	5627
Total	17 593	7562	16 900

Note: Impact areas sourced from the AEIS Volume 4, Appendix J1.

Koala

The koala (*Phascolarctos cinereus*) was listed as vulnerable under the EPBC Act after the project was designated a controlled action and targeted surveys for this species were not undertaken. Baseline surveys including habitat assessment, spotlighting and scat searches provide information relating to the species, which has been assessed as an SSBV, rather than MNES.

The project proposes to clear approximately 9919 ha of remnant vegetation in the mine area identified as potential koala habitat with an additional 163 ha affected by high-impact subsidence. Conservative habitat assessments indicated a total of 26 535 ha is present in the mine study area (AEIS Volume 4, Appendix J1). The proponent does not consider the project will have a significant impact on the koala due to the low densities in which they occur and the availability of similar habitat in the surrounding landscape. In addition, the EIS (EIS Volume 2, Section 5) notes that the local koala population does not fit the definition of an 'important population' for a vulnerable species as defined in the EPBC Significant Impact Guidelines⁸⁷ as it is not:

- a key source population for either breeding or dispersal
- a population that is necessary for maintaining genetic diversity
- a population near the limit of the species range.

I note that the proponent has proposed a Project Species Specific Management Plan in the AEIS (Volume 4, Appendix J1) to detail management and research items including:

- research of koala populations, densities and habitats
- ongoing monitoring of koala populations and habitats on and surrounding the project area

⁸⁷ Department of the Environment 2013, *Matters of National Environmental Significance Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999*.

- management of preferred habitat types including ironbark-box grassy woodlands and fringing riparian vegetation communities to improve condition, reduce fragmentation and encourage dispersal
- monitoring of pest dog populations and implementation of an eradication program if necessary.

Bygana West Nature Refuge

The Bygana West Nature Refuge is a Category C Environmentally Sensitive Area as defined under the EP Act. It covers approximately 1487 ha and is wholly contained within the mine footprint. Environmental values within the nature refuge include areas of the endangered REs 11.4.6 and 11.4.8 as well as habitat suitable for threatened species known to occur in the project area.

Potential impacts to the nature refuge include the clearing of approximately 1238 ha of remnant vegetation with a further 182 ha potentially affected by subsidence.

Disturbance from weeds, erosion and cattle grazing were not obvious during the field surveys despite the occurrence of cattle grazing within the nature refuge. Fauna habitat types described by the proponent in the AEIS (Volume 4, Appendix J) occurring in the nature refuge are typically in good condition and include ironbark-box woodland, shrubby low woodland, tall mixed shrubland and gidgee/brigalow shrubby woodland.

Environmental values potentially impacted within the nature refuge have been considered in the preparation of the Environmental Offsets Package. Offset liabilities for EPBC listed species are discussed in section 5.1.

Nature refuges are voluntary arrangements between the State and landowners to protect significant biodiversity values while allowing compatible land uses to continue. The declaration of a nature refuge does not alter existing or future rights to mineral exploration or extraction under the MR Act. Unlike higher conservation tenures such as national parks, nature refuges are declared by the Governor-in-Council and can be revoked by the Governor-in-Council. The proponent should enter discussions with DEHP regarding the revocation of the Bygana West Nature Refuge under the NC Act prior to disturbance occurring within the refuge.

Weed and pest species

A total of 28 introduced plant species were recorded during the field assessment however the AEIS noted weeds are not generally abundant in the project area. Five species listed as Class 2 pests under the *Land Protection (Pest and Stock Route Management) Act 2002* (LP Act) were recorded in the study area. These species are also listed as Weeds of National Significance and are detailed in Table 6.5.

Table 6.5 Weed species recorded in the project area

Scientific name	Common name	Habitat records
<i>Cryptostegia grandiflora</i>	Rubber vine	Fringing vegetation of the Carmichael River
<i>Parkinsonia aculeata</i>	Parkinsonia	Near a storage dam on Obungeena Creek
<i>Opuntia stricta</i>	Prickly pear	Brigalow patches, adjacent to water storages
<i>Opuntia tomentosa</i>	Velvety tree pear	Brigalow patches
<i>Parthenium hysterophorus</i>	Parthenium	Generally sparse clusters in non-remnant areas, brigalow and box woodland on the Carmichael River

Introduced animal species recorded during the surveys are listed in Table 6.6 and included one amphibian, six mammals and two birds. Four of these species are listed under the LP Act as Class 2 pests. It is the responsibility of landholders to control species listed as Class 2 declared pests on their land.

Table 6.6 Introduced fauna species recorded in the project area

Scientific name	Common name	LP Act status
<i>Sus scrofa</i>	Feral pig	Class 2
<i>Felis catus</i>	Feral cat	Class 2
<i>Canis familiaris dingo</i>	Dingo	Class 2
<i>Oryctolagus cuniculus</i>	European rabbit	Class 2
<i>Rhinella marina</i>	Cane toad	Not declared
<i>Mus domesticus</i>	House mouse	Not declared
<i>Rattus rattus</i>	Black rat	Not declared
<i>Anas platyrhynchos</i>	Mallard	Not declared
<i>Streptopelia chinensis</i>	Spotted turtle-dove	Not declared

I note that the proponent has proposed control measures for weed and pest species in the mine EMP and committed to develop and implement Project Weed and Pest Management plans (commitment P6.61 and P6.62).

Aquatic ecology

Five main types of aquatic habitat types are available in the study area; lacustrine, palustrine, riverine, drainage lines and gilgais. The greatest diversity of habitat for aquatic fauna in the study area is supported by the Carmichael River and Cabbage Tree Creek. Both of these watercourses maintain aquatic habitat throughout the year. The aquatic ecology assessment is presented in the EIS Volume 2, Section 5 and Volume 4 Appendix O1. Hydrological impacts downstream of the mine and on the Carmichael River are presented in the AEIS (Volume 4, Appendices K2, K4 and K5).

Potential impacts of the project to the waxy cabbage palm population along the Carmichael River are discussed in section 5.1.1 of this report. Impacts and mitigation

measures regarding groundwater drawdown on the Carmichael River are addressed in section 5.1.7.

Macrophytes

Aquatic flora was generally only observed in dams and was not typically found in riverine systems. Only one location surveyed along the Carmichael River recorded submerged macrophytes (aquatic flora). The field surveys showed a low diversity and abundance of macrophytes throughout the study area, which is generally reflective of riverine habitats that experience high-flow events for short periods of time followed by extended dry periods. A desktop assessment indicated four species listed as either endangered or vulnerable under the NC Act had been recorded within 50 km of the study area; however, a likelihood of assessment analysis considered them all unlikely to occur within the study area and no threatened species were detected during field surveys.

Fish

The fish community of the study area is considered to be comprised of species that exclusively inhabit freshwater due to the construction of artificial barriers to estuarine fish passage such as the Burdekin Falls Dam and Clare Weir in the lower catchment. A desktop assessment predicted 17 fish species to occur in the study area of which 11 were confirmed during field surveys. The species diversity is low compared to other smaller catchments in northern Queensland and may be a result of factors that favour generalist species over specialist species including:

- high flows of short duration interspersed by long dry periods
- the low diversity of habitat and microhabitat
- degradation of habitat.

The desktop assessment indicated the freshwater sawfish (*Pristis microdon*) and the Australian lungfish (*Neoceratodus forsteri*), both listed as vulnerable under the EPBC Act, occur within the Burdekin Catchment; however, no suitable habitat is available in the study area. No pest fish species were recorded during the surveys and the desktop assessment revealed no records within a 50 km buffer of the study area and none are considered present in the Belyando sub-catchment.

Reptiles

Irwin's turtle (*Elseya irwini*) is endemic to the catchment and is listed as high priority under the Burdekin Back on Track framework⁸⁸. It prefers sandy riverine habitat with an abundance of macrophytes which are not well represented in the project area. It is considered unlikely that this species occurs in the project area. No threatened reptiles listed under either the NC Act or the EPBC Act are considered likely to occur in the project area.

⁸⁸ Department of Environment and Resource Management 2010, *Burdekin Natural Resource Management Region Back on Track Actions for Biodiversity*, Department of Environment and Resource Management, Brisbane.

Mammals

The platypus (*Ornithorhynchus anatinus*), listed as 'special least concern' under the NC Act, is known to occur within the Burdekin catchment, however a desktop assessment indicated the species has not previously been recorded within a 50 km buffer of the project area and field surveys did not detect suitable habitat.

Macro-crustaceans

A search of the Queensland Museum crustacean database indicated two crustacean species, *Daphniopsis pusilla* and *Moina baylyi*, have been previously recorded near Lake Buchanan, a salt lake located within a 50 km buffer of the project. The lake lies outside the project catchment basin and contains high concentrations of salt. Suitable habitat for these species was not detected during field surveys. Redclaw (*Cherax quadricarinatus*) was trapped in the Carmichael River and in Cabbage Tree Creek; however, this species is widespread and expected to occur in other water bodies across the region.

Macroinvertebrates

Macroinvertebrate sampling was undertaken at three locations along the Carmichael River and one location on Cabbage Tree Creek. The sampling recorded a prevalence of taxa that are tolerant to disturbance; potentially indicating disturbed aquatic habitats. The EIS noted that macroinvertebrate community diversity is expected to be substantially influenced by the uniform sandy substrate in the Carmichael River (Volume 4, Appendix O1). The greatest diversity was detected at sites where aquatic vegetation, woody debris, root balls and detritus were present; however, this type of habitat is less prevalent than the dominant sandy bed and bank habitat generally found in the Carmichael River.

The aquatic species assemblage and low diversity in the macroinvertebrate community are generally reflective of the ephemeral nature of the project area. Key ecological values protected under the EPBC Act including the waxy cabbage palm are discussed in section 5.1.1.

Mellaluka Springs complex

The Mellaluka Springs Complex is comprised of the Mellaluka Spring, Stories Spring and Lignum Spring, located approximately 20 km south of the Carmichael River. The complex is a wetland of local significance that does not form part of the GAB discharge spring wetlands TEC, which is listed as endangered under the EPBC Act. However, the springs complex may support similar ecological communities to the TEC.

An additional survey of the Mellaluka Springs Complex was undertaken in March/April 2013 for the AEIS (Volume 4, Appendix J3) following comments on the EIS that the initial survey effort had been inadequate. The survey assessed the habitat values of each spring and noted a number of disturbances including damage from domestic and feral animals and possible anthropogenic disturbances at the Mellaluka Spring from the nearby homestead. Water quality at the Lignum and Stories springs was noticeably degraded by cattle and pigs stirring up sediment, urinating and defecating in the water. Bores to provide water for domestic use or livestock watering have been installed at all

three springs. All of the springs were relatively free of weeds, with the exception of parthenium which was present in low densities.

The AEIS described habitat at the Mellaluka wetlands as less complex than that found at the Doongmabulla Springs complex, while noting that the wetlands provide a constant water source and refugial habitat for regional flora and fauna communities in dry periods. The Lignum and Stories springs lie to the north of the Mellaluka Spring and are connected to grassy woodland dominated by Reid River box (*Eucalyptus brownii*) and silver-leaved ironbark (*Eucalyptus melanophloia*). While habitat surrounding the Mellaluka Spring is more fragmented, it is the largest spring in the complex, supports the largest community of flora species and has the broadest range of habitats. No threatened or endemic species were found during the survey; however, a desktop assessment and likelihood of occurrence analysis indicated the following threatened species are considered likely to occur:

- squatter pigeon (*Geophaps scripta scripta*)
- ornamental snake (*Denisonia maculata*)
- yakka skink (*Egernia rugosa*)
- koala (*Phascolarctos cinereus*)
- black-throated finch (*Poephila cincta cincta*).

Potential impacts and mitigation measures to manage impacts to these species are discussed in section 5.1 (MNES).

Although the source aquifer is yet to be confirmed for the springs, the most likely source is thought to be the underlying Permian age units of the Colinlea Sandstone. Groundwater quality data from the springs supports this hypothesis (AEIS Appendix K6).

A significant reduction in pressure is predicted to occur at the springs during and after mine operations cease which, without mitigation, could potentially result in a loss of ecological function at all springs in the complex, with only the most deep-rooted tree species still able to access groundwater. Predicted impacts to the springs complex are substantially higher post closure than during the operational phase of the project. Impacts are not expected to commence until approximately 2020, with a reduction in pressure of the aquifers expected by approximately 2035. Potential impacts of groundwater drawdown across the Mellaluka springs complex are discussed in section 5.1.7.

I note that the proponent has made commitments specific to the management of the Mellaluka Springs complex including:

- ongoing monitoring, investigation of the source aquifer and reporting of a hydrogeological conceptual model (commitment P6.34)
- pumping groundwater to the surface to offset losses (commitments P6.35 and M4.26)
- preparing a wetland remediation and management in consultation with the Mellaluka owner (commitment P6.35)

- installing a pump to ensure continuation of water to the Mellaluka homestead if required (commitment P6.35)
- providing a revised draft Groundwater-Dependent Ecosystem (GDE) Management Plan for approval prior to the commencement of construction (commitment M4.27).

In addition, control measures to mitigate impacts to the springs complex are outlined in the draft Groundwater-Dependent Ecosystem (GDE) Management Plan (available from the proponent's website) addressing the main risks from groundwater drawdown, pests and fire and include:

- implementing weed and pest management measures
- monitoring feral species populations and implementing a control program if necessary
- implementing fire management strategies to reduce the potential of high intensity fires
- developing a suitable surface water management system.

Nevertheless, I consider that it is highly likely that the ecological values of the Mellaluka Springs Complex will be significantly impacted by the project and that proposed management measures are unlikely to mitigate these impacts. I therefore expect that the proponent will propose a suitable offset for the potential loss of the springs in the revised Biodiversity Offset Strategy. The offset must be implemented when significant impacts are identified. See section 5.1.7 for determinants of groundwater trigger levels.

Carmichael River GDE

The Carmichael River is the largest surface water feature running through the project, joining the Belyando River approximately 20 km to the east of the project area. It is subject to strong seasonal variability and typically becomes a low-flow environment late in the dry season interspersed by pooled water held in deeper sections of the stream bed. The riparian zone, dominated by river red gum (*Eucalyptus camaldulensis* var. *obtusata*), weeping paperbark (*Melaleuca leucadendra*) and narrow-leaved paperbark (*Melaleuca fluviatilis*), is well established and provides extensive shading of the water.

Water levels and stream flow are, at least partly, supported by direct groundwater flow from the underlying units and/or discharge from the Doongmabulla Springs. As such, the remnant riparian vegetation and fauna supported by these communities are groundwater dependent.

I note that the draft Groundwater Management Plan, provided following the AEIS submission period, identified potential impacts from the project to the Carmichael River including:

- changes to surface and groundwater regimes
- loss, degradation and fragmentation of habitat
- degradation of water quality
- introduction or spread of aquatic and terrestrial weed and pest species
- changes to fire regimes
- spills of environmentally hazardous materials

- reduced floodplain area connected to the Carmichael River
- altered stream morphology from scouring and sediment deposition
- the loss of 25 per cent (16 664 ha) of the catchment
- an increase in weed species
- a loss of bank stability leading to an increase in erosion.

The eastern half of the project area may be more susceptible to changes in base flow as the depth to groundwater is greater in that area. The predicted reduction in base flow volumes and increase in no flow periods is likely to stress plants and result in the death of some or all canopy trees where drawdown of up to four metres is expected. Maximum base flow impacts are expected approximately 20 years into the operation of the project.

Control measures to mitigate impacts to aquatic ecology, riparian vegetation, fire groundwater, surface water and weeds and pests are outlined in the draft GDEMP. Commitments detailed in the Proponent Commitments Register (Appendix 7) specific to the management of the Carmichael River include:

- retaining landscape permeability and east-west connectivity throughout the mine's operational life (commitment P6.13)
- protecting and managing the strip of land either side of the Carmichael River to maintain biodiversity values (commitment P6.13)
- not sourcing water from the Carmichael River (commitment P6.22)
- developing an ecological features map to assist in monitoring dieback, river health and identify priority management areas, waxy cabbage palm locations, rubber vine infestations and areas of connectivity or disconnection with groundwater (commitment P6.37)
- removing rubber vine and controlling feral pig populations (commitment P6.38)
- establishing a series of permanent CORVEG primary monitoring transects (commitment P6.39)
- maintaining a corridor 500 m either side of the Carmichael River centre line to protect it and the riparian zone from mining operations (commitment M1.4)
- undertaking construction works across the river only during dry conditions (commitment M4.6)
- locating bridge pylons and supports outside of the low flow channel (commitment M1.25)
- enhancing the ecological values of the buffer area through revegetation and active habitat management (commitment M 4.16).

Should groundwater drawdown have a significant impact on matters of state environmental significance supported by or contained within the Carmichael River corridor, I will require an offset for those values if they are have not already been offset as MNES.

Wetlands

Three areas mapped as GBR WPA are located on the project site, north of the Carmichael River. The areas cover approximately 6 ha and were resurveyed in May 2013 in response to comments on the EIS and to confirm the condition and status of the wetland areas. The areas had been dry during the original EIS survey and were again dry when revisited, however the flora species assemblage, soil characteristics and presence of snail and crab shells and burrows indicated the areas fit the Queensland wetland classification of a 'semi-arid grass, sedge and herb swamp'. Hydrological flood modelling also suggests that these areas are inundated with up to 1 m of water during a 10-year ARI flood event and up to 2 m of water during a 100-year ARI flood event. The report is presented in Volume 4, Appendix J8 of the AEIS.

All three areas are located within in the mine footprint and are proposed to be cleared and disturbed. Two of the wetlands are in an area designated as an open-cut pit and one will be impacted by the creation of a dam for mine-affected water. The loss of the GBR WPAs has been considered as a residual impact of the project and is included in the Environmental Offset Package (March 2014). I will consider the need for a GBR WPA offset when I determine and approve any State offset conditions that I consider necessary and that are not met by Australian Government MNES offset requirements.

Off-lease infrastructure area

Field surveys of the off-lease area were undertaken in April/May 2013 comprising a combination of comprehensive and rapid flora and fauna sites, rapid aquatic assessment sites, remote cameras, dam watches, diurnal and nocturnal active searches and driving transects.

Cleared land dominates the off-lease area with remnant vegetation mostly confined to patches on a floodplain between Eight Mile Creek and Obungeena Creek and fringing North Creek and Eight Mile Creek. Fourteen field-verified REs were recorded in the off-lease study area including the endangered REs 11.3.1 and 11.4.9. These REs correspond to the Brigalow TEC and do not occur within the proposed disturbance footprint. Remnant vegetation covers approximately 332.5 ha of the study area, comprised of 9.8 ha listed as 'endangered', 220.6 ha listed as 'of concern' and 102.1 ha listed as 'least concern' under the VM Act. Approximately 7.2 ha of the REs listed as 'least concern' occur within the project disturbance footprint and are proposed to be cleared for construction of the off-lease infrastructure.

Threatened fauna species, listed under the NC Act, that have been confirmed present or assessed as likely to occur in the off-lease area are detailed in Table 6.7. Impacts to species that are also listed under the EPBC Act are discussed in section 5.1.1.

Table 6.7 Off-lease threatened fauna species previously recorded in the region

Scientific name	Common name	EPBC Act	NC Act	Likelihood of occurrence	Impact area (ha)
<i>Chalinobus picatus</i>	Little pied bat	–	NT	Confirmed present	2.5
<i>Paradelma orientalis</i>	Brigalow scaly-foot	–	V	Likely	3.7
<i>Ephippiorhynchus asiaticus</i>	Black-necked stork		NT	Confirmed present	–
<i>Nettapus coromandelianu</i>	Cotton-pygmy goose		NT	Confirmed present	–
<i>Melithreptus gularis</i>	Black-chinned honeyeater		NT	Likely	–
<i>Lophoictinia isura</i>	Square-tailed kite		NT	Likely	–
<i>Phascolarctos cinereus</i>	Koala	V	SLC	Likely	2.7
<i>Tachyglossus aculeatus</i>	Echidna	–	SLC	Confirmed present	2.5

Note: Impact areas have been sourced from the AEIS Volume 4, Appendix J5.

Mitigation measures

The proponent has outlined a number of mitigation measures in the revised overarching mine and off-lease EMPs, available from the proponent’s website, including:

- designing lighting systems to minimise light spill into areas of native vegetation
- conducting pre-clearance habitat surveys
- relocating fauna species from areas to be cleared, as required
- conducting clearing in the presence of a fauna spotter catcher
- salvaging habitat features from areas to be cleared
- implementing an offset strategy and management plan
- conducting weed and pest control programs
- inspecting and cleaning vehicles prior to site entry
- scheduling works in watercourses for the dry season and avoiding works in flowing streams.

The mitigation measures will be developed and implemented through a series of specific issue management plans which have been outlined in the Project Commitments Register, available from the proponent’s website. The management plans include:

- Project Land Management (Flora and Fauna) Plan (commitment P6.58)
- Project Vegetation Management Plan (commitment P6.59)
- Project Species Specific Management Plan(s) (commitment P6.60)
- Project Weed and Pest Management Plan (weeds) (commitment P6.61)
- Project Weed and Pest Management Plan (introduced animals) (commitment P6.62)

- Project Erosion and Sediment Management Plan (commitment P6.63)
- Project Waste and Resource Management Plan and Project Hazardous Substances Management Plan (commitment P6.64)
- Project (Mine and Offsite Infrastructure) Bushfire Management Plan (commitment P6.65).

Offsets

The Queensland Government Environmental Offsets Policy (QGEOP) provides an overarching framework that sets the principles and requirements for the delivery and management of State offsets. Within this framework, specific-issue policies relevant to the project include the Biodiversity Offsets Policy and the Policy for Vegetation Management Offsets.

DEHP is currently developing a single environmental offsets framework for Queensland, due to start by mid-2014. The new framework will replace the QGEOP and its component offset policies.

The proponent has assessed the project and identified residual impact areas of State Significant Value that will potentially require an offset in accordance with these policies. The proponent's offset assessment and proposals were addressed initially in an Environmental Offset Strategy (EIS Volume 4, Appendix AH and AEIS Volume 4, Appendix F). The proponent revised the Strategy subsequent to the AEIS in response to comments received from DE and DEHP and provided a detailed Environmental Offset Package (March 2014). The package also includes MNES related offsets likely to be required by the Commonwealth Minister for the Environment under the EPBC Act.

Residual impacts to state environmental values that are not protected under the EPBC Act and the availability of offsets as set out in the package are listed in Table 6.8. The Environmental Offset Package indicates that residual impacts to all matters of state environmental significance and MNES can be offset within the five properties identified in the package and which are components of DEHP's Galilee Basin Offsets Strategy⁸⁹. The proposed offset areas have not yet been fully ground-truthed to determine the actual extent and condition of the environmental values on the ground.

The revised offset package provides a staged breakdown of residual impacts that require offsetting. The staging and delivery of offsets would be consistent with the following mine stages:

- Stage 1—years 1–10 of mining activity, including residual impacts from construction of the rail and off-lease infrastructure
- Stage 2—years 11–20 of mining activity
- Stage 3—years 21–60 of mining activity.

For coordinated projects, the Coordinator-General has the powers necessary to decide state offsets as part of the broad conditioning powers under the SDPWO Act. While I will take advice from state agencies on offsets and consider the existing State offset

⁸⁹ EHP. 2013. *Galilee Basin Offsets Strategy*. Brisbane: Department of Environment and Heritage Protection Government.

policies for the project, I will determine and approve any State offset conditions that are considered necessary over and above Australian Government requirements. I will not require any additional offsets for impacts to SSBV if the Australian Government also requires an offset for the same values.

To this effect, I have imposed a condition (Appendix 1, Section 3) that requires the proponent to finalise a Biodiversity Offset Strategy (based on the Offsets Package) following the Commonwealth Minister for the Environment's decision on the project. The strategy must include any new information relevant to the State values offset determination obtained since the last version. I will review and approve a final Biodiversity Offset Strategy that includes my State values offset determination. I have stated a condition as part of Schedule I of the draft EA (Appendix 1) that will ensure the approved strategy is implemented.

I do not expect the proponent to deliver up-front offset requirements related to potential impacts for the life of the project. Rather, the offsets relevant to each stage would be provided prior to the commencement of each stage.

Table 6.8 Proponent proposed offsets for State environmental values not assessed as MNES

State environmental value	Status	Residual mine and off-lease impact (ha)	Available offset area (ha)
Fauna			
NC Act			
Brigalow scaly-foot	V	6406.02	125 997.78
Cotton pygmy-goose	NT	20.45	41 454.54
Black-necked stork	NT	20.45	56 227.62
Square-tailed kite	NT	8746.24	154 609.58
Black-chinned honeyeater	NT	8746.24	97 658.31
Echidna	SLC	10 056.15	168 168.65
Koala	SLC	10 143.55	57 318.67
Little pied bat	NT	10 659.29	89 941.40
Regional ecosystems			
VM Act			
11.3.3	OC	12.45	2785.94
11.4.6	OC	148.01	1364.20
11.3.5	Threshold LC	56.02	413.10
Watercourses			
Stream order 2	–	404.26	168 168.74
Stream order 4	–	135.10	168 168.74
Stream order 8	–	12.96	44 693.03
Wetlands			
GBR WPA	–	6.04	833.11
significant wetlands	–	4.42	181.20
Connectivity			
connectivity	–	17 402.67	105 734.55

6.1.3 Coordinator-General's conclusions

I am satisfied that the mitigation and management measures outlined by the proponent can minimise risks to State biodiversity values and that where residual impacts remain, the values can be offset.

For areas outside the mining lease, I have made recommendations in Appendix 2, Section 2 requiring the proponent to conduct pre-clearance surveys prior to the commencement of construction and for the development and documentation of mitigation and management measures to maximise the ongoing protection and long-term conservation of threatened species. I note that the results of pre-clearance flora and fauna surveys may require a revision of the project's offset requirements if the presence of additional threatened species is detected.

With respect to impacts on GDEs, including spring complexes and Carmichael River corridor, I have stated a condition in the draft EA (Appendix 1, Schedule E) requiring a groundwater management and monitoring program to ensure the identification, mitigation and monitoring of potential groundwater impacts that will be reviewed at least every five years.

6.2 Air quality

6.2.1 Introduction

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.

An air quality assessment was undertaken as part of the EIS (Volume 2, section 7 and Volume 4, Appendix S), and subsequently revised to take into consideration changes by the proponent during the EIS process to the mine plan and layout, reduction in project life to 60 years and a change to the layout of the off-lease infrastructure area. The revised assessment also evaluated the combined effect of windblown coal dust from the mine and rail components where the railway overlaps with dust contours of the mine. The Revised Mine Air Quality Assessment Report was presented in the AEIS (Volume 4, Appendix L).

I note that emissions predicted from the off-lease infrastructure area will be assessed during the detailed design phase as stated in the Revised Mine Air Quality Assessment Report (section 4.1). Potential impacts to air quality from off-lease project activities during construction include air emissions from vegetation clearing and earthworks, odour emissions and gaseous chemical release from the sewage treatment plant, fuel storage, vehicle operation and blasting (off-lease EMP (March 2014) section 6.3). I expect impacts on air quality to be minimal during operation of the off-site infrastructure.

Information on air quality impacts relating to the rail line is provided in section 7.4 of this report.

6.2.2 Context

The proposed mine site is remote from non-natural pollutant loads and typical of an inland sub-tropical climate. Background values for the air quality impact assessment were estimated using data from the Bowen Basin due to a lack of existing data for the proposed project location.

The proponent assessed the potential impacts of the project on air quality for seven homesteads in proximity to the mine site and the initial portion of the rail line. A map of the sensitive receptors is shown in Figure 6.1. The closest homestead to the mine site is Lignum Homestead (receptor 32), which is situated 7.5 km from the boundary of the mining lease. I note that the Moray Downs homestead, located to the east of the mine site (receptor 18), has been included in the list of sensitive receptors, even though it has been acquired by the proponent and is likely to be removed or minimally used.

In addition to the homesteads, the proponent has assessed the impact of the project at the MWAV and the airport terminal centre. The homesteads are classed as sensitive receptors under the EP Act and will be protected by conditions in the mine EA and off-lease approvals, whereas the environmental amenity of the accommodation village and airport will be managed under provisions in the *Work Health and Safety Act 2011* (Qld) (WHS Act) as they are facilities that would be managed by the proponent and occupied by proponent employees.

Key issues raised in submissions on the EIS related to:

- the need for dust monitoring on site and an analysis of the dust impacts on the surrounding local area
- the dust criterion and standards used to predict long-term health impacts of changes in air quality
- impacts of coal dust on rail infrastructure and aquatic habitats.

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

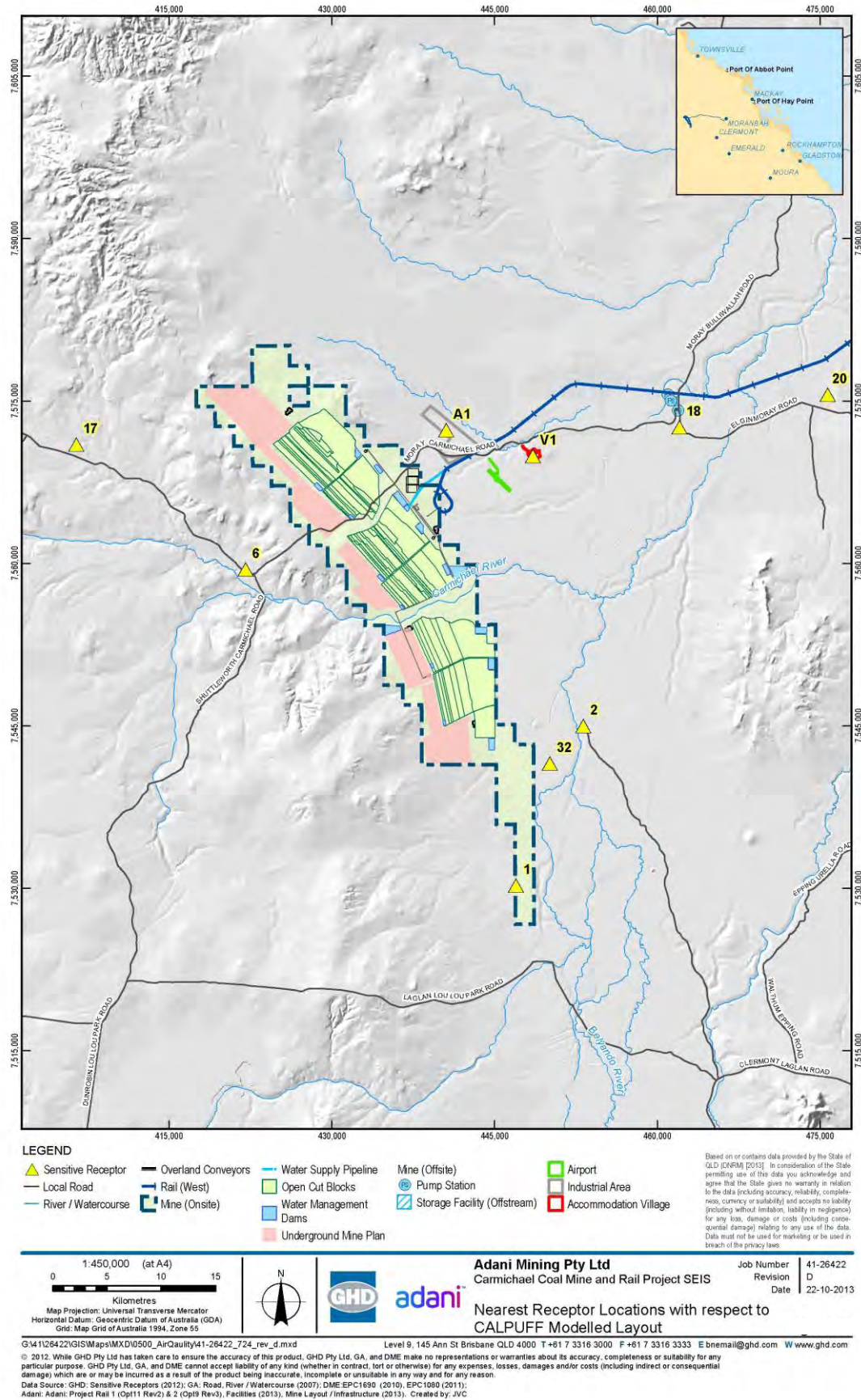


Figure 6.1 Air quality sensitive receptors

6.2.3 Potential impacts and mitigation

Impacts on air quality are expected to occur as a result of activities such as clearing, blasting, removing overburden, large truck haulage, wind erosion and coal mining, handling and transportation as described in the AEIS (Volume 4, Appendix L, Revised Mine Air Quality Assessment Report).

Impacts

Air quality impacts from the mine activities and the initial 40 km section of the rail were modelled to predict ambient levels of particulate matter (in the form of total suspended particles (TSP), PM₁₀ and PM_{2.5}) and ground-level dust concentrations to determine the impacts of these dust emissions on sensitive receptors (AEIS Volume 4, Appendix L, section 5).

I consider that pollutants such as oxides of nitrogen, carbon monoxide and any other potentially harmful gaseous substances are unlikely to exceed air quality goals off the mining lease due to the comparatively low emission rates and the large distances between significant sources and sensitive receptors. Accordingly, no further assessment of these emissions was required.

I note that the modelling found that for all sensitive receptors, the dust impacts would be within the objective levels specified in the Environmental Protection (Air) Policy 2008 (EPP (Air)), specifically:

- ambient PM₁₀ levels, for the worst case impacts, will not exceed 85% of the allowable limit, 50 µg/m³ (24-hour averaged, including background), for all sensitive receptors
- averaged PM_{2.5} levels will be below the assessment criteria of 25 µg/m³ (24-hour averaged) and 8 µg/m³ (annual average) for all sensitive receptors
- ambient TSP levels will be compliant with the maximum ambient level criterion of 90 µg/m³ (annual average) for all sensitive receptors
- deposited dust levels decrease rapidly beyond their source so that at all sensitive receptor locations, rates will be significantly below the assessment criteria of 4 g/m²/month.

Response to submissions on the EIS

Adequacy of the mine air quality assessment

Based on advice from DEHP I consider that:

- air quality technical reports and related EIS chapters have been prepared in accordance with the project TOR
- air quality environmental values likely to be impacted by the project have been identified appropriately
- existing air quality, climate, meteorology, and current emission sources have been described adequately
- ambient particulate matter background concentrations and project emission estimates have been derived using recognised methods and data sources

- appropriate air dispersion modelling tools have been used by suitably qualified professionals to predict ground-level particulate concentrations (GLC) likely to result from mining activities for three mine life scenarios and that modelled GLCs have been assessed against relevant air quality criteria
- dust management strategies and an air quality monitoring program have been proposed to demonstrate compliance, at least in the early life of the mine, with air quality criteria where exceedances were predicted in future years.

Background dust monitoring

One submitter on the EIS raised a concern about the absence of dust monitoring on site. The proponent has now established dust deposition gauges at several nearby homesteads to establish background levels of potential impacted receptors AEIS (Volume 2, section 7.3.1).

I note that the proponent has committed to install a system of dust monitors (commitment M6.1) upwind and downwind of the mine and at the sensitive receptor locations predicted to be at risk of receiving dust levels close to reaching the EPP (Air) objectives. The monitoring equipment will be used to establish pre-construction background dust levels and subsequently used to quantify dust impacts of the project activities during construction and operation.

Dust criterion standards

One submission on the EIS raised a concern that the standards used to estimate the impacts on human and wildlife health were insufficient. I consider that the air quality modelling and assessment for the EIS and AEIS has been undertaken in accordance with all relevant standards (EPP (Air)) and the requirements of the TOR (AEIS, Volume 2, section 7.3.1).

Coal dust impacts

Submissions on the EIS raised concerns about the impacts of coal dust on rail infrastructure and aquatic habitats. I note that coal dust impacts will be managed in accordance with the project's EMPs and that the proponent has committed to developing a coal dust management plan (CDMP) that will comply with best practice management procedures (commitment R6.4). Measures in the CDMP designed to minimise coal dust deposition on rail infrastructure and prevent nuisance at any sensitive places will also minimise coal dust deposition in aquatic habitats. Further information about the impacts of the project on surface water quality has been provided in section 5.1.7 and coal dust emissions from the rail in section 7.4.

Mitigation and monitoring

I note that the proponent has identified a broad range of control measures to mitigate and monitor the impacts of the project on air quality within section 6.6 of the mine EMP. The proposed controls I consider necessary include:

- dust suppression measures, including water sprays on access tracks
- planning, management and rehabilitation of exposed surfaces, roads and access tracks and minimising areas of exposed soils

- minimising dust in the design of stockpiles and the coal load-out facility
- stabilising topsoil stockpiles
- installing a meteorological monitoring station to monitor dust deposition at three downwind locations and one upwind location.

I note that if off-site ambient dust levels are demonstrated to be significantly detrimental due to mining operations beyond the site boundary, the proponent has committed to investigate and implement additional options for reducing emissions where required (commitment M6.2).

6.2.4 Coordinator-General's conclusions

I am satisfied the proponent has adequately assessed the project's predicted air quality impacts and that measures proposed to control emissions included within the mine and off-lease EMPs will adequately manage any adverse impacts.

I have stated draft EA conditions for the mine site (Appendix 1, Schedule B) which specify dust and particulate matter limit criteria that must not be exceeded at sensitive receptor locations, as well as monitoring and reporting requirements.

To address the impacts of off-lease activities on air quality, I have recommended that the proponent prepare and document measures and procedures relating to minimising air quality impacts throughout the project's construction and operation and adopt best practice coal dust management procedures to prevent any nuisance at a sensitive place, and damage to rail infrastructure and ecological values (Appendix 2, Section 2).

I am satisfied that by implementing the project's mine and off-lease EMPs (March 2014) and commitments outlined in the Proponent Commitments Register (Appendix 7) and complying with the draft EA and off-lease conditions, the project's potential air quality impacts on sensitive receptors can be appropriately managed within acceptable limits.

6.3 Noise and vibration

6.3.1 Introduction

This section of the report evaluates the proponent's assessment of noise and vibration impacts at the mine and in the off-lease infrastructure area. For information on noise and vibration relating to the rail line, refer to section 7.4 of this report.

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

Submissions on the EIS and AEIS raised issues relating to:

- compliance with key policies and legislation
- baseline noise levels assessment methodology and criteria
- impacts to human health, sensitive receptors and sensitive fauna.

I have considered each submission and how the information provided by the proponent addresses these issues.

As a result of changes made by the proponent subsequent to the release of the EIS to both the layout and operational duration of the mine and off-lease infrastructure (proposed in the AEIS), the proponent submitted an updated noise and vibration assessment (AEIS, Volume 4, Appendix N) which also accounted for potential noise impacts associated with the airport. In response to submissions, this updated assessment considered the World Health Organisation (WHO) noise criteria in relation to the baseline and anticipated construction/operational noise levels at each of the sensitive receptors within the vicinity of the project area (See Figure 6.2). I note that one of the sensitive receptors (identified in Figure 6.2 as receptor 7) has been acquired by the proponent and will no longer be a private residence and subject to nuisance impacts.

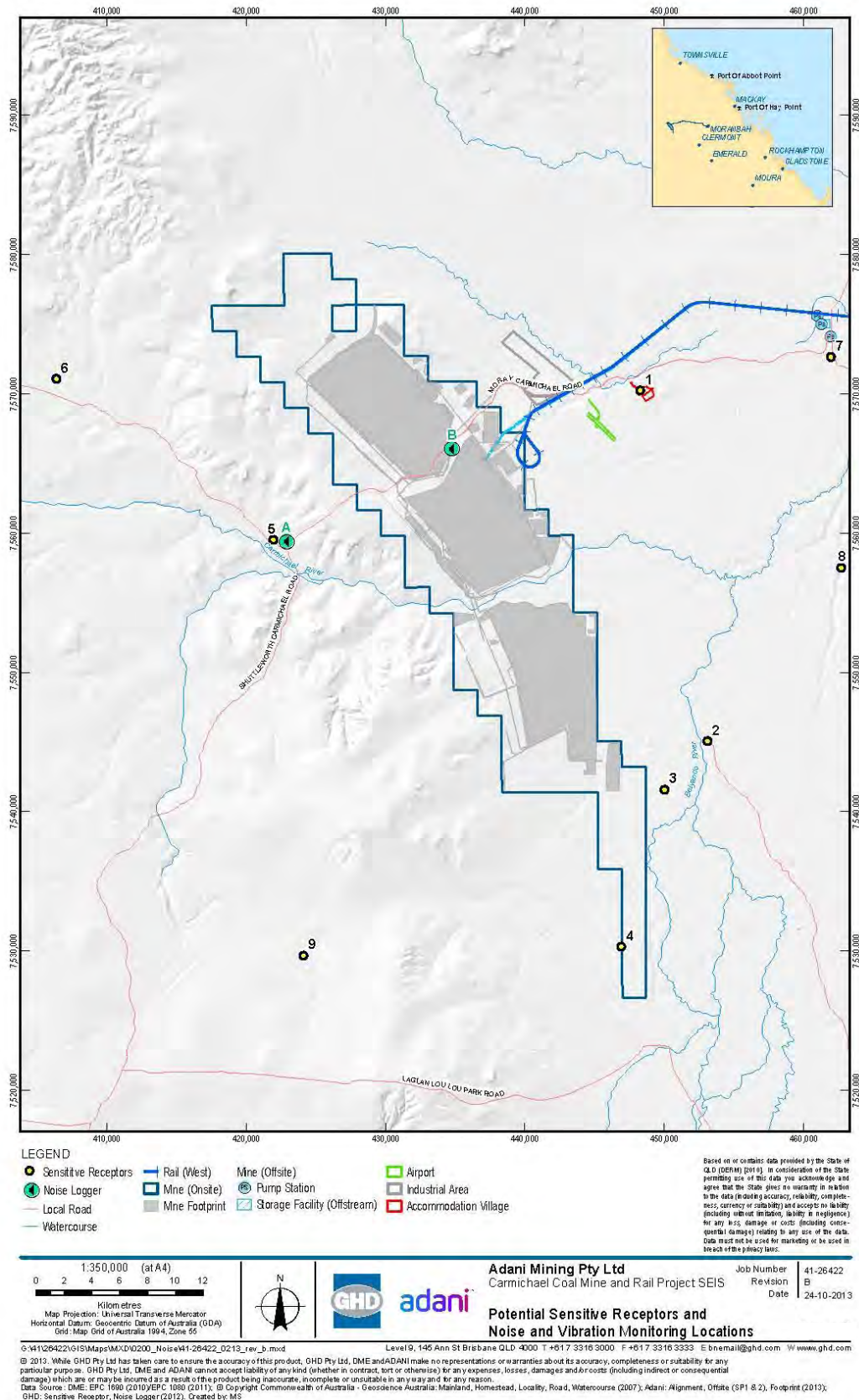


Figure 6.2 Location of noise and vibration sensitive receptors in proximity to the mine site and off-lease infrastructure area

Existing background noise levels in the proposed project area are considered low, as they are typical of a quiet rural environment. The area is dominated by natural noises, consisting of birds, insects and cattle, all of which can be affected by local meteorology. Baseline studies confirmed the lack of perceptible vibration throughout the mine and off-lease areas.

6.3.2 Potential impacts and mitigation

Potential impacts arising from noise and vibration at the mine and off-lease area were analysed by the proponent using acoustic modelling based on proposed construction and operational methods/equipment in combination with a desktop analysis. Any impacts relating to noise and vibration could potentially include:

- disturbance to sleep or social/work/study activities
- disturbance to native fauna and livestock
- discomfort to sensitive receptors
- damage to property and infrastructure.

Construction impacts

Noise modelling undertaken by the proponent indicated that construction noise resulting from civil works is not anticipated to cause any significant noise impacts at sensitive receptors, as noise levels will be under the 55 dB(A) WHO criteria. Similarly, noise from construction vehicle movements along the Elgin Moray Road is predicted to be under the 68 dB(A) $L_{10,18hr}$ maximum limit by DTMR.⁹⁰

The Environmental Protection (Noise) Policy 2008 (EPP (Noise)) does not include construction noise limits, provided the construction work is undertaken in daytime hours and all equipment is fitted with appropriate mufflers. I would expect the proponent to comply with such requirements.

The vibration modelling reported that all anticipated vibration levels are expected to be at 0.1 mm/s or less at a distance of approximately 300 m from mining equipment. These levels are within the adopted vibration criteria from section 440ZB of the EP Act and the *Noise and Vibration from Blasting Guideline*.⁹¹

As all potential sources of noise and vibration are likely to be less than the maximum limits, minimal direct mitigation measures are needed from the proponent. Any potential noise and vibration impacts that may occur throughout the staged construction of the MWAV will be managed under the WHS Act.

Operational impacts

The proponent has undertaken noise modelling for the operational phase during neutral and adverse weather conditions. Results indicate that the noise generated from the mine and off-lease infrastructure will be less than the WHO night-time limits of 28 dB(A) at the surrounding sensitive receptors throughout all weather conditions.

⁹⁰ Department of Transport and Main Roads, *Road Traffic Noise Management: Code of Practice*, Department of Transport and Main Roads, Brisbane, 2007.

⁹¹ Environmental Protection Agency, *Guideline: Noise and vibration from blasting*, Queensland Government, Brisbane, 2006.

Due to the close proximity of the MWAV to the power generation area, it is expected that the night-time criteria would be exceeded by up to 4 dB. The proponent is yet to make a decision on how long the temporary generators near the MWAV will need to operate or the long term power supply for the project. The Adani Group's Galilee Transmission Pty Ltd is investigating a transmission line linking to the Powerlink network. The proponent will manage any potential impacts to the MWAV under the WHS Act.

Operational low frequency noise from the coal handling and processing plant (CHPP) was also assessed by the proponent, which will be less than the noise limit of 50 dB(linear) at all sensitive receptors in accordance with the Queensland Government's *Assessment of Low Frequency Noise Guideline*. Similarly, noise from operations vehicle movements along the Elgin Moray Road is predicted to be under the 68 dB(A)L_{10,18hr} maximum limit used as a standard by DTMR.

Air blast overpressure and ground vibration levels are predicted to be under the acceptable thresholds for all sensitive receptors. However, overpressure for two of these are expected to be within 2–3 dB of the 115 dB(L) criteria required by section 440ZB of the EP Act. I expect that receptors will be notified in the event that predictions indicate this threshold may be approached or exceeded.

Based on the proponent's prediction of four flights per day, modelled noise levels at sensitive receptors in proximity to the airport are less than the 50 dB(A) to 60 dB(A) at existing buildings for 20 flights or less per day as per *Australian Standard AS2021-2000 Acoustics—Aircraft noise intrusion—Building siting and construction*.⁹²

Mitigation and monitoring

The mine and off-lease EMPs (March 2014) and the Proponent Commitments Register (Appendix 7) set out a range of mitigation measures and monitoring requirements relating to noise and vibration, including:

- monitor noise and vibration levels throughout construction and in response to any complaints from sensitive receptors
- monitor airblast overpressure at the mining lease boundary and/or closest sensitive receptor
- implement a complaint system during construction
- construct buildings to withstand air blast overpressure and ground vibration levels
- consult with adjacent landholders within 1 km of the mining lease boundary or 5 km of homesteads on a weekly basis regarding blasting activities and ensure areas are not occupied by humans when undertaking blasting
- establish a flyrock exclusion zone within a 1 km buffer from the mining lease
- check for structural damage at sensitive receptors.

During the detailed design phase, the proponent will undertake a further noise assessment of the airport using the Australian Noise Exposure Forecast approach or

⁹² Standards Australia, *Acoustics—Aircraft noise intrusion—Building siting and construction (AS2021-2000)*, Standards Australia, Sydney, 2000.

similar. If this were to identify unacceptable noise levels, mitigation measures would be developed and implemented.

6.3.3 Coordinator-General's conclusions

I am satisfied that the proponent has adequately assessed noise and vibration impacts for the mine and off-lease infrastructure area, given the fact that there are limited sensitive receptors in the vicinity of the project.

To supplement the proponent's proposed monitoring and mitigation measures, I have stated EA conditions for the mine site (Appendix 1, Schedule C) which specify noise, vibration and airblast overpressure limit criteria that must not be exceeded at sensitive receptor locations, as well as monitoring and reporting requirements.

For the off-lease infrastructure area, I have recommended that the proponent prepare and document measures and procedures to minimise noise and vibration impacts throughout construction and operation for inclusion in any applications for an MCU or development approval (Appendix 2, Section 2).

I am satisfied that through the implementation of the project EMPs (March 2014), Proponent Commitments Register (Appendix 7) and compliance with the draft EA and off-lease conditions, any potential noise and vibration impacts to sensitive receptors can be appropriately managed within acceptable limits.

6.4 Waste

6.4.1 Introduction

This section of the report evaluates potential impacts and mitigation measures associated with the management of both general waste and mining waste on the mining lease and in the off-lease infrastructure area. Mining wastes are the materials disturbed during mining (overburden and interburden) and coal processing (coarse and fine rejects), which do not have marketable value and are disposed of. General waste encompasses the remainder of unwanted materials produced by the mine and off-lease components of the project.

Submissions on the EIS and AEIS raised a number of issues in relation to waste, including:

- predicted volumes and disposal methods and locations of general and mining waste
- sewage treatment and quality
- mine waste characterisation
- potential acid mine drainage impacts to surface water and groundwater supplies.

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

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

6.4.2 General waste

Waste generation

The mine and off-lease components of the project will generate a range of general waste types throughout construction and operations from the following activities:

- vegetation clearing and earthworks
- construction of infrastructure
- use and maintenance of vehicles, plant and equipment
- general administration and business
- on-site medical facilities
- package wastewater treatment plants
- the operational workforce.

Table 6.9 shows the estimated waste quantities arising from the above activities.

Table 6.9 Estimated general waste quantities for construction and operations

Activity	Waste type	Approximate construction quantity	Approximate operations quantity
Vegetation clearing	<ul style="list-style-type: none"> green waste 	<ul style="list-style-type: none"> 3000 ha of clearing 	<ul style="list-style-type: none"> 1200 ha of initial clearing plus an additional 250 ha per annum in line with mine development schedules
Building construction during the construction phase and site/ building maintenance and upgrades throughout operations	<ul style="list-style-type: none"> timbers metals concrete paints, sealants, solvents, resins plastics electrical/electronic waste asphalt 	<ul style="list-style-type: none"> 250 tonnes per annum (tpa) 400 tpa 300 tpa <1 tpa <1 tpa <2 tpa 50 tpa 	<ul style="list-style-type: none"> 100 tpa 200 tpa 60 tpa <1 tpa <1 tpa <1 tpa 10 tpa
MWAV	<ul style="list-style-type: none"> food scraps and domestic wastes paper, cardboard, glass, aluminium batteries grease trap waste clinical waste from medical facilities sewage effluent sewage sludge 	<ul style="list-style-type: none"> 260 tpa 130 tpa <1 tpa <5 tpa <1 tpa 153 megalitres (ML) pa 50 tpa 	<ul style="list-style-type: none"> 1300 tpa 700 tpa <1 tpa <5 tpa <1 tpa 229 ML pa 75 tpa
Operation and maintenance of plant and machinery	<ul style="list-style-type: none"> waste oil and oil hydrocarbon waste tyres batteries electrical/electronic waste other regulated waste explosive waste waste storage drums 	<ul style="list-style-type: none"> 500 kilolitres (kL) pa 550 pa <2 tpa <2 tpa N/A N/A 5 tpa 	<ul style="list-style-type: none"> 2500 kL pa 1200 pa 20 tpa 1–5 tpa <10 tpa < 1tpa 10 tpa

Activity	Waste type	Approximate construction quantity	Approximate operations quantity
Processing plant and office based activities	• paper, cardboard, glass, aluminium	• N/A	• 50 tpa
	• batteries	• N/A	• <1 tpa
	• clinical waste from medical facilities	• N/A	• <1 tpa
	• food scraps and domestic waste	• N/A	• <1 tpa
	• radioactive wastes	• N/A	• <1 tpa
	• electrical and electronic waste	• N/A	• <1 tpa
	• printer cartridges	• N/A	• <1 tpa
Total solid waste (excluding green waste and tyres)		1460 tpa	2656 tpa

- Notes:
1. Table provided to my office by the proponent on 3 March 2014.
 2. Volumes marked with N/A have not been provided by the proponent.
 3. Total solid waste volumes exclude green waste and tyres, as provided by the proponent.

Waste management and disposal

All general wastes will be managed in accordance with the waste and resource management hierarchy (*Waste Reduction and Recycling Act 2011*)—avoid, reduce, re-use, recycle, recover, treat and dispose.

In response to concerns in submissions regarding waste disposal locations, the proponent provided me with further information identifying the key transfer stations within the region that may be utilised.⁹³

The proponent will engage private, licensed waste transport and disposal providers to ensure adequate waste capacity planning is undertaken. This is of particular relevance for waste streams such as concrete, metals and waste oils as they are anticipated to be generated in relatively large volumes. For these waste types, the proponent has committed to utilise private services rather than council facilities (commitment M9.22). The proponent has also begun working with the Queensland Government to enable regional waste transport and management service providers to participate in tender processes.

After agreements are finalised, waste will be stored in a designated waste management area fitted with a suitable contaminant and drainage system, collected by private contractors and taken to resource recovery centres and landfills (commitment M9.8). In response to comments made in submissions, the proponent provided information to my office on 3 March 2014 indicating that the waste generated from the project will not be a significant volume in the regional context as it equates to approximately 1.6 per cent of the Fitzroy region's total annual waste generation and 1.6 per cent of the Mackay region. Based on this, the proponent has determined that the general waste generated by the project will be within the annual operating capacities for potential waste facilities.

The proponent has included a suite of management measures in the Proponent Commitments Register (Appendix 7), the mine EMP (March 2014) and off-lease (March 2014) that will be adopted to ensure no adverse impacts to environmental values or public health occurs from waste, including:

- developing and implementing a Waste Management Plan prior to construction, operations and decommissioning to outline waste management and monitoring (commitment M9.2), pursuant to relevant legislation and government waste reduction strategies
- developing and implementing a Project Procurement Plan to avoid purchasing of excess quantities of materials (commitment M9.1)
- storing hazardous materials in accordance with Australian Standards (commitment M9.4)
- mulching, chipping and stockpiling all cleared vegetation material for rehabilitation and revegetation (commitment M9.3)
- maintaining a waste register outlining waste types, potential contaminants, quantities, storage locations and management methods

⁹³ As provided to my office by email on 3 March 2014.

- monitoring the waste register to identify areas for improvement.

For further detail on specific mitigation measures for each waste type likely to be generated as a result of the project, refer to section 12.5.2 of the mine EMP (March 2014) and section 11.5.2 of the off-lease EMP (March 2014).

To supplement the proponent's proposed waste management methods, I have stated a draft EA condition (Appendix 1, Schedule C) which prohibits the burning of general waste on the mining lease, other than vegetation in controlled circumstances, unless prior approval is obtained from the administering authority. In addition to this, I have stated a condition (Appendix 1, Schedule C) which will ensure that no environmental harm occurs at sensitive receptors as a result of burning cleared vegetation.

For the off-lease area, I have made a recommendation requiring the proponent to prepare and document waste management measures and procedures for the construction and operations phases in any application for an MCU or development approval (Appendix 2, Section 2).

Sewage treatment plants

In response to submissions on sewage treatment and quality, the proponent has committed to treat sewage on site with package STPs to Class A+ standard (commitment M3.26). The proponent has also committed to develop and implement site-specific wastewater management plans for the mine, off-lease and rail components to ensure sewage and grey water comply with effluent treatment and discharge requirements and to monitor untreated sewage tanks and pipes for leaks (commitments M9.5 and M11.11).

On the mining lease

STPs will be installed on the mining lease in each of the mine infrastructure areas (located at each major open-cut pit cluster and UGM). Conditions stated as part of the draft EA for mining activities (Appendix 1, Schedule G) provide for treated sewage effluent release limits, monitoring and reporting at each STP.

Off the mining lease

Installation of STPs will also occur in the off-lease component of the project at the MWAV, the industrial area and the airport. The treatment of sewage in the off-lease area is managed under ERA 63 of the EP Act which requires an EA, separate to the draft EA for the mining lease. Conditions stated for these sewage treatment activities are included in Appendix 2, Section 1, Part B and outline requirements that the proponent must operate under to ensure no land and/or water contamination occurs. The administering authority for the EP Act may include additional conditions in the final EA that are consistent with the stated conditions.

For further information on the separate EA required to carry out ERAs in addition to the EA for mining activities, refer to section 4.3 of this report.

Coordinator-General's conclusions

I am satisfied that the proponent has sufficiently addressed the potential impacts associated with waste generation, management and disposal, as well as sewage treatment and quality.

I am satisfied that the proponent would effectively manage general waste through compliance with the conditions stated for the mining lease (general waste in Appendix 1, Schedule C and sewage treatment in Appendix 1, Schedule G) and recommendations for the off-lease area (Appendix 2, Section 2).

I conclude that implementation of the measures identified in the Proponent Commitments Register (Appendix 7), the mine EMP (March 2014) and the off-lease EMP (March 2014) would sufficiently supplement the stated conditions in managing any potential impacts associated with general waste.

6.4.3 Mining waste

Context

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 from the CHPP, which do not have marketable value.

Coarse rejects are larger pieces of overburden or coal which are not suitable for product sale and fine rejects or 'tailings' are generally too high in ash or moisture to be sold. It is estimated that the mine will produce approximately 74 mtpa run-of-mine (ROM) coal, of which 60 mtpa will be saleable product. The remaining waste content will comprise up to 10.60 mtpa of coarse rejects and 3.46 mtpa of tailings (1.21 mtpa of 'dry tailings' from the belt press filter and 2.25 mtpa of 'wet tailings' from the tailings dam). In addition to these rejects from the CHPP, approximately 13.1 billion bcm of overburden/interburden will be generated over the life of the mine, which will be initially stored in the out-of-pit waste rock dumps. Subsequently, the balance will be placed into final voids as they become available.

Potential impacts and mitigation

In response to submissions regarding mine waste characterisation, the proponent completed a Mine Waste Characterisation Report (AEIS Volume 4, Appendix O1). The report outlines the following geochemical issues which could potentially result in adverse environmental impacts:

- some overburden/interburden is a potential source of salinity
- clay materials could have a markedly higher potential to release salts and metals to water than overburden/interburden, roof and floor wastes⁹⁴ and coal
- despite the majority of overburden/interburden being NAF in the long term, there are particular materials⁹⁵ which could be PAF and result in AMD
- some portion of the coal and roof and floor wastes could be PAF in the long term

⁹⁴ Roof and floor wastes refer to samples of material taken from immediately above or below the coal seams.

⁹⁵ This includes carbonaceous mudstone, carbonaceous sandstone, carbonaceous siltstone, clay, claystone, mudstone, sandstone, sandy clay, siltstone, tuff and zinc.

- concentrations of particular chemicals⁹⁶ in water run-off and percolate from the out-of-pit waste rock dump could exceed the cattle drinking water guidelines⁹⁷
- clays and weathered rocks⁹⁸ may potentially be dispersive
- weathered rock, siltstone and sandstone may have potential for deterioration and breakdown after exposure to water
- future geochemical assessments may indicate PAF materials in tailings.

Adverse impacts to surface water and groundwater quality could occur if mining waste is not appropriately managed due to the abovementioned geochemical issues; this particularly includes potential for AMD, saline drainage and erosion of dispersive and/or sodic waste materials. Elevated salinity, dissolved metal concentrations and acidic pH levels in groundwater and surface water could have consequential negative impacts on aquatic ecology.

Rehabilitation success could also be diminished if accelerated erosion was to occur or if dispersive materials were to be utilised for capping of waste rock dumps in the out-of-pit rehabilitation structures. As part of the AEIS, the proponent also conducted a Landform Design Study (AEIS, Volume 4, Appendix O3) to determine the potential stability of proposed waste landforms through erosion modelling.

Visual amenity may be impacted as waste storage and disposal will result in changes to landforms.

In order to address these potential impacts, the proponent has provided a range of mitigation measures in the Mine Waste Management Strategy (AEIS, Volume 4, Appendix O2), the Proponent Commitments Register (Appendix 7) and mine EMP (March 2014), including:

- developing a Mine Waste Management Plan to outline mine waste validation sampling, analysis and reporting throughout the life of the mine (commitment M9.11)
- establishing an ongoing geochemical characterisation program to identify potential locations and volumes of PAF, potentially saline or dispersive waste including conducting geochemical and leach testing of tailings to determine the long-term risk of AMD (commitments M5.13, M9.12 and M9.16)
- placing tailings and PAF materials in clay-lined encapsulation cells within waste rock dumps (commitments M9.13 and M9.20)
- establishing a mine waste tracking program to document waste placement and correlating this with surface water and groundwater monitoring locations
- preventing water contact with dispersive materials and storing such materials within the core of the waste rock dumps (commitment M9.10)
- designing and operating tailings storage facilities to minimise impacts to surface water and groundwater, and with hydraulic capacity as required by the Manual for

⁹⁶ This includes sulphate, fluoride, boron and molybdenum.

⁹⁷ AGWQMR, *Australian Guidelines for Water Quality Monitoring and Reporting*, Australian and New Zealand Conservation Council, Agriculture and Resource Management Council of Australia and New Zealand, Australia, 2000.

⁹⁸ This includes mudstone, claystone, carbonaceous mudstone and siltstone.

Assessing Consequence Categories and Hydraulic Performance of structures⁹⁹ (commitments M1.12 and M9.14)

- collecting and treating decanted water from the tailings in the storage facilities, which will then be returned to the Mine Water Management System (commitment M1.14)
- including the proposed tailings dams and out-of-pit waste rock dumps in the surface water and groundwater monitoring networks (commitments M5.12 and M9.15)
- reviewing surface water and groundwater monitoring programs every five years to ensure adequate monitoring is being undertaken in areas where waste is being disposed of
- appropriately designing mine affected water (MAW) dams and recycling recoverable MAW back into the CHPP (commitments M9.18 and M9.19)
- capping and rehabilitating waste rock dumps facilities post closure (commitment M9.21).

The proponent has committed to work with relevant industry associations (such as the Australian Coal Association Research Program) to achieve continuous improvement in tailings management outcomes (commitment M9.23).

For information on managing surface water and groundwater quality, refer to section 5.1.7 of this report and sections 6.1 and 7.1 for aquatic ecology. For information on erosion controls and progressive rehabilitation, refer to section 6.6 of this report.

Coordinator-General's conclusions

I accept that the proponent's Mine Waste Characterisation Report (AEIS, Volume 4, Appendix O1) concluded that the majority of overburden/interburden waste from all lithological groups is likely to be NAF in the long term and most of these materials are not expected to be an immediate source of salinity.

I have stated draft EA conditions (Appendix 1, Schedule H) to ensure the effective management of mining waste. Under these conditions, the proponent must develop and implement a Waste Rock, Spoil and Rejects Disposal Plan which includes a program of waste characterisation in order to predict the quality of runoff and seepage, information on how PAF and NAF materials will be placed to reduce AMD and a sampling program to verify these placements.

In relation to the management of tailings, I have stated a condition in (Appendix 1, Schedule C) which deals with tailings containment, management of seepage and leachate and a program of sampling and characterisation to identify PAF materials.

I consider that these conditions are consistent with the IESC's advice regarding mine waste management including management and handling of overburden material, soil testing to characterise overburden and monitoring for migration of AMD.

The conditions for tailings and waste rock, spoil and rejects (Appendix 1, schedules C and H) also require the proponent to develop a rehabilitation strategy and provide a self-sustaining vegetation and native ecosystem similar to those at nearby reference

⁹⁹ Department of Environment and Heritage Protection, *Manual for Assessing Consequence Categories and Hydraulic Performance of structures*, State of Queensland – Department of Environment and Heritage Protection, Brisbane, 2013.

sites. I note that commitments have been made by the proponent on this issue, particularly relating to final land forms and rehabilitation success criteria. For information on rehabilitation and post-mining land uses for the tailings cells and out-of-pit waste rock dumps, refer to section 6.6 of this report.

I have also stated conditions relating to regulated structures (Appendix 1, Schedule K), contaminated land (Appendix 1, Schedule H), surface water (Appendix 1, Schedule F) and groundwater (Appendix 1, Schedule E) which will ensure any potential impacts arising from mining waste are managed appropriately.

Based on compliance with the draft EA conditions and the implementation of the Mine Waste Management Strategy (AEIS, Volume 4, Appendix O2) and mitigation measures in the Proponent Commitments Register (Appendix 7) and the mine EMP (March 2014), I am satisfied that the proponent would effectively manage mining waste over the life of the project.

6.5 Hazard and risk

6.5.1 Introduction

This section of the report evaluates the hazards and risks associated with the mine and off-lease components of the project. Submissions received on the EIS and AEIS raised issues associated with:

- emergency response and safety procedures/facilities
- consultation with emergency services
- biosecurity risks and potential spread of communicable diseases
- impacts to regional health services
- fire management
- regulated structures (i.e. dams and levees) capacities
- increased traffic and road accidents
- flooding and water quality impacts.

I have considered each submission and how the information provided by the proponent responded to these issues as part of my evaluation of the environmental impacts of the project.

For information on hazard and risk matters relating to the rail component, refer to section 7.5. My evaluation of traffic and water impacts, including matters raised in submissions, can be found in sections 5.2 and 5.1.7 respectively.

6.5.2 Context

Statutory legislation (and related subordinate legislation and other guidance materials such as Regulations, Codes of Practice and Australian Standards) establishes the minimum standard by which activities for this project must be undertaken. Legislation and standards of particular relevance to the avoidance, mitigation and management of hazards include, but are not limited to:

- WHS Act, which outlines the laws regarding health and safety matters in workplaces
- Work Health and Safety Regulation 2011 (Qld), which supports the general duties and procedural/administrative matters under the WHS Act
- *Coal Mining Safety and Health Act 1999* (Qld) (CMSH Act), which sets obligations relevant to the design, construction and operation of a coal mine
- Coal Mining Safety and Health Regulation 2001 (Qld), which prescribes ways of achieving acceptable levels of risk at a coal mine
- Australian and New Zealand Standards (AS/NZS) ISO31000:2009 Risk management – Principles and guidelines (ISO 31000), which provides principles and generic guidelines for risk management
- *AS/NZS 4801:2001, Occupational health and safety management systems – Specification with guidance for use*, which provides a benchmark for occupational health and safety/environmental management systems for organisations.

6.5.3 Potential impacts and mitigation

Volume 2, Section 12 of the EIS outlined the proponent's assessment of hazard and risk assessment in accordance with the guidelines of ISO 31000. The assessment identified, prioritised, managed and compared risks and hazards of the project. Volume 2, Section 12 of the AEIS provided additional information relating to the management of hazard and risk in response to issues raised in submissions on the EIS.

Forty-two hazards were identified as having the potential to occur throughout the mine and/or off-lease components of the project (refer to EIS, Volume 2, Section 12, Table 12-7). These relate to water and waste management, traffic accidents, air transit, management of hazardous substances, security/access issues, explosions (unplanned detonation and gas/coal dust), the atmosphere of the underground mine, natural hazards including flooding and fire and alteration of surface topography.

Health and safety management system

Under the CSMH Act, the proponent is required to develop and implement a health and safety management system (HSMS) in order to achieve an acceptable level of risk. This will be implemented for both the mine and off-lease infrastructure area as part of an overarching project-wide HSMS (PWHSMS). The system will identify standard operating procedures under which the project must operate and include the required principal hazard management plans (as discussed below), organisational structure, responsibilities, practices and resources for achieving, maintaining and reviewing an acceptable level of risk.

General risk management

The proponent's evaluation of hazard and risk as discussed in Section 6.5.3 describes each risk, potential consequences, likelihood of occurrence and residual risk ratings. Each of these risks will be mitigated through both preventative and responsive measures as outlined in the EIS hazard analysis (Volume 2, Section 12, Table 12-7). The proponent has committed to implement these measures through risk management plans for the mine and off-lease areas, which will be implemented as part of the respective HSMSs (commitment M11.9). These plans will be developed and implemented pursuant to the relevant legislation and guidelines and in consultation with emergency services.

Disease vectors

There are potential breeding sites for mosquitos of pest and disease significance across the mine site including the Carmichael River, Eight Mile Creek, Cabbage Tree Creek, the sewage treatment plant, culverts at road crossings, dams and other water bodies. The proponent has determined that all sensitive receptors for the mine and off-lease components are outside of the 3 km buffer of major breeding sites within which people would be at higher risk of contracting disease. Therefore, the proponent has considered potential health impacts to be minimal. Nonetheless, a Mosquito/Biting Midge Management Plan (commitment M11.36 and EIS Volume 2, Section 12.2.4.1) has been developed and will be implemented as part of the mine and off-lease HSMSs prior to construction. This will avoid exposing workers, visitors and the community to disease vectors, particularly at the off-lease accommodation village. The plan focuses

on avoiding ponding of water, sampling of mosquito larvae and implementing appropriate mosquito control programs in consultation with Queensland Health.

Personnel health

The Workforce Management Strategy (refer to section 5.5, social and economic impacts), will provide for employee fatigue management, medical condition management (including communicable diseases), fitness and mental health management (commitment P1.9). Kitchen facilities will be provided in accordance with statutory requirements and operated in accordance with the *Food Act 2006* to ensure the health of workers (commitment M11.27).

Security

To further ensure the safety of personnel, the proponent has committed to develop and implement mine and off-lease security management plans to prevent unauthorised access to hazardous areas, restrict the use of equipment where appropriate training has not been obtained and outline processes required for visitor access. These are part of the network of plans which will be included under the HSMSs (commitment M11.38).

Emergency management planning

The proponent will prepare project-wide disaster management and hazardous substances management plans under the PWSMS (commitment M11.38). Emergency management plans specific to the mine and off-lease area will be developed as part of the project wide HSMS to incorporate requirements for workplace health and safety and community, environmental and natural hazard management (commitment P1.8).

As identified in the management plan hierarchy in the Proponent Commitments Register (Appendix 7), the emergency management plans will also contain the following sub-plans:

- Vehicle Accident Response Plan
- Spill Response Plan
- Spontaneous Combustion Management Plan (mine only)
- Fire Management Plan and associated Bushfire Management Plan.

To minimise demand on regional emergency services, the proponent has committed to:

- construct a fire station, fully equipped with fire truck, fire fighting equipment and personnel with appropriate training (commitment M11.7)
- provide a first aid room equipped with various response facilities including basic medical supplies, defibrillators and oxygen cylinders (commitment M11.22)
- provide QPS with resources including an office and workstations, a vehicle, accommodation at the village and upgrades to existing communication towers (commitment M11.37)
- establish an emergency services consultative committee with Queensland Ambulance Service, Queensland Fire and Rescue Service (QFRS) and QPS for ongoing monitoring of emergency services resourcing requirements (commitment M11.37).

Draft Environmental Authority conditions

In addition to the implementation of the HSMS, Emergency Management Plan and associated sub-plans, aspects of risk management on the mining lease are addressed in the draft EA conditions I have stated for this project (Appendix 1, Schedule A). The proponent must develop and implement a risk management system for the construction and operation of the project, pursuant to ISO 31000 or the latest edition of a similar Australian Standard.

The proponent must also notify the administering authority of emergencies and incidents including the release of contaminants not in accordance with EA conditions, and report on the outcomes of actions to manage any incidents, including the actions proposed to prevent recurrence.

In addition to the hazard assessment, the proponent has also completed an assessment of the proposed regulated structures against the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures.¹⁰⁰ This assessment has informed the conditioning of regulated structures under the EA (Appendix 1, Schedule K), which ensures that the structures are designed to accommodate extreme weather events. The conditions specify the design requirements and hydraulic performance criteria that must be addressed as part of the detailed design and operation of regulated structures.

The stated EA conditions also set a number of requirements for the effective management of impacts on air quality (Appendix 1, Schedule B), noise and vibration (Appendix 1, Schedule D), water (Appendix 1, Schedule F) and land (Appendix 1, Schedule H) which will also mitigate risks to the project workforce and broader community.

6.5.4 Coordinator-General's conclusions

Based on the mitigation measures provided as part of the hazard assessment, the proposed HSMSs, emergency management plans and associated sub-plans, as well as the requirements of the EA conditions, I am satisfied that the hazards and risks will be appropriately managed throughout the life of the project.

¹⁰⁰ Department of Environment and Heritage Protection, *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures*, State of Queensland – Department of Environment and Heritage Protection, Brisbane, 2013.

6.6 Land disturbance and rehabilitation

This section of the report evaluates the land disturbance and rehabilitation aspects of the mine and off-lease infrastructure areas. A number of submissions relevant to this section were raised during the EIS and AEIS comment periods, concerning the proponent's assessment of:

- land suitability
- soil survey and soil mapping
- good quality agricultural land (GQAL)
- subsidence
- final voids
- rehabilitation
- impacts to the stock route network (SRN).

As part of my evaluation of the environmental impacts of the project, I have considered each submission and how the additional information that was provided addressed these issues.

6.6.1 Overview

The mine and off-lease infrastructure is located primarily on Moray Downs, a large grazing property. The topography of the site is gently undulating and sits between 270 m and 300 m Australian Height Datum (AHD). With the exception of watercourses, slopes are generally less than 3 per cent and drain east to north-east. Although significant amendments were made to the mine plan after the EIS, the impacts to topography, soils and geology are not considered to have changed significantly from those described in the EIS.

6.6.2 Issues

Soils

A survey to determine soil distribution and characteristics at a scale of 1:100 000 was undertaken for the EIS. The assessment, presented in the EIS (Volume 4, Appendix L) was comprised of 146 ground observations on EPC 1690 and mapped 26 000 ha of the mine site. The proponent has committed to undertaking additional surveys of disturbance areas (commitment M3.4), EPC 1080 and the off-lease infrastructure areas (commitment M3.19); these will inform topsoil stripping and management, land suitability and GQAL status and be undertaken prior to construction.

The area surveyed is dominated by gradational or uniform yellow-brown or red Kandosols and Tenosols generally 0.5 to 1.5 m deep. Most soils contain moderate to high levels of fine sand capable of forming bulldust when disturbed. Other soils on the site include cracking clays and texture contrast soils, some of which have dispersive subsoils and contain excessive salt and sodium levels. The EIS includes topsoil stripping recommendations for all mapped soils and indicates most soils should only be used on very gentle slopes due to the high proportions of fine sand.

In terms of GQAL status, the total mine disturbance footprint supports 206.77 ha of class B, 27 939.75 ha of class C and 472.68 ha of class C/D land. These estimates have been revised since the AEIS submission period and are detailed in the Closure and Rehabilitation Strategy for the mine which is available on the proponent's website.

The soil assessment determined the land suitability of the mine area as restricted to grazing, with most of the area assessed as breeding country. The results of the soil assessment on EPC 1690 confirm the site is largely consistent with the CSIRO Land Systems mapping undertaken in the 1960s, with any differences generally explained by the different scales of assessment. An assessment of land suitability has not been undertaken for the off-lease areas; however, soil types are expected to be similar to those mapped on EPC 1690.

Potential impacts to soil resources identified in the EIS include:

- soil loss due to erosion and increased surface run-off
- reduced viability of soils to support vegetation
- sedimentation of water bodies adjacent to disturbance areas
- reduced agricultural productivity
- soil compaction and decreased infiltration
- production of bulldust from soils with moderate to high levels of fine sands and silt.

The additional survey work and assessment of disturbance areas will inform the preparation of a detailed Topsoil Management Plan and identify the depth of useable soil. It will also identify and map erosive soils. Commitments regarding soil management on the mine can be found in section 2.3.3 of the Proponent Commitments Register (Appendix 7). The commitments address future surveys, stockpiling and management of soil resources, and erosion and sediment control measures.

Performance outcomes and control measures to manage impacts on the mine are detailed in section 19 of the mine EMP (March 2014). For the off-lease infrastructure areas, performance outcomes and control measures are outlined in section 18 of the off-lease EMP (March 2014). The measures address all phases of construction and operation of the mine and off-lease infrastructure.

Rehabilitation

Mine

A Closure and Rehabilitation Strategy was prepared for the revised mine plan and provided with the AEIS (Volume 4, Appendix R1). This document has undergone significant revision since the AEIS in response to comments from DEHP and now addresses:

- an expansion of rehabilitation success criteria
- decommissioning of exploration bores
- progressive rehabilitation scheduling
- a revision of disturbance area estimates for each mine domain
- slopes of final landforms achievable with available soil resources

- contingencies to address a predicted shortfall in topsoil for rehabilitation
- mapping of final voids
- backfilling of Pit B to cover the D1 coal seam
- monitoring and maintenance of rehabilitation works after mine closure.

The overall rehabilitation objective for the site is to return it to a stable landform capable of supporting land uses similar to those currently in practice, grazing on a mosaic of native pastures and woodland habitat. Rehabilitation objectives, a final landform strategy and completion criteria have been outlined for each domain of the mine site. The domains described in the strategy are:

- open-cut voids and slopes
- underground mining areas
- mine infrastructure
- out-of-pit spoil dumps
- water storage areas
- stream diversions
- tailings drying cells
- the Carmichael River corridor.

Disturbance footprints for each domain and progressive rehabilitation scheduling are detailed in Table 6.10. Figure 6.3 illustrates the proposed progressive rehabilitation program. Current and proposed final land uses are detailed in Table 6.11.

Table 6.10 Proposed rehabilitation schedule

Domain	Disturbance (ha)	Disturbance begins	Rehabilitation begins	Rehabilitation ends
Voids	8331.55	2015	2054	2074
Underground	7786.76	2018	2030	2065
Mine infrastructure	2032.77	2014	2071	2074
Spoil dumps	8308.69	2014	2024	2074
Water storage areas	817.53	2014	2071	2074
Stream diversions	472.68	2014	2071	2074
Tailings cells	216.17	2014	2071	2074
Carmichael River corridor	50.78	2014	2071	2074

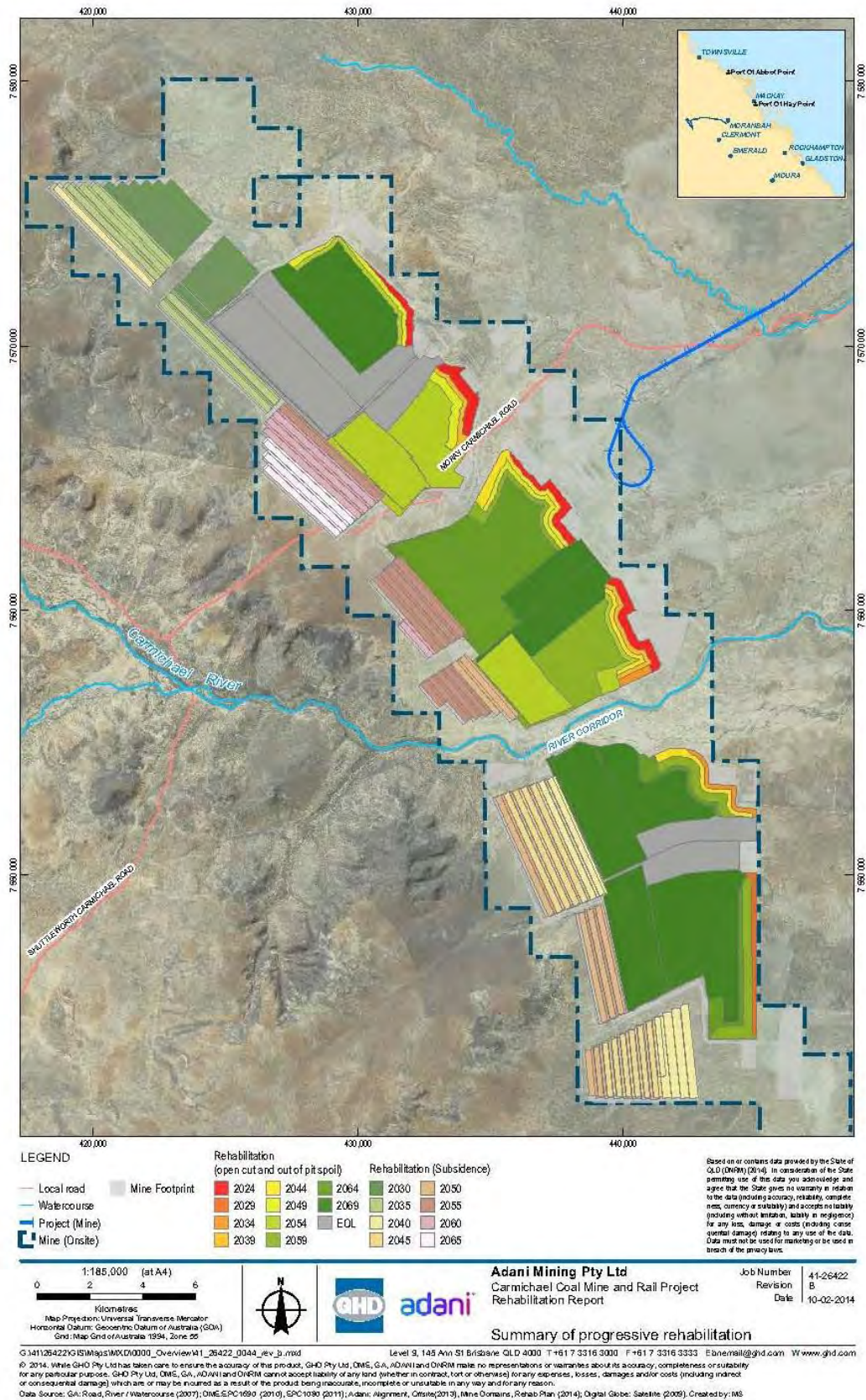


Figure 6.3 Proposed progressive rehabilitation of the mine

Table 6.11 Final land use and rehabilitation for mine domains

	Domain							
	Voids	Underground	Mine infrastructure	Spoil dumps	Water storage areas	Stream diversions	Tailings cells	Carmichael River corridor
Disturbance area (ha)	8331.55	7786.76	2032.77	8308.69	817.53	472.68	216.17	50.78
Current land use	Grazing	Grazing	Grazing	Grazing	Grazing	Grazing	Grazing	Grazing
Final land use	Water body or dry void with stable slopes Grazing suitability to be determined	Grazing	Grazing	Grazing suitability to be determined	Water supply, grazing or woodland habitat	Stable watercourses	Woodland habitat and grazing	Wildlife corridor with possible grazing
Target cover	Greater than 70 per cent grass cover							
Target slope	High-walls stable and $\leq 22^\circ$ Low-walls stable and $\leq 14^\circ$	Slopes do not exceed $5-6^\circ$	Slopes do not exceed $5-6^\circ$	Outer face slopes $\leq 7^\circ$ Inner face slopes = 14° forming a smooth profile with void area	All slopes to be $\leq 10^\circ$	Down-stream angles $\leq 6^\circ$	External slopes $\leq 7^\circ$ Surface slopes $\leq 3^\circ$	N/A

Post-mining land uses have been proposed for each of the domains on the mine site. The tailings cells, underground mining and infrastructure areas will all be returned to grazing country of native pastures and woodland habitat. All water storage areas that are not identified as beneficial for ongoing grazing purposes or do not meet suitable water quality criteria will be made suitable for grazing.

The out-of-pit spoil dumps have also been proposed to be returned to grazing country; however suitability of this domain for grazing will be determined at a later date.

Diverted streams will be left as stable water courses and the Carmichael River corridor will be left as a wildlife corridor with grazing occurring to a degree consistent with its management as wildlife habitat. Open-cut voids and slopes will be left as water bodies or dry voids; the suitability of these areas for grazing is also yet to be determined.

Final voids will be partially backfilled to cover the A/B and D1 coal seams and reduce the risk of spontaneous combustion. The backfilling of each void will limit potential evaporation from exposed groundwater aquifers. A shortfall of fill material will mean the pits cannot be filled to completely cover groundwater aquifers; however, modelled groundwater intrusion indicates the final voids are expected to remain mostly dry except for periods of high rainfall. The project's impacts on groundwater and surface water are discussed in more detail in section 5.1.7 of this report.

The proponent has proposed that monitoring of rehabilitated areas will be undertaken for a minimum of five years on all domains after mine closure. As the voids, underground mine area and spoil dumps represent the highest level of environmental risk, they will be monitored longer than the other domains to ensure they are safe, stable, sustainable and non-polluting.

Off-lease infrastructure

A Closure and Rehabilitation Strategy was also prepared for areas used to accommodate off-lease infrastructure and provided with the AEIS (Volume 4, Appendix R2). The areas, or domains, covered by the strategy include:

- MWAV
- airport
- off-site industrial area and rail sidings
- water infrastructure
- access roads.

The strategy was primarily developed to guide rehabilitation of operational infrastructure and activities. Rehabilitation of construction activities is to be managed by a Construction Off-site Operations Plan that will also be guided by the strategy. The stated objective is to leave a safe, stable, self-sustaining landform able to support land uses similar to those currently practised—in this case, grazing on pastures or a mosaic of pasture and woodland habitat. If a beneficial use for infrastructure such as roads and dams is identified they may be left in place beyond the life of the project.

Disturbance areas proposed for each off-lease infrastructure domain are shown in Table 6.12 with current and proposed final land use.

Table 6.12 Final land use and rehabilitation for off-lease areas

	Domain				
	Village	Airport	Industrial infrastructure	Water infrastructure	Access roads
Disturbance area (ha)	70.91	56.34	968.00	167.90	115.6
Current land use	Grazing	Grazing	Grazing	Grazing	Grazing
Final land use	Grazing	Grazing	Grazing	Water supply or grazing	Farm access roads or grazing
Target cover	Greater than 70 per cent grass cover				
Target slope	Consistent with local topography. Constructed slopes <6°			All slopes to be <10°	Consistent with local topography. Constructed slopes <6°

Completion criteria and indicators for each phase of rehabilitation are detailed in section 6 of the strategy. They have been described for each domain of the off-lease infrastructure area and will require revision after supporting information has been completed (including detailed soil surveys and the development of a Topsoil Management Plan to maximise the recovery and reuse of topsoil). In further developing the proposed rehabilitation strategy, the proponent has committed (commitment P6.66) to:

- develop a detailed procedure for rehabilitation of land in consultation with organisations such as government agencies and universities
- undertake or contribute to research to inform rehabilitation protocols
- develop and implement a monitoring protocol for rehabilitated areas
- continue rehabilitation works until targets have been achieved.

Methods of rehabilitation proposed in the strategy include:

- ripping to remove compacted surfaces
- replacing topsoil in accordance with a Topsoil Management Plan
- seeding or planting and watering of disturbed soils
- management of weeds and revegetation until vegetation cover of greater than 70 per cent is achieved
- grading and re-profiling to restore surface drainage and reduce the risk of scouring and ponding.

Subsidence

The revised mine plan submitted with the AEIS described a change from 16 open-cut and three underground mines to six open-cut and five underground mines. The new mine plan proposes a disturbance of 7786.76 ha from subsidence due to underground mining of the AB1 and D1 coal seams. Within the mine area, the seams dip 2 to 4

degrees to the west and vary between 4 m and 11.5 m in thickness. There are 110 longwall panels proposed, approximately 310 m in width and up to 6 km long. Extraction heights in the longwalls are 2.75 m in the AB1 seam and 3.25 m in the D1 seam. This is predicted to result in a maximum subsidence of 2625 mm after extraction in the AB1 seam and 5550 mm after extraction in both the AB1 and D1 seams.

Surface cracking from subsidence can be highly variable and difficult to predict, however zones of cracking are expected to occur around the sides and the ends of longwall panels where the depth of cover is less than 300 m. This will be most pronounced in the easternmost areas of the underground mines where the coal seams are at their shallowest, particularly in the most northern and most southern underground mines, underground mine 1 and underground mine 5 respectively.

Large tensile cracks are expected where higher curvature occurs and when depth of cover is approximately 200 m or less. Cracks and compressive humps are also expected in the centre of the panels. Where underground panels are under deeper cover, these effects are expected to be minor and less frequent. The modelling undertaken for the mine (AEIS, Volume 4, Appendix I1) predicts cracking widths will vary from 10 mm to 280 mm across the mine site, depending on the thickness of the top surface strata layer and plasticity. The EIS proposed carrying out visual monitoring during mining operations to assess the degree of surface cracking and coordinate remediation works.

An assessment of ponding in subsided panels was undertaken for the AEIS (Volume 4, Appendix K4) based on a typical wet and dry year. As subsidence is largely expected to follow the existing topography, ponding will occur at various locations within a longwall section. The largest ponds are expected at the end of each longwall section and around existing drainage lines. Sub-surface cracking and potential impacts on hydraulic conductivity are discussed in section 5.1.7 of this report. Where ponding exceeds two days in duration, vegetation communities are expected to die back as saturated soils are depleted of oxygen and groundcover will be unable to photosynthesise.

A draft Subsidence Management Plan was provided with the AEIS in Volume 4, Appendix I2. This document was subsequently revised to address comments received during the submission period concerning:

- quantification of subsidence impacts on MNES and MSES
- more accurate mapping of subsidence impacts
- a more conservative estimate of high and low impact rankings
- information on how cracks, ponding and buckling will be monitored and remediated
- more detail on management measures to inform the development of relevant EA conditions as the initial plan was presented at a strategic level.

The methodology proposed by the proponent to assess the severity of surface impacts from subsidence has been extracted from the plan and is presented in Table 6.13.

Table 6.13 Ranking of subsidence impacts

Impact	Ranking
Subsidence	High: slope change greater than 2 per cent (>5 m)
	Low: slope change less than 2 per cent (<5 m)
Cracking	High: greater than 100 mm (width)
	Low: less than 100 mm (width)
Ponding	High: duration of ponding greater than 2 days
	Low: duration of ponding less than 2 days
Infrastructure	High: impacted by infrastructure
	Low: not impacted by infrastructure

The proponent also considered the combined effects of subsidence, cracking and ponding (post-mitigation). An area considered to have a ‘high impact’ is one where there is high subsidence and/or high cracking and/or high ponding. Areas considered as having a ‘low impact’ are those where there is low subsidence and/or low cracking and/or low ponding.

High impact areas have been considered as residual impacts and included in the environmental offsets package. Mitigation measures have been proposed for the low impact areas and these are not considered as residual impacts for offsetting purposes. Impacts of subsidence on MNES and MSES are discussed in section 5 and section 6 respectively. A staged offset proposal has also been developed and is discussed in section 6.1 of this report.

An assessment of potential subsidence impacts is presented in the Subsidence Management Plan. The impacts described in the plan include:

- subsidence of up to 5.5 m
- altered drainage patterns and increased duration of ponding
- reduced downstream flows
- reduced water quality
- tension cracks in the surface
- increased erosion potential and mobilisation of sediment
- vegetation slumping, tree falls, exposure of root systems and root severance.

High level monitoring and management measures for construction and operation phases have also been outlined in the plan. These include:

- refining the subsidence model based on on-site geological data
- designing creek diversions around open-cut areas that will remain functional after subsidence
- constructing fences to exclude cattle from the subsided area
- implementing a monitoring program to determine baseline conditions for:
 - stream characteristics
 - vegetation health
 - habitat features

- site topography
- establishing appropriate reference sites for impacted areas
- re-profiling of subsided areas to prevent future ponding
- connecting low flow channels through subsided terrain with diversion channels or existing waterways.

Erosion and sediment control

The majority of the surface soils in the surveyed area of the mine site are poorly structured and contain high proportions of fine sand capable of forming bulldust which is susceptible to wind and water erosion. Other soils identified on the mine contain sodic or saline subsoils which have the potential to become dispersive if exposed and are susceptible to tunnel and gully erosion.

Estimates of potential long-term soil loss were undertaken for each soil unit present on the mine and found to be generally low, ranging from 9 to 263 tonnes per hectare per year (t/ha/year). The higher value of 263 t/ha/year was calculated for a very shallow soil occurring on rocky side slopes of rocky outcrops. For the purposes of the EIS, soils occurring in the off-lease infrastructure areas have been assumed to be similar to those present on EPC 1690, as no soil surveys have been conducted on these areas. These areas will need to be surveyed and appropriate controls put in place prior to any construction works.

Potential impacts arising from erosion and sediment deposition are identified in section 17 of the mine EMP (March 2014) and section 16 of the off-lease EMP (March 2014). These include:

- increased turbidity in aquatic environments
- smothering aquatic habitat with sediment
- geomorphological changes to watercourses
- degraded water quality for downstream users.

Performance outcomes and control measures for the construction and operation phases of the project are also outlined in the EMPs and include:

- designing stormwater systems to include sediment basins
- locating infrastructure and facilities away from drainage lines and steep slopes
- scheduling major earthworks outside the wet season
- reforming disturbed surfaces to accommodate drainage patterns
- minimising the exposure of disturbed surfaces
- undertaking rehabilitation and revegetation as soon as practicable
- installing short-term control measures such as silt fences and diversion mounds around disturbed areas.

Project-wide commitments to erosion and sediment control are detailed in commitments P6.20 and P6.63. Commitments regarding erosion specific to the off-lease infrastructure area are detailed in M3.12, M4.5 and M4.14. For the mine, commitments to minimise erosion risk are detailed in M1.24, M1.27, M1.28, M3.7 and M3.11.

The commitments apply to a range of activities potentially requiring erosion and sediment control measures including water course crossings, rehabilitation of disturbance areas and the use of soils likely to slake or seal. They also detail a hierarchy of control measures to be implemented through an Erosion and Sediment Control Plan and complemented by other management plans, including a Rehabilitation Management Plan, Topsoil Management Plan and an Overburden Management Plan.

6.6.3 Coordinator-General's conclusions

I am satisfied the Closure and Rehabilitation Strategy proposed by the proponent has been developed to a degree that will, with the proposed additional studies and more detailed planning, allow the effective closure of the mine and a return of the site to the nominated post-mining land uses.

The additional work undertaken subsequent to the AEIS has addressed the issues raised by DEHP. The proponent has made a range of commitments regarding rehabilitation of the mine including the development of a detailed Topsoil Management Plan (commitment M3.3), establishing rehabilitation success criteria for subsided areas (commitment M3.16) and undertaking progressive rehabilitation of disturbed areas (commitment M3.30).

I have stated conditions for land and rehabilitation in Schedule H of the draft EA in Appendix 1 of this report. These conditions relate to the rehabilitation of land disturbed by mining and detail completion criteria, monitoring and residual void treatment. Regarding the off-lease infrastructure areas, I have made a recommendation in Appendix 2, Section 2 requiring the preparation and documentation of management measures for decommissioning and rehabilitation works.

The proponent has committed to undertake detailed soil surveys on disturbance areas on the mine site to more accurately determine topsoil characteristics and stripping depths (commitment M3.4) and to a soil assessment covering EPC 1080 (commitment M3.19). These surveys are necessary to inform the development of specific mitigation measures to be implemented through the relevant management plans.

In regards to erosion and sediment control, the proponent has committed to developing and implementing a range of control measures outlined in the EMPs prior to construction. I am satisfied the potential impacts can be adequately managed through implementing these measures. To ensure this outcome, I have stated an EA condition in Schedule F, Appendix 1 requiring the development and implementation of an Erosion and Sediment Control Plan for the mine site. For the off-lease infrastructure area I have included recommendations regarding the development and implementation of environmental management measures and procedures, including erosion and sediment control, for construction and operation phases (Appendix 2, Section 2).

I am satisfied the control measures outlined by the proponent can adequately manage the impacts of subsidence once fully developed and implemented. To ensure environmental risks are minimised and these areas are effectively managed, I have stated EA conditions in Schedule J, Appendix 1 requiring the development and implementation of a Subsidence Management Plan prior to any activities that result in subsidence.

Given the uncertainty regarding subsidence impact predictions, the proponent will need to ensure the availability of offsets for MNES and MSES values within the total underground mining area. However, as residual impacts may be significantly lower than estimated, and to encourage the proponent to implement appropriate mitigation measures, the offset delivery requirements will need to be reviewed and quantified by ongoing monitoring and evaluation of residual impacts.

I have recommended that in any approval for the project, the Commonwealth Minister for the Environment consider offsets for residual impacts to EPBC listed species and communities that reflect the total underground mining area.

I have also recommend that the proponent be required by the Commonwealth Minister for the Environment, to provide upfront, sufficient offsets for residual impacts that reflect the planned total underground mining area for the first 10 years of mining operations. Should ongoing monitoring and successful mitigation measures identify that residual impacts are less than the total underground mining area; adjustments should be made to subsequent offset provisions.

7. Evaluation of environmental impacts—rail

This section outlines the major potential environmental impacts identified in the EIS, AEIS, submissions on the EIS and AEIS and advice from advisory agencies and other stakeholders relating specifically to the rail component of the project. The report provides comments on the potential impacts and, where necessary, includes conditions or recommendations to mitigate and manage any adverse impacts.

7.1 Biodiversity

A number of submissions regarding impacts to biodiversity were raised during the EIS and AEIS submission periods. The submissions addressed the proponent's assessment of:

- habitat loss and degradation
- impacts to threatened species and communities
- survey adequacy
- adequacy of proposed mitigation measures
- cumulative impacts of multiple large Galilee Basin projects
- weed and pest management
- offsets.

I have considered each submission and how the additional information provided responded to these issues as part of my evaluation of the environmental impacts of the project. My evaluation of the potential ecological impacts and mitigation associated with the mine and off-lease infrastructure area is discussed in section 6.1.

7.1.1 Overview

Much of the 189 km rail alignment transects the Brigalow Belt bioregion, with only the most western edge crossing the boundary into the Desert Uplands bioregion. The 95-metre-wide corridor transects a largely fragmented landscape that has been subjected to extensive clearing for agriculture. Patches of remnant vegetation cover approximately 20 per cent (or 367 ha) of the total disturbance footprint. The other 80 per cent (approximately 1502 ha) traverses non-remnant vegetation or cleared areas predominantly used for grazing.

Desktop and field studies were undertaken to assess terrestrial and aquatic ecological values associated with the rail corridor, with the field surveys being conducted over five days in May 2011 and five days in September 2011. The surveys comprised 24 rapid flora assessment sites, two comprehensive fauna and 22 rapid fauna assessment sites. Visual aquatic habitat assessments were also undertaken at five sites during these periods, as dry conditions prevented comprehensive field surveys, desktop research supplemented the assessment. Further survey work contributing to the assessment was undertaken to support the preparation of property maps of assessable

vegetation (PMAV) documentation. I consider this survey work adequate for identifying significant values that could be potentially impacted by the rail.

The rail alignment intersects major watercourses at 24 locations and minor watercourses at 76 locations, including Eight Mile Creek, North Creek, Belyando River, Mistake Creek, Gowrie Creek, Logan Creek, Diamond Creek and Grosvenor Creek. The Belyando River is the largest watercourse affected by the rail alignment and has the highest ecological values, providing aquatic flora and fauna habitat throughout the year. Approximately 85 per cent of the alignment lies within the Burdekin catchment with the remaining 15 per cent located within the upper Fitzroy Basin catchment.

Minor alterations to the design of the rail alignment since submission of the EIS include relocating the rail loop south of its original position and the realignment of approximately 4.7 km of the dual gauge section 140 m to the north. I do not consider these changes to significantly alter the impacts of the rail development, which are presented in Volume 3, section 5 and Volume 4, Appendix AA of the EIS.

7.1.2 Issues

Vegetation communities and flora species

Mapping by the Queensland Herbarium identified 18 REs within the total disturbance footprint of the rail line. This was made up of 343 ha within the rail corridor, 19 ha within the associated infrastructure footprint and 5 ha within the footprint of proposed construction camps. Of these REs, three are classed as 'endangered', four as 'of concern' and 10 as 'least concern' under the VM Act.

In terms of DEHP biodiversity status, which considers the condition as well as the areal extent of the REs, six are classed as 'endangered', six as 'of concern' and six as 'no concern at present'. Desktop assessment also identified the presence of one of the endangered TECs protected under the EPBC Act within the disturbance footprint. This was Brigalow (*Acacia harpophylla* dominant and co-dominant), which corresponds to REs 11.3.1, 11.4.8 and 11.4.9.

REs of conservation significance mapped within the disturbance footprints for the rail line and residual impacts to REs classified as 'endangered' or 'of concern' under the EPBC Act and VM Act are shown in Table 7.1.

Table 7.1 Regional ecosystems of conservation significance

RE	Status		Biodiversity	Residual impacts to endangered and of concern REs (VM Act) (ha)
	EPBC Act	VM Act		
11.3.1	Endangered	Endangered	Endangered	8.69
11.3.3	–	Of concern	Of concern	66.87
11.3.5	–	Least concern	Of concern	–
11.3.7	–	Least concern	Of concern	–
11.3.25	–	Least concern	Of concern	–
11.4.4	Endangered	Least concern	Of concern	–
11.4.5	–	Of concern	Endangered	1.52
11.4.6	–	Of concern	Endangered	41.41
11.4.8	Endangered	Endangered	Endangered	3.68
11.4.9	Endangered	Endangered	Endangered	14.26
11.4.11	Endangered	Of concern	Of concern	145.81
11.9.3	–	Of concern	Endangered	–
11.9.10	–	Of concern	Endangered	–

A total of 125 flora species was recorded during field surveys, including 11 introduced species. Desktop searches showed 311 species known to occur in the area are recorded in the Wildlife Online database and 378 species recorded in the Queensland Herbariums HERBRECS database. These searches revealed nine threatened species known to occur in the region, shown with a likelihood of occurrence as determined in the EIS in Table 7.2.

A likelihood of occurrence assessment for flora and fauna species of conservation significance was undertaken for the EIS. It considered factors including species habitat preferences, known distribution, relative abundance, previous records from the region, occurrence of habitat in the study area and field observations. Species were then categorised as either ‘unlikely to occur’, ‘may occur’, ‘likely to occur’ or ‘confirmed present’.

- Species considered ‘unlikely to occur’ had either not been recorded in the region, the study area was outside their known distribution or suitable habitat was unavailable in the study area.
- Species that ‘may occur’ had not previously been recorded in the region but the study area contains suitable habitat and was within the known species distribution range.
- Species determined ‘likely to occur’ had previously been recorded in the region and suitable habitat is present in the study area.
- Species listed as ‘confirmed present’ are those that were recorded in the field surveys undertaken in the study area for the EIS assessment.

Table 7.2 Threatened flora species previously recorded in the region

Scientific name	Common name	Status		Likelihood of occurrence
		EPBC Act	NC Act	
<i>Acacia deuteroneura</i>		V	V	Unlikely
<i>Acacia ramiflora</i>		V	–	May occur
<i>Eucalyptus raveretiana</i>	Black ironbox	V	V	Unlikely
<i>Digitaria porrecta</i>	Finger panic grass	–	NT	Unlikely
<i>Dichanthium queenslandicum</i>	King blue-grass	V	V	May occur
<i>Cycas ophiolitica</i>	Marlborough blue cycad	E	E	Unlikely
<i>Leucopogon cuspidatus</i>	Northern beard heath	V	–	Unlikely
<i>Ozothamnus eriocephalus</i>		V	V	Unlikely
<i>Solanum adenophorum</i>		–	E	Likely

E = Endangered, V = Vulnerable, NT = Near Threatened

Two records of *Solanum adenophorum*, listed as endangered under the NC Act, were revealed through desktop research and suitable habitat exists within the study area in acacia woodland to forest communities as well as brigalow shrubland to open forest communities, particularly on slopes and REs with cracking clay soils. The EIS estimates 82 ha of potential habitat for this species will be cleared for the rail development.

Fauna

Desktop search results revealed 238 vertebrate species previously recorded in the area. Field surveys recorded 129 species including the squatter pigeon (southern) (*Geophaps scripta scripta*), listed as vulnerable under both the EPBC Act and the NC Act, and the little pied bat (*Chalinolobus picatus*), listed as near-threatened under the NC Act. Essential habitat for three species listed under the EPBC Act and four species listed under the NC Act is present within a 50 km buffer of the rail alignment; however, none occurs within the disturbance footprint. Threatened fauna species known to occur in the region are shown in Table 7.3.

Three migratory bird species listed under the EPBC Act—the eastern great egret (*Ardea modesta*), rainbow bee-eater (*Merops ornatus*) and white-bellied sea eagle (*Haliaeetus leucogaster*)—were confirmed present in the study area during the field surveys. The habitat available for these species in the study area is not considered by the proponent to be ‘important habitat’ as defined in the *Matters of National Environmental Significance (MNES) Significant Impact Guidelines*. Desktop and habitat assessments revealed an additional 11 migratory species that are either likely to occur or may occur in the study area. These are discussed in more detail in the MNES chapter of this report in section 5.1.

Table 7.3 Threatened fauna species previously recorded in the region

Scientific name	Common name	EPBC Act	NC Act	Likelihood of occurrence	Impact area (ha)
<i>Denisonia maculata</i>	Ornamental snake	V	V	Likely	349.48
<i>Egernia rugosa</i>	Yakka skink	V	V	May occur	–
<i>Furina dunmalli</i>	Dunmall's snake	V	V	May occur	–
<i>Paradelma orientalis</i>	Brigalow scaly-foot	–	V	Likely	355.49
<i>Chalinolobus picatus</i>	Little pied bat	–	NT	Confirmed present	–
<i>Nyctophilus timoriensis alt. (corbeni)</i>	Greater long-eared bat	V	V	May occur	–
<i>Ephippiorhynchus asiaticus</i>	Black-necked stork	–	NT	Likely	–
<i>Erythrotriorchis radiatus</i>	Red goshawk	V	E	May occur	–
<i>Falco hypoleucos</i>	Grey falcon	–	NT	Likely	–
<i>Geophaps scripta scripta</i>	Squatter pigeon (southern)	V	V	Confirmed present	337.04
<i>Nettapus coromandelis</i>	Cotton pygmy-goose	M	NT	Likely	299.81
<i>Poephila cincta cincta</i>	Black-throated finch	E	E	Likely	16.24
<i>Rostratula australis</i>	Australian painted snipe	V	V	May occur	–
<i>Lophoictinia isura</i>	Square-tailed kite	–	NT	Likely	299.81
<i>Melithreptus gularis</i>	Black-chinned honeyeater	–	E	Likely	299.81
<i>Phascolarctos cinereus</i>	Koala	V	SLC	Likely	176.88

E = Endangered, V = Vulnerable, NT = Near threatened, M = Marine, SLC = Special least concern

Aquatic ecology

Desktop assessments revealed 51 species of fish known from the Burdekin Basin and 47 species known from the Fitzroy Basin, with 40 of these species common to both basins. The EIS determined 17 of these species could potentially occur in waterways intersected by the rail line; however, none are listed as threatened under the NC Act or the EPBC Act. It also noted habitat suitable for four species of turtle known to occur in the region is available within the rail study area. These species are Cann's longneck turtle (*Chelodina canni*), broad-shelled turtle (*Chelodina expansa*), Krefft's River turtle (*Emydura macquarii krefftii*) and the saw-shelled turtle (*Wollumbinia latisternum*). I note that none are listed as threatened under either the NC Act or EPBC Act or as high priority for conservation in EHP's *Burdekin Natural Resource Management Region Back on Track Actions for Biodiversity*.

The main impacts to aquatic habitat that I have assessed will occur where there is an intersection with the rail alignment; this includes the permanent loss of approximately 70 ha of watercourse vegetation in the Brigalow Belt bioregion. The proponent has identified offsets for these residual impacts which are discussed in section 6.1. I note that no wetland protection areas (WPA), significant wetlands or other wetlands recognised under the VM Act were recorded in the rail disturbance footprint. Other potential impacts identified in the EIS include water ponding in areas of low topography, installing drainage and crossing structures that create barriers to movement for aquatic species, altered hydrological flow patterns and a loss of aquatic habitat.

Measures to mitigate impacts to aquatic environments are outlined in the section 12 of the rail EMP and include designing diversions and watercourse crossings to provide connectivity between aquatic habitats and facilitate aquatic fauna passage. The proponent has also made a commitment to this effect (commitment R4.18). Flooding impacts of the railway are discussed in section 7.2 of this report.

I consider that impacts to water quality are most likely to be associated with increases in turbidity, the mobilisation of sediment and the introduction of contaminants from machinery and waste material. The EIS noted localised evidence of riparian habitat degradation from cattle trampling that has resulted in erosion and sedimentation throughout the study area. Where there is a change in hydrological patterns, resulting scour or deposition of sediments may alter the existing habitat structure and remove microhabitat features.

Weed and pest species

Eleven introduced flora species were recorded during the field surveys, of which three are listed as Class 2 declared pests under the LP Act. These are prickly pear (*Opuntia* sp.), harrisia cactus (*Harrisia martini*) and parthenium (*Parthenium hysterophorus*). A desktop review identified 29 species either listed as 'declared plants' under the LP Act or as priority species in the IRC Draft Pest Management Plan 2011–2015 overlapping the study area. Six introduced fauna species were recorded during the surveys, the feral pig (*Sus scrofa*), wild dog (*Canis familiaris*), feral cat (*Felis catus*), European fox (*Vulpes vulpes*), European rabbit (*Oryctolagus cuniculus*) and cane toad (*Rhinella marina*). Except for the cane toad, all of these species are declared Class 2 pests under the LP Act. Landholders are obligated under the LP Act to try to keep their property free of all Class 2 pests.

A number of introduced aquatic pest species were assessed as potentially occurring in the study area. These were Mozambique tilapia, (*Oreochromis mossambicus*), Spotted tilapia (*Tilapia mariae*), mosquitofish (*Gambusia holbrooki*), guppy (*Poecilia reticulata*) and the goldfish (*Carassius auratus*).

Database records revealed the exotic species balloon vine (*Cardiospermum halicacabum* var. *halicacabum*), parkinsonia (*Parkinsonia aculeate*) and Noogoora burr (*Xanthium occidentale*) could potentially inhabit the rail alignment. Parkinsonia and balloon vine are declared Class 2 and Class 3 plants respectively. There is no obligation for landholders to control Class 3 plants unless the land is located adjacent to an environmentally significant area and a pest control notice has been issued.

Impacts

I consider that impacts resulting from the development of the rail project have been minimised by locating the alignment in areas that have been cleared or degraded by previous land uses and by avoiding major watercourses where possible. Unavoidable residual impacts will result in the clearing of 366 ha of remnant vegetation as detailed in Table 7.4. The remainder of the disturbance footprint (1502 ha) runs through cleared or non-remnant vegetation predominantly used for grazing. Excluding the quarry and borrow pit areas, the total disturbance footprint from temporary and permanent rail infrastructure is 1868 ha.

Table 7.4 Clearance of regional ecosystems by VM Act status

RE status	Clearance footprint (ha)
Endangered	37.4
Of concern	200.4
Least concern	128.5
Total	366.3

The potential direct and indirect impacts of concern to me associated with the construction and operation phases of the railway include:

- loss of remnant vegetation and flora habitat
- loss of roosting, shelter, foraging and breeding habitat for native fauna including conservation significant fauna
- landscape fragmentation, reduction in ecological connectivity and reduced capacity for fauna dispersal
- disruption of faunal behaviour
- fauna injury and mortality
- introduction of pest and feral species
- disturbance to water bodies and watercourses
- changes to floodplain hydrology
- alteration of fire regimes and an increased risk of fire
- degradation of terrestrial and aquatic habitat.

Mitigation measures

Measures to mitigate impacts to ecological values in terrestrial and aquatic habitat are detailed in sections 5 and 6 of the EIS Rail Ecology Report (Appendix AA). I support these measures which cover both the construction and operational phases of the project and include:

- locating infrastructure within previously cleared areas and avoiding remnant vegetation
- identifying clearing areas in construction plans and in the field
- undertaking clearing activities in a sequential manner to allow more mobile species dispersal opportunities and supervision of clearing activities by a qualified fauna spotter-catcher

- rehabilitating any areas cleared for construction works as soon as possible
- salvaging and retaining habitat features such as log piles and tree hollows, or if this is not possible, artificial habitat such as nest boxes and water sources will be created
- undertaking construction works within watercourses during dry periods to reduce disturbance to surface flows and aquatic habitats
- undertaking hot work in open cleared areas of lower fire risk and with adequate fire prevention controls in place
- implementing the Fauna Crossing Strategy submitted with the AEIS to mitigate the impacts of the rail line on fauna movement through key ecological corridors
- using directional lighting near remnant vegetation and limiting lighting work areas
- undertaking a baseline weed and pest survey and weed mapping prior to construction and implementing measures to manage waste, soil, vehicle movement and monitoring activities during construction and operational phases.

A more detailed list of control measures, monitoring and corrective actions was provided by the proponent in the rail EMP (March 2014) following the release of the AEIS. These measures elaborate on those listed above and will be implemented through relevant sub-plans such as:

- pest and weed management plans
- Erosion and Sediment Control Plan
- Fire Management Plan
- Land Rehabilitation Plan
- Waste and Hazardous Materials Management Plan
- Fauna Salvage and Relocation Plan
- Dust Management Plan.

Where offsets are required for MNES or MSES that could not be avoided or mitigated, the proponent will undertake ecological equivalence assessments of impact areas prior to disturbance. Project-wide offsets requirements are discussed in section 6.1 of this report.

7.1.3 Coordinator-General's conclusions

I am satisfied that the combination of route selection and implementation of the proposed mitigation measures have minimised potential impacts to biodiversity values. Where residual impacts to MNES and MSES remain, the loss of these values can be offset. The proponent has committed to undertaking pre-clearance flora and fauna surveys to confirm the presence or absence of threatened species considered likely to occur in the area—the results of which may require a revision of the project's offset requirements. The proponent has also committed to implementing the mitigation and management measures outlined in the EIS and draft rail EM Plan. These commitments are listed in section 2.2.4 of the Proponent Commitments Register (Appendix 7).

To ensure the ongoing protection and long-term conservation outcomes, I have made recommendations in Appendix 2, Section 2 regarding the monitoring, mitigation and

reporting of impacts to MNES and MSES for all stages of the project. This includes a recommendation to undertake ecological equivalence surveys of impact areas prior to construction.

I note that a draft Species Management Plan and draft applications for the clearing of native vegetation and protected plants in accordance with the requirements of the VM Act and NC Act were prepared for the railway and provided as part of the AEIS. The proponent has elected to have these assessed by the relevant authorities subsequent to the EIS process. Similarly, approval applications for the quarries that were provided with the AEIS will be processed separately to the EIS. I have stated conditions for inclusion in any approval for extraction and screening activities associated with the quarries (Appendix 2, Section 1, Part B).

7.2 Flooding

A number of submissions received during the EIS submission period raised the issue of hydrological and flooding impacts on landholders resulting from the development of the railway and the adequacy of the proponent's flood modelling. In responding to these comments, the proponent has prepared a revised Rail Flood Modelling Report (AEIS, Volume 4, Appendix S1) and a rail flood inundation assessment that was provided after the AEIS comment period. I have considered each submission and how the additional information has addressed the issues raised, as part of my evaluation of the impacts of the project.

7.2.1 Overview

The majority of the rail alignment lies within the Belyando River/Suttor River sub-catchment with the eastern section, approximately 27 km, situated in the Isaac River catchment. The alignment crosses minor waterways and overland flow paths at 76 locations and major waterways at 12 locations. Significant floodplains are crossed at North Creek, Belyando River, Mistake Creek/Gowrie Creek, Logan Creek, Diamond Creek and Grosvenor Creek.

Almost all of the waterways within the project area are ephemeral and are prone to extended periods of inundation following high intensity rainfall in the wet season associated with tropical low pressure systems. Annual rainfall and river flows can vary substantially and larger rivers are the only systems experiencing base flow during the dry season.

Clearing undertaken for agricultural purposes has resulted in altered hydrological regimes within the affected catchments leading to increases in runoff, drainage density and erosion and sediment yields. The resulting changes to channel morphology become increasingly pronounced with distance downstream from the catchment headwater. Flood modelling undertaken for the EIS and AEIS adopted an immunity standard of a 50-year average recurrence interval (ARI) for all waterway crossings to achieve an acceptable afflux (rise in flood level).

7.2.2 Issues

Design criteria for flood immunity, cross drainage structures, longitudinal drainage and inundation duration were specified in the AEIS and are shown in Table 7.5. The proponent has stated the design standards for developing the railway will follow those described in the *Australian Rainfall and Runoff Manual (AR&R)*¹⁰¹, *Waterway Design – A Guide to the Hydraulic Design of Bridges*,¹⁰² *Queensland Urban Drainage Manual*¹⁰³ and DTMR's *Road Drainage Design Manual*.¹⁰⁴ Modelling undertaken for the revised rail hydrology reports determined afflux levels for major waterways adjacent to the

¹⁰¹ Engineers Australia, *Australian Rainfall and Runoff Manual*, Engineers Australia, Barton, 1987, viewed 3 March 2014, <http://www.ncwe.org.au/arr>.

¹⁰² Austroads, *Waterway Design – A Guide to the Hydraulic Design of Bridges*, Austroads, Sydney.

¹⁰³ Department of Natural Resources and Water, *Queensland Urban Drainage Manual*, Volume 1, Second Edition, Department of Natural Resources and Water, Brisbane, 2007.

¹⁰⁴ Department of Transport and Main Roads, *Road Drainage Manual*, Engineering and Technology Division, Department of Transport and Main Roads, Brisbane, 2010, viewed 3 March 2014, <http://www.tmr.qld.gov.au/business-industry/Technical-standards-publications/Road-drainage-manual.aspx>

railway predominantly meet the design criteria for cross drainage structures with minor localised areas of inundation exceeding 0.5 m at some waterway crossings.

Table 7.5 Design criteria for rail drainage infrastructure

Infrastructure component	Design aspect	Design criteria
Flood immunity	Lowest edge of formation level	50-year ARI flood immunity plus 300 mm freeboard
	Top of rail	100-year ARI flood immunity
	Major road crossings	50-year ARI flood immunity or as specified by appropriate statutory body
	Minor road crossings	10-year ARI flood immunity or as specified by appropriate statutory body
Cross drainage structures	Major floodplain structure	Defined floodplains subject to EIS approval
	Major bridge structure	Design flow rate Q50 >250 m ³ /s
	Major drainage structure	Design flow rate Q50 >50 m ³ /s
	Minor drainage structure	Design flow rate Q50 <50 m ³ /s
Longitudinal drainage	ARI event	20-year ARI design flow for longitudinal drainage
		50-year ARI design flow for diversion drainage
	Maximum velocity	3.5 m/s for the design event with appropriate scour protection
	Scour protection	Rock protection as per Austroads waterway design (if required)
Inundation duration	Inundation during 50-year ARI event	Duration not to exceed an average of 72 hours or 20 per cent (whichever is greater)

Potential impacts during the construction and operational phases of concern to me were described in the EIS (Volume 4, Appendix AB) and include:

- altered hydrological flows
- a rise in flood levels (afflux) upstream of the railway
- degradation of water quality
- increased extent and depth of flooding
- increased periods of inundation
- altered drainage patterns
- scouring and changes in geomorphology
- the loss of grazing land for the duration of flooding
- increased risk of parthenium invasion in flooded areas
- inundation of farm roads and tracks.

To mitigate these impacts, I require the proponent to implement the following measures:

- ongoing flood modelling throughout the design process to minimise impacts of crossing structures (commitments R2.4, R2.5 and R2.6)
- implementation of appropriate erosion and sediment control measures (commitments R3.8 and 5.7)
- preferential use of bridges rather than causeways as temporary structures during construction (commitment R5.7)
- where temporary causeways are necessary, ensuring they have sufficient capacity to allow flows with a minimal increase in velocity or afflux (commitment R2.1)
- selectively raising farms roads with fill material (commitment R2.7)
- where appropriate, compensation will be negotiated with land and asset owners affected by excessive afflux from the railway (commitment R2.8)
- consultation with landholders and public agencies.

The rail flood inundation duration assessment provided after the AEIS comment period modelled pre and post construction scenarios for Belyando River, North Creek, Mistake Creek, Diamond Creek, Grosvenor Creek and Logan Creek and the 14 properties affected by flooding in these waterways, 11 of which are directly traversed by the railway. Mapping for 20, 50 and 100-year ARI flood events was prepared to demonstrate compliance with the Hydrology and Hydraulics Design Criteria submitted with the AEIS (Volume 4, Appendix S1b) and for use in landholder consultation.

7.2.3 Coordinator-General's conclusions

The EIS concluded that some level of afflux could be an unavoidable impact of the project. I note that flood modelling is an iterative process that will continue throughout the design phase of the project to refine predicted impacts and determine appropriate span lengths for waterway crossings. The proponent has committed to undertaking further detailed flood modelling and analysing the potential impacts on floodplains, properties, assets and other infrastructure (section 2.2.2, Proponent Commitments Register (Appendix 7)).

In my evaluation reports for the Alpha and Galilee Coal Projects, I conditioned specific limits for afflux, culvert exit velocities and extended inundation times. The drainage design criteria established for those rail proposals has been generally accepted. With regards to the criteria proposed by the proponent, I note that they are consistent with these limits. However, I require all Galilee rail proposals to adhere to consistent drainage design criteria and have imposed conditions at Appendix 2, Section 3 setting the same stringent limits for afflux, culvert exit velocities and inundation times as those for other Galilee rail proposals.

In regards to landholder consultation, I have set a condition in Appendix 2, Section 3 requiring the proponent to consult further with land and asset owners, including government agencies, regarding the potential impacts of the railway and mitigation measures addressing flooding impacts. This consultation will occur after completion of detailed design work for the rail, when flood modelling will be reviewed and updated.

7.3 Land

A number of submissions relevant to this section were raised during the EIS and AEIS comment periods, including the proponent's assessment of:

- soil and land suitability
- SCL
- GQAL
- acid sulfate soils.

I have considered each submission and how the AEIS responded to these issues as part of my evaluation of the environmental impacts of the project. My evaluation of the potential impacts and mitigation associated with land disturbance and rehabilitation of the mine and off-lease infrastructure area is discussed in section 6.6.

7.3.1 Overview

The rail alignment crosses 10 freehold properties and 11 leasehold properties primarily used for cattle breeding and fattening. With the exception of intersections with major drainage lines, the corridor is located on gentle inclines above 200 m AHD and is unlikely to encounter acid sulfate soils. Surface geology in the area is mostly comprised of Tertiary to Quaternary deposits of sand, silt and clay. A desktop assessment mapped a number of soil types in the study area with Vertosols the dominant soils type and Chromosols and Sodosols also present in large expanses. The inclusion of the quarries and minor changes to the rail alignment led to a revision of the disturbance footprint in the AEIS. The rail impact areas are now predicted to affect 192 ha of Class A, 420 ha of Class B1, 1308 ha of Class C1 GQAL and 154 ha of SCL (AEIS Volume 3, Section 4).

7.3.2 Issues

Soil and land suitability

A preliminary soil assessment, conducted at a desktop level was initially provided with the EIS (Volume 4, Appendix Y). In response to comments from DNRM, I directed that a more detailed soil assessment consistent with the terms of reference should be submitted. The proponent proposed a methodology for a staged soil and land suitability assessment, for the rail corridor, ancillary infrastructure areas and quarries and will be implemented prior to construction. It is presented in Volume 4, Appendix T2 of the AEIS and will address the following key assessment items for the study area:

- a general soil assessment to identify the types, distribution and management requirements of soil resources
- a survey of GQAL at a scale of 1:50 000
- a contaminated land assessment involving desktop assessment, stakeholder consultation, ground truthing, and assessment of one property, Lot 637 on Plan PH1980 identified on the Environmental Management Register (EMR) as containing a Livestock Dip or Spray Race

- surveys of ancillary infrastructure areas with the level of detail required adapted to account for the level of disturbance likely to occur
- field verification of areas where existing 1:100 000 scale mapping already exists.

I expect that the general soil assessment will be undertaken at a range of scales depending on landscape complexity and the level of disturbance proposed. It will account for cracking clays, dispersive and unstable soils and saline, acidic or sodic soils that may require special attention in terms of management and use in rehabilitation works.

I expect that the proposed soil assessment will also identify management strategies for different land systems impacted by the project, including those with high erosion potential and likely deposition areas requiring erosion and sediment control measures. Results from the assessment will need to be reflected in updated management plans dealing with rehabilitation activities, erosion and sediment control and topsoil management.

My assessment has identified the following potential impacts to soil resources:

- loss of GQAL
- reduced agricultural productivity
- increased surface runoff from clearing leading to erosion and soil loss
- sedimentation of adjacent water bodies
- exposure of sodic subsoils
- reduced viability of soils to support native plants and pasture
- soil compaction.

I consider that measures as outlined in the rail EMP would mitigate these impacts including:

- avoiding disturbance of sodic, reactive and saline soils
- developing and implementing an Erosion and Sediment Control Plan prior to any earthworks
- developing and implementing a Topsoil Management Plan
- stabilising disturbed areas as soon as possible
- implementing control measures to restrict traffic to designated roads tracks
- ripping and rehabilitating compacted areas
- minimising removal of vegetation cover
- ameliorating impacted soils with fertiliser, lime or gypsum or other conditioners as appropriate.

Strategic cropping land

The disturbance footprint of the rail corridor and associated infrastructure covers 155 ha of land identified in SCL trigger mapping. Under current legislation potential SCL intersected by the rail project must have a demonstrated history of cropping and meet a number of field tested criteria to be considered SCL. Six properties along the rail alignment contain areas shown on the SCL trigger map. Two of these, Avon Downs

and Lambing Lagoon, have evidence of a history of cropping over 72.8 ha of land within the proposed disturbance footprint.

I note that the proponent has accepted the trigger mapping for these properties and proposes not to undertake field verification. Further details regarding impacts to these areas may need to be provided to DNRM as part of the assessment process to establish appropriate rehabilitation requirements and a mitigation fee. For the properties with no evidence of a cropping history—Myra, Rugby Run, Rugby and Wentworth—the proponent will submit appropriate validation applications and relevant information used in the assessment to DNRM separate to the EIS process. This information is presented in the AEIS (Volume 4, Appendix T1).

I note that the SCL Act does not apply to activities in an SDA under an approval by the Coordinator-General. Should the rail alignment be included in the proposed GBSDA, further approvals relating to SCL will not be required. In addition, the SCL regulatory framework is under review and may change. I encourage the proponent to monitor future announcements in relation to the regulation of activities on cropping land that may affect future approval processes. Advice should be sought from DNRM before making any development applications.

Erosion and sediment control

The proponent has committed to develop a detailed Erosion and Sediment Control Plan (ESCP) for the railway to minimise erosion and avoid sedimentation of watercourses and existing water storages (commitment R3.36). The plan will be prepared in accordance with the *Best Practice Erosion and Sediment Control Manual*¹⁰⁵ and be informed by results of the soil survey. It will be customised for each work area and implemented prior to any earthworks taking place. The ESCP will identify control practices for all phases of the project as well as performance criteria, monitoring and corrective actions. Management of erosion and sedimentation in and adjacent to cleared areas will be undertaken in accordance with a project construction EMP, also to be developed and informed by the results of the soil survey.

The proponent has identified performance outcomes and preliminary control measures in section 16 of the rail EMP (March 2014), which was provided following the comment period for the AEIS and is available from the proponent's website. The measures identified by the proponent include sediment fences, wing walls on embankments, shotcrete, and rip-rap or gabion bed protection in watercourses. Design measures to minimise erosion risk of access roads, tracks, drainage systems and watercourse crossings will need to be developed prior to construction. Project-wide commitments to manage erosion and sediment impacts have been stated in commitments P6.20 and 6.64 of the Proponent Commitments Register (Appendix 7). Commitments specific to the construction and operation of the railway are stated in commitments R3.8, R3.36, R4.6 and R5.2. I have also stated a condition requiring the development and implementation of erosion and sediment control measures for the project in Appendix 2, Section 1, Part A.

¹⁰⁵ International Erosion Control Association (Australasia), *Best Practice Erosion and Sediment Control Manual*, International Erosion Control Association (Australasia), Picton, 2008.

Mining tenure

The rail alignment traverses a number of exploration tenements and a small section of Mineral Development Lease (MDL) 391 (Diamond Creek). To ensure that sterilisation of any potential resources is minimised, and on the advice of DNRM, I requested that the proponent consult with the relevant tenure holders regarding construction of the railway. Where construction on a granted mining tenure is necessary, it will need to be undertaken in accordance with the requirements of the MR Act. I note that the proponent has made a commitment (commitment R3.23) that any construction on granted mining tenure will be undertaken in accordance with the requirements of the MR Act.

Quarries

Additional information to the EIS included applications to extract approximately 37.5 million tonnes of fill from five quarries in proximity to the rail line for the construction of the project and to upgrade the Elgin-Moray and Moray-Carmichael Roads. The quarries have a combined disturbance footprint of approximately 283 ha, with the largest being Disney quarry at 92.6 ha. The other quarries are South Back Creek, North Creek, Moray and Borrow 7. Borrow 7 is the only quarry intended to be retained for the life of the project, the others being utilised only for the construction phase.

Development applications for the quarries are presented in the AEIS (Volume 4, Appendix C5). The applications are for approvals sought under the SP Act, EP Act, Forestry Act, VM Act and NC Act as appropriate for each quarry. These include applications for an MCU, clearing of protected plants and native vegetation and an EA for ERAs. Locations of the quarries are shown in Figure 7.1.

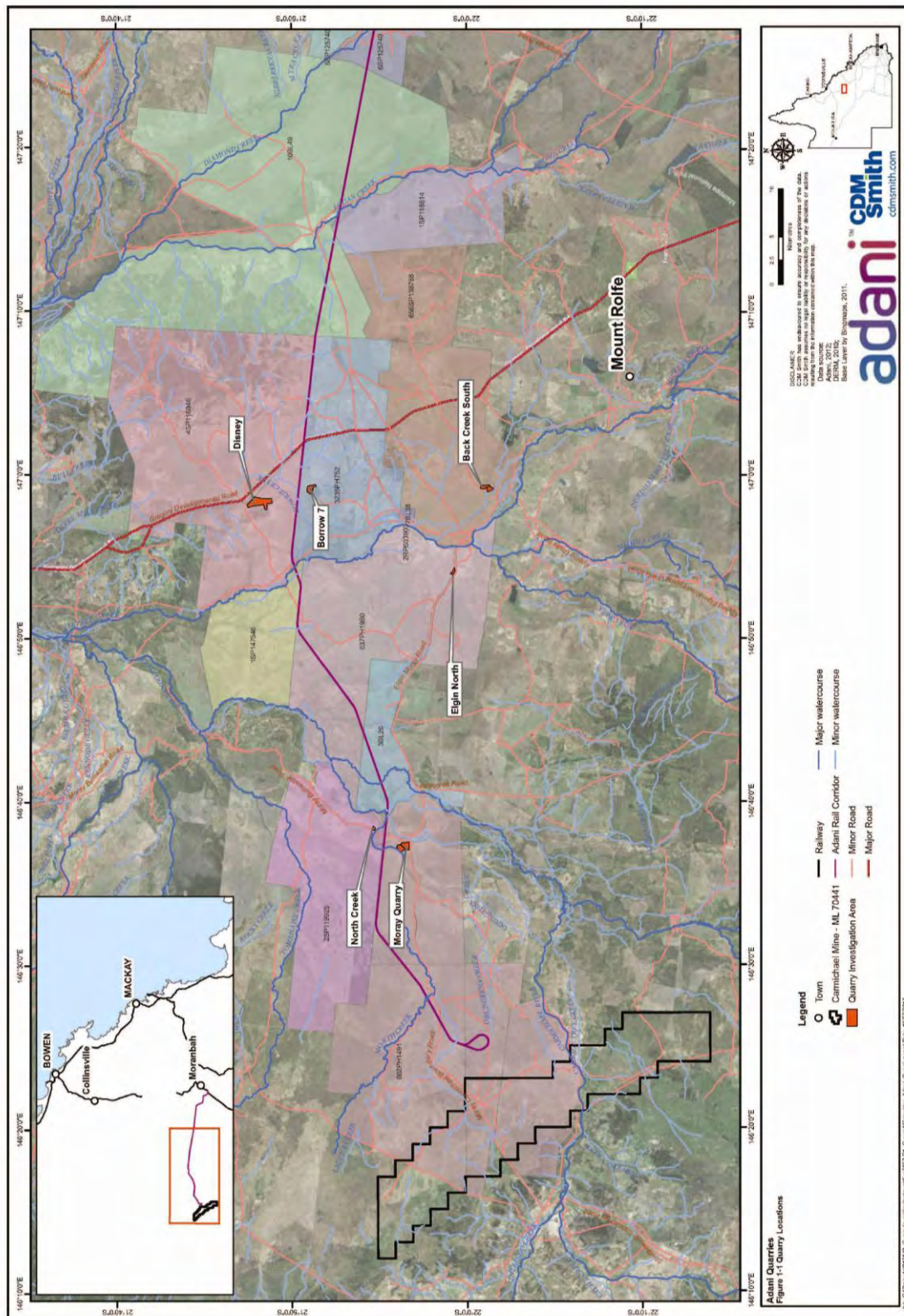


Figure 7.1 Quarry locations

South Back Creek Quarry

South Back Creek Quarry is located on a cleared, generally flat site used for intermittent quarrying activities, 102 km north-west of Clermont. It is intended as a short-term hard rock quarry providing over one million tonnes per year of road base and ballast material. The quarry has an operational footprint covers 55.5 ha with extraction occurring to a depth of 15–16 m below ground level. It is proposed to operate for approximately two years.

Disney Quarry

The Disney Quarry is a short-term operation to provide 11.75 million tonnes of embankment material over two to three years until completion of the rail construction phase. It has four extraction areas and a total disturbance footprint of 92.6 ha with extraction occurring to a depth of 5 m. The site is currently used primarily for cattle grazing and is largely covered by remnant vegetation. It lies approximately 3 km to the north of the railway and will have a 1 km access road through an easement to Gregory Development Road.

Borrow 7 Quarry

The Borrow 7 Quarry will be a new hard rock quarry supplying material for rail ballast, scour protection and concrete aggregate during construction of the railway and for maintenance purposes throughout the life of the mine. It will provide approximately 100 000 tonnes of material per year. The operational footprint of the quarry is 36.2 ha with extraction occurring to a depth of 15 m. A haul road connecting the quarry to the rail corridor will also be constructed.

North Creek Quarry

North Creek Quarry is located close to the rail corridor to minimise haulage requirements. It lies just north of the rail alignment and has two access points to Bulliwah Road. The site is primarily used for agricultural production but has previously been used as a quarry. It is expected to supply approximately 603 000 tonnes of road base and embankment material over a 2 year period. The operational footprint is approximately 7.6 ha and extraction will occur to a depth of 10 m below ground.

Moray Quarry

Material extracted from Moray Quarry is anticipated to be used for road construction, local council road upgrades and the rail embankment. The operation will be an expansion of an existing road construction and embankment material quarry. An initial 652 000 tonnes of material is being sought involving an operational footprint of 91.2 ha with extraction occurring to a depth of 8 m.

Specific impacts resulting from the quarries, including impacts to air quality, noise and vibration, have been considered together with those of the railway in section 7.4. Potential offset areas for the residual impacts to biodiversity values in the quarry areas have also been considered with the rail impacts and are discussed in section 6.1 of this report.

Closure and rehabilitation

Rail

The proponent's long-term preference is to sell or relinquish the railway line and associated infrastructure following the end of mining operations (AEIS Volume 4, Appendix X1). If this option is not available, a post-mining land use strategy will be enacted to return the landform to conditions similar to those present prior to the development, with the primary land use being grazing on exotic pastures and/or a mosaic of native pasture and woodland habitat. To this end, the proponent has developed a Closure and Rehabilitation Strategy (AEIS, Volume 4, Appendix X) identifying short-, medium- and long-term rehabilitation objectives for the rail and quarries.

I consider that the rehabilitation objectives of the strategy provide for a safe, stable and self-sustaining landform with limited maintenance requirements and land suitability similar to that of its pre-disturbance condition. General rehabilitation strategies and activities have been developed for the rail corridor, permanent rail infrastructure areas and temporary infrastructure areas.

Temporary infrastructure required for the construction phase includes, track laydown areas, bridge laydown areas, turning circles, construction camps, construction depots and concrete batching plants. Rehabilitation of temporarily disturbed areas and mitigation measures to address impacts arising from construction is outlined in the rail EMP (March 2014). A revised version of this document was provided after the public comment period for the AEIS and is available on the proponent's website. I consider that the measures to manage impacts to soil and land suitability will address erosion and sediment control, compaction of soils, topsoil management and progressive rehabilitation of disturbed areas. I note that the rehabilitation strategy for all disturbance areas associated with the rail provides for:

- removal of all infrastructure not identified for future use
- ripping of compacted surfaces
- re-profiling of the alignment to be consistent with the surrounding landscape
- assessment of contaminated soils as required with treatment either conducted on site or disposal at an authorised facility
- vegetation appropriate to the end land use, slope and soil type will be seeded or planted and watered
- weed inspections and control will until be undertaken until vegetation cover is greater than 70 per cent.

Completion criteria have been detailed in section 6 of the rail Closure and Rehabilitation Strategy for the decommissioning, landform establishment, vegetation establishment and sustainable landform phases of rehabilitation for each domain. A conceptual outline of monitoring and maintenance activities to commence post-rehabilitation has also been provided covering surface water, geotechnical and soil testing, dust, rehabilitation and weed and pest control. I note the land will be returned to low ranking Class C or Class D GQAL after operations cease.

Quarries

I note that staged and progressive rehabilitation programs for each quarry have been included in the quarry application material; provided with the AEIS (Volume 4, Appendix C5). Proposed rehabilitation methods to be applied at the quarries include:

- removing all temporary infrastructure and facilities
- returning disturbed areas to a stable form
- re-profiling of voids to match gully contours
- installing permanent erosion and sediment controls
- topsoiling re-profiled contours
- seeding rehabilitated areas with native grasses or sterile crops
- closing and rehabilitating temporary access roads
- undertaking weed control and monitoring.

7.3.3 Coordinator-General's conclusions

While soil characteristics have not been described in detail or validated through field surveys, I am satisfied that the proposed soil survey methodology, to be undertaken prior to construction, will be adequate to identify environmental risks and minimise construction impacts. I have made a recommendation in Appendix 2, Section 2 requiring the proponent to develop and document management measures and procedures that minimise adverse impacts to soil structure and quality.

Results of the soil surveys will need to be reflected in updated management practices in the rail EMP, ESCP and Topsoil Management Plan. I have also stated a condition requiring the development and implementation of erosion and sediment control measures for the project in Appendix 2, Section 1, Part A to minimise erosion and sediment release to receiving waters.

In regards to rehabilitation of the rail corridor, I am satisfied the strategy proposed by the proponent will be adequate to return the landform to conditions suitable to support the existing land use, should the infrastructure no longer be required. The proponent has committed to developing a Decommissioning and Rehabilitation Plan (commitment R1.2) to manage progressive and final rehabilitation of the railway. I have made a recommendation in Appendix 2, Section 2 regarding the preparation and documentation of management measures for the construction and operation of the project that are relevant to land impacts and rehabilitation works.

7.4 Impacts to landowners

7.4.1 Introduction

This section of the report will evaluate the impacts of the project on key issues of interest to landholders, including agricultural productivity, property management, air quality and noise and vibration.

7.4.2 Existing land uses and sensitive receptors

The properties surrounding the rail alignment are rural in nature and primarily used for broad acre cattle grazing. The proposed rail alignment and quarries traverse 11 leasehold properties and 10 freehold properties and the closest sensitive receptor is 1.6 km from the rail alignment. There are eight sensitive receptors and the MWAV located within 5 km of the rail alignment and quarries. Figure 7.2 shows the location of sensitive receptors, property boundaries and stock routes in the context of the project infrastructure.

7.4.3 Issues

Issues raised relating to landowner impacts of construction and operation of the railway line included:

- reduction in agricultural productivity due to land severance and reduced access to sections of properties
- impacts on stock, grazing activities and agricultural business interests
- railway embankment impacts on fencing, flooding, fire and weed management
- impacts on stock routes
- loss of scenic amenity and the need for increased property security
- dust impacts and the need for a CDMP
- noise impacts.
- As part of my direction for additional information, the proponent was asked to provide a report to address landholder concerns over potential rail line impacts on agricultural productivity, including mitigation measures to address land severance and impacts on pasture and cattle health. The proponent provided a summary of mitigation measures in the AEIS, Volume 3, section 4.3.8.

7.4.4 Potential impacts and mitigation

Agricultural productivity

Many concerns raised by landholders about the EIS related to the impacts of the project on agricultural productivity. Concerns included:

- reduced cattle health as a result of coal dust permeating fodder and water sources potentially affecting cattle interest in fodder and subsequently affecting weight gain, market prices and the profitability of the grazing business
- loss of cattle due to ingestion of toxins
- disruption to cattle operations due to paddock gates being left open
- impacts of land severance on stock movements, maintenance and access tracks, livestock for grazing and water access and property values
- the need for appropriate rail crossings to access severed land parcels, designed to support the flow of cattle movements
- disruption to stock movement through the stock route network
- impacts of ponding on grazing areas (addressed above in section 7.2).
- The sections below identify the potential impacts and mitigation measures relating to stock and grazing activities, property severance and stock routes.

Coal dust impacts on stock and grazing activities

Landholder concerns about coal dust impacts on stock and grazing activities will be addressed as part of broader strategies to address the management of coal dust from passing coal trains. The proponent has committed to developing a CDMP which will comply with best practice management procedures (commitment R6.4). Measures in the CDMP designed to minimise coal dust deposition on rail infrastructure and prevent

nuisance at any sensitive receptors will also minimise coal dust deposition on grazing land and watering points. Further discussion on the predictive air quality model for the rail, and coal dust management, can be found in the Air Quality section below.

Property severance

The AEIS identified that while all attempts were made to run the rail alignment along property boundaries, the construction and operation of the rail line is still expected to fragment some properties. I consider that without mitigation, fragmentation may affect stock movements, sever maintenance and access tracks, decrease land values and reduce access to water on severed parcels. I note the commitments to mitigate these impacts are provided in the Proponent Commitments Register (Appendix 7), and include:

- Private tracks will be joined to local roads or grade separated where possible to preserve their utility. Occupational crossings will be constructed to provide access typically under the rail alignment. The design of the project may be further modified based on the outcomes from the proponent's consultation with landholders (commitment R3.25).
- Ongoing consultation will be undertaken with landholders and government agencies regarding land access, occupational crossings of the rail corridor, decrease in land values and usability and access to water on severed parcels. Consultation will also include discussions with landholders and IRC regarding the safe management of cattle on at grade railway crossing access during construction and operations (commitment R3.26).
- Where there is direct loss of agricultural production, purchasing the property(ies) in part or whole will be considered where impact is likely to be significant (commitment R3.27).
- Impacts on infrastructure and facilities will be avoided as far as possible and, where impacted, will be replaced on a like-for-like basis (commitment R3.28).
- The proponent will work with landowners to agree on the location of easements to reduce impacts e.g. outside property boundaries and/or along fence lines, rather than through middle of property where practicable (commitment P3.2).

Further to these commitments, I expect the proponent to enter into interface agreements with affected landholders that will include arrangements to address severance issues.

Stock routes

Submissions on the EIS from landholders highlighted the importance of the stock routes to their businesses, particularly for use as a low-cost transportation system and for grazing during drought periods.

The EIS proposed grade-separated crossings as the treatment for the three points where the proposed rail alignment intersects the stock route network – at Kilcummin Diamond Downs Road, Amaroo Road and Mistake Creek. These crossings would prevent potential impacts resulting from closure of the stock route network such as disruption of stock movement and cattle operations, stock distress, reduced pastoral productivity and higher stock transportation costs.

In addition, there are two stock routes which will be impacted by the mine. One traverses a proposed open-cut mining area and will require permanent realignment. A second stock route crosses the project site in two locations—on the south-west boundary of the mine in an area proposed for underground mining and the southern portion of EPC1080 which is not expected to be used for mining or stockpiling (see Figure 7.2). The latter stock route is expected to be realigned during mining to avoid areas impacted by subsidence and reintroduced once mining is complete and the land surface is stable (EIS, Volume 2, Section 4.4.5.5).

The proponent has committed to discussions with DNRM, IRC and landholders regarding re-alignment of stock routes where required (commitment R3.34). Furthermore, the proponent will develop a stock route agreement with key stakeholders addressing the final treatment for each stock route, designs of the stock route crossings (including drainage, ramps and stockyards) and ongoing maintenance arrangements (commitment R3.33).

Other property impacts and management

Concerns were raised by landholders about the impacts of the rail line on their properties, particularly in relation to bushfire management, the ability for landholders to fulfil state government Environmental Risk Management Plan requirements, property security, scenic amenity and maintenance of culverts to reduce flooding and scouring impacts.

Bushfire

Landholders raised concerns that the rail operations might increase the risk of fire to their grazing properties which would become the responsibility of the landholder to manage.

The proponent has recognised this risk and committed to maintaining adequate firebreaks on either side of the rail corridor, particularly during prolonged dry periods and negotiating land management practices with adjacent landholders to maintain firebreaks (commitment R2.9). Further measures to prevent and respond to bushfires have been detailed in the Rail Safety Bushfire Management Plan (AEIS, Volume 4, Appendix S2) and the rail EMP (March 2014).

Furthermore, Adani has made arrangements for the provision of emergency services at the MWAV and industrial area which will be available to attend to emergencies along the rail line (AEIS, section 4.3.8). Additional response procedures, trained personnel and emergency equipment will be established to address all foreseeable emergency risks arising during the construction phase of the project.

For further information on emergency management and response procedures for the rail line, refer to section 7.5.

Environmental risk management plans

In submissions on the EIS, landholders raised concerns that the rail alignment may hinder their ability to fulfil state government Environmental Risk Management Plan requirements. The proponent has committed to undertaking ongoing consultation with

landholders regarding specific management measures contained within environmental risk management plans (commitment R3.14).

Property security

Concerns were raised in response to the EIS that increased numbers of workers on the property could create issues with property security, cattle loss due to paddock gates being left open and damage to the property from vehicle access.

Impacts on community values and workforce behaviour are addressed in the AEIS within the Land Access and Landholder Management Strategy and Workforce Management Strategy (Volume 4, Appendix D2, sections 3.3 and 3.5). Measures identified in these strategies which will address property security concerns include:

- implementing land access protocols including (but not limited to) permissions to enter the property, accessing different parts of the property, opening and closing of fence gates, speed of proponent vehicles on private properties and protocols relating to weed management
- ensuring statutory requirements in relation to land acquisition and compensation are followed
- closely consulting with landholders about project design measures to minimise impacts
- implementing an ongoing program of landholder liaison during construction and operation in Stakeholder Engagement Strategy
- developing programs to foster integration between the project workforce and the local community
- implementing a code of conduct with clear consequences for employees and contractors if the code is not followed
- engaging with QPS for advice to manage security, behaviour and offending issues at worker accommodation sites.

The proponent has committed to develop and implement these strategies as per the management plans and systems hierarchy (section 3, Project Management Plans and Strategies) in the Proponent Commitments Register (Appendix 7) (commitment R11.43).

Visual impacts

One submission on the EIS raised a concern that the visual impact assessment did not accurately reflect the impacts to their visual amenity and that the classification in the assessment should be high, rather than low. The rail line traverses 11 km of the property and is located on the eastern section of the rail alignment.

The proponent responded in the AEIS by acknowledging that visual impacts may be interpreted differently by the landholder, however maintaining that the visual impacts were assessed objectively. The proponent has committed to minimising visual impacts by progressively revegetating disturbed areas in accordance with the Rehabilitation Management Strategy to minimise impact on neighbouring landholders as identified in the rail EMP (March 2014).

- I consider that further negotiation on this issue should be a component of an interface agreement between the landholder and the proponent. Such an agreement would be complementary to compensation arrangement and set out how the proponent would construct and operate the rail on the property to minimise impacts to the landholder.

Maintenance of drainage structures

Landholders raised concerns about managing flooding impacts such as blocked culverts resulting from a flooding event. The AEIS stated that ongoing consultation will be undertaken between the proponent and affected landholders regarding flood modelling and flood impacts. The removal of obstructions after flooding has been included within the rail EMP (March 2014). The proponent has also committed to routine maintenance of the rail corridor to ensure the free operation of all drainage structures, including removal of obstructions where required, during construction and operation (commitment R3.32).

Air quality

Key air quality impacts on sensitive receptors during both construction and operation were described in the EIS, Appendix AD, section 4.3.1. The AEIS (Volume 4, Appendix C5) also included an air quality impact assessment of five quarries along the rail alignment which were not included in the EIS.

The potential impacts of coal dust on landholder agricultural operations have been discussed earlier in this section.

Construction impacts and mitigation

During construction of the rail line, air emissions are expected to be primarily generated as a result of dust-generating activities such as land clearance, earthworks, handling of soil, gravel and ballast materials, grading of access tracks, wind erosion, laying of concrete sleepers and rail, vehicle and equipment movements. In addition, the project will generate exhaust emissions from a range of motor vehicles and mobile plant. The EIS (Volume 3, section 7.3.3) stated that dust generated by construction activities is unlikely to impact air quality at sensitive places. The assessment in the AEIS of the impacts of quarry activities also concluded that quarry activities would be acceptable and that it was unlikely for the project to have any major or high risk air quality impacts.

Measures for controlling dust during the construction phase of the rail are proposed in Table 6.6 of the rail EMP (March 2014). Emissions are proposed to be controlled through dust suppression, topsoil stabilisation, soil management, vehicle speed limits, load management and maintenance requirements and restrictions on burning and other measures to minimise dust creation.

The proponent has also committed to watering the construction site and access roads as required using water sprays to manage impacts on air quality (commitment 6.2).

Operation impacts

During the operational phase of the project, the expected sources of air emissions include exhaust emissions from diesel powered locomotive engines, fugitive coal dust

emissions from coal wagons in transit, particulate emissions from quarry operations and odour emissions and gaseous chemical release from the STP operation.

Modelling within the Rail Air Quality Report (EIS, Volume 4, Appendix AD) concluded that there would be no impact on sensitive receptors from the rail component of the project. Exhaust pollutants, total suspended particles and particulate matter as PM_{2.5} and PM₁₀ were each determined to be well below the EPP (Air) objectives at the boundary of the rail corridor, which is at least 1.6 km from the closest sensitive receptor.

An assessment of the worst-case combined impacts of quarry activities on sensitive receptors also concluded that air quality criteria would be met at all sensitive receptors, as detailed in the AEIS (Volume 4, Appendix C5e).

Coal dust management

There is growing community interest in the impacts of airborne coal dust from coal trains. The potential sources of emissions from coal trains include:

- wind erosion of the coal surface of loaded wagons during transit
- leakage of coal particles from the doors of loaded wagons
- wind erosion of spilled coal in the rail corridor
- residual coal dust and leakage through doors from unloaded wagons
- residual coal dust on sills and other external surfaces of wagons.

In 2010 the then QR Network Pty Ltd on behalf of QR Limited, now Aurizon, prepared a coal dust management plan in consultation with the then Department of Environment and Resource Management and coal supply chain participants. The initial focus of the plan's development was reducing coal dust impacts on the environment and communities adjacent to but beyond the rail corridor. However, a review was also undertaken to better understand the full economic impact of coal loss to track and coal dust deposition on the rail ballast, increasing maintenance and operational costs. The resulting QR Network (2010) CDMP has been adopted by existing coal rail operators as the standard for coal dust management in Queensland and has been shown to reduce dust emission by up to 75 per cent.

DTMR has advised that mines currently being serviced by the Aurizon Goonyella system in central Queensland have installed coal surface veneering stations and load profiling techniques that implement the principles of the QR Network CDMP. DTMR see an overall benefit to the coal industry in terms of maximising export capacity and systems resilience if all coal mines, railways and coal terminals were operating under broadly consistent coal dust management regimes. The department has therefore recommended that the proponent commit to veneering as a key dust mitigation measure. It is noted that other coal rail proponents in the Galilee have been conditioned to include development of a CDMP broadly consistent with the QR Network CDMP, including either veneering or covering of wagons.

The proponent has committed to implement control measures to mitigate emissions generated by rail operations in the rail EMP (March 2014), Table 6-7 and the

Proponent Commitments Register (Appendix 7), Table 2.2.6. These control measures include:

- developing a CDMP that identifies measures to mitigate the emission of dust from loaded and unloaded coal trains and complies with recommendations stated in the QR Network CDMP (commitment R6.4)
- clear and regular communication between coal train operators and community groups, councils, forums and individuals and provision of information on train-related coal dust mitigation initiatives being undertaken (commitment R6.3)
- optimising train speed to minimise fugitive emissions
- removing coal dust from ballast and tracks
- supervising coal wagon loading to prevent overloading
- stabilising stockpiles left in place for longer than two weeks
- regularly servicing vehicles, plant and equipment to ensure exhaust systems and fuel consumption comply with manufacturer's specifications to minimise impacts of particulate impacts, minor air pollutants, amenity impact of dust deposition and impacts on flora, fauna, pasture and crops.

Noise and vibration

Existing background noise and vibration levels in the proposed project area are typical of a rural environment with low background noise levels and a lack of any perceivable vibration. Background monitoring was undertaken at two homesteads which are 1.9 and 4.2 km from the proposed rail alignment.

Potential impacts

The potential noise and vibration impacts of the project are described in the EIS (Volume 3, section 9). A number of changes were made to the proposed project subsequent to the EIS noise and vibration assessment, including the addition of five quarries and the realignment of the rail alignment and the rail balloon loop. The impacts of these changes are described in the AEIS (Volume 3, Section 9 and Appendix C5 Quarry Applications).

Noise and vibration impacts for sensitive receptors are expected to occur during the construction phase of the project as a result of:

- civil works including earthworks, drainage construction, haul road and access track construction, maintenance and bridgework construction and impact piling
- track construction including track laying, signalling installation and communications installation
- extraction activities using dump trucks and excavators, blasting and haulage from five quarries.

Impacts from the operational phase of the project are expected to be generated by:

- train movements on the rail line
- extraction activities using dump trucks and excavators, blasting and haulage from one quarry (Borrow 7).

Noise modelling undertaken by the proponent assessed the potential impacts of the proposed rail construction and operation activities against the standards set out in the EPP (Noise) and the Queensland Rail Code of Practice. The EIS assessment indicates that rail noise levels from the proposed corridor are expected to meet the noise targets at all identified sensitive receptors. Similarly, operational vibration targets would be readily met at all identified receptors.

The assessment of quarry activities concluded that impacts would be acceptable and no major or high risk noise and vibration impacts are likely. It was predicted that noise criteria would be exceeded at the Moray Downs, Elgin Downs and Disney sensitive receptors. However, the proponent has committed to implement control measures to ensure noise impacts are reduced and limits not exceeded. Furthermore, the Moray Downs homestead has been acquired by the proponent and is likely to be removed or mostly unoccupied during the operation of the quarries.

Mitigation and control measures

The proponent has committed to implement control measures to minimise or mitigate noise and vibration impacts resulting from the quarry and rail operations (refer to tables 8-6 to 8-8 of the rail EMP (March 2014), Quarry Applications (AEIS, Volume 4, Appendix C5) and the Proponent Commitments Register (Appendix 7). Key control measures include:

- restricting the hours of operation for significant noise-generating activities (particularly blasting and pile driving) and notifying relevant sensitive receptors of any scheduled atypical noise events
- placing and directing noise sources away from sensitive receptors
- fitting noise suppression devices on equipment where possible
- using and servicing vehicles and equipment according to manufacturer's specifications
- adopting blasting techniques that minimise noise and vibration
- designing blasting activities specifically to ensure that airblast overpressure and ground vibration limits are met at sensitive receptors
- monitoring properties potentially susceptible to vibration damage
- managing vehicle use and haul road conditions to reduce noise from vehicle movements
- switching off plant and equipment when not required
- enclosing sources of noise where possible
- training construction and operational workers on noise and vibration management controls – particularly appropriate use of audible warning devices and avoiding unnecessary revving and idling of engines
- limit dropping materials from heights
- rail track lubrication on areas of potential noise such as tight curves.

7.4.5 Coordinator-General's conclusions

I am satisfied that the EIS has adequately assessed the impacts of the project on landholders with respect to agricultural productivity, property management, air quality (including coal dust) and noise and vibration.

Agricultural productivity

I am satisfied that through the implementation of a CDMP that the proponent will minimise the coal dust impacts on stock grazing and watering and I have included a recommendation in Appendix 2, Section 2 recommending for the proponent to adopt best practice coal dust management procedures to prevent any nuisance at a sensitive receptor, and minimise damage to rail infrastructure and ecological values. (This condition also serves to address broader air quality issues and is also mentioned below).

I acknowledge the importance of the stock route network to the grazing industry and have made a recommendation in Appendix 2, Section 2 requiring the proponent to prepare and document management measures to ensure stock route crossings are designed and maintained in accordance with the proponent's proposed stock route agreement with DNRM, IRC and landholders. I note the proponent's commitments to conduct discussions with DNRM, DTMR, IRC and landholders regarding re-alignment of stock routes where required and develop a stock route agreement with these stakeholders specifying the location, treatment, design and maintenance arrangements for any alterations made to the existing stock routes.

I am satisfied that the impacts of property severance on landowners will be suitably addressed by the commitments proposed by the proponent in the Proponent Commitments Register (Appendix 7) and through interface agreements with respective landholders.

- I expect that any economic loss as a result of any acquisition of land would be dealt with in land acquisition negotiations between the landholder and the proponent (or government in the case of compulsory acquisition).

Property management

I am satisfied with the commitments the proponent has made to minimise the impacts of the project on landholders as they relate to bushfire, environmental risk management plans, property security, visual impacts and maintenance of drainage structures are adequate.

To establish appropriate proponent engagement with landholders in relation to these issues, I have recommended a condition that requires land access negotiations to be conducted in a manner consistent with the Queensland Government Land Access Code (Appendix 2, Section 2). The Code sets out best practice landholder engagement strategies for resource sector proponents relating to:

- proponent workforce induction training
- preferential use of existing access points, roads and tracks
- minimising disturbance to livestock and property

- preventing the spread of declared pests
- location of camps in appropriate places
- removal of waste to authorised facilities
- restrictions on items being brought onto the property, such as firearms, domestic animals and alcohol
- closing gates and repairing any damage to grids and fences.

Air quality

Modelling has indicated that there will be no air quality impacts on sensitive receptors resulting from the construction or operation of the project. The proponent has committed to implement control measures to mitigate emissions generated by rail operations (refer to Table 6-7 of the rail EMP March 2014). I have stated a condition in Appendix 2, Section 1, Part A which specifies air quality criteria that must not be exceeded at sensitive receptor locations and standards that must be met in accordance with Schedule 1 of the EPP (Air). I am satisfied that through the implementation of the project's EMPs and compliance with the stated air quality condition, air quality impacts of the project on sensitive receptors can be managed within acceptable limits.

I note that while the proponent has committed to developing a CDMP identifying control measures to mitigate dust emissions, the proponent has not made a specific commitment to introduce veneering or an equivalent technique as set out in the QR Network CDMP adopted by other coal operators in the region. On the advice of DTMR and in response to submissions, I have included a recommendation in Appendix 2, Section 2 requiring the proponent to develop and implement a CDMP that will have environmental and rail maintenance benefits and produce outcomes similar to those in the QR Network CDMP. The condition includes adoption of veneering or an equivalent mechanism to minimise coal dust emissions from wagons.

Noise and vibration

Modelling has indicated that noise impacts of the quarry activities may exceed acceptable noise criteria at three sensitive receptor locations – the Moray Downs, Elgin Downs and Disney homesteads. The proponent has committed to implement specific measures in the rail EMP (March 2014) in accordance with the EP Act and Appendix 7 of this report.

I have stated conditions in Appendix 2, Section 1, Part A which specify vibration and airblast overpressure limit criteria that must not be exceeded at sensitive receptor locations and protect landholders from noise nuisance.

I am satisfied that through the implementation of the project's EMPs and compliance with the stated noise and vibration conditions, noise and vibration impacts of the project on sensitive receptors can be managed within acceptable limits.

Management procedures

I have recommended a condition in Appendix 2, Section 2 that requires the proponent to prepare and document management procedures that address environmental impacts

on landholders as an essential component of applications for an MCU or development approvals for the rail and off-lease developments.

7.5 Hazard and risk

7.5.1 Introduction

This section of the report evaluates the hazards and risks associated with the rail component of the project. Based on submissions received on the EIS and AEIS, I have concerns with:

- impacts to public health and safety relating to biosecurity, pests and communicable diseases
- emergency response and safety procedures and facilities
- bushfire risks to landholders and the development of fire breaks
- impacts on regional health services
- the need for consultation with emergency services and relevant agencies
- compliance with health and safety legislative and policy requirements
- flooding impacts along the rail line and impacts to agricultural productivity
- traffic and road safety.

I have considered each submission and how information provided by the proponent responded to these issues as part of my evaluation of the environmental impacts of the project.

For information on hazard and risk matters relating to the mine and off-lease infrastructure, refer to section 6.5. For my evaluation of flooding impacts, impacts to agricultural productivity and traffic and road safety, as raised in submissions, refer to sections 7.2, 7.4 and 0, respectively.

7.5.2 Context

Statutory legislation (and related subordinate legislation and other guidance materials such as Regulations, Codes of Practice and Australian Standards) establishes the minimum standard by which activities for this project must be undertaken. Legislation and standards of particular relevance to the avoidance, mitigation and management of hazards include, but are not limited to:

- WHS Act
- *Work Health and Safety Regulation 2011*
- *Fire and Rescue Service Act 1990*
- *Transport Infrastructure (Dangerous Goods by Rail) Regulation 2008*
- *Transport Operations (Road Use Management – Dangerous Goods) Regulation 2008*
- *Transport (Rail Safety) Act 2010*
- *Transport (Rail Safety) Regulation 2010*
- AS/NZS ISO31000:2009 Risk management – Principles and guidelines
- AS 1940:2004 The storage and handling of flammable and combustible liquids
- AS 1692:2006 Steel tanks for flammable and combustible liquids

- AS/NZS 4801:2001, Occupational health and safety management systems – Specification with guidance for use.

7.5.3 Potential impacts and mitigation

Volume 3, section 12 of the EIS outlines the proponent's assessment of hazard and risk of the rail in accordance with the requirements of ISO 31000. This standard establishes the basis for the proponent to identify, prioritise, manage and compare risks and hazards of the rail component of the project for the construction, operations and decommissioning phases. Volume 3, section 12 of the AEIS provided additional information relating to the management of hazard and risk in response to issues raised in submissions on the EIS.

I note that thirty-nine hazards were identified as potentially occurring which relate to traffic accidents, flooding, spill of hazardous substances, fire, and train derailment or collision (refer to the EIS; Volume 3, section 12, Table 12-6). Key health and safety risks identified include air quality, noise, traffic, water quality and disease vectors. In response to submissions on the EIS, the scope of hazard and risk studies was expanded to include biosecurity matters.

My evaluation of potential impacts and management associated with roads and traffic is discussed in section 5.2. Refer also to my assessment of flooding (section 7.2), air quality (section 7.4) and noise (section 7.4).

Rail health and safety management system

I note that a rail health and safety management system (RHSMS) will be developed as part of an overarching PWSMS. The RHSMS will ensure the safety of employees, contractors, visitors and surrounding landholders, and will include various specific management plans, as discussed below.

General risk management

The proponent's evaluation of hazard and risk, as discussed in section 7.5.3, describes each risk, potential consequences, likelihood of occurrence and residual risk ratings. Each of these risks will be mitigated through both preventative and responsive measures as outlined in the hazard analysis and evaluation (refer to the EIS, Volume 3, section 12, Table 12-6). The proponent has committed to implement these measures through the use of a Risk Management Plan (commitment R11.13). This plan will be developed and implemented for the management of general hazards and risks on the rail line, pursuant to the relevant legislation and guidelines and in consultation with emergency services.

Disease vectors

I note that the proponent has committed to integrate measures to safeguard workers and surrounding landholders from disease by mosquitos and biting midges. The proponent has determined that there are three sensitive receptors¹⁰⁶ within 3 km of major breeding sites within which there is a higher risk of contracting disease. All other sensitive receptors are outside of this 3 km buffer.

¹⁰⁶ For a definition of 'sensitive receptor', refer to the glossary on page 583

A Mosquito/Biting Midge Management Plan has been developed as part of the RHSMS and will be implemented prior to construction (commitment R11.40 and EIS Volume 3, section 12, Table 12-8). The plan focuses on avoiding ponding of water, sampling of mosquito larvae and implementing appropriate mosquito control programs in consultation with QH. I support the key objective of the plan which is to ensure that there is no ponding of water which would potentially promote local populations of mosquitos and biting midges. As part of the plan, the proponent has also committed to consult with surrounding landholders to identify where management measures prove ineffective and eradication programs are required.

Biosecurity

Movement of vehicles, machinery, vegetation, waste, soil and people has the potential to spread weeds within and surrounding the rail line. As recommended by DAFF, the proponent has committed to achieving a no net increase in pest and weed species throughout the life of the project (commitments P6.62 and P6.63). In order to achieve this, the proponent has developed a Biosecurity Management Plan as a sub-plan of the rail EMP (March 2014) which includes a variety of mitigation measures and incorporates advice from DAFF and IRC. I note that all eradication/control measures will be undertaken in accordance with industry accepted species-based protocols (commitments P6.62 and P6.63). For further information on pest and weed species present within the project area, refer to section 7.1.

Train incidents

To avoid train malfunction and/or accident, the proponent has committed to various safety measures. These include routine inspections and maintenance of tracks, wagons and signalling equipment (commitments R11.26, 11.28 & 11.29), implementation of speed restrictions (commitment R11.27) and the construction of grade separators at identified crossings as required by the DTMR (commitment R11.31). Rail safety accreditation will be obtained and all communication systems will be installed as per Australian Standards (commitments R11.25 & R11.34). A Safety Management Plan for the rail is included in the hierarchy of management plans and would be implemented as part of the RHSMS (commitment R11.43).

Security

To ensure the safety of personnel and adjacent landholders, the proponent proposes to develop and implement a Security Management Plan to prevent unauthorised access, restrict the use of equipment where appropriate training has not been obtained and outline processes required for visitor access. This is one of the hierarchy of management plans which will be included under the RHSMS (commitment R11.43).

Rail emergency management planning

The proponent will prepare a project-wide Disaster Management Plan and a Hazardous Substances Management Plan under the PWHSMS (commitment R11.43).

An Emergency Management Plan specific to the rail has also been developed (AEIS, Volume 4, Appendix V) as a component of the overarching PWHSMS. This plan outlines the safety standards and response procedures required for all emergencies,

including natural hazards. The plan consists of various sub-plans of which the proponent has developed a Bushfire Management Plan (AEIS, Volume 4, Appendix S2). Management measures have been identified for inclusion in a Spill Response Plan (commitments R11.17-R11.21) and a Vehicle Accident Response Plan will be developed at the appropriate project stage.

An emergency response plan has been developed as a sub-plan of the rail EMP (March 2014), section 19, which forms part of the Environmental Management System and the RHSMS.

Bushfire

The Bushfire Management Plan has been developed pursuant to the relevant legislation and Australian Standards as per section 7.5.2 of this chapter and section 7 of the AEIS, Volume 4, Appendix S2, in order to protect the rail corridor, rail operations and neighbouring landholders and properties. The plan will be subject to review prior to each Queensland bushfire season and will be utilised to inform future site-based bushfire management sub-plans and hazard reduction plans in an ongoing program of communication and consultation with stakeholders. Implementation of the plan and site specific plans is required as per section 19.3 of the rail EMP (March 2014).

I consider that the plan identifies various activities which could potentially result in a bushfire risk as well as relevant control measures. Key aspects of the plan include:

- interface agreements with adjoining property owners
- establishment of fire breaks and asset protection zones
- compliance with local bylaws, state legislation, regulations and guidelines
- training of personnel
- ongoing consultation with QFRS and the Rural Fire Brigade (RFB).

A fire evacuation plan will also be developed as part of the RHSMS (commitment R11.43)

To reduce the demand on regional emergency services, the proponent has committed to constructing a fire station at the mine site. This will be fully equipped with fire fighting equipment and a fire truck, which will be made available in the event of bushfire along the rail line (commitment R11.10). Adani fire fighting crews will operate under the relevant requirements of QFRS/RFB (commitment R11.10). Appropriate equipment in order to implement fire response procedures will be purchased and maintained by the proponent. The proponent will ensure an adequate supply of water for fire fighting purposes and safe access for emergency vehicles and evacuations at all times (commitments R11.7 & R11.11). In the event of fire impacting property and/or other assets, I expect the proponent to follow all of the required legal and regulatory processes.

Hazardous spills

The proponent has committed to develop and implement a project-wide Hazardous Substances Management Plan which will outline the storage and handling of hazardous materials in order to minimise accidental release of contaminants to the greatest extent possible (commitment P6.65). A Spill Response Plan will provide

response actions in the event of a spill of hazardous substances that may occur throughout transport, storage and handling (refer to commitments R11.16 – R11.21 for specific measures). The proponent will ensure all activities will be carried out in accordance with the WHS Act, which provides for the regulation of dangerous goods and major hazard facilities. In the event of a spillage, emergency services and DEHP will be notified (commitments R11.17 & R11.18). All substances will be prevented from entering drains and/or watercourses through the use of absorbent materials (commitment R11.20) which a licensed contractor will remove and dispose of, in addition to any contaminated soils for treatment (commitments R11.21 & R11.20).

7.5.4 Coordinator-General's conclusions

Based on the mitigation measures in the Proponent Commitments Register (Appendix 7) and the RHSMS, the rail Emergency Management Plan and various sub-plans, I am satisfied that potential impacts relating to hazard and risk will be appropriately managed throughout the life of the project.

7.6 Waste

7.6.1 Introduction

The EIS provided an assessment of the waste impacts of the construction and operation of the rail line in Volume 3, section 10. An assessment of the waste impacts of the quarries was undertaken after the EIS was released for consultation and a summary has been provided in the AEIS Volume 3, section 10.

7.6.2 Potential impacts and mitigation

The construction and operation of the rail alignment and quarries will generate waste from a range of waste sources including vegetation, packaging, concrete and concrete washout, scrap metal, building and demolition, oil and oil contaminated wastes, solvents and paints, offices, food, other domestic sources, wastewater and sewage, water treatment sludge, tyres and batteries, as detailed in the rail EMP (March 2014) section 11.

The AEIS stated that there were no comments raised in the EIS submissions relevant to waste management associated with the rail component of the project. However, I note that some comments about waste in DEHP and IRC submissions are relevant to waste disposal from the rail construction camps. These included concerns about:

- the management of sewage – particularly the disposal of solid waste from sewage waters and the disposal and management of effluent of less than a class A+ standard
- the proposed location for disposal of general waste at an appropriate transfer station.

Sewage treatment

In response to these concerns about the disposal of sewage waste, the proponent has updated the rail EMP (March 2014) to include measures to manage sewage and committed to treating sewage and grey water on-site prior to disposal and developing implementing site specific wastewater management plans to ensure compliance with effluent treatment and discharge requirements (commitment R9.8).

With regard to effluent quality, the proponent has committed to treating sewage to Class A+ standard such that value and quality of aquatic habitats is not adversely impacted (commitment P6.23).

I note that sewage and water treatment plant sludge is proposed to be stored in fully contained receptacles in a designated area away from watercourses and flood plain areas (Table 11-2 of the rail EMP (March 2014)).

The treatment of sewage is an environmentally relevant activity (ERA 63) under the EP Act which requires an EA. Conditions stated for sewage treatment activities can be found in Appendix 2.

Waste disposal at an appropriate transfer station

Submissions on the EIS and AEIS by DEHP and IRC raised concerns about whether an appropriate waste disposal facility or transfer station had been identified by the proponent.

In response to these concerns, the proponent provided additional information identifying the key transfer stations in the region which may be used for the disposal of waste and provided advice that anticipated waste generation from the project will not be a significant volume in the regional context and will be within the annual operating capacities for waste facilities.

The proponent has committed to engage with both waste transporters and waste disposal operators to ensure adequate waste capacity planning is undertaken, particularly for waste streams such as concrete, metals and waste oils which are in relatively large volumes and to preferentially engage private waste specialists to ensure these wastes are managed and reprocessed by private industry rather than council facilities (commitment R9.12).

Detailed information about mine and off-lease waste generation and disposal has been included in section 6.4 of this report.

Hazardous waste

I note that hazardous waste will be managed in accordance with the regulatory requirements under the EP Act for the storage, transport, treatment and disposal of hazardous (or regulated) waste such as oils, grease, batteries, tyres, fuel, chemicals, pesticides and herbicides.

Quarries

The AEIS identified that four of the five quarries will operate during the construction period only. Borrow 7 will operate for the life of the mine. Due to the operating principles and temporary nature of four of the quarries, significant quantities of waste materials are not expected to be generated. Waste generated during construction will be managed as outlined in the rail EMP (March 2014). Any waste generated through the operation of Borrow 7 will be managed in accordance the mine general waste measures as detailed in AEIS, Volume 4, Appendix Q1, mine EMP (March 2014). A detailed description and impact assessment has been undertaken for each of the five quarries (refer to the AEIS, Volume 4, Appendix C5, Quarry Applications).

Mitigation

I note that waste will be managed in accordance with the controls identified in section 11 of the rail EMP (March 2014).

I support the proponent's commitments to manage waste streams produced by the rail component of the project (commitments R9.1–R9.12). These include commitments to:

- develop a procurement plan that will minimise waste
- develop a Waste Management Plan (WMP) that will include waste management measures, monitoring and other safeguards, in line with the relevant legislation and government waste reduction strategies

- manage cleared vegetation to be used for rehabilitation and revegetation
- manage putrescible waste, recycling and non-recyclables and appropriately dispose of these forms of waste
- store chemicals, fuels and oils to prevent spills
- treat sewage and grey water
- maintain vehicles, plant and machinery to reduce unnecessary exhaust emissions
- ensure waste is transferred to its intended destination by licensed contractors
- construct a designated waste management area.
- Further commitments addressing the management of hazardous waste can be found in the Proponent Commitments Register (Appendix 7), Table 2.2.11.

7.6.3 Coordinator-General's conclusions

I am satisfied that the EIS has adequately assessed the waste impacts of the project and that impacts can be suitably managed through the implementation of the controls outlined in the rail EMP (March 2014) and the proponent commitments.

I have made a recommendation in Appendix 2, Section 2, requiring the proponent to prepare and document management measures that will ensure compliance with applicable environmental legislation and approval conditions.

8. Management plans and proponent commitments

8.1 Introduction

This section of the report provides an overview of the environmental management plans (EMPs) for the project, and the proponent's commitments made in response to the potential impacts of the project identified during the EIS.

EMPs reflect the findings and recommendations of the studies undertaken for the EIS. Post Coordinator-General's report, they become the key reference documents that guide the detailed design, construction and operation of the project. EMPs specify:

- proposed environmental management strategies, actions and procedures to be implemented to mitigate adverse and enhance beneficial environmental impacts
- monitoring, reporting and auditing requirements
- the entity responsible for implementing proposed actions and their timing
- corrective actions if monitoring indicates that requirements have not been met.

The TOR required the development of an EMP addressing discrete project elements and proposing whole-of-project-lifecycle mitigation strategies. The proponent has prepared three draft EMPs for the mine, rail and off-site components of the project, with each EMP covering all phases of the project. The draft EMPs are supported by issue-specific sub-plans and proponent commitments.

A number of submissions on the draft EMPs were made during the EIS process. The submissions identified additional issues and information for inclusion in the EMPs, and sought clarification where there appeared to be inconsistencies between the EMPs and other content in the EIS. The submissions along with the proponent's responses and commitments have been considered during the evaluation of the project.

8.2 Environmental management plans

The three draft EMPs are based on an environmental management framework aimed at preventing or minimising environmental harm, ensuring compliance and promoting continuous improvement.

The framework includes performance indicators, monitoring and reporting requirements, management review and corrective action processes, and competency-based training arrangements that will apply to employees and contractors during all phases of the project. These elements form the basis for a series of issue specific sub-plans within each EMP addressing the critical elements of the project. Tables Table 8.1, 8.2 and 8.3 provide an overview of the structure and content of the draft EMPs and sub-plans.

The draft mine EMP (EIS, Volume 4, Appendix Q1) has been prepared for the mine site and infrastructure located within the mining lease area incorporating EPC1960 and part of EPC1080. The mine and on-site infrastructure includes:

- six open-cut mines
- five underground mines mine infrastructure areas (MIAs)
- out-of-pit waste rock dumps
- mine water management dams
- office, workshop and other facilities
- power and water distribution.

The draft off-site EMP (EIS, Volume 4, Appendix Q2) has been prepared for the off-lease infrastructure required to construct and operate the mine. All off-site infrastructure will be situated on the Moray Downs cattle station, Lot 662 on PH1491 to the east of the mine site and includes:

- workers accommodation village
- industrial precinct including rail siding to facilitate services such as a fuel farm, freight unloading terminal, etc.
- permanent airport
- off-site water supply infrastructure
- the upgrade and realignment of Moray-Carmichael Road.
- Section 13 in Volume 2 (Mine Studies) of the EIS identifies the key issues raised in submissions in relation to the draft mine EMP and draft off-site EMP:
- insufficient information on wastewater discharge management, ERAs and notifiable activities under the EP Act, groundwater monitoring, regulated structures, soil management, subsidence and rehabilitation
- rehabilitation of wildlife corridors and the use of locally indigenous plants
- identification of nature refuges as sensitive areas
- stygofauna sampling and mitigation measures
- biosecurity (weed and pest) management.

The comments have been addressed through changes to the Environmental Management Framework, and the Surface Water and Biosecurity Management sub-plans of the draft mine EMP. Rehabilitation and closure details are outlined in the Mine Closure and Rehabilitation Strategy (Volume 4, Appendix R1) and the Off-site Closure and Rehabilitation Strategy (Volume 4, Appendix R2).

The draft rail EMP (EIS, Volume 4, Appendix W) has been prepared for the greenfield rail line including:

- a 69 km narrow gauge portion running east from Diamond Creek connecting to the Goonyella rail system south of Moranbah
- a 120 km dual gauge portion from the mine site running west to east to Diamond Creek
- five local quarries to extract quarry materials for construction and operational purposes
- terminus and maintenance facilities located in the mine infrastructure area (EPC1080) and off-site infrastructure area (Lot 662 on PH1491)
- rolling stock, passing loops and signalling and communications systems.

- Section 13 in Volume 3 (Rail Studies) of the EIS identifies the key issues raised by submissions in relation to the draft rail EMP:
- ensuring adequate access to the project area for emergency services and evacuation during construction and maintenance
- managing the potential impacts of coal dust, flooding and bushfire management on adjacent landowners and grazing properties
- addressing concerns about erodible soil and biosecurity (weed and pest) management.
- The comments have been addressed through changes to the Air Quality, Surface Water, Flora and Fauna Management, and Emergency Management and Response sub-plans in the draft rail EMP.

8.3 Project commitments

EMPs are supported by project commitments that form the basis for the proponent's enhancement and mitigation strategies, and monitoring and reporting arrangements. In accordance with the TOR the proponent has compiled a commitment register (Appendix 7) that has continued to evolve during the EIS process.

The commitments in the register are divided into three categories—mine, rail and project-wide. Commitments relating specifically to the EMPs include the development of:

- Waste Management Plans including monitoring and control measures as sub-plans for each of the EMPs
- site and risk-specific management plans to control the potential impact of fire, pollution, weed and pest infestations and contamination, to be implemented and controlled through the rail and off-site EMPs
- a Coal Dust Management Plan identifying control measures to mitigate the emission of dust from loaded and unload trains to be implemented and controlled through the rail EMP
- monitoring, management and mitigation measures for erosion and sediment control, and stormwater and runoff management, in the mine infrastructure and off-site infrastructure areas to be incorporated in the Off-site and mine EMPs
- measures to minimise disturbance to the riparian zone arising from the design and layout of off-site water supply infrastructure, to be incorporated in the Off-site and mine EMPs
- a Mine Water Management Plan identifying monitoring and reporting measures for surface flows and all regulated water management infrastructure (dams, levees and diversion dams), to be incorporated in the mine EMP
- a Fuel Management Strategy considering mine planning, logistics, driver education and maintenance, to be incorporated in the mine EMP
- baseline assessments and monitoring arrangements for existing registered bores that could be significantly affected by the mine, to be incorporated into the mine EMP

- clean-out frequencies for on-site sediment dams to reduce the risk of high sediment loads being released to the environment, to be incorporated into the mine EMP
- water quality targets, monitoring and reporting requirements, and corrective actions to be clearly articulated in an Operational Water Quality Management Plan embedded within the off-site EMP.

The monitoring requirements for individual sub-plans are outlined in section 4 of each EMP, along with the proponent's commitment to finalise the requirements either prior to the commencement of construction or during the pre-construction phase in some instances. The proponent has also committed to reviewing the EMPs at least annually to ensure ongoing adequacy and effectiveness, and to assess opportunities for improvement.

8.4 Coordinator-General's conclusions

I have considered submissions made on the draft EMPs during the EIS process, along with the proponent's responses and commitments. I note the proponent has continued to revise the draft EMPs following the completion of the AEIS, and that updated versions are available on the proponent's website.

The draft mine EMP has been developed sufficiently for my report to state draft EA conditions for the project (Appendix 1, Section 1). Section 4 of this report outlines the state government approvals required prior to the commencement of mining, including the issue of an EA pursuant to the EP Act and in accordance with my stated conditions.

The draft rail and off-site EMPs have been developed sufficiently for my report to state conditions and recommendations for the construction and operation of these components of the project (Appendix 2).

The draft EMPs form part of a broader suite of management systems and plans for the entire project that is outlined in Section 3 of the Proponent Commitments Register (Appendix 7), along with a hierarchy diagram illustrating the critical relationships between each component. I note that the proponent has committed to developing and implementing the entire hierarchy of management systems and plans at the appropriate project stage (commitment R11.43).

I am satisfied that the effective implementation of the revised draft EMPs, supporting managements systems and plans, and proponent commitments would ensure that environmental impacts of the project could be managed appropriately.

Table 8.1 Structure of Mine Environmental Management Plan

EMP sub-plan	Management plans	EIS/AEIS reference	Commitment register reference (April 2014)	Relevant draft EA conditions (Appendix 1 of this report)
Air quality (refer to section 6.2 of this report)		AEIS Vol 4 Appendix L	Section 2.3.6 M6.1 – M6.2 Section 2.3.11 M11.23	Schedule B – conditions B1 – B2
Greenhouse gas emissions (refer to section 5.3 of this report)		AEIS Vol 4 Appendix M	Section 2.3.7 M7.1 – M7.5	Post EA commitments
Noise and vibration (refer to section 6.3 of this report)		AEIS Vol 4 Appendix N	Section 2.3.8 M8.1 – M8.2	Schedule D - conditions D1 – D3
Surface water (refer to section 5.1.7 of this report)	Surface Water Management Plan	AEIS Vol 4 Appendix K2 - K5	Section 2.1.6 P6.69 Section 2.3.1 M1.31 Section 2.3.3 M3.14 Section 2.3.4 M4.23 Section 2.3.5 M5.3, M5.7, Section 2.3.9 M9.13 - M9.16	Schedule F – conditions F1 – F27

EMP sub-plan	Management plans	EIS/AEIS reference	Commitment register reference (April 2014)	Relevant draft EA conditions (Appendix 1 of this report)
Groundwater (refer to section 5.1.7 of this report)	Groundwater Dependent Ecosystem Management Plan ¹⁰⁷	AEIS Vol 4 Appendix K1, K6 - K8	Section 2.1.6 P6.29 - P6.37, P6.44 Section 2.3.1 M1.2 Section 2.3.3 M3.5 Section 2.3.4 M4.23, M4.24, M4.26, M4.27 Section 2.3.5 M5.3, M5.5, M5.7, M5.11, M5.12, M5.13, M5.17 Section 2.39 M9.14 - M9.16	Schedule E – conditions E1 – E16
Mine waste management (refer to section 6.4 of this report)	Mine Waste Management Strategy	AEIS Vol 4 Appendix O1 Appendix O2	Section 2.3.3 M3.23, M3.25 Section 2.3.4 M4.12, M4.14 Section 2.3.5 M5.19, M5.27 Section 2.3.9 M9.2, M9.7, M9.8, M9.11- M9.23	Schedule C – conditions C1 – C5
General and hazardous waste management (refer to section 6.4 of this report)	Waste and Resource Management Plan Hazardous Substances Management Plan	AEIS Vol 2 Mine Studies	Section 2.1.6 P6.45, P6.64 Section 2.3.1 M1.18 Section 2.3.9 M9.1, M9.2, M9.5, M9.9 Section 2.3.11 M11.17	Schedule C – conditions C1 – C5 Schedule G – conditions G1 – G3

¹⁰⁷ Coordinator-General requirement

EMP sub-plan	Management plans	EIS/AEIS reference	Commitment register reference (April 2014)	Relevant draft EA conditions (Appendix 1 of this report)
Terrestrial ecology (refer to sections 5.1 and 6.1 of this report)	Offsets Management Plan Threatened Species Management Plans	AEIS Vol 2 Mine Studies AEIS Vol 4 Appendix F Appendix H Appendix J1, J2, J4	Section 2.1.6 P6.1 – P6.4, P6.14 - P6.16, P6.25 – P6.28, P6.41 - P6.43, P6.47 – P6.61, P6.66, P6.67 Section 2.3.1 M1.27, M1.29, M1.30 Section 2.3.4 M4.1 – M4.4, M4.15 – M4.23, M4.28 – M4.30	Schedule H – conditions H1 – H15 Schedule I – conditions I1 - I7
Aquatic ecology (refer to sections 5.1 and 6.1 of this report)		AEIS Vol 2 Mine Studies AEIS Vol 4 Appendix H Appendix J1, J3	Section 2.1.6 P6.39, P6.47 Section 2.3.1 M1.4 Section 2.3.4 M4.6, M4.8 – M4.11, M4.24, M4.25, M4.29, M4.30	No specific conditions
Biosecurity management (refer to sections 5.1 and 6.1 of this report)	Weed and Pest Management Plan	AEIS Vol 4 Appendix H Appendix J1	Section 2.1.3 P3.3 Section 2.1.6 P6.6, P6.7, P6.9, P6.11, P6.45, P6.46, P6.50, P6.61, P6.62	Schedule I – condition I6 part d
Scenic amenity (refer to section 5.5 of this report)		AEIS Vol 4 Appendix D1, D2	Section 2.1.1 P1.13 Section 2.3.3 M3.1, M3.2	Not applicable – outside EA
Erosion and sediment control (refer to section 6.6.2 of this report)	Erosion and Sediment Management Plan	AEIS Vol 4 Appendix K5, O3	Section 2.1.6 P6.20, P6.63 Section 2.3.3 M3.11 Section 2.3.4 M4.5	Schedule F – condition F12, F26, F27 Schedule H – condition H9 part h Schedule J – condition J3 part c Schedule K – condition K7 part b and K26 part b

EMP sub-plan	Management plans	EIS/AEIS reference	Commitment register reference (April 2014)	Relevant draft EA conditions (Appendix 1 of this report)
Contaminated land (refer to section 6.4.3 of this report)	Spill Response Plan	AEIS Vol 4 Appendix R1	Section 2.3.3 M3.20 – M3.26 Section 2.3.5 M5.3 Section 2.3.11 M11.16	Schedule H – conditions H11 – H13
Soil resources (refer to section 6.6 of this report)	Topsoil Management Plan Rehabilitation Management Plan	AEIS Vol 2 AEIS Vol 4 Appendix O3, R1	Section 2.3.1 M1.29 Section 2.3.3 M3.3 – M3.19 Section 2.3.4 M4.6 Section 2.3.9 M9.10	Schedule C – condition C4 Schedule H – condition H8
Aboriginal cultural heritage (refer to section 5.4 of this report)	Cultural Heritage Management Plans Social Impact Management Plan	AEIS Vol 4 Appendix D1, D2	Section 2.1.2 P2.1 – 2.3	Separate statutory approval
Non-Indigenous cultural heritage (refer to section 5.4 of this report)	Social Impact Management Plan	AEIS Vol 4 Appendix D1, D2	Section 2.1.2 P2.3	Not applicable – outside EA
Subsidence management (refer to section 6.6 of this report)	Subsidence Management Plan	AEIS Vol 4 Appendix I1, I2	Section 2.1.6 P6.59 Section 2.3.3 M3.16 – M3.18	Schedule J – conditions J1 – J11

EMP sub-plan	Management plans	EIS/AEIS reference	Commitment register reference (April 2014)	Relevant draft EA conditions (Appendix 1 of this report)
Emergency management and response (refer to sections 5.5 and 6.5 of this report)	Health and Safety Management System Emergency Response Plan Fire Management Plan Risk Management Plan Disaster Management Plan Traffic Management Plan Bushfire Management Plan	AEIS Vol 4 Appendix V	Section 2.1.1 P1.8. P1.11 Section 2.1.6 P6.65 Section 2.3.1 M1.7 Section 2.3.2 M2.1 – M2.4 Section 2.3.4 M4.12 Section 2.3.9 M9.7 Section 2.3.10 M10.1, M10.16 Section 2.3.11 M11.1 – M11.38	Schedule A – conditions A9, A10
Community (refer to sections 5.1.9 and 5.5 of this report)	Social Impact Management Plan	AEIS Vol 4 Appendix D1, D2	Section 2.1.1	Not applicable – outside EA

Table 8.2 Structure of Rail Environmental Management Plan

EMP sub-plan	Management plans	EIS/AEIS reference	Commitment register reference (April 2014)
Air quality (refer to sections 5.2 and 7.4.4 of this report)	Coal Dust Management Plan	AEIS Vol 3	Section 2.2.6 R6.1 – R6.5 Section 2.2.11 R11.36
Greenhouse gas emissions (refer to section 5.3 of this report)	Traffic Management Plan	AEIS Vol 3	Section 2.2.3 R3.3 Section 2.2.7 R7.1 – R7.3
Noise and vibration (refer to section 7.4.4 of this report)	Noise Management Plan	AEIS Vol 3	Section 2.2.8 R8.1 – R8.3
Surface water (refer to sections 5.1.7, 7.2 and 7.4.4 of this report)	Water Supply Management Plan	AEIS Vol 4 Appendix S1a, S1b, S1c	Section 2.2.3 R3.13, R3.29 Section 2.2.5 R5.1 Section 2.2.11 R11.1
Groundwater (refer to section 5.1.7 of this report)	Groundwater Monitoring Plan Groundwater Management Plan	AEIS Vol 4 Appendix S1a, S1b, S1c	Section 2.2.5 R5.18
General and hazardous waste management (refer to section 7.6 of this report)	Waste and Resource Management Plan Hazardous Substances Management Plan	AEIS Vol 3	Section 2.1.6 P6.45, P6.64 Section 2.2.5 R5.9 Section 2.2.9 R9.1 – R9.12
Flora and fauna management (refer to sections 5.1 and 7.1.2 of this report)	Threatened Species Management Plans Land Management Plan Vegetation Offsets Management Plan	AEIS Vol 3 AEIS Vol 4 Appendix F	Section 2.1.6 P6.1 – P6.5, P6.16, P6.57 - P6.59, P6.67 Section 2.2.3 R3.35 Section 2.2.4 R4.1 – R4.28 Section 2.2.6 R6.1

EMP sub-plan	Management plans	EIS/AEIS reference	Commitment register reference (April 2014)
Biosecurity management (refer to sections 7.1.2 and 7.5.3 of this report)	Weed and Pest Management Plan	AEIS Vol 4 Appendix H	Section 2.1.3 P3.3 Section 2.1.6 P6.6 - P6.9, P6.11, P6.45, P6.46, P6.50, P6.61, P6.62 Section 2.2.4 R4.13 – R4.16
Scenic amenity (refer to sections 5.1.9, 5.5 and 7.4.4 of this report)		AEIS Vol 4 Appendix D1, D2	Section 2.1.1 P1.13 Section 2.2.3 R3.1 – R3.4
Contaminated land (refer to section 7.3 of this report)	Spill Response Plan	AEIS Vol 4 Appendix X1	Section 2.2.3 R3.20 Section 2.2.5 R5.14 Section 2.2.11 R11.17, R11.18, R11.20, R11.21
Soil resources (refer to section 7.3 of this report)	Erosion and Sediment Control Plan	AEIS Vol 3 AEIS Vol 4 Appendix T2	Section 2.1.6 P6.20, P6.63 Section 2.2.3 R3.8 Section 2.2.4 R4.6
Aboriginal cultural heritage (refer to section 5.4 of this report)	Cultural Heritage Management Plans Social Impact Management Plan	AEIS Vol 4 Appendix D1, D2	Section 2.1.2 P2.1 – 2.3
Non-Indigenous cultural heritage (refer to section 5.4 of this report)	Social Impact Management Plan	AEIS Vol 4 Appendix D1, D2	Section 2.1.2 P2.3
Emergency management and response (refer to sections 5.5 and 7.5.3 of this report)	Health and Safety management System Emergency Response Plan Fire Management Plan Risk Management Plan Disaster Management Plan	AEIS Vol 4 Appendix S2	Section 2.2.2 R2.11 Section 2.2.10 R10.1 Section 2.2.11 R11.3 – R11.14, R11.17, R11.18, R11.23, R11.35, R11.42

EMP sub-plan	Management plans	EIS/AEIS reference	Commitment register reference (April 2014)
Community (refer to section 5.5 of this report)	Social Impact Management Plan	AEIS Vol 4 Appendix D1, D2	Section 2.1.1

Table 8.3 Structure of Off-site Environmental Management Plan

EMP sub-plan	Management plans	EIS/AEIS reference	Commitment register reference (April 2014)
Air quality (refer to section 6.2 of this report)		AEIS Vol 4 Appendix L	Section 2.3.6 M6.1 – M6.2
Greenhouse gas emissions (refer to section 5.3 of this report)		AEIS Vol 4 Appendix M	Section 2.3.7 M7.2, M7.3
Noise and vibration (refer to section 6.3 of this report)		AEIS Vol 4 Appendix N	Section 2.2.8 R8.3 Section 2.3.8 M8.1
Surface water (refer to section 5.1.7 of this report)	Surface water management system Surface Water Management Plan	AEIS Vol 4 Appendix K2 Appendix K3 Appendix K5	Section 2.3.1 M1.6, M1.8, M1.15 Section 2.3.3 M3.11, M3.14 Section 2.3.4 M4.7, M4.13, M4.14, M1.31 Section 2.3.5 M5.3, M5.7, M5.28
Groundwater (refer to section 5.1.7 of this report)	Groundwater Dependent Ecosystem Management Plan	AEIS Vol 4 Appendix K1 Appendix K6	Section 2.2.3 R3.9 Section 2.2.5 R5.12 Section 2.3.4 M4.27 Section 2.3.5 M5.5

EMP sub-plan	Management plans	EIS/AEIS reference	Commitment register reference (April 2014)
General and hazardous waste management (refer to section 6.4 of this report)	Waste and Resource Management Plan Hazardous Substances Management Plan	AEIS Vol 2 Mine Studies	Section 2.1.6 P6.6, P6.21, P6.45, P6.64 Section 2.3.1 M1.18 Section 2.3.5 M5.19
Terrestrial ecology (refer to sections 5.1 and 6.1 of this report)	Offsets Management Plan	AEIS Vol 4 Appendix J5 – J7	Section 2.1.6 P6.1 – P6.4, P6.14 – P6.16, P6.66, P6.67 Section 2.3.1 M1.28, M1.30 Section 2.3.4 M4.1 – M4.4, M4.15 – M4.22
Aquatic ecology (refer to sections 5.1 and 6.1 of this report)		AEIS Vol 2 Mine Studies AEIS Vol 4 Appendix H Appendix J1, J3	Section 2.3.4 M4.6, M4.8 - M4.12
Biosecurity management (refer to sections 5.1 and 6.6 of this report)	Weed and Pest Management Plan	AEIS Vol 4 Appendix H Appendix J1	Section 2.1.6 P6.6, P6.11, P6.45, P6.61, P6.62
Scenic amenity (refer to section 5.5 of this report)		AEIS Vol 4 Appendix D1, D2	Section 2.1.1 P1.13 Section 2.3.3 M3.1, M3.2
Erosion and sediment control (refer to section 6.6.2 of this report)	Off-site Facility Erosion and Sediment Control Plan Rehabilitation Management Plan Topsoil Management Plan	AEIS Vol 4 Appendix K5, O3	Section 2.1.6 P6.20, P6.63 Section 2.3.1 M1.27, M1.28 Section 2.3.3 M3.11, M3.12 Section 2.3.4 M4.5
Contaminated land (refer to section 6.42 of this report)		AEIS Vol 4 Appendix R2	Section 2.3.3 M3.20 - M3.26

EMP sub-plan	Management plans	EIS/AEIS reference	Commitment register reference (April 2014)
Soil resources (refer to section 6.6 of this report)	Rehabilitation Management Plan	AEIS Vol 2 AEIS Vol 4 Appendix O3, R2	Section 2.3.1 M1.27, M1.28 Section 2.3.3 M3.12 – M3.14, M3.19
Aboriginal cultural heritage (refer to section 5.4 of this report)	Cultural Heritage Management Plans Social Impact Management Plan	AEIS Vol 4 Appendix D1, D2	Section 2.1.2 P2.1 – 2.3
Non-Indigenous cultural heritage (refer to section 5.4 of this report)	Social Impact Management Plan	AEIS Vol 4 Appendix D1, D2	Section 2.1.2 P2.3
Emergency management and response (refer to sections 5.5 and 6.5 of this report)	Bushfire Management Plan		Section 2.1.6 P6.21
Community (refer to section 5.5 of this report)	Social Impact Management Plan	AEIS Vol 4 Appendix D1, D2	Section 2.1.1

9. Conclusion

The Carmichael Coal Mine and Rail project has undergone a comprehensive environmental impact assessment. In undertaking my evaluation of the EIS, I have considered the following:

- the EIS and AEIS prepared for this project
- submissions on the EIS and AEIS, including agency advice
- additional documentation provided to the Coordinator-General by the proponent as requested.

I am satisfied that the requirements of the SDPWO Act have been met and that sufficient information has been provided to enable the necessary evaluation of the potential impacts, and development of mitigation strategies and conditions of approval.

The environmental assessment commenced with the declaration of this project in November 2010 and has involved a comprehensive body of work by the proponent. More detailed work will occur in the detailed design phase of the project.

The potential impacts identified in the EIS documentation and submissions have been assessed. I consider that the mitigation measures adopted by the proponent and required by the conditions stated in this report would result in acceptable overall outcomes.

Based on the information provided by the proponent and outlined in section 2.3, I conclude that the project would deliver substantial economic benefits to both the local, regional and state economies. The predicted employment benefits generated by the project would be significant with the estimation that it will create 2475 construction jobs, 3920 operational jobs, and provide direct and indirect local, regional and Indigenous employment opportunities. The project would also contribute to an increase in state and federal revenue through taxes and royalties, provide improved infrastructure such as new rail infrastructure and road upgrades, and enhance economic development opportunities throughout the region.

Accordingly, I approve the Carmichael Coal Mine and Rail project, subject to the conditions in Appendix 1 and Appendix 2. In addition, I require the proponent's commitments to be fully implemented as presented in the EIS documentation and included in Appendix 7 of this report.

To proceed further, the proponent will be required to:

- obtain EPBC Act approval
- obtain the relevant development approvals under the SP Act and the SDPWO Act, should components of the project be included in a state development area
- obtain a range of State and Local government approvals required for the project
- finalise and implement a range of environmental management plans and sub-plans for the mine, off-lease infrastructure and rail
- finalise the Biodiversity Offsets Strategy.

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 5.1 of this report describes the extent to which the material supplied by Adani Mining Pty Ltd addresses the actual or likely impacts on MNES of each controlled action for the project. A copy of this report will be provided to the Commonwealth Minister for the Environment for his consideration in relation to the EPBC Act approval.

Copies of this report will be issued to agencies with approval responsibilities including:

- DE
- DEHP
- DNRM
- DTMR
- IRC.

A copy of this report will be available on the Department of State Development, Infrastructure and Planning's website at www.dsdip.qld.gov.au/cg

Appendix 1 Mine conditions

Section 1 Stated conditions

This section includes the Coordinator-General's stated conditions¹⁰⁸ for the draft EA (mining lease) under the EP Act for the mine component of the project. These conditions are stated pursuant to section 47C of the SDPWO Act.

These conditions authorise the ERAs identified in Table A1.

Table A1. Authorised ERAs under the stated draft EA conditions

Activity(s)	Location
Mining black coal Schedule 2A, Environmental Protection Regulation 2008	Mining Lease (application) 70441, 70505, 70506
8(1)(d)(i) Chemical storage Storing the following total quantity of other chemicals in containers of at least 10m ³ — 200 tonnes or more, if they are solids or gases. Schedule 2, Environmental Protection Regulation 2008	
8(1)(d)(ii) Chemical storage Storing the following total quantity of other chemicals in containers of at least 10m ³ — 200m ³ or more, if they are liquids. Schedule 2, Environmental Protection Regulation 2008	
16(1)(b) Extractive and Screening Activities Extracting, other than by dredging, a total of 5000t or more of material, in a year, from an area. Schedule 2, Environmental Protection Regulation 2008	
31(2)(b) Mineral Processing Mineral processing consists of processing, in a year, more than 100,000t of mineral products. Schedule 2, Environmental Protection Regulation 2008	
56(1) Regulated waste storage Operating a facility for receiving and storing regulated waste for more than 24 hours. Schedule 2, Environmental Protection Regulation 2008	
63(1)(a) Sewage Treatment Operating 1 or more sewage treatment works at a site that have a total daily peak design capacity of at least 21EP. Schedule 2, Environmental Protection Regulation 2008	

¹⁰⁸ For a definition, refer to the glossary on page 583

The section is structured as follows:

Schedule A—General

Schedule B—Air

Schedule C—Waste

Schedule D—Noise

Schedule E—Groundwater

Schedule F—Water

Schedule G—Sewage treatment

Schedule H—Land and rehabilitation

Schedule I—Offsets and biodiversity

Schedule J—Subsidence

Schedule K—Dams and levees

Attachment A—Definitions

Attachment B—Rehabilitation requirements

Attachment C—Subsidence guidance material

Attachment D—Figures

Schedule A—General

A1 This environmental authority authorises the 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 74.5 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal in accordance with this environmental authority.

A3 In carrying out the mining activity authorised by this environmental authority, the holder of this environmental authority must comply with *Table A3: Mining Domains*, and Figures A1–A9.

Table A3: Mining domains

Mine Domain	Location	Domain Area (ha)	Disturbance Areas			Maximum Disturbance Area
			Year 1–10	Year 11–20	Year 21–60	
Open-cut voids and slopes	See Figure A2	8331.55	3729.56	2011.95	2590.04	8331.55
Underground mining and subsidence boundary	See Figure A3	7786.76	1931.95	3030.16	2824.65	7786.76
Mine infrastructure	See Figure A4	2032.77	1911.13	110.42	11.22	2032.77
Out-of-pit spoil dumps	See Figure A5	8308.69	6603.10	1670.80	34.79	8308.69
Water storage areas, including MAW dams, raw water dams	See Figure A6	817.53	813.47	4.06	0	817.53
Stream diversions	See Figure A7	472.68	412.34	60.34	0	472.68
Tailings drying cell	See Figure A8	216.17	216.17	0	0	216.17
Carmichael River corridor and levees	See Figure A9	1799.02	50.78	0	0	50.78
Carmichael River	See Figure A1	1748.24	0	0	0	0
Levees	See Figure A1	50.78	50.78	0	0	50.78
Total						28 016.93

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; and
- 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 a period of not less than 5 years.

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 Standard for Risk Management (ISO31000:2009), or the latest edition of an Australian standard for risk management, to the extent relevant to environmental management, within 3 months from date of issue of this environmental authority.

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 which results in the release of contaminants not in accordance, or reasonably expected to be not in accordance with, the conditions of this environmental authority.

A10 Within 10 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; and
- c) proposed actions to prevent a recurrence of the emergency or incident.

A11 Complaints

The holder of this environmental authority must record all environmental complaints received about the mining activities including:

- a) name, address and contact number 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; and
- h) person responsible for resolving the complaint.

A12 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. 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.

A13 Third-party reporting

The holder of this environmental authority must:

- a) within 1 year of the commencement of this environmental authority, 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 3 yearly intervals, from the completion of the report referred to above; and
- c) provide each report to the administering authority within 90 days of its completion.

A14 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 2 years of the amendment or change being made, unless a different period is specified in the amended standard or relevant legislation or another timeframe approved by the administering authority; and
- 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.

Schedule B—Air

B1 The release of dust or particulate matter or both resulting from mining activity authorised by this environmental authority must not cause an environmental nuisance at any nuisance sensitive or commercial place.

B2 The holder of the Environmental Authority shall 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 1 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 50 micrograms per cubic metre over a 24-hour averaging time, for no more than 5 exceedances¹⁰⁹ recorded each year, when monitored in accordance with the most recent version of 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.
 3. Australian Standard AS3580.9.8 Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – PM10 continuous direct mass method using a tapered element oscillating microbalance (TEOM) analyser

¹⁰⁹ These five exceedances (as allowed for in the EPP(Air)) are for natural events such as bushfires and dust storms.

- c) A concentration of particulate matter suspended in the atmosphere of 90 micrograms per cubic metre over a 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 or using an alternative sampling methodology determined in consultation with EHP.

NOTE: *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 B2 (b).*

Schedule C—Waste

- C1** 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 must not be burnt.
- C2** The holder of this environmental authority may burn vegetation cleared in the course of carrying out extraction activities provided the activity does not cause environmental harm at any sensitive place or commercial place.

C3 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 management of seepage and leachates both during operation and the foreseeable future;
- c) the control of fugitive emissions to air;
- d) a program of progressive sampling and characterisation to identify acid producing potential and metal concentrations of tailings;
- e) maintaining records of the relative locations of any other waste stored within the tailings;
- f) rehabilitation strategy; and
- g) 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.

C4 Acid sulphate soils

Treat and manage acid sulphate soils in accordance with the latest edition of the Queensland Acid Sulphate Soil Technical Manual.

- C5** Scrap tyres are authorised to be stored awaiting disposal or disposed of on the Mining Lease in a manner that minimises environmental harm. A record must be kept of the number and location for tyres disposed.

Schedule D—Noise

- D1** The holder of this environmental authority must ensure that noise generated by the mining activities approved under this Environmental Authority does not cause the criteria in *Table D1 – Noise limits* to be exceeded at a sensitive place or commercial place

Table D1—Noise limits

Sensitive or commercial place			
Noise level dB(A) measured as:	Monday to Sunday		
	7am to 6pm	6pm to 10pm	10pm to 7am
LAeq, adj, 15 mins	41	41	33
LA1, adj, 15 mins	46	46	35

D2 Airblast overpressure nuisance

The holder of this environmental authority must ensure that blasting does 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 or commercial place blasting noise limits	
	7am to 6pm (daylight hours)	6pm to 7am (non-daylight hours)
Airblast overpressure	115 dB (Linear) Peak for 4 out of 5 consecutive blasts initiated; and not greater than 120 dB (Linear) Peak for any single blast	No blasting to occur
Ground vibration peak particle velocity	10 mm/s for ground vibration of no more than 35 Hz; and 25 mm/s for ground vibration of more than 35Hz	No blasting to occur

D3 Monitoring and reporting

Noise monitoring and recording must include the following descriptor characteristics and matters:

- LAN,T (where N equals the statistical levels of 1, 10 and 90 and T = 15 mins);
- background noise LA90;
- 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; and
- if the complaint concerns low frequency noise, Max LpLIN,T and one third octave band measurements in dB(LIN) for centre frequencies in the 10–200 Hz range.

Schedule E—Groundwater

E1 The holder of this environmental authority must not release contaminants to groundwater.

E2 Monitoring and reporting

All determinations of groundwater quality, groundwater monitoring and biological monitoring must be performed by appropriately qualified person/s.

E3 Baseline Monitoring Program

A baseline groundwater monitoring program must be developed and certified by an appropriately qualified person and implemented by the holder of this environmental authority no later than < 4 months from the issuance of the EA>. The program must be made available to the administering authority on request. The baseline groundwater monitoring program must result in the holder of this environmental authority finalising a groundwater dataset that must be provided to the administering authority at least 30 days prior to commencing any mining activities associated with box cut excavation. The groundwater dataset must:

- a) contain representative groundwater quality samples from the geological units identified as potentially affected by mining activities including Quaternary alluvium, Tertiary sediments, Bandanna Formation, Colinlea Sandstone, Clematis Sandstone, Rewan Formation, Dunda Beds, and Early Permian sediments;
- b) include at least 12 sampling events that are no more than 2 months apart over a 2 year period, so as to determine background groundwater quality;
- c) include background groundwater quality in hydraulically isolated background bore(s); and
- d) allow for the identification of natural groundwater level trends and groundwater contaminant trigger levels.

E4 Groundwater Management and Monitoring Program

A Groundwater Management and Monitoring Program must be developed and certified by an appropriately qualified person which addresses all phases of the mining operation approved under this environmental authority. The groundwater management and monitoring program must be provided to the administering authority for approval with the baseline monitoring program in condition E3. The groundwater management and monitoring program must be developed to ensure that the plan meets the following objectives:

- a) Validation of groundwater numerical model (including review of boundary and recharge conditions) to refine and confirm accuracy of groundwater impacts predicted;
- b) Groundwater level monitoring in all identified geological units present across and adjacent to the mine site to confirm existing groundwater flow patterns and monitor drawdown impacts;
- c) Identification of groundwater drawdown level thresholds for monitoring the impacts to Groundwater Dependant Ecosystems (including spring complexes and Carmichael River alluvium);
- d) Monitoring of aquifers in the area to the south of the mining lease that may affect the Mellaluka springs;
- e) Identify and refine potential impacts on groundwater levels in the Great Artesian Basin Clematis Sandstone and Dunda Beds geological units;
- f) Estimation of groundwater inflow to mine workings and surface water ingress to groundwater from flooding events using the groundwater model;
- g) Monitoring in any identified source aquifers for alternative water supplies, relevant to any approval issued under the *Water Act 2000* for the project;
- h) Monitoring of geological units throughout all phases of project life including for the period post-closure in accordance with Appendix 1;
- i) Identifying monitoring bores that will be replaced due to mining activities; and
- j) To ensure all potential groundwater impacts from mine dewatering and mine water and waste storage facilities (artificial recharge) are identified, mitigated and monitored.

E5 Monitoring Program Review

The Groundwater Management and Monitoring Program required under condition E4 must be reviewed by an appropriately qualified person at least every 5 years with a report provided on the outcome of the review to the administering authority by <insert 5 years from issuance of EA>, and then no later than 1 July every 5 years following. The review must include:

- a) an assessment of the groundwater management and monitoring program against the objectives in condition E4
- b) a review of the adequacy of the monitoring locations, frequencies and groundwater quality triggers specified in Table E1, E2 and E3

- c) a review of the validity of the groundwater monitoring program against the regular model predictions.

Note: The review under this condition must be conducted initially at a minimum of 5 yearly intervals. Depending on the results of the review under condition E8 the administering authority may consider amending the required review timeframe from at least 5 yearly intervals to at least 10 yearly intervals.

E6 Groundwater Model Review

The numerical groundwater model in the reports titled “Carmichael Coal Mine and Rail Project SEIS: Report for Mine Hydrogeology Report (13 November 2013)” and “Carmichael Coal Mine and Rail Project SEIS: Mine Hydrogeology Report Addendum (24 October 2013)” must be reviewed to incorporate groundwater monitoring data and measured mine dewatering volumes from the Groundwater Management and Monitoring Program in condition E4 and E5. The review must be conducted within two years of commencement of any mining activities associated with box cut excavation and at least every 5 years thereafter, or at other intervals specified by the administering authority in writing, if the observed groundwater levels and groundwater flow rates to surface water are not consistent with those predicted by the groundwater model.

The review must provide a revised numerical groundwater model which is based on a transient calibration and includes additional model layers for aquifers below the D seam of the Colinlea Sandstone. The revised model must include:

- a) Review of the hydrogeological conceptualisation used in the previous model;
- b) An update of the predicted impacts;
- c) Revised water balance model;
- d) Review of assumptions used in the previous model;
- e) Predictions of changes in groundwater levels for a range of scenarios;
- f) Information about any changes made since the previous model review, including data changes;
- g) A report outlining the justification for the refined model and the outputs of the refined model;
- h) An evaluation of the accuracy of the predicted changes in groundwater levels, groundwater flow rates to surface water and recommended actions to improve the accuracy of the model predictions.

E7 A report outlining the findings and any recommendations from the review under condition E6 must be completed by an appropriately qualified person and submitted to the administering authority for approval no later than 3 months after the commencement of the model review.

E8 Based on monitoring data collected in Condition E3 the holder of the Environmental Authority must provide the following to the administering authority for approval prior to any mining activities associated with box cut excavation:

- a) A proposed groundwater monitoring network for detecting potential impacts of the mine operations on groundwater quality.

Note: this network is to inform Table E1 and E2

- b) A groundwater monitoring network for detecting if:
 1. Drawdown caused by the mining operation may exceed predictions in the numerical model referred to in condition E6.
 2. State significant biodiversity values may be impacted.

Note: this network is to inform Table E3

E9 Groundwater quality monitoring

Groundwater quality and levels must be monitored at the locations and frequencies defined in *Table—E1 Groundwater monitoring locations and frequency for the mine site* for quality characteristics identified in *Table E2 - Groundwater quality triggers*. The monitoring must commence as soon as reasonably practical after approval by the administering authority in condition E8.

Table E1—Groundwater monitoring locations and frequency for the mine site

Monitoring Point ¹	Location		Surface RL (m) ²	Monitoring Frequency
	Easting (GDA94—Zone 55)	Northing (GDA94—Zone 55)		
Groundwater Monitoring points to cover the Alluvium, Tertiary, Bandanna Formation, Colinlea Sandstone, Rewan Formation, Dunda Beds, Clematis Sandstone and Early Permian				At least 2 monthly

Notes: 1. Monitoring is not required where a bore has been removed as a direct result of the mining activity.
 2. RL must be measured to the nearest 5cm from the top of the bore casing.
 3. Locations, monitoring frequency and surface RL to be finalised based on information provided to the administering authority under condition E8 (a)

Table E2 –Groundwater quality trigger levels

Parameter	Units	Contaminant Trigger Levels calculation to be based on	Contaminant Trigger Levels
Major anions and cations			
Calcium	mg/L Ca	85 th percentile of background	TBA
Magnesium	mg/L Mg	85 th percentile of background	TBA
Potassium	mg/L K	85 th percentile of background	TBA
Sodium	mg/L Na	85 th percentile of background	TBA
Chloride	mg/L Cl	85 th percentile of background	TBA
Sulphate	mg/L SO ₄	85 th percentile of background	TBA
Alkalinity	mg/L	85 th percentile of background	TBA
Sulphide	mg/L S ₂	85 th percentile of background	TBA
Fluoride	mg/L F	85 th percentile of background	TBA
Dissolved Metals			
Aluminium	µg/L Al	85 th percentile of background	TBA
Arsenic	µg/L As	85 th percentile of background	TBA
Boron	µg/L B	85 th percentile of background	TBA
Cadmium	µg/L Cd	85 th percentile of background	TBA
Chromium (Total)	µg/L Cr	85 th percentile of background	TBA
Cobalt	µg/L Co	85 th percentile of background	TBA
Copper	µg/L Cu	85 th percentile of background	TBA
Iron	µg/L Fe	85 th percentile of background	TBA
Lead	µg/L Pb	85 th percentile of background	TBA
Manganese	µg/L Mn	85 th percentile of background	TBA
Molybdenum	µg/L Mo	85 th percentile of background	TBA
Nickel	µg/L Ni	85 th percentile of background	TBA

Parameter	Units	Contaminant Trigger Levels calculation to be based on	Contaminant Trigger Levels
Selenium	µg/L Se	85 th percentile of background	TBA
Silver	µg/L Ag	85 th percentile of background	TBA
Uranium	µg/L U	85 th percentile of background	TBA
Vanadium	µg/L V	85 th percentile of background	TBA
Zinc	µg/L Zn	85 th percentile of background	TBA
Mercury	µg/L Hg	85 th percentile of background	TBA
Nutrients			
Ammonia	mg/L N	85 th percentile of background	TBA
Nitrate	mg/L N	85 th percentile of background	TBA
Nitrite	mg/L N	85 th percentile of background	TBA
Total phosphorous	mg/L P	85 th percentile of background	TBA
Hydrocarbons			
Total Petroleum Hydrocarbons	ppb (C ₆ -C ₄₀)	85 th percentile of background	TBA
BTEX	ppb	85 th percentile of background	TBA
Physio-chemical			
pH	pH units	85 th percentile of background	TBA
Electrical Conductivity	µS/cm	85 th percentile of background	TBA
Total Dissolved Solids	mg/L	85 th percentile of background	TBA

Note: Contaminant trigger levels to be finalised based on information provided to the administering authority under condition E8 (a)

E10 Trigger level investigation

If groundwater quality characteristics from groundwater monitoring bores identified as per *Table E1—Groundwater monitoring locations and frequency for mine site* reach any of the trigger levels stated in *Table E2 –Groundwater quality trigger levels*, an investigation must be undertaken by the holder of this environmental authority within 14 days of detection to determine if the exceedance is a result of:

- a) mining activities authorised under this environmental authority; or
- b) natural variation; or
- c) neighbouring land use resulting in groundwater impacts.

E11 If the investigation under condition E10 determines that the exceedance was the result of mining authorised under this environmental authority, then investigations must be undertaken by the holder of this environmental authority to establish whether environmental harm has occurred or may occur.

E12 If an investigation undertaken in accordance with condition E11 determines that environmental harm has or may occur, the holder of this environmental authority must

- a) Implement immediate measures to reduce the potential for environmental harm; and
- b) Develop long-term mitigation measures to address any existing groundwater contamination and prevent recurrence of groundwater contamination.

The holder of this environmental authority must provide details of the measures implemented to reduce the potential for environmental harm as well as the long-term mitigation measures to the administering authority within 28 days after completing the investigation under condition E11.

E13 Groundwater (water levels)

In the event that groundwater level fluctuations in excess of the groundwater level thresholds in Table E3 occur at the groundwater monitoring locations in Table E3, an investigation must be instigated within 14 days of detection to determine if the fluctuations are a result of:

- a) mining activities authorised under this environmental authority;
- b) pumping from licensed bores;
- c) seasonal variation; or
- d) neighbouring land use resulting in groundwater impacts.

Table E3 –Groundwater level thresholds

Monitoring location ¹	Unit	Easting (GDA94 - Zone 55)	Northing (GDA94 - Zone 55)	Groundwater level thresholds
Carmichael River Location				
TBA	Dunda Beds	TBA	TBA	To be determined ¹
TBA	Tertiary	TBA	TBA	
TBA	Alluvium	TBA	TBA	
TBA	Early Permian	TBA	TBA	
Great Artesian Basin to West of Mine Lease				
TBA	Rewan	TBA	TBA	To be determined
TBA	Dunda Beds	TBA	TBA	
TBA	Clematis	TBA	TBA	
Doongmabulla to West of Mine Lease				
TBA	D seam	TBA	TBA	To be determined
TBA	AB seam	TBA	TBA	
TBA	Rewan	TBA	TBA	
TBA	Dunda Beds	TBA	TBA	
TBA	Clematis	TBA	TBA	
Mellaluka Springs to the southeast of Mine Lease				
TBA	Tertiary	TBA	TBA	To be determined
TBA	Early Permian	TBA	TBA	
Early Warning Bores				
TBA	Early Permian	TBA	TBA	To be determined

Note: Locations and groundwater level thresholds to be finalised based on information provided to the administering authority under condition E8 (b) and the refined modelling under Condition E6.

E14 If the investigation under condition E13 concludes that the trigger exceedance is the result of mining activities authorised under this environmental authority, the holder of this environmental authority must:

- a) Notify the administering authority within 28 days of detection to determine
 1. Whether actual environmental harm has occurred or is likely to occur;
 2. Any proposed long-term mitigation measures required to address the affected groundwater resource.
 3. Proposed actions to reduce the potential for environmental harm
- b) Undertake an assessment of the associated impact to SSBVs in accordance with condition I4.

E15 When requested, the monitoring data collected in accordance with this schedule must be submitted to the administering authority in the format and at the frequency specified by the administering authority.

E16 Bore construction and maintenance and decommissioning

The construction, maintenance and management of groundwater bores (including groundwater monitoring bores) must be undertaken in a manner that prevents or minimises impacts to the environment and ensures the integrity of the bores to obtain accurate monitoring.

Schedule F—Water

F1 Release of contaminants

Contaminants that will, or have the potential to cause environmental harm must not be released directly or indirectly to any waters as a result of the authorised mining activities, except as permitted under the conditions of this environmental authority.

Discharge of mine affected water

F2 Unless otherwise permitted under the conditions of this environmental authority, the release of mine affected water to waters must only occur from the release points specified in *Table F1 - Mine affected water release points, sources and receiving waters* and depicted in *Figure F1: Water release/monitoring locations* attached to this environmental authority.

F3 The release of mine affected water to internal water management infrastructure installed and operated in accordance with a water management plan that complies with condition F26 is permitted.

Table F1—Mine Affected Water Release Points, Sources and Receiving Waters

Release Point (RP)	Latitude (decimal degree, GDA94)	Longitude (decimal degree, GDA94)	Contaminant Source and Location	Monitoring Point	Receiving Waters Description
RP1—Central MAW North	-22.073	146.435	Mine Affected Water Dam Central - North	Outlet works to Carmichael River	Carmichael River
RP2—Central MAW South	-22.118	146.375	Mine Affected Water Dam Central—South	Outlet works to Carmichael River	Carmichael River

F4 The release of mine affected water to waters in accordance with condition F2 must not exceed the release limits stated in *Table F2 - Mine affected water release limits* when measured at the monitoring points specified in *Table F1 - Mine affected water release points, sources and receiving waters* for each quality characteristic.

Table F2 - Mine affected water release limits

Quality characteristic	Release limits	Monitoring frequency
Electrical conductivity (µS/cm)	Release limits specified in Table F4 for variable flow criteria.	Continuous
pH (pH Unit)	6.5 (minimum) 9.0 (maximum)	Continuous
Turbidity (NTU)	5001	Continuous

¹ Turbidity release limits can be reviewed once sufficient monitoring data is available to adequately characterise the baseline turbidity in the Carmichael River (including consideration of natural spatial and temporal variability).

F5 The release of mine affected water to waters from the release points must be monitored at the locations specified in *Table F1 - Mine affected water release points, sources and receiving waters* for each quality characteristic and at the frequency specified in *Table F2 - Mine affected*

water release limits and Table F3 - Release contaminant trigger investigation levels, potential contaminants.

Note: the administering authority will take into consideration any extenuating circumstances prior to determining an appropriate enforcement response in the event condition F5 is contravened due to a temporary lack of safe or practical access. The administering authority expects the environmental authority holder to take all reasonable and practicable measures to maintain safe and practical access to designated monitoring locations.

Table F3 - Release contaminant trigger investigation levels, potential contaminants

Quality Characteristic	Trigger Levels (µg/L)	Monitoring frequency
Aluminium ¹	55	Commencement of release and thereafter weekly during release (first sample to be taken within 2 hours of commencement of release)
Arsenic ¹	13	
Cadmium ¹	0.2	
Chromium ¹	2	
Copper ¹	4	
Iron ¹	300	
Lead ¹	4	
Mercury ¹	0.2	
Nickel ¹	11	
Zinc ¹	30	
Boron ¹	370	
Cobalt ¹	90	
Manganese ¹	1900	
Molybdenum ¹	34	
Selenium ¹	10	
Silver ¹	1	
Uranium ¹	1	
Vanadium ¹	10	
Ammonia as N	900	
Nitrate as NO ₃	1100	
Total Nitrogen	590	
Total Phosphorus	200	
Petroleum hydrocarbons (C6-C9)	20	
Petroleum hydrocarbons (C10-C36)	100	
Fluoride	2000	
Sodium ¹	180,000	
Suspended Solids	106	
Sulphate (SO ₄ ²⁻) (mg/L)	1000	

¹ All metals and metalloids must be measured as total (unfiltered) and dissolved (filtered). Trigger levels for metal/ metalloids apply if dissolved results exceed trigger.

The quality characteristics required to be monitored as per Table F3 - Release contaminant trigger investigation levels, potential contaminants can be reviewed with the support of additional baseline monitoring data from the Carmichael River, or if it can be

Appendix 1. Mine conditions

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adequately demonstrated that there is negligible environmental risk. It may be determined that a reduced monitoring frequency is appropriate, that a trigger level be increased or reduced or that certain quality characteristics can be removed from Table F3 - Release contaminant trigger investigation levels, potential contaminants by amendment.

F6 If quality characteristics of the release exceed any of the trigger levels specified in *Table F3 - Release contaminant trigger investigation levels, potential contaminants* during a release event, the environmental authority holder must compare the downstream results in the receiving waters to the trigger values specified in *Table F3 - Release contaminant trigger investigation levels, potential contaminants* and:

- a) where the trigger values are not exceeded then no action is to be taken; or
- b) where the downstream results exceed the trigger values specified *Table F3 - Release contaminant trigger investigation levels, potential contaminants* for any quality characteristic, compare the results of the downstream site to the data from background monitoring sites and
 - 1. if the result is less than the background monitoring site data, then no action is to be taken; or
 - 2. if the result is greater than the background monitoring site data, complete an investigation into the potential for environmental harm and provide a written report to the administering authority within 90 days of receiving the result , outlining
 - i) details of the investigations carried out
 - ii) actions taken to prevent environmental harm.

Note: Where an exceedance of a trigger level has occurred and is being investigated, in accordance with F6 b (2) of this condition, no further reporting is required for subsequent trigger events for that quality characteristic.

F7 If an exceedance in accordance with condition F6 b (2) is identified, the holder of the environmental authority must notify the administering authority in writing within 24 hours of receiving the result.

Mine Affected Water Release Events

F8 The holder must ensure a stream flow gauging station/s is installed, operated and maintained to determine and record stream flows at the locations and flow recording frequency specified in *Table F4 - Mine affected water release during flow events*.

F9 Notwithstanding any other condition of this environmental authority, the release of mine affected water to waters in accordance with condition F2 must only take place during periods of natural flow in accordance with the receiving water flow criteria for discharge specified in *Table F4 - Mine affected water release during flow events* for the release point(s) specified in *Table F1 - Mine affected water release points, sources and receiving waters*.

F10 The release of mine affected water to waters in accordance with condition F2 must not exceed the Maximum Release Rate (for all combined release point flows) for each receiving water flow criterion for discharge specified in *Table F4 - Mine affected water release during flow events* when measured at the monitoring points specified in *Table F1 - Mine affected water release points, sources and receiving waters*.

Table F4 - Mine affected water release during flow events

Receiving waters/ stream	Release Point (RP)	Gauging station	Gauging Station Latitude (decimal degree, GDA94)	Gauging Station Longitude (decimal degree, GDA94)	Receiving Water Flow Recording Frequency	Receiving Water Flow Criteria for discharge (m ³ /s)	Maximum release rate (for all combined RP flows)	Electrical Conductivity Release Limits
Carmichael River	RP1 (Central MAW North) RP2 (Central MAW South)	Carmichael River CAR04 Gauging station	-22.1087960	146.3527180	Continuous (minimum daily)	Low Flow	0.05 m ³ /s	Electrical conductivity: 168 µS/cm (maximum)
						Medium Flow	0.25 m ³ /s	Electrical conductivity: 840 µS/cm (maximum)
						Medium Flow	0.5 m ³ /s	Electrical conductivity: 1850 µS/cm (maximum)
						High Flow	0.5 m ³ /s	Electrical conductivity: 3,500 µS/cm (maximum)
						<0.2 m ³ /s for a period of 28 days after natural flow events that exceed 0.2 m ³ /s		
						1 m ³ /s to 5 m ³ /s		
						5 m ³ /s to 10 m ³ /s		
						> 10 m ³ /s		

F11 The daily quantity of mine affected water released from each release point must be measured and recorded.

F12 Releases to waters must be undertaken so as not to cause erosion of the bed and banks of the receiving waters, or cause a material build-up of sediment in such waters.

Notification of Release Event

F13 The environmental authority holder must notify the administering authority as soon as practicable and no later than 24 hours after commencing to release mine affected water to the receiving environment. Notification must include the submission of written advice to the administering authority of the following information:

- a) release commencement date/time
- b) details regarding the compliance of the release with the conditions of Department Interest: Water of this environmental authority (that is, contaminant limits, natural flow, discharge volume)
- c) release point/s
- d) release rate
- e) release salinity
- f) receiving water/s including the natural flow rate.

Note: Notification to the administering authority must be addressed to the Manager and Project Manager of the local administering authority via email, facsimile or via the WaTERS reporting system.

F14 The environmental authority holder must notify the administering authority as soon as practicable and nominally no later than 24 hours after cessation of a release event of the cessation of a release notified under Condition F13 and within 28 days provide the following information in writing:

- a) release cessation date/time
- b) natural flow rate in receiving water
- c) volume of water released
- d) details regarding the compliance of the release with the conditions of Department Interest; Water of this environmental authority (i.e. contaminant limits, natural flow, discharge volume)
- e) all in-situ water quality monitoring results
- f) any other matters pertinent to the water release event.

Note: Successive or intermittent releases occurring within 24 hours of the cessation of any individual release can be considered part of a single release event and do not require individual notification for the purpose of compliance with conditions F13 and F14, provided the relevant details of the release are included within the notification provided in accordance with conditions F13 and F14.

Notification of Release Event Exceedance

F15 If the release limits defined in *Table F2 - Mine affected water release limits* are exceeded, the holder of the environmental authority must notify the administering authority within 24 hours of receiving the results.

F16 The environmental authority holder must, within 28 days of a release that is not compliant with the conditions of this environmental authority, provide a report to the administering authority detailing:

- a) the reason for the release
- b) the location of the release
- c) the total volume of the release and which (if any) part of this volume was non-compliant
- d) the total duration of the release and which (if any) part of this period was non-compliant
- e) all water quality monitoring results (including all laboratory analyses)
- f) identification of any environmental harm as a result of the non-compliance
- g) all calculations
- h) any other matters pertinent to the water release event.

Receiving Environment Monitoring and Contaminant Trigger Levels

F17 The quality of the receiving waters must be monitored at the locations specified in *Table F6 - Receiving water upstream background sites and downstream monitoring points* for each quality characteristic and at the monitoring frequency stated in *Table F5 - Receiving waters contaminant trigger levels*.

Table F5—Receiving waters contaminant trigger levels

Quality Characteristic	Trigger Level	Monitoring Frequency
pH	6.5–9.0	Daily during the release
Electrical Conductivity (µS/cm)	270	
Turbidity (NTU)	660	
Sulphate (SO ₄ ²⁻) (mg/L)	250	
Sodium (mg/L)	180	

Table F6 - Receiving water upstream background sites and downstream monitoring points

Monitoring Points	Receiving Waters Location Description	Latitude (decimal degree, GDA94)	Longitude (decimal degree, GDA94)
Upstream Background Monitoring Points			
CAR04	Carmichael River at US GS	-22.1087960	+146.3527180
BEL02	Belyando River at Bygana Waterhole	-22.1620320	+146.5285470
Downstream Monitoring Points			
CAR01	Carmichael River far DS mining lease	-22.0740740	+146.4675990
BEL01	Belyando River at Carmichael/Moray Rd	-21.9594600	+146.6568190

Table F6 - Receiving water upstream background sites and downstream monitoring points notes:

- (a) The upstream monitoring point should be within 5 km of the nearest release point.
- (b) The downstream point should not be greater than 3 km from the nearest release point.
- (c) The data from background monitoring points must not be used where they are affected by releases from other mines.

F18 If quality characteristics of the receiving water at the downstream monitoring points exceed any of the trigger levels specified in *Table F5 - Receiving waters contaminant trigger levels* during a release event the environmental authority holder must compare the downstream results to the upstream results in the receiving waters and:

- a) where the downstream result is the same or a lower value than the upstream value for the quality characteristic then no action is to be taken; or
- b) where the downstream results exceed the upstream results complete an investigation into the potential for environmental harm and provide a written report to the administering authority in the next annual return, outlining
 1. details of the investigations carried out
 2. actions taken to prevent environmental harm.

Note: Where an exceedance of a trigger level has occurred and is being investigated, in accordance with F18 b) of this condition, no further reporting is required for subsequent trigger events for that quality characteristic.

F19 All determinations of water quality and biological monitoring must be performed by an appropriately qualified person.

Receiving Environment Monitoring Program (REMP)

F20 The environmental authority holder must develop and implement a Receiving Environment Monitoring Program (REMP) to monitor, identify and describe any adverse impacts to surface water environmental values, quality and flows due to the authorised mining activity. This must include monitoring the effects of the mine on the receiving environment periodically (under natural flow conditions) and while mine affected water is being discharged from the site. For the purposes of the REMP, the receiving environment is the waters of the Carmichael River and connected or surrounding waterways within 12 km downstream of the release (this includes the Belyando River, immediately downstream of the confluence with the Carmichael River). The REMP should encompass any sensitive receiving waters or environmental values downstream of the authorised mining activity that will potentially be directly affected by an authorised release of mine affected water.

F21 A REMP Design Document that addresses the requirements of the REMP must be prepared and made available to the administering authority upon request.

F22 A report outlining the findings of the REMP, including all monitoring results and interpretations must be prepared annually and made available on request to the administering authority. This must include an assessment of background reference water quality, the condition of

downstream water quality compared against water quality objectives, and the suitability of current discharge limits to protect downstream environmental values.

Water reuse

F23 Mine affected water may be piped or trucked or transferred by some other means that does not contravene the conditions of this environmental authority and deposited into artificial water storage structures, such as farm dams or tanks, or used directly at properties owned by the environmental authority holder or a third party (with the consent of the third party).

Annual Water Monitoring Reporting

F24 The following information must be recorded in relation to all water monitoring required under the conditions of this environmental authority and submitted to the administering authority in the specified format:

- a) the date on which the sample was taken
- b) the time at which the sample was taken
- c) the monitoring point at which the sample was taken
- d) the measured or estimated daily quantity of mine affected water released from all release points
- e) the release flow rate at the time of sampling for each release point
- f) the results of all monitoring and details of any exceedances of the conditions of this environmental authority
- g) water quality monitoring data must be provided to the administering authority in the specified electronic format upon request.

Water Management Plan

F25 A Water Management Plan must be developed by an appropriately qualified person and implemented.

Stormwater and Water sediment controls

F26 An Erosion and Sediment Control Plan must be developed by an appropriately qualified person and implemented for all stages of the mining activities on the site to minimise erosion and the release of sediment to receiving waters and contamination of stormwater.

F27 Stormwater, other than mine affected water, is permitted to be released to waters from:

- a) erosion and sediment control structures that are installed and operated in accordance with the Erosion and Sediment Control Plan required by condition F26
- b) water management infrastructure that is installed and operated, in accordance with a Water Management Plan that complies with condition F25, for the purpose of ensuring water does not become mine affected water.

Schedule G—sewage treatment

G1 The only contaminant permitted to be released to land or to mine affected water storages is treated sewage effluent in compliance with the release limits stated in *Table G1*.

Table G1 - Contaminant release limits to land or mine affected water storages

Contaminant	Unit	Release limit	Limit type	Monitoring Frequency
5 day Biochemical oxygen demand (BOD) ₁	mg/L	20	Maximum	Monthly
Total suspended solids	mg/L	30	Maximum	Monthly
Nitrogen	mg/L	30	Maximum	Monthly
Phosphorus	mg/L	15	Maximum	Monthly
E-coli	Organisms/100ml	10	Maximum	Monthly

- G2** All effluent released from the treatment plant must be monitored at the frequency and for the parameters specified in *Table G1 - Contaminant release limits to land or mine affected water storages*.
- G3** The daily volume of effluent release to land or mine affected water storages must be measured and records kept of the volumes of effluent released.

Schedule H –Land and rehabilitation

H1 Rehabilitation

Land disturbed by mining activities authorised under the Environmental Authority must be rehabilitated in accordance with *Table H1* (Appendix A) and Figures H1, H2, H3 and H4.

- H2** The rehabilitation completion criteria outlined in *Table H1* (Appendix A) must be reviewed by an appropriately qualified person by <insert date 5 years after EA issue date>, and from then on every 5 years with any proposed amendments or changes submitted to the administering authority for approval.

H3 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 *Table H1*. 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:

- Progressive certification of rehabilitation under chapter 5A of the *Environmental Protection Act 1994*.
- 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 upon request.

- H4** Rehabilitation must commence progressively in accordance with the plan of operations.

- H5** Self-sustaining vegetation and native ecosystem, as per *Table H1* (located in Appendix A of this Environmental Authority), must be consistent with the reference sites identified in *Table H2* and *Figure H5*.

Table H2: Reference Sites

Reference Site ID	Final Land Use Objective	Latitude (decimal degree, GDA94)	Longitude (decimal degree, GDA94)	Regional Ecosystem Reference
1	Pasture	-22° 6' 11.833"	146° 22' 11.927"	Not Applicable
2	Pasture	-22° 5' 44.893"	146° 26' 51.605"	Not Applicable
3	Pasture	-22° 6' 4.986"	146° 25' 15.388"	Not Applicable
4	Woodland and Pasture	-22° 7' 27.108"	146° 27' 48.783"	10.3.12a
5	Woodland	-21° 56' 47.229"	146° 13' 27.199"	10.5.5a, 10.5.5a/10.3.6ax1
6	Woodland	-21° 54' 12.481"	146° 17' 5.682"	10.5.5a/10.3.6ax1
7	Woodland	-21° 53' 53.108"	146° 15' 51.986"	10.5.5a/10.3.6ax1
8	Woodland and Pasture	-22° 17' 37.791"	146° 29' 27.491"	10.3.6a
9	Woodland and Pasture	-22° 15' 40.375"	146° 28' 36.881"	10.5.5a/10.3.6ax1
10	Woodland	-22° 13' 42.943"	146° 27' 25.175"	10.5.5a

Reference Site ID	Final Land Use Objective	Latitude (decimal degree, GDA94)	Longitude (decimal degree, GDA94)	Regional Ecosystem Reference
11	Pasture	-22° 12' 6.558"	146° 28' 16.570"	Not Applicable
12	Woodland and Pasture	-22° 6' 45.187"	146° 22' 2.562"	10.3.6a

H6 Residual void outcome

Residual 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 residual void itself and subject to any other condition within this environmental authority.

H7 Residual voids, as detailed and presented in *Figure H1* for Open Cut Pits B, C, D, E, F and G are authorised in accordance with *Table H3*.

Table H3: Residual Voids

Open Cut Pit	Residual Void Treatment
B	Residual void authorised to the depth of the top of the D1 Seam at the highwall face
C	Residual void authorised to the depth of the top of the AB1 Seam at the highwall face
D	Residual void authorised to the depth of the top of the D1 Seam at the highwall face
E	Residual void authorised to the depth of the top of the AB1 Seam at the highwall face
F	Residual void authorised to the depth of the top of the AB1 Seam at the highwall face
G	Residual void authorised to the depth of the top of the D1 Seam at the highwall face

H8 Topsoil management plan

A topsoil management plan must be developed by an appropriately qualified person and implemented.

H9 Mining Waste and Rejects Management

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 runoff 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) rehabilitation strategy.
- 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.

H10 Reject disposal areas must be designed and constructed to ensure that any runoff or seepage from the reject disposal area is contained within the mine water management system.

H11 Contaminated Land

Before applying for surrender of a mining lease, 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 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.

H12 Before applying for progressive rehabilitation certification for 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 area the subject of the application 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 under condition H1.

H13 Minimise the potential for contamination of land by hazardous contaminants.

H14 Chemicals and flammable or combustible liquids

All flammable and combustible liquids must be contained within an on-site containment system and controlled in a manner that prevents environmental harm and maintained in accordance with the current edition of *AS 1940—Storage and Handling of Flammable and Combustible Liquids*.

H15 All chemicals and flammable or combustible liquids stored on site that have the potential to cause environmental harm must be stored in or serviced by an effective containment system that is impervious to the materials stored and managed to prevent the release of liquids to waters or land. Where no relevant Australian standard exists, store such materials within an effective on-site containment system, the holder of this environmental authority must;

- a) 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.

Schedule I—Offsets and biodiversity

- I1** The holder of this environmental authority must provide an offset for impacts on applicable state significant biodiversity values, in accordance with the Carmichael Coal Project Biodiversity Offset Strategy <dated XXXX>. The biodiversity offset must be provided:
- a) prior to impacting on state significant biodiversity values; or
 - b) where a land based offset is to be provided, within 36 months of the later of either of the following:
 - 1. the date of issue of this environmental authority; or
 - 2. the relevant stage identified in the Biodiversity Offset Strategy; or
 - c) where an offset payment is to be provided, within 4 months of the later of either of the following:
 - 1. the date of issue of this environmental authority; or
 - 2. the relevant stage identified in the Biodiversity Offset Strategy.

Review of Biodiversity Offset Delivery

- I2** The Biodiversity Offset Strategy must be reviewed by <insert date 5 years after EA issue date>, and from then on every 5 years with a report prepared by an appropriately qualified person. The report must:
- a) Assess the area of state significant biodiversity value proposed to be impacted by the mining activities in the Biodiversity Offset Strategy; and
 - b) Identify the actual on ground areas of state significant biodiversity value impacted by the mining activities.
- I3** If an investigation conducted under conditions E13 or E14 of this environmental authority indicates that there is a risk of impacting a state significant biodiversity value, or condition J11 is triggered, the Biodiversity Offset Strategy must be reviewed and a report must be prepared within 3 months by an appropriately qualified person. The report must:
- a) Assess the area of state significant biodiversity value proposed to be impacted by the mining activities in the Biodiversity Offset Strategy; and
 - b) Identify the actual on ground areas of state significant biodiversity value impacted by the mining activities.
- I4** If the review under condition I3 or I4 finds that the actual areas of disturbance to state significant biodiversity values differs from the area of disturbance as detailed in the Biodiversity Offset Strategy, the holder of the environmental authority must amend the Biodiversity Offset Strategy as per condition I5 and deliver the amended offset requirement within 12 months.
- I5** In response to condition I4 the holder of this environmental authority may apply to the administering authority to amend the Biodiversity Offset Strategy within either 30 days, or a lesser period agreed to by the administering authority, prior to impacting on the applicable state significant biodiversity value.

Black-throated finch (BTF) Species Management Plan (SMP) at Carmichael project

- I6** The holder of this environmental authority must submit a BTF SMP prepared and certified by a suitably qualified person to the administering authority prior to commencement of project stage 2 for approval. The holder must publish the BTF SMP on its website within 10 business days of receiving the administering authority's approval in writing. The holder must align the SMP with any Bioregional BTF Management Plan and relevant documentation requirements under the *Environmental Protection and Biodiversity Conservation Act 1999* including BTF Recovery Plan, conservation advice and the threat abatement plan.

The submitted BTF SMP plan must include:

- a) A baseline research program on the specific nesting and feeding requirements of the species that will be undertaken prior to and during project stage 1;
- b) A baseline research program to establish whether the BTF at the project site are sedentary, locally migratory or regionally migratory;
- c) A description of how the results of baseline research are to be used to determine any changes of classification of and/or impact on BTF habitat;

- d) Details of proposed impacts to BTF habitat from each project stage including impacts from clearing, subsidence, ecological function changes, hydrological changes and weed and pest infestation changes; and
 - e) Mitigation measures to be undertaken to avoid, mitigate and manage impact resulting from each stage of the project, including rehabilitation of habitat.
- I7** The BTF SMP under condition I6 must be reviewed by an appropriately qualified person annually and a report prepared on 1 July each year. The report must:
- a) assess the plan against the requirements under condition I6;
 - b) include recommended actions to ensure actual and potential environmental impacts are effectively managed for the coming year; and
 - c) identify any amendments made to the BTF SMP following the review.

Groundwater Dependent Ecosystems Management Plan

- I8** The proponent must develop and implement a Groundwater Dependent Ecosystems Management Plan (GDEMP) to detail the management of threats to defined environmental values and to report results and corrective actions for each GDE over the full period of mining activities and for a period of five years post mining rehabilitation.
- I9** The GDEMP must be approved by the administering authority in writing and the GDEMP published on a website before the commencement of project stage 2.
- I10** For the purposes of conditions I8 and I9, the GDEs include the affected Carmichael River riparian zone (ecosystems associated with the Carmichael River between Doongmabulla Springs and the Belyando River, including populations of Waxy Cabbage Palm), the Lignum, Stories and Mellaluka springs and the Doongmabulla, Spring complex.
- I11** A report of the findings of the GDEMP, including all monitoring results and interpretations, must be prepared annually and made available on request to the administering authority. The report must include:
- a) an assessment of background reference groundwater levels (see condition E9)
 - b) the condition of each GDE compared with previous monitoring results
 - c) the suitability of current groundwater trigger thresholds (as defined in condition E13)
 - d) detail on the effectiveness of avoidance, mitigation and management actions in curtailing adverse impacts on GDE ecosystems
 - e) a description of any adaptive management initiatives implemented
 - f) any offsets required for residual impacts

Schedule J—Subsidence

- J1** Subsidence is authorised within the subsidence impact area identified in Figure A3.
- J2** A Subsidence Management Plan must be developed and certified by an appropriately qualified person and implemented by the holder of this environmental authority prior to the commencement of activities that result in subsidence.
- J3** The Subsidence Management Plan must:
- a) provide for the proper and effective management of the actual and potential environmental impacts resulting from the mining activity authorised by this environmental authority and to ensure compliance with the conditions of this environmental authority;
 - b) include baseline data;
 - c) describe the proposed impacts of subsidence on any land, Black Throated Finch (BTF) habitat, watercourse and floodplain including but not limited to:
 1. physical condition of surface drainage:
 - 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;
 - ix) BTF habitat
2. overland flow:
 - i) capture of overland flow by subsided long-wall panels;
 - ii) increased overbank flows due to lowering of high bank of watercourses;
 - iii) the portion of local and large scale catchment likely to be captured by subsided long-wall panels and the associated impacts on downstream users;
 3. water quality:
 - i) surface water;
 - ii) groundwater;
 4. land condition: current land condition to be impacted by subsidence;
 5. 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;
- d) propose options for mitigating any impacts associated with subsidence, how these mitigation methods will be implemented, and the extent to which these measures will impact a state significant biodiversity value(s);
 - e) describe cumulative impacts on watercourses, diversions or catchments;
 - f) describe impacts on groundwater;
 - g) quantify the area of on ground impacts to state significant biodiversity values; and
 - h) include a program for monitoring and review of the effectiveness of the Subsidence Management Plan.

Guidance material has been provided in Appendix B to assist with the development of the Subsidence Management Plan.

J4 The Subsidence Management Plan must be reviewed each calendar year and a report prepared on 1 July each year and certified by an appropriately qualified person. The report must:

- a) assess the plan against the requirements under condition J3 and the certified reports required under J10;
- b) include recommended actions to ensure actual and potential environmental impacts are effectively managed for the coming year; and
- c) identify any amendments made to the Subsidence Management Plan following the review.

J5 The holder of this environmental authority must attach a written response and recommended actions to the review report required by condition J4. The response must detail the actions taken and/or proposed to be taken in order to ensure continuing compliance with this environmental authority.

J6 The review report required by condition J4 and the written response to the review report required by condition J5 must be submitted to the administering authority upon request.

J7 Annual Inspection of Subsidence

The holder of this environmental authority must arrange for each subsided longwall panel to be inspected annually by an appropriately qualified person, in accordance with conditions J8 through to J10 inclusive.

If the appropriately qualified person deems and records under J9 that a subsided long wall no longer has an associated environmental risk, the long wall panel does not need to be reinspected in the future annual inspections under condition J7 to J9.

J8 The annual inspection must be conducted between 1 April and 1 November each year.

J9 At each annual inspection, the condition of each subsided longwall panel must be assessed by an appropriately qualified person. The inspection must include assessments of the structural, geotechnical and hydraulic adequacy of the subsided longwall panel and the adequacy of the works with respect to the Subsidence Management Plan.

- J10** For each inspection required under condition J9, copies of a report certified by the an appropriately qualified person, including any recommendations to ensure the integrity of each subsided longwall panel, must be provided to the administering authority upon request.
- J11** If the review under J4 or J7 indicates that the impact to State Significant Biodiversity Values caused by mining activities authorised under this environmental authority differs from the area of disturbance detailed in the Biodiversity Offset Strategy, the holder of this Environmental Authority must undertake a review in accordance with conditions I4 and I5.

Schedule K—Dams and levees

Consequence Category

- K1** The consequence category of any regulated 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 (EM635)* at the following times:
- prior to the design and construction of the structure, if it is not an existing structure; or
 - if it is an existing structure, prior to the adoption of this schedule; or
 - 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 (EM635)*.

Design and Construction of a Regulated Structure

- K4** All regulated structures must be designed by, and constructed 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 (EM635)*.
- K5** Construction of a regulated structure is prohibited unless the holder of this environmental authority has submitted a consequence category assessment report and certification to the administering authority which has been certified by a suitably qualified and experienced person for the design and design plan and the associated operating procedures 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 (EM635)*, and must be recorded in the Register of Regulated Structures.
- K7** Regulated structures must:
- be designed and constructed in accordance with and conform to the requirements of the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*;
 - be designed and constructed with due consideration given to ensuring that the design integrity would not be compromised on account of:
 - floodwaters from entering the regulated dam from any watercourse or drainage line; and
 - wall failure due to erosion by floodwaters arising from any watercourse or drainage line.
 - For dams associated with a failure to contain; 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.

Operation of a regulated structure

K9 Operation of a regulated structure, except for an existing structure, is prohibited unless:

- a) the holder of this environmental authority has submitted to the administering authority:
 1. one paper copy and one electronic copy of the design plan and certification of the 'design plan' in accordance with condition K6;
 2. a set of 'as constructed' drawings and specifications;
 3. certification of those 'as constructed drawings and specifications' in accordance with condition K8; and
 4. where the regulated structure is to be managed as part of an integrated containment system for the purpose of sharing the DSA volume across the system, a copy of the certified system design plan;
- b) the requirements of this environmental authority relating to the construction of the regulated structure have been met;
- c) the holder has entered the details required under this environmental authority into a Register of Regulated Structures; and
- d) there is a current operational plan for the regulated structure.

K10 Each regulated structure must be maintained and operated, for the duration of its operational life until decommissioned and rehabilitated, in a manner that is consistent with the current operational plan and, if applicable, the current design plan and associated certified 'as constructed' drawings.

Mandatory Reporting Level

K11 Conditions K11 to K15 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 of this environmental authority must, as soon as practical and 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 of this environmental authority 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 of this environmental authority must record any changes to the MRL in the Register of Regulated Structures.

Design storage allowance

K16 The holder of this environmental authority 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 Design Storage Allowance (DSA) volume for the dam (or network of linked containment systems).

K18 The holder of this environmental authority must, as soon as possible and 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 of this environmental authority 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.

Annual Inspection

- K20** 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 recommended actions to ensure the integrity of the regulated structure.
- 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 (EM635)*.
- K23** The holder of this environmental authority must:
- a) Within 20 business days of receipt of the annual inspection report, provide to the administering authority:
 1. The recommendations section of the annual inspection report; and
 2. If applicable, any actions being taken in response to those recommendations; and
 - b) If, following receipt of the recommendations and (if applicable) actions, the administering authority requests a full copy of the annual inspection report from the holder, provide this to the administering authority within 10 business days of receipt of the request.

Transfer arrangements

- K24** The holder of this environmental authority must provide a copy of any reports, documentation and certifications prepared under this authority, including but not limited to any Register of Regulated Structures, consequence assessment, design plan and other supporting documentation, to a new holder on transfer of this authority.

Decommissioning and rehabilitation

- K25** Dams must not be abandoned but must be either:
- a) decommissioned and rehabilitated to achieve compliance with condition (K26); or
 - b) be left in-situ for a beneficial use(s) provided that:
 1. it no longer contains contaminants that will migrate into the environment; and
 2. it contains water of a quality that is demonstrated to be suitable for its intended beneficial use(s); and
 3. the administering authority, the holder of this environmental authority and the landholder agree in writing that the dam will be used by the landholder following the cessation of the environmentally relevant activity(ies).
- K26** After decommissioning, all significantly disturbed land caused by the carrying out of the environmentally relevant activity(ies) must be rehabilitated to meet the following final acceptance criteria:
- a) the landform is safe for humans and fauna;
 - b) the landform is stable with no subsidence or erosion gullies for at least three (3) years;
 - c) any contaminated land (e.g. contaminated soils) is remediated and rehabilitated;
 - d) not allowing for acid mine drainage;
 - e) there is no ongoing contamination to waters (including groundwater);
 - f) rehabilitation is undertaken in a manner such that any actual or potential acid sulfate soils on the area of significant disturbance are treated to prevent or minimise environmental harm in accordance with the Instructions for the treatment and management of acid sulfate soils (2001);
 - g) all significantly disturbed land is reinstated to the pre-disturbed soil suitability class;
 - h) for land that is not being cultivated by the landholder:
 1. groundcover, that is not a declared pest species is established and self-sustaining;
 2. vegetation of similar species richness and species diversity to pre-selected analogue sites is established and self-sustaining; and

- 3. the maintenance requirements for rehabilitated land is no greater than that required for the land prior to its disturbance caused by carrying out the petroleum activity(ies); and
- i) for land that is to be cultivated by the landholder, cover crop is revegetated, unless the landholder will be preparing the site for cropping within 3 months of petroleum activities being completed.

Register of Regulated Structures

- K27** A Register of Regulated Structures must be established and maintained by the holder for each regulated dam.
- K28** 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.
- K29** The holder must make a final entry of the required information in the Register of Regulated Structures once compliance with condition K9 has been achieved.
- K30** The holder must ensure that the information contained in the Register of Regulated Structures is current and complete on any given day.
- K31** All entries in the Register of Regulated Structures must be endorsed by the chief executive officer for the holder of this authority, or their delegate, as being accurate and correct.
- K32** 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.

Attachment A—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 1994 or subordinate legislation, the definition in the EP Act or subordinate legislation must be used.

‘acid rock drainage’ means any contaminated discharge emanating from a mining activity formed through a series of chemical and biological reactions, when geological strata is disturbed and exposed to oxygen and moisture.

‘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).

‘annual exceedance probability’ or **‘AEP’** the probability that at least one event in excess of a particular magnitude will occur in any given year.

‘annual inspection report’ means an assessment prepared by a suitably qualified and experienced person containing details of the assessment against the most recent consequence assessment report and design plan (or system design plan);

- (a) against recommendations contained in previous annual inspections reports;
- (b) against recognised dam safety deficiency indicators;
- (c) for changes in circumstances potentially leading to a change in consequence category;
- (d) for conformance with the conditions of this authority;
- (e) for conformance with the ‘as constructed’ drawings;
- (f) for the adequacy of the available storage in each regulated dam, based on an actual observation or observations taken after 31 May each year but prior to 1 November of that year, of accumulated sediment, state of the containment barrier and the level of liquids in the **dam** (or network of linked containment systems);
- (g) for evidence of conformance with the current operational plan.

‘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.

‘assessed’ or **‘assessment’** by a suitably qualified and experienced person in relation to a consequence assessment of a dam, 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 of the assessment:

- (a) exactly what has been assessed and the precise nature of that determination;
- (b) the relevant legislative, regulatory and technical criteria on which the assessment has been based;
- (c) the relevant data and facts on which the assessment has been based, the source of that material, and the efforts made to obtain all relevant data and facts; and
- (d) the reasoning on which the assessment has been based using the relevant data and facts, and the relevant criteria.

‘associated works’ in relation to a dam, means:

- (a) operations of any kind and all things constructed, erected or installed for that dam; and
- (b) any land used for those operations.

‘authority’ means an environmental authority.

'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 reuse.

'BTF Management Plan' refers to the plan prepared in accordance with the conditions of the environmental authority for the project's mining activities issued under the *Environmental Protection Act 1994* (Qld)

'Carmichael Coal Project Biodiversity Offset Strategy' means the Biodiversity Offset Strategy approved by the Coordinator-General in accordance with the imposed conditions under Section 54B of the *State Development and Public Works Organisation Act 1971* for the Carmichael Coal Mine and Rail project.

'certifying, certify, certification or certified relating to regulated structures' means assessment and approval must be undertaken by a suitably qualified and experienced person in relation to any assessment or documentation required by this Manual, including design plans, 'as constructed' drawings and specifications, construction, operation or an annual report regarding regulated structures, undertaken in accordance with the Board of Professional Engineers of Queensland Policy Certification by RPEQs (ID: 1.4 (2A)).

In all other cases **'certifying, certify, certification or certified'** means by an appropriately qualified and experienced person in relation to any program, plan or report, 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; and
- (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;
- (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.

'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.

Note: A 'sensitive place' and 'commercial place' is based on Schedule 1 of EPP Noise. That is a commercial place is inside or outside a commercial or retail activity.

'consequence' in relation to a structure as defined, means the potential for environmental harm resulting from the collapse or failure of the structure to perform its primary purpose of containing, diverting or controlling flowable substances.

'consequence 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 the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*.

'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.

'dam' means a land-based structure or a void that contains, diverts or controls flowable substances, and includes any substances that are thereby contained, diverted or controlled by that land-based structure or void and **associated works**.

'dam crest volume' means the volume of material (liquids and/or solids) that could be within the walls of a dam at any time when the upper level of that material is at the crest level of that dam. That is, the instantaneous maximum volume within the walls, without regard to flows entering or leaving (for example, via spillway).

'design document' for the purposes of a REMP is a document that demonstrates compliance with condition F21. The document should also address each criterion on what a REMP should be as outlined in the guide.

'design plan' is a document setting out how all identified consequence scenarios are addressed in the planned design and operation of a regulated structure.

'design storage allowance' or **'DSA'** means an available volume, estimated in accordance with the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)* published by the administering authority, must be provided in a dam as at 1 November each year in order to prevent a discharge from that dam to an **annual exceedance probability (AEP)** specified in that Manual.

'designer' for the purposes of a regulated dam, means the certifier of the design plan for the regulated dam.

'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; or
- (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.

'EC' means electrical conductivity.

'effluent' treated waste water released from sewage treatment plants.

'emergency action plan' means documentation forming part of the operational plan held by the holder or a nominated responsible officer, that identifies emergency conditions that sets out procedures and actions that will be followed and taken by the dam owner and operating personnel in the event of an emergency. The actions are to minimise the risk and consequences of failure, and ensure timely warning to downstream communities and the implementation of protection measures. The plan must require dam owners to annually update contact.

'existing structure' means a structure that was in existence prior to the adoption of this schedule of conditions under the authority.

'extreme storm storage'—means a storm storage allowance determined in accordance with the criteria in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)* published by the administering authority

'Groundwater Dependent Ecosystem Management Plan (GDEMP)'

A GDEMP is a plan developed by a suitably qualified and experienced person that is consistent with any Bioregional Management Plan for the bioregion, the Water Resource (Great Artesian Basin) Plan and relevant threat abatement plans, conservation advice and project species management plans. The plan must include:

- (1) A description and map of each GDE potentially or indirectly impacted by mining activities
- (2) Detailed baseline monitoring (using QuickBird imagery or similar) to be undertaken on the specific ecology of each GDE, groundwater level, groundwater and surface water quality, threatened species and ecosystem function
- (3) Detailed baseline research to establish:
 - (a) the extent and ecological composition of each GDE, in accordance with the Wetland Monitoring Methodology for springs in the Great Artesian Basin (R. Fensham, 2009) where applicable
 - (b) the source aquifer(s) for groundwater supply to the GDE
 - (c) the natural variation of the groundwater level/pressure
 - (d) GDE ecosystem pressure response to groundwater level/pressure fluctuation
- (4) A description of how the results of baseline research and annual monitoring are to be used to determine any changes in GDE ecology attributable to mining activities
- (5) A description of the potential impact on each GDE from each project stage including impacts from subsidence, mine dewatering of aquifers, water discharge, hydrological changes and weed and pest infestation
- (6) Mitigation measures to be undertaken to avoid, mitigate, offset and manage impacts to GDE environmental values resulting from each stage of the project

'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 Consequence Categories and Hydraulic Performance of Structures (EM635)*.

'holder' means:

- (a) where this document is an environmental authority, any person who is the holder of, or is acting under, that environmental authority; or
- (b) where this document is a development approval, any person who is the registered operator for that development approval.

'incident' means a set of circumstances arising as a result of activities carried out under an environmental authority which cause or threaten to cause environmental harm

'infrastructure' means water storage dams, levees,, roads and tracks, buildings and other structures built for the purpose of the mining activity.

'land' in the 'land schedule' of this document 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 activities.

'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.

'levee' means an embankment that only provides for the containment and diversion of stormwater or flood flows from a contributing catchment, or containment and diversion of flowable materials resulting from releases from other works, during the progress of those stormwater or flood flows or those releases; and does not store any significant volume of **water** or **flowable substances** at any other times.

'low consequence dam' means any dam that is not a high or significant consequence category as assessed using the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*; and

'm' means metres.

'mandatory reporting level' or **'MRL'** means a warning and reporting level determined in accordance with the criteria in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)* published by the administering authority.

'manual' means the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)* published by the administering authority.

'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.

'mine affected water':

- (a) means the following types of water:
 - (i) pit water, tailings dam water, processing plant water;
 - (ii) 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;
 - (iii) rainfall runoff which has been in contact with any areas disturbed by mining activities which have not yet been rehabilitated, excluding rainfall runoff 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 runoff, provided that this water has not been mixed with pit water, tailings dam water, processing plant water or workshop water;
 - (iv) groundwater which has been in contact with any areas disturbed by mining activities which have not yet been rehabilitated;
 - (v) groundwater from the mine's dewatering activities;
 - (vi) a mix of mine affected water (under any of paragraphs i)-v) and other water.
- (a) does not include surface water runoff 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:
 - (vii) 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

- (viii) 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:
 - (1) areas that are been capped and have monitoring data demonstrating hazardous material adequately contained with the site;
 - (2) 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 runoff; or both.

'mine site' means the area of land on which the project is located

'modification' or **'modifying'** (see definition of 'construction')

'NATA' means National Association of Testing Authorities, Australia.

'natural flow' means the flow of water through waters caused by nature.

'non-polluting' means having no adverse impacts upon the receiving environment.

'operational plan' includes:

- (a) normal operating procedures and rules (including clear documentation and definition of process inputs in the DSA allowance);
- (b) contingency and emergency action plans including operating procedures designed to avoid and/or minimise environmental impacts including threats to human life resulting from any overtopping or loss of structural integrity of the regulated structure.

'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).

'project' means the Carmichael Coal Mine located within Mining Lease (applications) 70441, 70505 and 70506

'project stage 1' means project activities carried out prior to commencement of significant ground disturbance including:

- (a) pre-construction surveying and technical assessment including geotechnical, establishment of site security arrangements (including signs, fences, safety barriers, and temporary security personnel facilities) and maintenance of existing roads and tracks;
- (c) installation of facilities for the purpose of environmental monitoring compliance; and
- (d) other works limited to the existing site facilities and access roads.

'project stage 2' means project activities, other than activities carried out under project stage 1, leading to the production of coal including:

- (a) removal of existing structures, site clearance
- (e) construction of access roads, potable water treatment and sewage treatment plants, new power plants, mine administrative buildings, water storage infrastructure and hardstanding
- (f) removal and stockpiling of overburden and excavation of box cuts for open pit or underground mining
- (g) commencement of dewatering operations.

'protected area' means—a protected area under the *Nature Conservation Act 1992*; or

- (a) a marine park under the *Marine Parks Act 1992*; or
- (h) a World Heritage Area.

'receiving environment' in relation to an activity that causes or may cause environmental harm, means the part of the environment to which the harm is, or may be, caused. The receiving environment includes (but is not limited to):

- (a) a watercourse;
- (i) groundwater; and
- (j) an area of land that is not specified in Schedule # – Table # (Authorised Activities) of this environmental authority.

The term does not include land that is specified in Table A3 of this environmental authority.

'receiving waters' means the waters into which this environmental authority authorises releases of mine affected water.

'Register of Regulated Dams' includes:

- (a) Date of entry in the register;
- (k) Name of the dam, its purpose and intended/actual contents;
- (l) The consequence category of the dam as assessed using the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635);
- (m) Dates, names, and reference for the design plan plus dates, names, and reference numbers of all document(s) lodged as part of a design plan for the dam;
- (n) Name and qualifications of the suitably qualified and experienced person who certified the design plan and 'as constructed' drawings;
- (o) For the regulated dam, other than in relation to any levees—
 - (i) The dimensions (metres) and surface area (hectares) of the dam measured at the footprint of the dam;
 - (ii) Coordinates (latitude and longitude in GDA94) within five metres at any point from the outside of the dam including its storage area
 - (iii) Dam crest volume (megalitres);
 - (iv) Spillway crest level (metres AHD).
 - (v) Maximum operating level (metres AHD);
 - (vi) Storage rating table of stored volume versus level (metres AHD);
 - (vii) Design storage allowance (megalitres) and associated level of the dam (metres AHD);
 - (viii) Mandatory reporting level (metres AHD);
- (p) The design plan title and reference relevant to the dam;
- (q) The date construction was certified as compliant with the design plan;
- (r) The name and details of the suitably qualified and experienced person who certified that the constructed dam was compliant with the design plan;
- (s) Details of the composition and construction of any liner;
- (t) The system for the detection of any leakage through the floor and sides of the dam;
- (u) Dates when the regulated dam underwent an annual inspection for structural and operational adequacy, and to ascertain the available storage volume for 1 November of any year;
- (v) Dates when recommendations and actions arising from the annual inspection were provided to the administering authority;
- (w) Dam water quality as obtained from any monitoring required under this authority as at 1 November of each year.

'regulated dam' means any dam in the significant or high consequence category as assessed using the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)* published by the administering authority.

'regulated structure' includes land-based containment structures, levees, bunds and voids, but not a tank or container designed and constructed to an Australian Standard that deals with strength and structural integrity.

'rehabilitation' the process of reshaping and revegetating land to restore it to a stable landform

'rejects' means all coal waste material generated from the washing of coal at the Coal Preparation Plant.

'release event' means a surface water discharge from mine affected water storages or contaminated areas on the mine site.

'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.

'residual void' means an open pit resulting from the removal of ore and/or waste rock which will remain following the cessation of all mining activities and completion of rehabilitation processes.

'RL' means reduced level, relative to mean sea level as distinct from depths to water.

'saline drainage' The movement of waters, contaminated with salts, as a result of the mining activity.

'sensitive place' means:

- (a) a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises; or
- (x) a motel, hotel or hostel; or
- (y) an educational institution; or
- (z) a medical centre or hospital; or
- (aa) a protected area under the Nature Conservation Act 1992, the Marine Parks Act 1992 or a World Heritage Area; or
- (bb) a public park or gardens.

A sensitive place does not include 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), whether or not the mining camp is located within a mining tenement that is part of the mining project which is 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 not 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.

In contrast, 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.

Note: A '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 & educational institution, childcare or kindergarten, school or playground, hospital, surgery or other medical institution, commercial & retail activity, protected area or an area identified under a conservation plan under *Nature Conservation Act 1992* as a critical habitat or an area of major interest, marine park under *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.

'spillway' means a weir, channel, conduit, tunnel, gate or other structure designed to permit discharges from the dam, normally under flood conditions or in anticipation of flood conditions.

'structure' means dam or levee.

'suitably qualified and experienced person' in relation to regulated structures means a person who is a Registered Professional Engineer of Queensland (RPEQ) under the provisions of the *Professional Engineers Act 2002*, and has demonstrated competency and relevant experience:

- for regulated dams, an RPEQ who is a civil engineer with the required qualifications in dam safety and dam design.
- for regulated levees, an RPEQ who is a civil engineer with the required qualifications in the design of flood protection embankments.

Note: It is permissible that a suitably qualified and experienced person obtain subsidiary certification from an RPEQ who has demonstrated competence and relevant experience in either geomechanics, hydraulic design or engineering hydrology.

'system design plan' means a plan that manages an integrated containment system that shares the required DSA and/or ESS volume across the integrated containment system.

'the Act' means the *Environmental Protection Act 1994*.

'µS/cm' means micro siemens per centimetre.

'void' means any constructed, open excavation in the ground.

'water quality' means the chemical, physical and biological condition of water.

'watercourse' has the meaning in Schedule 4 of the *Environmental Protection Act 1994* and means a river, creek or stream in which water flows permanently or intermittently—

- (a) in a natural channel, whether artificially improved or not; or
- (b) in an artificial channel that has changed the course of the watercourse.

Watercourse includes the bed and banks and any other element of a river, creek or stream confining or containing water.

'waters' includes all or any part of a river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, unconfined water in natural or artificial watercourses, bed and banks of a watercourse, dams, non-tidal or tidal waters (including the sea), stormwater channel, stormwater drain, roadside gutter, stormwater run-off, and groundwater.

'wet season' means the time of year, covering one or more months, when most of the average annual rainfall in a region occurs. For the purposes of DSA determination this time of year is deemed to extend from 1 November in one year to 31 May in the following year inclusive.

Attachment B—Rehabilitation requirements

Table H1: Rehabilitation acceptance criteria

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria		
Open cut voids and slopes	Long term safety	Structurally safe with no hazardous materials.	Safety assessment of landform stability (geotechnical studies).	Certification by an appropriately qualified person in the Rehabilitation Report that slopes are now safe and exhibit characteristics for long term stability.		
				A risk assessment has been completed and risk mitigation measures have been implemented. Where risk mitigation measures include bunds, safety fences and warning signs, these have been erected in accordance with relevant guidelines and Australian Standards.		
				Landform design meets the design requirements of Table 4.1: Summary of final land use and rehabilitation ¹¹⁰ .		
				Certification by an appropriately qualified person that the Rehabilitation Report includes predictions about future changes and that the specified cover thickness is in place.		
					Exposure to and availability of heavy metals and other toxic materials.	Evidence in the Rehabilitation Report that monitoring results for dust and particulate matter indicates compliance with the limits in the environmental authority.
				Results of site contaminated land investigation report.	Evidence in the Rehabilitation Report that measures required in site contaminated land investigation report have been implemented.	
				Stream bank erosion.	Evidence in the Rehabilitation Report that creek diversions are stable at closure and exhibit characteristics for long term stability.	
			Site is safe for humans and animals now and in the foreseeable future.	Safety assessment of landform stability (geotechnical studies).	An appropriately qualified person certifies the long-term geotechnical stability of the residual slopes and faces in the voids and evidence of this is documented in the Rehabilitation Report.	
		Adequacy and predicted long-term performance of safety barriers.	Evidence in the Rehabilitation Report that a safety risk assessment of the open-cut voids and slopes has been completed and proposed mitigation measures are documented in a Safety Plan.			

¹¹⁰ Mine Closure and Rehabilitation Strategy (March 2014), available on the proponent's website

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Installation of safety barriers and human/wildlife exclusion fencing of open-cut void.	If required, mitigation measures documented in a Safety Plan, e.g. fencing or other suitable barrier around the open-cut void and slopes are installed to restrict access.
	Non-polluting	Mine affected water contained on site.	Downstream surface water quality.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Groundwater quality.	Certification by an appropriately qualified person that groundwater quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Final landform water storages are contained on-site, with no over flows into external surface water systems.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
				Receiving water affected by surface water runoff has contaminant limits in accordance with the environmental authority.
			All permanent stream diversion will meet approved design criteria.	Certification by an appropriately qualified person that all stream diversions have been constructed and are operating in accordance with approved design criteria.
			All permanent regulated structures will meet approved design criteria.	The regulated structures are certified by a suitably qualified and experienced person.
			All non-permanent regulated structures decommissioned appropriately.	Regulated structures are decommissioned in accordance with the administering authority requirements.
			Open-cut voids protected from flooding.	Certification by a suitably qualified and experienced person in the Rehabilitation Report that the open-cut voids have an adequate protection system to prevent inundation from a 1: 1,000 year annual exceedance probability flood event.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
		Diversion design and maintenance.	The administering authority of the water licence under the <i>Water Act 2000</i> (QLD) has determined that the water licence is no longer required.	Confirmation in writing from the administering authority that the water licence under the <i>Water Act 2000</i> (QLD) is no longer required.
	Stable landform	Very low probability of rock falls with serious environmental consequences.	Past record of rock falls.	Evidence in the Rehabilitation Report that appropriate control measures are in place to prevent recurrence.
		Landform design achieves appropriate erosion rates.	Slope angle and length.	Evidence in the Rehabilitation Report that the rehabilitated slopes have been designed to the specifications outlined in Table 4.1 Summary of final land use and rehabilitation.
			Engineered structures to control water flow.	Evidence in the Rehabilitation Report that required contour banks, channel linings, surface armour, engineered drop structures and other required measures are in place and functioning.
			Rates of soil loss.	Certification by an appropriately qualified person that land disturbed by mining activities does not exhibit any signs of continued erosion greater than that exhibited at a comparable reference site. The comparable reference site must have similar chemical and physical characteristics including slope as the rehabilitated landform.
			Dimensions and frequency of occurrence of erosion of rills and gullies.	Evidence in the Rehabilitation Report that the dimensions and frequency of occurrence of erosion rills and gullies are no greater than that in comparable reference site(s).
		Vegetation cover sufficient for a self-sustaining community and to minimise erosion.	Vegetation type and density.	Evidence that the vegetation type and density are of species suited to the sites characteristics including soil type, topography and climate and that soil erosion meets the goals set in this plan.
				Vegetation types and densities are comparable with the relevant reference site.
		The diversions and run-off drainage lines mirror natural stream functions.	Design and stability of drainage diversions.	Documentation in the Rehabilitation Report how drainage diversions have changed over the life of mine and that they are stable at closure and are likely to remain that way into the foreseeable future.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
				To be designed and constructed in accordance with the Queensland Government Natural Resources and Mines, <i>Central West Water Management and Use Regional Guideline: Watercourse Diversions-Central Queensland Mining Industry</i> (2008) and with consideration of contemporary research, i.e. the ACARP report <i>Maintenance of Geomorphic Processes in Bowen Basin River diversions</i> (Project number C8030-C9068).
		Very low probability of rock falls with serious environmental consequences.	Geotechnical studies.	Evidence in the Rehabilitation Report that a risk assessment has been done and mitigation measures (if any) have been documented and implemented.
			Past record of rock falls.	Evidence in the Rehabilitation Report that appropriate controls measures have put in place to prevent rock falls.
	Sustainable land-use	Soil properties support the desired land-use.	Chemical properties, e.g. pH, salinity, nutrient content, sodium content of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the topsoil chemical properties do not limit the suitability of the land for the intended land use and are consistent with the following: <ul style="list-style-type: none"> - soil salinity content is <0.6 dS/m; - soil pH is between 5.5 and 8.5; soil exchange sodium percentage (ESP) is <15%; - nutrient accumulation and recycling processes are occurring as evidenced by the presence of a litter layer, mycorrhizae and/or other microsymbionts; and - adequate macro and micro-nutrients are present.
			Physical properties of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the soil physical properties, e.g. rockiness, depth of soil, wetness and plant available water capacity are adequate for plant growth.
				Certification in the Rehabilitation Report of suitability for beef cattle grazing land use in accordance with Department of Minerals and Energy (DME) 1995 <i>Land Suitability Assessment Techniques in Technical Guidelines for the Environmental Management of Exploration and Mining</i> .
			Topsoil thickness.	Certification in the Rehabilitation Report that topsoil has been respread according to the depths required in the Topsoil Management Plan.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Site soil characteristics.	Certification in the Rehabilitation Report that the site's soil characteristics have acceptable levels of surface roughness, infiltration capacity, aggregate stability and surface condition as defined in the <i>Australian Soil and Land Survey Field Handbook</i> (National Committee on Soil and Terrain 2009).
		Establish self-sustaining natural vegetation or habitat.	Presence of key plant species.	Certification by an appropriately qualified person that key plant species identified in the comparable reference site occur on the rehabilitation site. The presence of key plant species may also be guided by future vegetation trials for rehabilitation.
			Density of key plant species.	Certification by an appropriately qualified person that the density of key plant species in comparable reference sites is similar to the rehabilitation site. The density of key plant species may also be guided by future vegetation trials for rehabilitation.
			Structure of vegetation habitat.	Certification by an appropriately qualified person that the structure of vegetation, i.e. groundcover, shrub and canopy structure is trending towards being similar to comparable reference sites.
		Self-sustaining natural vegetation or habitat.	Native fauna species.	Certification by an appropriately qualified person that native fauna species identified in pre-mining baseline studies and the five years of reference site monitoring prior to the completion of rehabilitation are present or indicators of these species or habitat elements are developing within the rehabilitated areas.
			Plant regeneration.	Certification by an appropriately qualified person that plants in rehabilitated areas show evidence of flowering, seed setting and seed germination.
			Abundance of declared plants (weeds) identified through surveys.	Certification by an appropriately qualified person that the abundance of declared plants (weeds) identified in rehabilitated areas is no greater than comparable reference sites.
			Actions taken to eradicate plants declared under local or State legislation.	Evidence to demonstrate that action has been taken to eradicate declared plants (weeds) under local or State legislation should they occur on the site.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Abundance of declared animals identified through surveys.	Certification by an appropriately qualified person that the abundance of declared animals identified in rehabilitated areas is no greater than comparable reference sites.
			Management actions taken to control animals declared under local or State legislation.	Evidence to demonstrate that action has been taken to control declared animals under local or State legislation should they occur on the site.
			Weed hygiene procedures.	Records indicating that appropriate weed and seed hygiene procedures were implemented during rehabilitation.
		Agricultural grazing.	Livestock stocking rates.	An appropriately qualified person has predicted and defined the economics/ benefits and these have been agreed with relevant stakeholders.
			Landform stability when grazed.	Land maintenance requirements are comparable to comparable reference sites.
			Stock access to water sources.	Stock has access to water that meet accepted livestock drinking water guidelines.
Underground mining areas	Long term safety	Rehabilitation or conversion of exploration drill holes and groundwater monitoring bores.	All non-artesian exploration drill holes undertaken on the mining lease have been rehabilitated or converted to water bores.	Certification by an appropriately qualified person that all non-artesian exploration drill holes that are not converted to either a water bore or a groundwater monitoring bore have been rehabilitated.
				Certification by an appropriately qualified person that all sub-artesian aquifers have been isolated where non-artesian exploration drill holes have intersected more than one sub-artesian water bearing strata, in accordance with <i>Minimum Construction Requirements for Water Bores in Australia</i> (Australian Government February 2012) or latest edition.
				Certification by an appropriately qualified person that all non-artesian exploration drill holes converted to a water bore have been converted in accordance with the <i>Minimum Construction Requirements for Water Bores in Australia</i> (Australian Government February 2012) or latest edition.
				Certification by an appropriately qualified person that all non-artesian exploration drill holes converted to water bores are compliant with the <i>Water Act 2000</i> (QLD).

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			All monitoring bores undertaken on the mining lease have been rehabilitated.	Certification by an appropriately qualified person that all monitoring bores have been rehabilitated in accordance with the <i>Minimum Construction Requirements for Water Bores in Australia</i> (Australian Government February 2012) or latest edition.
		Structurally safe with no hazardous materials.	Safety assessment of landform stability (geotechnical studies).	Certification by an appropriately qualified person in the Rehabilitation Report that slopes are now safe and exhibit characteristics for long term stability.
				A risk assessment has been completed and risk mitigation measures have been implemented. Where risk mitigation measures include bunds, safety fences and warning signs, these have been erected in accordance with relevant guidelines and Australian Standards
				Landform design meets the design requirements of Table 4.1: Summary of final land use and rehabilitation.
			Stream bank erosion.	Evidence in the rehabilitation report that stream banks and creek diversions in the domain are currently stable and exhibit characteristics for long term stability.
	Non-polluting	Mine affected water contained on site.	Downstream surface water quality.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Groundwater quality.	Certification by an appropriately qualified person that groundwater quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Final landform water storages are contained on-site, with no over flows into external surface water systems.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
				Receiving water affected by surface water runoff has contaminant limits in accordance with the environmental authority.
			All permanent stream diversion will meet approved design criteria.	Certification by an appropriately qualified person that all stream diversions have been constructed and are operating in accordance with approved design criteria.
			All permanent regulated structures will meet approved design criteria.	The regulated structures are certified by a suitably qualified and experienced person.
			All non-permanent regulated structures decommissioned appropriately.	Regulated structures are decommissioned in accordance with the administering authority requirements.
		Diversion design and maintenance.	The administering authority of the water licence under the <i>Water Act 2000</i> (QLD) has determined that the water licence is no longer required.	Confirmation in writing from the administering authority that the water licence under the <i>Water Act 2000</i> (QLD) is no longer required.
		Hazardous materials adequately managed.	Exposure to and availability of heavy metals and other toxic materials.	Certification by an appropriately qualified person that the Rehabilitation Report includes predictions about future changes and that the specified cover thickness is in place.
				Evidence in the Rehabilitation Report that monitoring results for dust and particulate matter indicates compliance with the limits in the environmental authority.
		Removal of potential sources of contamination.	Results of site contaminated land investigation report.	Evidence in the Rehabilitation Report that measures required in site contaminated land investigation report have been implemented.
	Stable landform	Landform design achieves appropriate erosion rates.	Engineered structures to control water flow.	Evidence in the Rehabilitation Report that required contour banks, channel linings, surface armour, engineered drop structures and other required measures are in place and functioning.
			Rates of soil loss.	Certification by an appropriately qualified person that land disturbed by mining activities does not exhibit any signs of continued erosion greater than that exhibited at a comparable reference site. The comparable reference site must have similar chemical and physical characteristics including slope as the rehabilitated landform.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
		Vegetation cover sufficient for a self-sustaining community and to minimise erosion.	Vegetation type and density.	Evidence that the vegetation type and density are of species suited to the sites characteristics including soil type, topography and climate and that soil erosion meets the goals set in this plan.
				Vegetation types and densities are comparable with the relevant reference site.
			Foliage cover.	Minimum of 70% groundcover is present (or 50% if rocks, logs or other features are present). No bare surfaces >20 m ² in area or > 10 m in length down slope.
		The diversions and run-off drainage lines mirror natural stream functions.	Design and stability of drainage diversions.	Documentation in the Rehabilitation Report regarding how drainage diversions have changed over the life of mine and that they are stable at closure and are likely to remain that way into the foreseeable future.
				To be designed and constructed in accordance with the Queensland Government Natural Resources and Mines, <i>Central West Water Management and Use Regional Guideline: Watercourse Diversions-Central Queensland Mining Industry</i> (2008) and with consideration of contemporary research, i.e. the ACARP report <i>Maintenance of Geomorphic Processes in Bowen Basin River diversions</i> (Project number C8030-C9068).
		Surface water drainage	Stable drainage works.	Certification by an appropriately qualified person that local drainage works, e.g. small diversion bunds and engineered rock chute structures work as intended and are stable.
		Minimal changes to hydrological conditions.	Ponding	Evidence in the Rehabilitation Report to demonstrate unimpeded drainage/flows of subsidence ponds and creek channels.
			Cracking	Evidence in the Rehabilitation Report that no subsidence cracks greater than 25 mm occur (that are attributable to subsidence).

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
	Sustainable land-use	Soil properties support the desired land-use.	Chemical properties, e.g. pH, salinity, nutrient content, sodium content of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the topsoil chemical properties do not limit the suitability of the land for the intended land use and are consistent with the following: <ul style="list-style-type: none"> - soil salinity content is <0.6 dS/m; - soil pH is between 5.5 and 8.5; soil exchange sodium percentage (ESP) is <15%; - nutrient accumulation and recycling processes are occurring as evidenced by the presence of a litter layer, mycorrhizae and/or other microsymbionts; and - adequate macro and micro-nutrients are present.
			Physical properties of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the soil physical properties, e.g. rockiness, depth of soil, wetness and plant available water capacity are adequate for plant growth.
				Certification in the Rehabilitation Report of suitability for beef cattle grazing land use in accordance with Department of Minerals and Energy (DME) 1995 <i>Land Suitability Assessment Techniques in Technical Guidelines for the Environmental Management of Exploration and Mining</i> .
			Topsoil thickness.	Certification in the Rehabilitation Report that topsoil has been respread according to the depths required in the Topsoil Management Plan.
			Site soil characteristics.	Certification in the Rehabilitation Report that the site's soil characteristics have acceptable levels of surface roughness, infiltration capacity, aggregate stability and surface condition as defined in the <i>Australian Soil and Land Survey Field Handbook</i> (National Committee on Soil and Terrain 2009).
		Establish self-sustaining natural vegetation or habitat.	Presence of key plant species.	Certification by an appropriately qualified person that key plant species identified in the comparable reference site occur on the rehabilitation site. The presence of key plant species may also be guided by future vegetation trials for rehabilitation.
			Density of key plant species.	Certification by an appropriately qualified person that the density of key plant species in comparable reference sites is similar to the rehabilitation site. The density of key plant species may also be guided by future vegetation trials for rehabilitation.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Structure of vegetation habitat.	Certification by an appropriately qualified person that the structure of vegetation, i.e. groundcover, shrub and canopy structure is trending towards being similar to comparable reference sites.
		Self-sustaining natural vegetation or habitat.	Native fauna species.	Certification by an appropriately qualified person that native fauna species identified in pre-mining baseline studies and the five years of reference site monitoring prior to the completion of rehabilitation are present or indicators of these species or habitat elements are developing within the rehabilitated areas.
			Plant regeneration.	Certification by an appropriately qualified person that plants in rehabilitated areas show evidence of flowering, seed setting and seed germination.
			Abundance of declared plants (weeds) identified through surveys.	Certification by an appropriately qualified person that the abundance of declared plants (weeds) identified in rehabilitated areas is no greater than comparable reference sites.
			Actions taken to eradicate plants declared under local or State legislation.	Evidence to demonstrate that action has been taken to eradicate declared plants (weeds) under local or State legislation should they occur on the site.
			Abundance of declared animals identified through surveys.	Certification by an appropriately qualified person that the abundance of declared animals identified in rehabilitated areas is no greater than comparable reference sites.
			Management actions taken to control animals declared under local or State legislation.	Evidence to demonstrate that action has been taken to control declared animals under local or State legislation should they occur on the site.
			Weed hygiene procedures.	Records indicating that appropriate weed and seed hygiene procedures were implemented during rehabilitation.
		Agricultural grazing.	Livestock stocking rates.	An appropriately qualified person has predicted and defined the economics/ benefits and these have been agreed with relevant stakeholders.
			Landform stability when grazed.	Land maintenance requirements are comparable to comparable reference sites.
			Stock access to water sources.	Stock has access to water that meet accepted livestock drinking water guidelines.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria	
Mining infrastructure area	Long term safety	Rehabilitation or conversion of exploration drill holes and groundwater monitoring bores.	All non-artesian exploration drill holes undertaken on the mining lease have been rehabilitated or converted to water bores.	Certification by an appropriately qualified person that all non-artesian exploration drill holes that are not converted to either a water bore or a groundwater monitoring bore have been rehabilitated.	
				Certification by an appropriately qualified person, that all sub-artesian aquifers have been isolated where non-artesian exploration drill holes have intersected more than one sub-artesian water bearing strata, in accordance with <i>Minimum Construction Requirements for Water Bores in Australia</i> (Australian Government February 2012) or latest edition	
				Certification by an appropriately qualified person that all non-artesian exploration drill holes converted to a water bore have been converted in accordance with the <i>Minimum Construction Requirements for Water Bores in Australia</i> (Australian Government February 2012) or latest edition.	
				Certification by an appropriately qualified person that all non-artesian exploration drill holes converted to water bores are compliant with the <i>Water Act 2000</i> (QLD).	
				All monitoring bores undertaken on the mining lease have been rehabilitated.	Certification by an appropriately qualified person that all monitoring bores have been rehabilitated in accordance with the <i>Minimum Construction Requirements for Water Bores in Australia</i> (Australian Government February 2012) or latest edition.
			Structurally safe with no hazardous materials.	Safety assessment of landform stability (geotechnical studies).	Certification by an appropriately qualified person in the Rehabilitation Report that slopes are now safe and exhibit characteristics for long term stability.
					A risk assessment has been completed and risk mitigation measures have been implemented. Where risk mitigation measures include bunds, safety fences and warning signs, these have been erected in accordance with relevant guidelines and Australian Standards
					Landform design meets the design requirements of Table 4.1: Summary of final land use and rehabilitation.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
		Site is safe for humans and animals now and in the foreseeable future.	Appropriate decommissioning of infrastructure.	Certification by an appropriately qualified person in the site Rehabilitation Report that the infrastructure has been decommissioned and rehabilitated. Buildings, water storage(s), roads (except those used by the public) and other infrastructure have been removed unless stakeholders have entered into formal written agreements for their retention. Access to the area is conducive of the intended purpose of the post-mining land use including pastoral farming.
	Non-polluting	Mine affected water contained on site.	Downstream surface water quality.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Groundwater quality.	Certification by an appropriately qualified person that groundwater quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Final landform water storages are contained on-site, with no over flows into external surface water systems.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
				Receiving water affected by surface water runoff has contaminant limits in accordance with the environmental authority.
			All permanent stream diversion will meet approved design criteria.	Certification by an appropriately qualified person that all stream diversions have been constructed and are operating in accordance with approved design criteria.
			All permanent regulated structures will meet approved design criteria.	The regulated structures are certified by a suitably qualified and experienced person .

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			All non-permanent regulated structures decommissioned appropriately.	Regulated structures are decommissioned in accordance with the administering authority requirements.
		Hazardous materials adequately managed.	Exposure to and availability of heavy metals and other toxic materials.	Certification by an appropriately qualified person that the Rehabilitation Report includes predictions about future changes and that the specified cover thickness is in place.
				Evidence in the Rehabilitation Report that monitoring results for dust and particulate matter indicates compliance with the limits in the environmental authority.
		Removal of potential sources of contamination.	Results of site contaminated land investigation report.	Evidence in the Rehabilitation Report that measures required in site contaminated land investigation report have been implemented.
	Stable landform	Landform design achieves appropriate erosion rates.	Slope angle and length.	Evidence in the Rehabilitation Report that the rehabilitated slopes have been designed to the specifications outlined in Table 4.1 Summary of final land use and rehabilitation.
			Engineered structures to control water flow.	Evidence in the Rehabilitation Report that required contour banks, channel linings, surface armour, engineered drop structures and other required measures are in place and functioning.
			Rates of soil loss.	Certification by an appropriately qualified person that land disturbed by mining activities does not exhibit any signs of continued erosion greater than that exhibited at a comparable reference site. The comparable reference site must have similar chemical and physical characteristics including slope as the rehabilitated landform.
		Vegetation cover sufficient for a self-sustaining community and to minimise erosion.	Vegetation type and density.	Evidence that the vegetation type and density are of species suited to the sites characteristics including soil type, topography and climate and that soil erosion meets the goals set in this plan.
				Vegetation types and densities are comparable with the relevant reference site.
			Foliage cover.	Minimum of 70% groundcover is present (or 50% if rocks, logs or other features are present). No bare surfaces >20 m ² in area or > 10 m in length down slope.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
		The diversions and run-off drainage lines mirror natural stream functions.	Design and stability of drainage diversions.	Documentation in the Rehabilitation Report how drainage diversions have changed over the life of mine and that they are stable at closure and are likely to remain that way into the foreseeable future.
				To be designed and constructed in accordance with the Queensland Government Natural Resources and Mines, <i>Central West Water Management and Use Regional Guideline: Watercourse Diversions-Central Queensland Mining Industry</i> (2008) and with consideration of contemporary research, i.e. the ACARP report <i>Maintenance of Geomorphic Processes in Bowen Basin River diversions</i> (Project number C8030-C9068).
		Very low probability of rock falls with serious environmental consequences.	Geotechnical studies.	Evidence in the Rehabilitation Report that appropriate geotechnical risk assessment has been done and control measures put in place.
			Past record of rock falls.	Evidence in the Rehabilitation Report that appropriate control measures are in place to prevent recurrence.
	Sustainable land-use	Soil properties support the desired land-use.	Chemical properties, e.g. pH, salinity, nutrient content, sodium content of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the topsoil chemical properties do not limit the suitability of the land for the intended land use and are consistent with the following: <ul style="list-style-type: none"> - soil salinity content is <0.6 dS/m; - soil pH is between 5.5 and 8.5; soil exchange sodium percentage (ESP) is <15%; - nutrient accumulation and recycling processes are occurring as evidenced by the presence of a litter layer, mycorrhizae and/or other microsymbionts; and - adequate macro and micro-nutrients are present.
			Physical properties of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the soil physical properties, e.g. rockiness, depth of soil, wetness and plant available water capacity are adequate for plant growth.
				Certification in the Rehabilitation Report of suitability for beef cattle grazing land use in accordance with Department of Minerals and Energy (DME) 1995 <i>Land Suitability Assessment Techniques in Technical Guidelines for the Environmental Management of Exploration and Mining</i> .

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Topsoil thickness.	Certification in the Rehabilitation Report that topsoil has been respread according to the depths required in the Topsoil Management Plan.
			Site soil characteristics.	Certification in the Rehabilitation Report that the site's soil characteristics have acceptable levels of surface roughness, infiltration capacity, aggregate stability and surface condition as defined in the <i>Australian Soil and Land Survey Field Handbook</i> (National Committee on Soil and Terrain 2009).
		Establish self-sustaining natural vegetation or habitat.	Presence of key plant species.	Certification by an appropriately qualified person that key plant species identified in the comparable reference site occur on the rehabilitation site. The presence of key plant species may also be guided by future vegetation trials for rehabilitation.
			Density of key plant species.	Certification by an appropriately qualified person that the density of key plant species in comparable reference sites is similar to the rehabilitation site. The density of key plant species may also be guided by future vegetation trials for rehabilitation.
			Structure of vegetation habitat.	Certification by an appropriately qualified person that the structure of vegetation, i.e. groundcover, shrub and canopy structure is trending towards being similar to comparable reference sites.
		Self-sustaining natural vegetation or habitat.	Native fauna species.	Certification by an appropriately qualified person that native fauna species identified in pre-mining baseline studies and the five years of reference site monitoring prior to the completion of rehabilitation are present or indicators of these species or habitat elements are developing within the rehabilitated areas.
			Plant regeneration.	Certification by an appropriately qualified person that plants in rehabilitated areas show evidence of flowering, seed setting and seed germination.
			Abundance of declared plants (weeds) identified through surveys.	Certification by an appropriately qualified person that the abundance of declared plants (weeds) identified in rehabilitated areas is no greater than comparable reference sites.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Actions taken to eradicate plants declared under local or State legislation.	Evidence to demonstrate that action has been taken to eradicate declared plants (weeds) under local or State legislation should they occur on the site.
			Abundance of declared animals identified through surveys.	Certification by an appropriately qualified person that the abundance of declared animals identified in rehabilitated areas is no greater than comparable reference sites.
			Management actions taken to control animals declared under local or State legislation.	Evidence to demonstrate that action has been taken to control declared animals under local or State legislation should they occur on the site.
			Weed hygiene procedures.	Records indicating that appropriate weed and seed hygiene procedures were implemented during rehabilitation.
		Agricultural grazing.	Livestock stocking rates.	An appropriately qualified person has predicted and defined the economics/ benefits and these have been agreed with relevant stakeholders.
			Landform stability when grazed.	Land maintenance requirements are comparable to comparable reference sites.
			Stock access to water sources.	Stock has access to water that meet accepted livestock drinking water guidelines.
Out-of-pit spoil dump areas	Long term safety	Structurally safe with no hazardous materials.	Safety assessment of landform stability (geotechnical studies).	Certification by an appropriately qualified person in the Rehabilitation Report that slopes are now safe and exhibit characteristics for long term stability.
				A risk assessment has been completed and risk mitigation measures have been implemented. Where risk mitigation measures include bunds, safety fences and warning signs, these have been erected in accordance with relevant guidelines and Australian Standards
				Landform design meets the design requirements of Table 4.1: Summary of final land use and rehabilitation.
			Exposure to and availability of heavy metals and other toxic materials.	Certification by an appropriately qualified person that the Rehabilitation Report includes predictions about future changes and that the specified cover thickness is in place.
				Evidence in the Rehabilitation Report that monitoring results for dust and particulate matter indicates compliance with the limits in the environmental authority.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Results of site contaminated land investigation report.	Evidence in the Rehabilitation Report that measures required in site contaminated land investigation report have been implemented.
			Stream bank erosion.	Evidence in the Rehabilitation Report that creek diversions are stable at closure and exhibit characteristics for long term stability.
		Site is safe for humans and animals now and in the foreseeable future.	Safety assessment of landform stability (geotechnical studies).	An appropriately qualified person certifies the long-term geotechnical stability of the residual slopes and faces and evidence of this is documented in the Rehabilitation Report.
			Adequacy and predicted long-term performance of safety barriers.	Evidence in the Rehabilitation Report that a safety risk assessment of the slopes has been completed and proposed mitigation measures are documented in a Safety Plan.
			Installation of safety barriers and human/wildlife exclusion fencing.	If required, mitigation measures documented in a Safety Plan, e.g. fencing or other suitable barrier around the slopes are installed to restrict access.
	Non-polluting	Mine affected water contained on site.	Downstream surface water quality.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Groundwater quality.	Certification by an appropriately qualified person that groundwater quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Final landform water storages are contained on-site, with no over flows into external surface water systems.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
				Receiving water affected by surface water runoff has contaminant limits in accordance with the environmental authority.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			All permanent regulated structures will meet approved design criteria.	The regulated structures are certified by a suitably qualified and experienced person .
			All non-permanent regulated structures decommissioned appropriately.	Regulated structures are decommissioned in accordance with the administering authority requirements.
		Acid mine drainage will not cause serious environmental harm.	Technical design of tailings emplacement cells.	Certification by suitably qualified person in the Rehabilitation Report that the tailings emplacement cells is in accordance with recommendations in the Acid Mine Drainage Assessment report.
	Stable landform	Landform design achieves appropriate erosion rates.	Slope angle and length.	Evidence in the Rehabilitation Report that the rehabilitated slopes have been designed to the specifications outlined in Table 4.1 Summary of final land use and rehabilitation.
			Engineered structures to control water flow.	Evidence in the Rehabilitation Report that required contour banks, channel linings, surface armour, engineered drop structures and other required measures are in place and functioning as intended.
			Rates of soil loss.	Certification by an appropriately qualified person that land disturbed by mining activities does not exhibit any signs of continued erosion greater than that exhibited at a comparable reference site. The comparable reference site must have similar chemical and physical characteristics including slope as the rehabilitated landform.
			Dimensions and frequency of occurrence of erosion of rills and gullies.	Evidence in the Rehabilitation Report that the dimensions and frequency of occurrence of erosion rills and gullies are no greater than that in comparable reference site(s).
		Vegetation cover sufficient for a self-sustaining community and to minimise erosion.	Native fauna species.	Certification by an appropriately qualified person that native fauna species identified in pre-mining baseline studies and the five years of reference site monitoring prior to the completion of rehabilitation are present or indicators of these species or habitat elements are developing within the rehabilitated areas.
			Vegetation type and density.	Evidence that the vegetation type and density are of species suited to the sites characteristics including soil type, topography and climate and that soil erosion meets the goals set in this plan.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
				Vegetation types and densities are comparable with the relevant reference site.
		The diversions and run-off drainage lines mirror natural stream functions.	Design and stability of drainage diversions.	Documentation in the Rehabilitation Report how drainage diversions have changed over the life of mine and that they are stable at closure and are likely to remain that way into the foreseeable future.
				To be designed and constructed in accordance with the Queensland Government Natural Resources and Mines, <i>Central West Water Management and Use Regional Guideline: Watercourse Diversions-Central Queensland Mining Industry</i> (2008) and with consideration of contemporary research, i.e. the ACARP report <i>Maintenance of Geomorphic Processes in Bowen Basin River diversions</i> (Project number C8030-C9068).
	Sustainable land-use	Soil properties support the desired land-use.	Chemical properties, e.g. pH, salinity, nutrient content, sodium content of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the topsoil chemical properties do not limit the suitability of the land for the intended land use and are consistent with the following: <ul style="list-style-type: none"> - soil salinity content is <0.6 dS/m; - soil pH is between 5.5 and 8.5; soil exchange sodium percentage (ESP) is <15%; - nutrient accumulation and recycling processes are occurring as evidenced by the presence of a litter layer, mycorrhizae and/or other microsymbionts; and - adequate macro and micro-nutrients are present.
			Physical properties of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the soil physical properties, e.g. rockiness, depth of soil, wetness and plant available water capacity are adequate for plant growth.
				Certification in the Rehabilitation Report of suitability for beef cattle grazing land use in accordance with Department of Minerals and Energy (DME) 1995 <i>Land Suitability Assessment Techniques in Technical Guidelines for the Environmental Management of Exploration and Mining</i> .
			Topsoil thickness.	Certification in the Rehabilitation Report that topsoil has been respread according to the depths required in the Topsoil Management Plan.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Site soil characteristics.	Certification in the Rehabilitation Report that the site's soil characteristics have acceptable levels of surface roughness, infiltration capacity, aggregate stability and surface condition as defined in the <i>Australian Soil and Land Survey Field Handbook</i> (National Committee on Soil and Terrain 2009).
		Establish self-sustaining natural vegetation or habitat.	Presence of key plant species.	Certification by an appropriately qualified person that key plant species identified in the comparable reference site occur on the rehabilitation site. The presence of key plant species may also be guided by future vegetation trials for rehabilitation.
			Density of key plant species.	Certification by an appropriately qualified person that the density of key plant species in comparable reference sites is similar to the rehabilitation site. The density of key plant species may also be guided by future vegetation trials for rehabilitation.
			Structure of vegetation habitat.	Certification by an appropriately qualified person that the structure of vegetation, i.e. groundcover, shrub and canopy structure is trending towards being similar to comparable reference sites.
		Self-sustaining natural vegetation or habitat.	Native fauna species.	Certification by an appropriately qualified person that native fauna species identified in pre-mining baseline studies and the five years of reference site monitoring prior to the completion of rehabilitation are present or indicators of these species or habitat elements are developing within the rehabilitated areas.
			Plant regeneration.	Certification by an appropriately qualified person that plants in rehabilitated areas show evidence of flowering, seed setting and seed germination.
			Abundance of declared plants (weeds) identified through surveys.	Certification by an appropriately qualified person that the abundance of declared plants (weeds) identified in rehabilitated areas is no greater than comparable reference sites.
			Actions taken to eradicate plants declared under local or State legislation.	Evidence to demonstrate that action has been taken to eradicate declared plants (weeds) under local or State legislation should they occur on the site.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Abundance of declared animals identified through surveys.	Certification by an appropriately qualified person that the abundance of declared animals identified in rehabilitated areas is no greater than comparable reference sites.
			Management actions taken to control animals declared under local or State legislation.	Evidence to demonstrate that action has been taken to control declared animals under local or State legislation should they occur on the site.
			Weed hygiene procedures.	Records indicating that appropriate weed and seed hygiene procedures were implemented during rehabilitation.
		Agricultural grazing.	Livestock stocking rates.	An appropriately qualified person has predicted and defined the economics/ benefits and these have been agreed with relevant stakeholders.
			Landform stability when grazed.	Land maintenance requirements are comparable to comparable reference sites.
			Stock access to water sources.	Stock has access to water that meet accepted livestock drinking water guidelines.
Water storage areas	Long term safety	Structurally safe with no hazardous materials.	Safety assessment of landform stability (geotechnical studies).	Certification by an appropriately qualified person in the Rehabilitation Report that slopes are now safe and exhibit characteristics for long term stability.
				A risk assessment has been completed and risk mitigation measures have been implemented. Where risk mitigation measures include bunds, safety fences and warning signs, these have been erected in accordance with relevant guidelines and Australian Standards.
				Landform design meets the design requirements of Table 4.1: Summary of final land use and rehabilitation.
		Site is safe for humans and animals now and in the foreseeable future.	Appropriate decommissioning of regulated dams.	Certification by a suitably qualified and experienced person in the site Rehabilitation Report that regulated dams and structures have been decommissioned and rehabilitated.
	Non-polluting	Mine affected water contained on site.	Downstream surface water quality.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Groundwater quality.	Certification by an appropriately qualified person that groundwater quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Final landform water storages are contained on-site, with no over flows into external surface water systems.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
				Receiving water affected by surface water runoff has contaminant limits in accordance with the environmental authority.
			All permanent stream diversion will meet approved design criteria.	Certification by an appropriately qualified person that all stream diversions have been constructed and are operating in accordance with approved design criteria.
			All permanent regulated structures will meet approved design criteria.	The regulated structures are certified by a suitably qualified and experienced person .
			All non-permanent regulated structures decommissioned appropriately.	Regulated structures are decommissioned in accordance with the administering authority requirements.
			Voids protected from flooding.	Certification by a suitably qualified and experienced person in the Rehabilitation Report that the voids have an adequate protection system to prevent inundation from a 1: 1,000 year annual exceedance probability flood event.
		Hazardous materials adequately managed.	Exposure to and availability of heavy metals and other toxic materials.	Certification by an appropriately qualified person that the Rehabilitation Report includes predictions about future changes and that the specified cover thickness is in place.
				Evidence in the Rehabilitation Report that monitoring results for dust and particulate matter indicates compliance with the limits in the environmental authority.
		Removal of potential sources of contamination.	Results of site contaminated land investigation report.	Evidence in the Rehabilitation Report that measures required in site contaminated land investigation report have been implemented.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
		Diversion design and maintenance.	The administering authority of the water licence under the <i>Water Act 2000</i> (QLD) has determined that the water licence is no longer required.	Confirmation in writing from the administering authority that the water licence under the <i>Water Act 2000</i> (QLD) is no longer required.
	Stable landform	Landform design achieves appropriate erosion rates.	Engineered structures to control water flow.	Evidence in the Rehabilitation Report that required contour banks, channel linings, surface armour, engineered drop structures and other required measures are in place and functioning.
			Rates of soil loss.	Certification by an appropriately qualified person that land disturbed by mining activities does not exhibit any signs of continued erosion greater than that exhibited at a comparable reference site. The comparable reference site must have similar chemical and physical characteristics including slope as the rehabilitated landform.
			Dimensions and frequency of occurrence of erosion of rills and gullies.	Evidence in the Rehabilitation Report that the dimensions and frequency of occurrence of erosion rills and gullies are no greater than that in comparable reference site(s).
		Vegetation cover sufficient for a self-sustaining community and to minimise erosion.	Vegetation type and density.	Evidence that the vegetation type and density are of species suited to the sites characteristics including soil type, topography and climate and that soil erosion meets the goals set in this plan.
				Vegetation types and densities are comparable with the relevant reference site.
			Foliage cover.	Minimum of 70% groundcover is present (or 50% if rocks, logs or other features are present). No bare surfaces >20 m ² in area or > 10 m in length down slope.
		The diversions and run-off drainage lines mirror natural stream functions.	Design and stability of drainage diversions.	Documentation in the Rehabilitation Report how drainage diversions have changed over the life of mine and that they are stable at closure and are likely to remain that way into the foreseeable future.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
				To be designed and constructed in accordance with the Queensland Government Natural Resources and Mines, <i>Central West Water Management and Use Regional Guideline: Watercourse Diversions-Central Queensland Mining Industry</i> (2008) and with consideration of contemporary research, i.e. the ACARP report <i>Maintenance of Geomorphic Processes in Bowen Basin River diversions</i> (Project number C8030-C9068).
	Sustainable land-use	Soil properties support the desired land-use.	Chemical properties, e.g. pH, salinity, nutrient content, sodium content of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the topsoil chemical properties do not limit the suitability of the land for the intended land use and are consistent with the following: <ul style="list-style-type: none"> - soil salinity content is <0.6 dS/m; - soil pH is between 5.5 and 8.5; soil exchange sodium percentage (ESP) is <15%; - nutrient accumulation and recycling processes are occurring as evidenced by the presence of a litter layer, mycorrhizae and/or other microsymbionts; and - adequate macro and micro-nutrients are present.
			Physical properties of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the soil physical properties, e.g. rockiness, depth of soil, wetness and plant available water capacity are adequate for plant growth.
				Certification in the Rehabilitation Report of suitability for beef cattle grazing land use in accordance with Department of Minerals and Energy (DME) 1995 <i>Land Suitability Assessment Techniques in Technical Guidelines for the Environmental Management of Exploration and Mining</i> .
			Topsoil thickness.	Certification in the Rehabilitation Report that topsoil has been respread according to the depths required in the Topsoil Management Plan.
			Site soil characteristics.	Certification in the Rehabilitation Report that the site's soil characteristics have acceptable levels of surface roughness, infiltration capacity, aggregate stability and surface condition as defined in the <i>Australian Soil and Land Survey Field Handbook</i> (National Committee on Soil and Terrain 2009).

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
		Establish self-sustaining natural vegetation or habitat.	Presence of key plant species.	Certification by an appropriately qualified person that key plant species identified in the comparable reference site occur on the rehabilitation site. The presence of key plant species may also be guided by future vegetation trials for rehabilitation.
			Density of key plant species.	Certification by an appropriately qualified person that the density of key plant species in comparable reference sites is similar to the rehabilitation site. The density of key plant species may also be guided by future vegetation trials for rehabilitation.
			Structure of vegetation habitat.	Certification by an appropriately qualified person that the structure of vegetation, i.e. groundcover, shrub and canopy structure is trending towards being similar to comparable reference sites.
		Self-sustaining natural vegetation or habitat.	Plant regeneration.	Certification by an appropriately qualified person that plants in rehabilitated areas show evidence of flowering, seed setting and seed germination.
			Native fauna species.	Certification by an appropriately qualified person that native fauna species identified in pre-mining baseline studies and the five years of reference site monitoring prior to the completion of rehabilitation are present or indicators of these species or habitat elements are developing within the rehabilitated areas.
			Abundance of declared plants (weeds) identified through surveys.	Certification by an appropriately qualified person that the abundance of declared plants (weeds) identified in rehabilitated areas is no greater than comparable reference sites.
			Actions taken to eradicate plants declared under local or State legislation.	Evidence to demonstrate that action has been taken to eradicate declared plants (weeds) under local or State legislation should they occur on the site.
			Abundance of declared animals identified through surveys.	Certification by an appropriately qualified person that the abundance of declared animals identified in rehabilitated areas is not greater than comparable reference sites.
			Management actions taken to control animals declared under local or State legislation.	Evidence to demonstrate that action has been taken to control declared animals under local or State legislation should they occur on the site.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Weed hygiene procedures.	Records indicating that appropriate weed and seed hygiene procedures were implemented during rehabilitation.
		Agricultural grazing.	Landform stability when grazed.	Land maintenance requirements are comparable to comparable reference sites.
			Stock access to water sources.	Stock has access to water that meet accepted livestock drinking water guidelines.
Stream diversions	Long term safety	Structurally safe with no hazardous materials.	Safety assessment of landform stability (geotechnical studies).	Certification by an appropriately qualified person in the Rehabilitation Report that slopes are now safe and exhibit characteristics for long term stability.
				A risk assessment has been completed and risk mitigation measures have been implemented. Where risk mitigation measures include bunds, safety fences and warning signs, these have been erected in accordance with relevant guidelines and Australian Standards
				Landform design meets the design requirements of Table 4.1: Summary of final land use and rehabilitation.
		Site is safe for humans and animals now and in the foreseeable future.	Appropriate decommissioning of regulated dams.	Certification by a suitably qualified and experienced person in the site Rehabilitation Report that regulated structures have been decommissioned and rehabilitated.
	Non-polluting	Mine affected water contained on site.	Downstream surface water quality.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Groundwater quality.	Certification by an appropriately qualified person that groundwater quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Final landform water storages are contained on-site, with no over flows into external surface water systems.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
				Receiving water affected by surface water runoff has contaminant limits in accordance with the environmental authority.
			All permanent stream diversion will meet approved design criteria.	Certification by an appropriately qualified person that all stream diversions have been constructed and are operating in accordance with approved design criteria.
			All permanent regulated structures will meet approved design criteria.	The regulated structures are certified by an appropriately qualified person.
			All non-permanent regulated structures decommissioned appropriately.	Regulated structures are decommissioned in accordance with the administering authority requirements.
		Hazardous materials adequately managed.	Exposure to and availability of heavy metals and other toxic materials.	Certification by an appropriately qualified person that the Rehabilitation Report includes predictions about future changes and that the specified cover thickness is in place.
				Evidence in the Rehabilitation Report that monitoring results for dust and particulate matter indicates compliance with the limits in the environmental authority.
		Removal of potential sources of contamination.	Results of site contaminated land investigation report.	Evidence in the Rehabilitation Report that measures required in site contaminated land investigation report have been implemented.
		Diversion design and maintenance.	The administering authority of the water licence under the <i>Water Act 2000</i> (QLD) has determined that the water licence is no longer required.	Confirmation in writing from the administering authority that the water licence under the <i>Water Act 2000</i> (QLD) is no longer required.
	Stable landform	Landform design achieves appropriate erosion rates.	Engineered structures to control water flow.	Evidence in the Rehabilitation Report that required contour banks, channel linings, surface armour, engineered drop structures and other required measures are in place and functioning.
		Vegetation cover sufficient for a self-sustaining community and to minimise erosion.	Vegetation type and density.	Evidence that the vegetation type and density are of species suited to the sites characteristics including soil type, topography and climate and that soil erosion meets the goals set in this plan.
				Vegetation types and densities are comparable with the relevant reference site.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Foliage cover.	Minimum of 70% groundcover is present (or 50% if rocks, logs or other features are present). No bare surfaces >20 m ² in area or > 10 m in length down slope.
		The diversions and run-off drainage lines mirror natural stream functions.	Design and stability of drainage diversions.	Documentation in the Rehabilitation Report how drainage diversions have changed over the life of mine and that they are stable at closure and are likely to remain that way into the foreseeable future.
				To be designed and constructed in accordance with the Queensland Government Natural Resources and Mines, <i>Central West Water Management and Use Regional Guideline: Watercourse Diversions-Central Queensland Mining Industry</i> (2008) and with consideration of contemporary research, i.e. the ACARP report <i>Maintenance of Geomorphic Processes in Bowen Basin River diversions</i> (Project number C8030-C9068).
	Sustainable land-use	Soil properties support the desired land-use.	Chemical properties, e.g. pH, salinity, nutrient content, sodium content of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the topsoil chemical properties do not limit the suitability of the land for the intended land use and are consistent with the following: <ul style="list-style-type: none"> - soil salinity content is <0.6 dS/m; - soil pH is between 5.5 and 8.5; soil exchange sodium percentage (ESP) is <15%; - nutrient accumulation and recycling processes are occurring as evidenced by the presence of a litter layer, mycorrhizae and/or other microsymbionts; and - adequate macro and micro-nutrients are present.
			Physical properties of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the soil physical properties, e.g. rockiness, depth of soil, wetness and plant available water capacity are adequate for plant growth.
				Certification in the Rehabilitation Report of suitability for beef cattle grazing land use in accordance with Department of Minerals and Energy (DME) 1995 <i>Land Suitability Assessment Techniques in Technical Guidelines for the Environmental Management of Exploration and Mining</i> .
			Topsoil thickness.	Certification in the Rehabilitation Report that topsoil has been respread according to the depths required in the Topsoil Management Plan.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Site soil characteristics.	Certification in the Rehabilitation Report that the site's soil characteristics have acceptable levels of surface roughness, infiltration capacity, aggregate stability and surface condition as defined in the <i>Australian Soil and Land Survey Field Handbook</i> (National Committee on Soil and Terrain 2009).
		Establish self-sustaining natural vegetation or habitat.	Presence of key plant species.	Certification by an appropriately qualified person that key plant species identified in the comparable reference site occur on the rehabilitation site. The presence of key plant species may also be guided by future vegetation trials for rehabilitation.
			Density of key plant species.	Certification by an appropriately qualified person that the density of key plant species in comparable reference sites is similar to the rehabilitation site. The density of key plant species may also be guided by future vegetation trials for rehabilitation.
			Structure of vegetation habitat.	Certification by an appropriately qualified person that the structure of vegetation, i.e. groundcover, shrub and canopy structure is trending towards being similar to comparable reference sites.
		Self-sustaining natural vegetation or habitat.	Plant regeneration.	Certification by an appropriately qualified person that plants in rehabilitated areas show evidence of flowering, seed setting and seed germination.
			Native fauna species.	Certification by an appropriately qualified person that native fauna species identified in pre-mining baseline studies and the five years of reference site monitoring prior to the completion of rehabilitation are present or indicators of these species or habitat elements are developing within the rehabilitated areas.
			Abundance of declared plants (weeds) identified through surveys.	Certification by an appropriately qualified person that the abundance of declared plants (weeds) identified in rehabilitated areas is no greater than comparable reference sites.
			Actions taken to eradicate plants declared under local or State legislation.	Evidence to demonstrate that action has been taken to eradicate declared plants (weeds) under local or State legislation should they occur on the site.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Abundance of declared animals identified through surveys.	Certification by an appropriately qualified person that the abundance of declared animals identified in rehabilitated areas is no greater than comparable reference sites.
			Management actions taken to control animals declared under local or State legislation.	Evidence to demonstrate that action has been taken to control declared animals under local or State legislation should they occur on the site.
			Weed hygiene procedures.	Records indicating that appropriate weed and seed hygiene procedures were implemented during rehabilitation.
		Agricultural grazing.	Landform stability when grazed.	Land maintenance requirements are comparable to comparable reference sites.
			Stock access to water sources.	Stock has access to water that meet accepted livestock drinking water guidelines.
Tailings drying cells	Long term safety	Structurally safe with no hazardous materials.	Safety assessment of landform stability (geotechnical studies).	Certification by an appropriately qualified person in the Rehabilitation Report that slopes are now safe and exhibit characteristics for long term stability.
				A risk assessment has been completed and risk mitigation measures have been implemented. Where risk mitigation measures include bunds, safety fences and warning signs, these have been erected in accordance with relevant guidelines and Australian Standards.
				Landform design meets the design requirements of Table 4.1: Summary of final land use and rehabilitation.
		Site is safe for humans and animals now and in the foreseeable future.	Appropriate decommissioning of infrastructure.	Certification by an appropriately qualified person in the site Rehabilitation Report that the infrastructure has been decommissioned and rehabilitated. Buildings, water storage(s), roads (except those used by the public) and other infrastructure have been removed unless stakeholders have entered into formal written agreements for their retention. Access to the area is conducive of the intended purpose of the post-mining land use including pastoral farming.
	Non-polluting	Mine affected water contained on site.	Downstream surface water quality.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Groundwater quality.	Certification by an appropriately qualified person that groundwater quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Final landform water storages are contained on-site, with no over flows into external surface water systems.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
				Receiving water affected by surface water runoff has contaminant limits in accordance with the environmental authority.
			All permanent stream diversion will meet approved design criteria.	Certification by an appropriately qualified person that all stream diversions have been constructed and are operating in accordance with approved design criteria.
			All permanent regulated structures will meet approved design criteria.	The regulated structures are certified by a suitably qualified and experienced person .
			All non-permanent regulated structures decommissioned appropriately.	Regulated structures are decommissioned in accordance with the administering authority requirements.
		Hazardous materials adequately managed.	Exposure to and availability of heavy metals and other toxic materials.	Certification by an appropriately qualified person that the Rehabilitation Report includes predictions about future changes and that the specified cover thickness is in place.
				Evidence in the Rehabilitation Report that monitoring results for dust and particulate matter indicates compliance with the limits in the environmental authority.
		Removal of potential sources of contamination.	Results of site contaminated land investigation report.	Evidence in the Rehabilitation Report that measures required in site contaminated land investigation report have been implemented.
		Acid mine drainage will not cause serious environmental harm.	Technical design of tailings emplacement cells.	Certification by suitably qualified person in the Rehabilitation Report that the tailings drying cells were in accordance with recommendations in the Acid Mine Drainage Assessment Report.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
		Diversion design and maintenance.	The administering authority of the water licence under the <i>Water Act 2000</i> (QLD) has determined that the water licence is no longer required.	Confirmation in writing from the administering authority that the water licence under the <i>Water Act 2000</i> (QLD) is no longer required.
		Hazardous materials adequately managed.	Exposure to and availability of heavy metals and other toxic materials	Evidence that surface water quality for the 5 years post mine closure has complied with the surface water contaminant limits in the environmental authority.
	Stable landform	Landform design achieves appropriate erosion rates.	Slope angle and length.	Evidence in the Rehabilitation Report that the rehabilitated slopes have been designed to the specifications outlined in Table 4.1 Summary of final land use and rehabilitation.
			Engineered structures to control water flow.	Evidence in the Rehabilitation Report that required contour banks, channel linings, surface armour, engineered drop structures and other required measures are in place and functioning.
			Rates of soil loss.	Certification by an appropriately qualified person that land disturbed by mining activities does not exhibit any signs of continued erosion greater than that exhibited at a comparable reference site. The comparable reference site must have similar chemical and physical characteristics including slope as the rehabilitated landform.
			Dimensions and frequency of occurrence of erosion of rills and gullies.	Evidence in the Rehabilitation Report that the dimensions and frequency of occurrence of erosion rills and gullies are no greater than that in comparable reference site(s).
		Vegetation cover sufficient for a self-sustaining community and to minimise erosion.	Vegetation type and density.	Evidence that the vegetation type and density are of species suited to the sites characteristics including soil type, topography and climate and that soil erosion meets the goals set in this plan.
				Vegetation types and densities are comparable with the relevant reference site.
			Foliage cover.	Minimum of 70% groundcover is present (or 50% if rocks, logs or other features are present). No bare surfaces >20 m ² in area or > 10 m in length down slope.
		The diversions and run-off drainage lines mirror natural stream functions.	Design and stability of drainage diversions.	Documentation in the Rehabilitation Report how drainage diversions have changed over the life of mine and that they are stable at closure and are likely to remain that way into the foreseeable future.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
				To be designed and constructed in accordance with the Queensland Government Natural Resources and Mines, <i>Central West Water Management and Use Regional Guideline: Watercourse Diversions-Central Queensland Mining Industry</i> (2008) and with consideration of contemporary research, i.e. the ACARP report <i>Maintenance of Geomorphic Processes in Bowen Basin River diversions</i> (Project number C8030-C9068).
	Sustainable land-use	Soil properties support the desired land-use.	Chemical properties, e.g. pH, salinity, nutrient content, sodium content of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the topsoil chemical properties do not limit the suitability of the land for the intended land use and are consistent with the following: <ul style="list-style-type: none"> - soil salinity content is <0.6 dS/m; - soil pH is between 5.5 and 8.5; soil exchange sodium percentage (ESP) is <15%; - nutrient accumulation and recycling processes are occurring as evidenced by the presence of a litter layer, mycorrhizae and/or other microsymbionts; and - adequate macro and micro-nutrients are present.
			Physical properties of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the soil physical properties, e.g. rockiness, depth of soil, wetness and plant available water capacity are adequate for plant growth.
				Certification in the Rehabilitation Report of suitability for beef cattle grazing land use in accordance with Department of Minerals and Energy (DME) 1995 <i>Land Suitability Assessment Techniques in Technical Guidelines for the Environmental Management of Exploration and Mining</i> .
			Topsoil thickness.	Certification in the Rehabilitation Report that topsoil has been respread according to the depths required in the Topsoil Management Plan.
			Site soil characteristics.	Certification in the Rehabilitation Report that the site's soil characteristics have acceptable levels of surface roughness, infiltration capacity, aggregate stability and surface condition as defined in the <i>Australian Soil and Land Survey Field Handbook</i> (National Committee on Soil and Terrain 2009).

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
		Establish self-sustaining natural vegetation or habitat (remnant vegetation areas).	Presence of key plant species.	Certification by an appropriately qualified person that key plant species identified in the comparable reference site occur on the rehabilitation site. The presence of key plant species may also be guided by future vegetation trials for rehabilitation.
			Density of key plant species.	Certification by an appropriately qualified person that the density of key plant species in comparable reference sites is similar to the rehabilitation site. The density of key plant species may also be guided by future vegetation trials for rehabilitation.
			Structure of vegetation habitat.	Certification by an appropriately qualified person that the structure of vegetation, i.e. groundcover, shrub and canopy structure is trending towards being similar to comparable reference sites.
	Self-sustaining natural vegetation or habitat.		Plant regeneration.	Certification by an appropriately qualified person that plants in rehabilitated areas show evidence of flowering, seed setting and seed germination.
			Abundance of declared plants (weeds) identified through surveys.	Certification by an appropriately qualified person that the abundance of declared plants (weeds) identified in rehabilitated areas is no greater than comparable reference sites.
			Actions taken to eradicate plants declared under local or State legislation.	Evidence to demonstrate that action has been taken to eradicate declared plants (weeds) under local or State legislation should they occur on the site.
			Abundance of declared animals identified through surveys.	Certification by an appropriately qualified person that the abundance of declared animals identified in rehabilitated areas is no greater than comparable reference sites.
			Management actions taken to control animals declared under local or State legislation.	Evidence to demonstrate that action has been taken to control declared animals under local or State legislation should they occur on the site.
			Weed hygiene procedures.	Records indicating that appropriate weed and seed hygiene procedures were implemented during rehabilitation.
	Agricultural grazing.		Livestock stocking rates.	An appropriately qualified person has predicted and defined the economics/ benefits and these have been agreed with relevant stakeholders.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Landform stability when grazed.	Land maintenance requirements are comparable to comparable reference sites.
			Stock access to water sources.	Stock has access to water that meet accepted livestock drinking water guidelines.
Carmichael River corridor	Long term safety	Rehabilitation or conversion of exploration drill holes and groundwater monitoring bores.	All non-artesian exploration drill holes undertaken on the mining lease have been rehabilitated or converted to water bores.	Certification by an appropriately qualified person that all non-artesian exploration drill holes not converted to either a water bore or a groundwater monitoring bore have been rehabilitated.
				Certification by an appropriately qualified person, that all sub-artesian aquifers have been isolated where non-artesian exploration drill holes have intersected more than one sub-artesian water bearing strata, in accordance with <i>Minimum Construction Requirements for Water Bores in Australia</i> (Australian Government February 2012) or latest edition.
				Certification by an appropriately qualified person that all non-artesian exploration drill holes converted to a water bore have been converted in accordance with the <i>Minimum Construction Requirements for Water Bores in Australia</i> (Australian Government February 2012) or latest edition.
				Certification by an appropriately qualified person that all non-artesian exploration drill holes converted to water bores are compliant with the <i>Water Act 2000</i> (QLD).
			All monitoring bores undertaken on the mining lease have been rehabilitated.	Certification by an appropriately qualified person that all monitoring bores have been rehabilitated in accordance with the <i>Minimum Construction Requirements for Water Bores in Australia</i> (Australian Government February 2012) or latest edition.
	Non-polluting	Mine affected water contained on site.	Downstream surface water quality.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Groundwater quality.	Certification by an appropriately qualified person that groundwater quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Final landform water storages are contained on-site, with no over flows into external surface water systems.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
				Receiving water affected by surface water runoff has contaminant limits in accordance with the environmental authority.
			All permanent stream diversion will meet approved design criteria.	Certification by an appropriately qualified person that all stream diversions have been constructed and are operating in accordance with approved design criteria.
			All permanent regulated structures will meet approved design criteria.	The regulated structures are certified by a suitably qualified and experienced person .
			All non-permanent regulated structures decommissioned appropriately.	Regulated structures are decommissioned in accordance with the administering authority requirements.
		Diversion design and maintenance.	The administering authority of the water licence under the <i>Water Act 2000</i> (QLD) has determined that the water licence is no longer required.	Confirmation in writing from the administering authority that the water licence under the <i>Water Act 2000</i> (QLD) is no longer required.
		Removal of potential sources of contamination.	Results of site contaminated land investigation report.	Evidence in the Rehabilitation Report that measures required in site contaminated land investigation report have been implemented.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
	Sustainable land-use	Self-sustaining natural vegetation or habitat.	Native fauna species.	Certification by an appropriately qualified person that native fauna species identified in pre-mining baseline studies and the five years of reference site monitoring prior to the completion of rehabilitation are present or indicators of these species or habitat elements are developing within the rehabilitated areas.
			Plant regeneration.	Certification by an appropriately qualified person that plants in the area show evidence of flowering, seed setting and seed germination.
			Abundance of declared plants (weeds) identified through surveys.	Certification by an appropriately qualified person that the abundance of declared plants (weeds) identified in rehabilitated areas is no greater than comparable reference sites.
			Actions taken to eradicate plants declared under local or State legislation.	Evidence to demonstrate that action has been taken to eradicate declared plants (weeds) under local or State legislation should they occur on the site.
			Abundance of declared animals identified through surveys.	Certification by an appropriately qualified person that the abundance of declared animals identified in rehabilitated areas is no greater than comparable reference sites.
			Management actions taken to control animals declared under local or State legislation.	Evidence to demonstrate that action has been taken to control declared animals under local or State legislation should they occur on the site.
			Weed hygiene procedures.	Records indicating that appropriate weed and seed hygiene procedures were implemented during works in the area.

Attachment C—Subsidence guidance material

When to use

This appendix is to be used by the Environmental Authority (EA) holders in the preparation of a Subsidence Management Plan (SMP) where a watercourse, as defined under the *Water Act 2000*, is to be impacted as a result of underground longwall mining. For a feature to be defined as a watercourse under Chapter 1, Part 2 of the *Water Act 2000*, the feature must possess particular characteristics. Watercourse determinations are regularly undertaken across Central Queensland by authorised departmental officers as it is the determining factor in the requirement for approvals under the *Water Act 2000*.

In addition, this appendix is to be used by the Department when providing advice and assessing Subsidence Management Plans submitted by EA holders or proposed EA holders.

Purpose

The purpose of this appendix is to detail the information to be provided in a SMP and the legislative basis of the requirement for approval. The SMP forms the major reference document regarding subsidence impacts on watercourses as a result of underground longwall mining and is required to accompany proposals for watercourse subsidence.

The objective of the SMP is to ensure that the impacts of subsidence are properly managed. Where surface subsidence intersects a watercourse, it is important for the situation to be managed effectively to ensure no long-term maintenance is required within the watercourse, and to ensure that naturally occurring processes are not impaired.

A SMP should include the following information:

- Location of proposed longwall panels and modelled subsidence effects on the watercourse;
- Pre-subsidence management of watercourses proposed to be subsided;
- Monitoring methods pre and post-subsidence to detect and document any impacts on watercourses;
- Post-subsidence management of impacted watercourses through remediation and rehabilitation;
- Agreed outcome for proposed future landscape between the Department and the EA holder.

Governing legislation

Historically, subsidence on mining leases has been managed under two separate Government Departments; the Environmental Protection Agency (EPA) and Natural Resources and Water (NRW). Under the former EPA, subsidence within mining leases was conditional to the EA holder's EA, however the impact on watercourses was not specifically addressed.

Now Departments are as one, regulation can be coordinated such as watercourse subsidence is authorised under specific conditions included in an EA issued under the *Environmental Protection Act 1994*. Works undertaken within the bed and banks of a watercourse aimed at mitigating or remediating any physical impacts pre or post-subsidence are also authorised under the conditions of the EA. This guideline has been developed to assist the Department and EA holders in undertaking a single collaborative process in the assessment and authorisation of proposals regarding subsidence of watercourses.

Environmental impact associated with mining activities is regulated under the *Environmental Protection Act 1994*. While this legislation does not identify longwall mining as a specific mining activity, it provides a definition of a 'mining activity' and 'environmental harm'. The process of longwall mining and resultant subsidence is governed by the legislation and authorised under a EA holder's EA.

The holder or holders of a mining tenement issued under the *Mineral Resources Act 1989* must hold an EA for the mining activities to be carried out on the tenement. When applying for

an EA, a number of environmental management documents must be in place describing the proposed project and the management of any environmental impacts.

A Plan of Operations describes the actions and programs required to achieve compliance with the conditions of an EA. It also describes the actions and programs required to achieve or implement the commitments contained in the relevant EM Plan. All activities carried out on a mining lease must be carried out in accordance with the submitted Plan of Operations. A Plan of Operations describes an action program for complying with the conditions of the associated EA and EM Plan, contains a plan showing where all activities are to be carried out on the land, and includes a rehabilitation program for land disturbed or proposed to be disturbed.

Whilst management of subsidence will be included the Plan of Operations, the Subsidence Management Plan is a stand-alone document authorised under the conditions of the EA.

Background

Throughout the Bowen Basin, economically viable coal deposits frequently extend beneath watercourses. Consequently, underground mining operations targeting the associated coal seams often also extend beneath watercourses. Underground mining is not a new concept in the extraction of coal throughout the Bowen Basin. This form of mining is preferred when economic constraints reduce the feasibility of mining using open cut methods. Whilst coal deposits located beneath watercourses contribute to total extractable coal, more importantly, extraction of this coal facilitates underground mining activities to continue along a coal seam uninterrupted across both sides of a watercourse. This provides for a more cost effective extraction of coal that might otherwise be uneconomic to mine.

Technological improvements in underground mining methods have provided the ability to extract coal in areas previously inaccessible for mining. Modern day underground coal mining operations commonly utilise longwall mining techniques which allow extraction of more of the coal seam. Longwall mining allows access to the coal seam via a shaft, a decline or a highwall portal and system of underground workings, without the need to remove overburden. This technique is used to extract the coal seam via a series of “panels”, which can be hundreds of metres wide and kilometres in length. As the coal shearer removes the coal in the seam along the length of a panel, the overlying strata is collapsed behind, filling the void (goaf) left by the extracted coal. The collapse and settlement of the overlying strata can extend to the land surface above, resulting in localised lowering of the surface profile, and depressions in the landscape (commonly referred to as subsidence troughs).

Where a watercourse is located above a longwall panel, extraction of the coal seam causes subsidence of the panel can have a number of impacts on the watercourse. Some of these impacts include:

- Lowering of bed and banks
- Creation of in-stream waterholes
- Changes to local drainage patterns
- Incision processes
- Stream widening
- Erosion
- Increased overbank flows due to lowering of the high banks
- Tension cracking through both shallow and deeper underlying strata (including aquifers)
- Root shear and loss of riparian vegetation
- Changes to water quality (surface water and groundwater).

The degree of subsidence is generally a function of thickness of coal extracted, depth of overburden, strata type and panel width. The point of maximum subsidence generally occurs along the centreline of an extracted panel, whilst the pillar zones located between panels remain at natural surface level. Experience gained through widespread adoption of longwall mining processes in the Bowen Basin has seen advancement in the modelling and ability to predict the likely impacts of a subsidence event. This technology has also facilitated improved design and implementation of mitigation measures (engineered structures and associated earthworks) and highlighted potential short and long term maintenance issues which may require specific management intervention.

Appendix 1. Mine conditions

Carmichael Coal Mine and Rail project:

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

Subsidence Management Plan

The objective of the SMP is to ensure that the impacts of subsidence are properly managed. Where surface subsidence intersects a watercourse, effective management is required to ensure no long-term maintenance is required within the watercourse, and to ensure that naturally occurring processes are not unduly impaired. Consideration must be given for potential impacts on erosion, groundwater and surface water as a result of a proposed subsidence event.

A Subsidence Management Plan must address the following issues:

- (1) Description of Pre Subsidence Situation & Survey
 - (a) A general description of the area pre subsidence including photographic record should be provided.
 - (b) Survey of cross-section and longitudinal profiles should be undertaken on all watercourses with potential to be impacted through subsidence. Permanent transects should be detailed within the proposed Subsidence Management Plan. Surveys should include the confluence with any other watercourses in the impacted area as well as any infrastructure spanning the watercourse. Surface drainage patterns should be investigated to determine current paths of water movement through the landscape. This path of water movement should be maintained where possible post-subsidence.
- (2) Predicted Subsidence

The degree of anticipated subsidence should be provided, including the length of watercourse to be impacted and the average depth of subsidence across individual panels. The predicted subsidence should be modelled to indicate the change in surface elevations expected. The volumes of water expected to be captured within the bed of the watercourse due to creation of waterholes should be provided. Consequences of any lowering of the high banks of the watercourse should be discussed, including impacts associated with greater floodplain interaction and potential for creation of new channels.
- (3) Infrastructure

Prior to mining, the anticipated impacts from subsidence should be determined on all infrastructure located within or above the watercourse to be subsided along with measures to be implemented to mitigate any impacts. Priority should be given to infrastructure which provides services to external parties (other mines, towns, industry). Measures for dealing with any interruption to such services should be outlined. Relocation of infrastructure may be necessary should the proposed subsidence pose sufficient risk.
- (4) Preventative Works

Where preventative measures are required to ensure the stability of the bed and banks of the watercourse (establishment of pile fields, exclusion of cattle, bentonite treatment) these should be discussed in the Subsidence Management Plan, including supporting evidence outlining the legitimacy of such works. These works may be required where self-repair by natural processes will not provide adequate remediation of impacted areas. Where there is potential for root shear to result in significant loss of riparian vegetation, mitigation measures may be required.
- (5) Engineered Structures

Engineered works may be required to maintain the stability and function of a watercourse impacted by subsidence. These works are often constructed prior to subsidence occurring within the watercourse. Such works can include timber pile fields, rock revetment, reshaping of existing stream banks, and river bed treatment to prevent increased ingress of surface water into underground aquifers. Where subsidence mitigation measures require engineered structures be installed, the design, monitoring and maintenance of these structures should be detailed in the Subsidence Management Plan. The plan should detail the purpose of each structure and any consequences should the structure fail to be installed. Appropriate design plans

including the location of each structure will be required. As a minimum, fourth and fifth order watercourse will require the installation of engineered structures. Works undertaken within the bed and banks of a watercourse aimed at mitigating or remediating any physical impacts pre or post-subsidence are authorised under the conditions of the Environmental Authority. Where a separate report has been produced for engineered structures, this should be included as an appendix to the Subsidence Management Plan.

(6) Erosion

The Subsidence Management Plan should detail the current watercourse condition to be impacted by subsidence. Identification of erosion zones which are likely to be exacerbated through tension cracking should be stabilised using appropriate methods. Such areas may include reaches with elevated rates of bed and bank erosion, access tracks and areas with poor quality, sparsely populated riparian vegetation. Sufficient riparian vegetation should be established prior to subsidence to assist with initial stabilisation of the bed and banks. Removal of grazing animals to allow establishment or recovery of riparian vegetation may be required for an extended period prior to subsidence.

(7) Groundwater

Where groundwater aquifers exist beneath the mine plan area, investigations should be undertaken regarding the potential for impacts on these aquifers as a result of subsidence. The Subsidence Management Plan should discuss these aquifers, any anticipated impacts on each aquifer and proposed measures for mitigating these impacts. Any anticipated movement of surface water into underlying aquifers should be discussed, as this can result in loss of surface water from the system and impacts on water quality in these aquifers. Geotechnical assessment across the bed and banks of the watercourse should be undertaken to provide an indication of potential permeability issues related to sub-surface cracking and interaction with local groundwater tables. Monitoring bores should be established in each aquifer prior to subsidence and monitored for a period of time sufficient for obtaining background water levels and trends. Monitoring of these bores should continue post-subsidence to aid the detection of impacted aquifers.

(8) Surface Water

(a) Baseline Monitoring

The Subsidence Management Plan should detail baseline condition monitoring of all watercourses likely to be impacted through subsidence. The preferred monitoring assessment technique for stream condition in the Bowen Basin is the Index of Diversion Condition. This methodology was established as a result of the Australian Coal Association Research Program (ACARP) Project C9068. Monitoring of watercourses should extend a minimum of 1km upstream and downstream of the proposed area to be impacted and should include a geomorphic assessment of the entire reach. Where a baseline monitoring assessment has been undertaken as part of an Environmental Impact Statement (EIS) process, this may be considered sufficient provided there has been no subsequent modification or interference to the watercourse. The condition of riparian vegetation should also be detailed.

(9) Cumulative Impacts on Watercourses

With an increasing number of mines being established in close proximity to watercourses, a EA holder utilising longwall mining methods may be requested to investigate the cumulative impact of these activities on the watercourse.

Monitoring and Reporting Requirements

The following criteria have been developed to provide detailed direction regarding monitoring and reporting requirements associated with subsidence of watercourses.

These criteria are outlined in a four step approach:

- Monitoring

Appendix 1. Mine conditions

Carmichael Coal Mine and Rail project:

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

- Assessment
- Reporting
- Mitigation

Monitoring

- Representative sites need to be identified that allow the impacts of subsidence to be assessed in a particular watercourse with particular attention to the following:
 - Sites must be located at all pillar zones intersecting a watercourse or tributary.
 - Sites must include representative locations at the interface of natural ground level and observed changes in surface elevation from subsidence within a watercourse.
- Control sites beyond proposed mining extents should be established to verify pre-mining conditions. In watercourses, the sites should extend a minimum of 1km both upstream and downstream of the subsidence reach.
- Assessment of watercourse condition: Specific monitoring assessment techniques for watercourse condition should include but not be limited to the Index of Diversion Condition, as outlined in the ACARP Project C9068.
- Vegetation and ecological condition assessments should form part of the baseline dataset.
- Rainfall monitoring should be undertaken within areas proposed to be impacted by subsidence. In addition, flow event monitoring should occur in watercourses proposed to be impacted by subsidence. The type of monitoring devices and locations to be installed should be detailed in the Subsidence Management Plan.
- Where preventative works are undertaken pre-subsidence, subsequent monitoring assessments should include the integrity and effectiveness of these works in reducing the impact of subsidence within the watercourse.
- Surveys must include cross-sectional area and bed slope throughout all monitored reaches of impacted watercourses.
- Annual aerial photography and Digital Terrain Mapping is required to verify predicted subsidence surface profiles, and to identify potential short and long term erosion issues resulting from subsidence of watercourses.
- Surveys pre-subsidence should quantify the following features within watercourses:
 - pool/riffle sequences
 - bed controls
 - entry points of other watercourses and localised tributaries
 - existing bed and bank scour points
 - infrastructure located within the watercourse.
- Surveys post-subsidence should quantify any changes to the pre-mining conditions including:
 - erosion or deposition processes that have occurred as a result of subsidence,
 - migration of head cut erosion within watercourses and tributaries,
 - localised changes to stream bed slope,
 - localised widening of channels,
 - destabilisation of stream bed and banks including fracturing and incision,
 - localised changes to bank heights
 - size of subsidence void created within the watercourse.
- The subsidence monitoring program for groundwater must include the following information:
 - Sites must include representative locations at the interface of natural ground surface and observed changes in surface elevation from subsidence.
 - Monitoring bores should be established in each aquifer at each monitoring site.
 - Monitoring must include both water level measurements and water quality sampling in accordance with the following:
 - water level measurement to be taken quarterly
 - water quality field conductivity measurement to be taken 6 monthly
 - full chemical analysis of water samples to be taken annually.

Frequency of Monitoring

A proposed timeframe should be provided by the EA holder in relation to the monitoring outlined in the Subsidence Management Plan. The Department, upon review of the proposed Subsidence Management Plan will determine a suitable monitoring timeframe based on the information provided. Monitoring requirements will depend on a number of factors, including the stream order of the watercourse proposed to be impacted. As a guide:

Stream Order 1, 2 and 3

Monitoring must be undertaken at the following intervals:

- immediately prior to subsidence,
- within two (2) months of the initial subsidence,
- following a rainfall event of **1 in 2 year** ARI for the duration equal to the time of concentration for the catchment at the location of the subsidence.
- following a peak flow event of greater than a **1 in 2 year** ARI and
- annually.

Stream Order 4 and higher

Monitoring (including surveys) must be undertaken at the following intervals:

- immediately prior to subsidence,
- within two (2) months of the initial subsidence,
- following a rainfall event of **1 in 5 year** ARI for the duration equal to the time of concentration for the catchment at the location of the subsidence.
- following a peak flow event of greater than a **1 in 5 year** ARI, and
- annually.

Cumulative Impacts

Where subsidence is proposed in a Subsidence Management Plan, and the watercourse has already been subsided upstream or downstream, the monitoring assessment must determine not only the localised impacts on the watercourse resulting from the proposed subsidence, but also any cumulative impacts on the watercourse as a result of all other subsidence events.

Assessment

The design and assessment of engineered structures should be performed by a Registered Professional Engineer of Queensland (RPEQ). All other assessments should be performed by suitably qualified and experienced persons in the fields that they are assessing.

- The results of all monitoring activities should be reviewed by an appropriately qualified person and detailed in the associated monitoring report.
- Recommendations should be made after assessment of the results regarding any specific treatment, remediation works, or engineered structures required post-subsidence to achieve stability in the watercourse.

Reporting

An annual report will be requested by the administering authority post-subsidence. The report should detail mining activities and all monitoring and rehabilitation activities as outlined within the Subsidence Management Plan. The reporting date will be determined in consultation with the administering authority.

- A monitoring report should contain the results of all monitoring activities, the assessment of these results, and recommendations for any remedial works required. The report should comment on the following:
 - Watercourse condition and geomorphic processes;
 - The condition of vegetation in riparian zones;
 - Examination of pillar zones in watercourses with particular attention to potential for tension cracking;
 - The creation of in-stream waterholes;
 - Any impacts on groundwater.

- Where preventative works were undertaken pre-subsidence, subsequent monitoring assessments should include assessment of the integrity and effectiveness of these works in mitigating the impacts of subsidence.
- An annual report in the form of two (2) hard copies and one electronic copy shall be furnished to the administering authority. The report should in addition to addressing specific monitoring requirements provide comment on:
 - The current state of the groundwater and surface water resources;
 - Any impacts on these features;
 - Any remedial works required to be undertaken including a timetable for implementation.
 - Commitment from the EA holder to addressing the recommendations in the report.

Mitigation

Where recommendations are made regarding specific treatment, remediation works, or engineered structures required post-subsidence to achieve stability in the watercourse, the EA holder must ensure this work is undertaken.

Rehabilitation

The holder of the EA, if directed by the administering authority, will carry out additional remedial works deemed necessary to minimise the impacts of subsidence on the physical integrity of the watercourse.

Relinquishment

Relinquishment of monitoring and rehabilitation responsibilities conditional under a EA holder's EA can only occur after the subsidence and approved mitigation and rehabilitation measures have been subjected to a suitable range of rainfall and flow events, and are deemed by the administering authority to be in a stable and functional condition. Any request for relinquishment will be negotiated with the administering authority and will require a submission containing monitoring data demonstrating stability and functionally in the watercourse over a suitable range of rainfall and flow events.

Acknowledgement

In 2007, BMA and Anglo Coal instigated discussions with the Department into a proposed assessment on the cumulative impacts of longwall mining beneath the Isaac River in Central Queensland. A final report was produced by Alluvium Consulting in July 2009 documenting the outcomes of the study. The Department greatly acknowledges the findings from this report and the assistance provided in the development of this guideline.

R Lucas, J Crerar, R Hardie, J Merritt and B Kirsch, 2009. *Isaac River Cumulative Impact Assessment of Mining Developments*. Report by Alluvium Consulting. ACARP for Diversion assessment guideline ex C9068

Attachment D—Figures

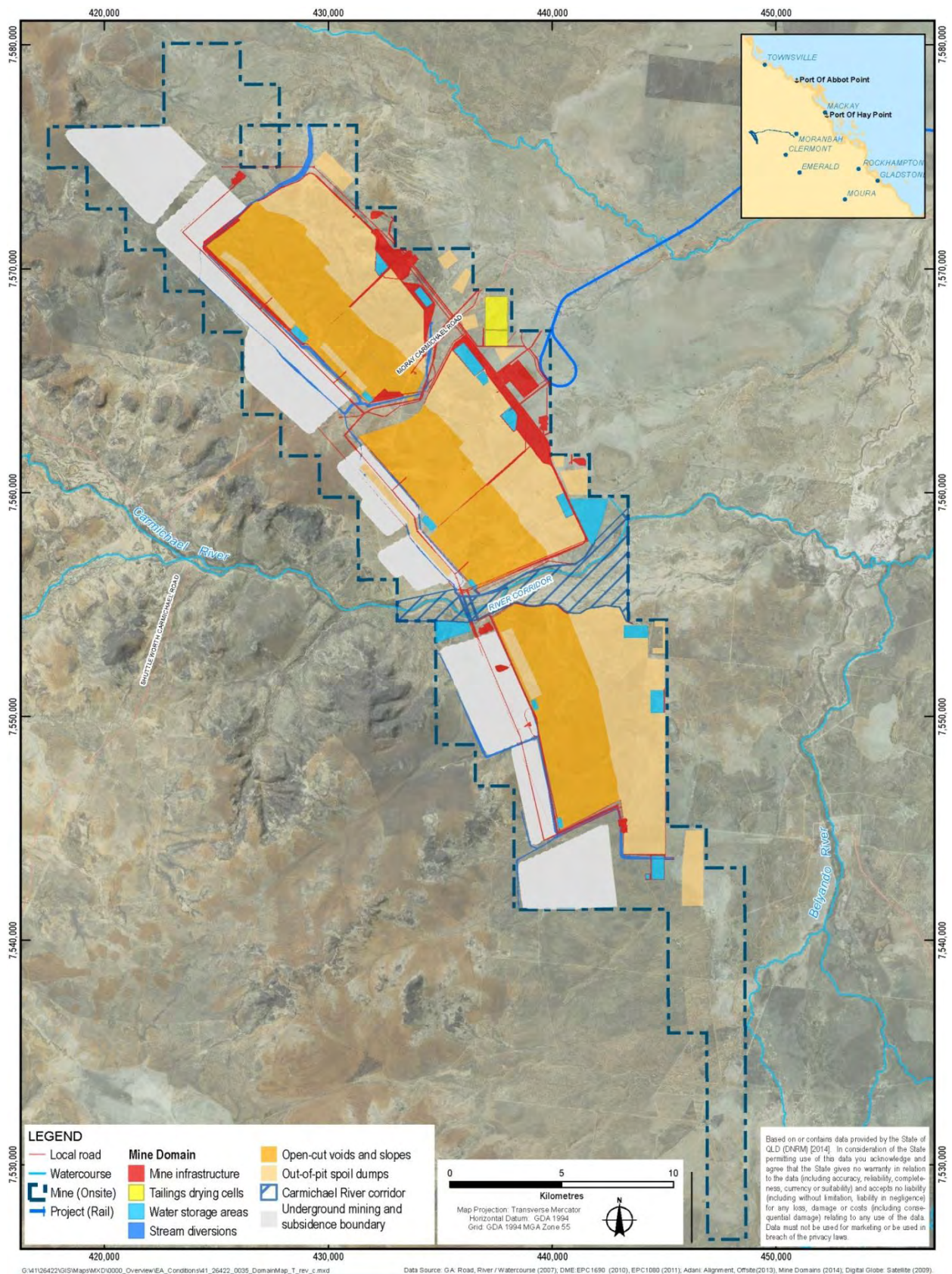


Figure A1: Overall Site Layout Domain Plan

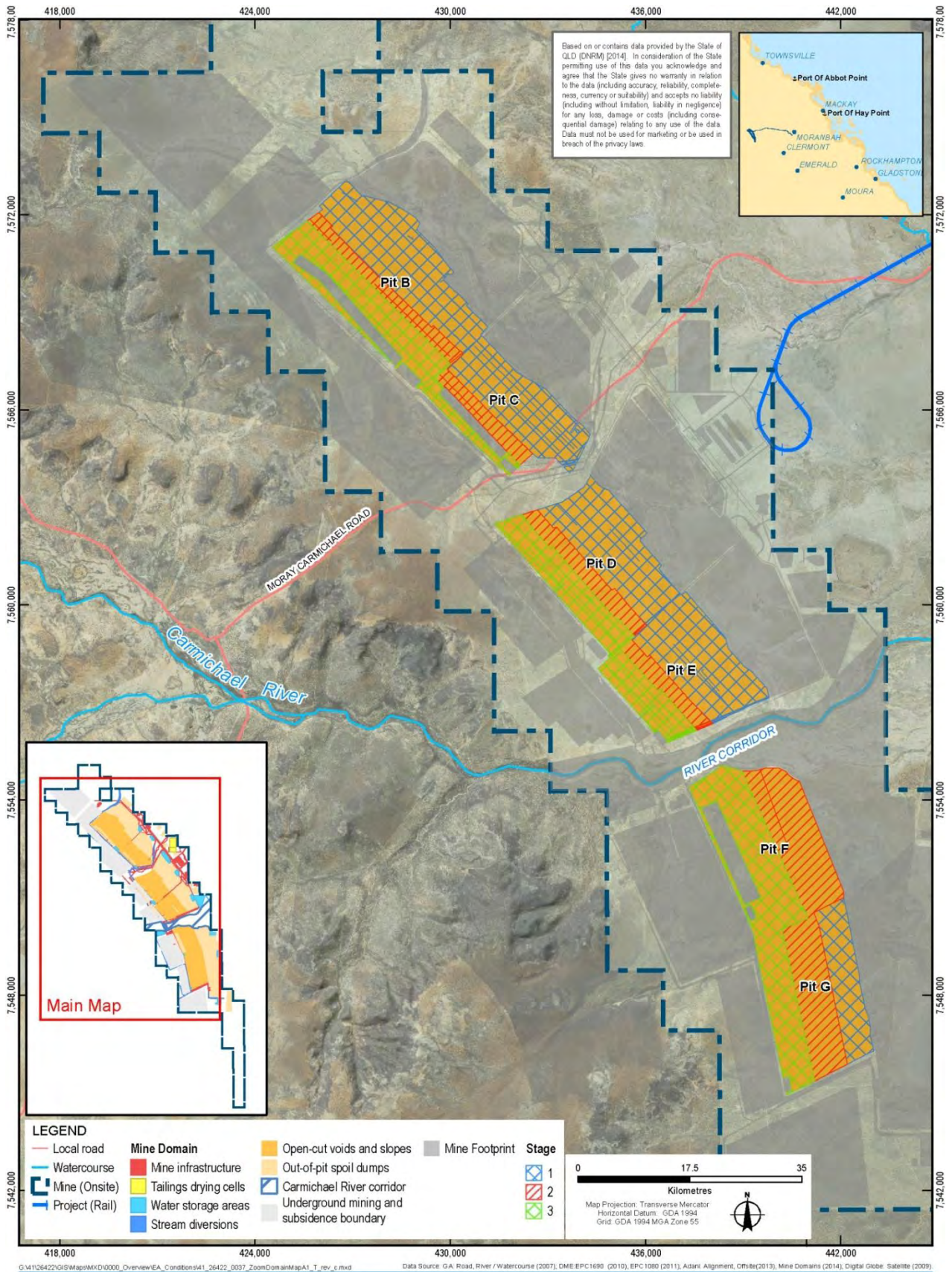


Figure A2. Breakdown of Domain Map 1

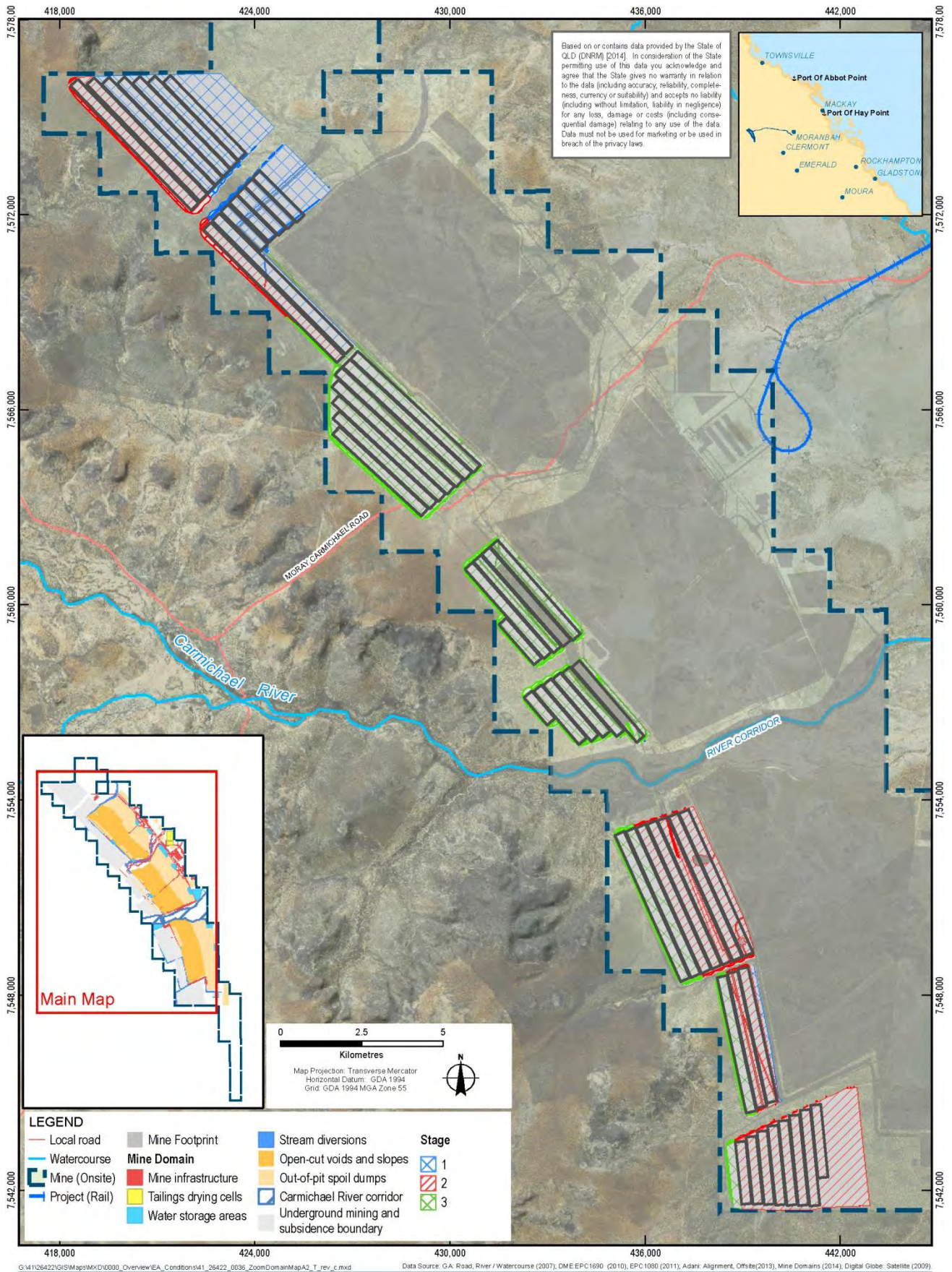


Figure A3. Breakdown of Domain Map 2

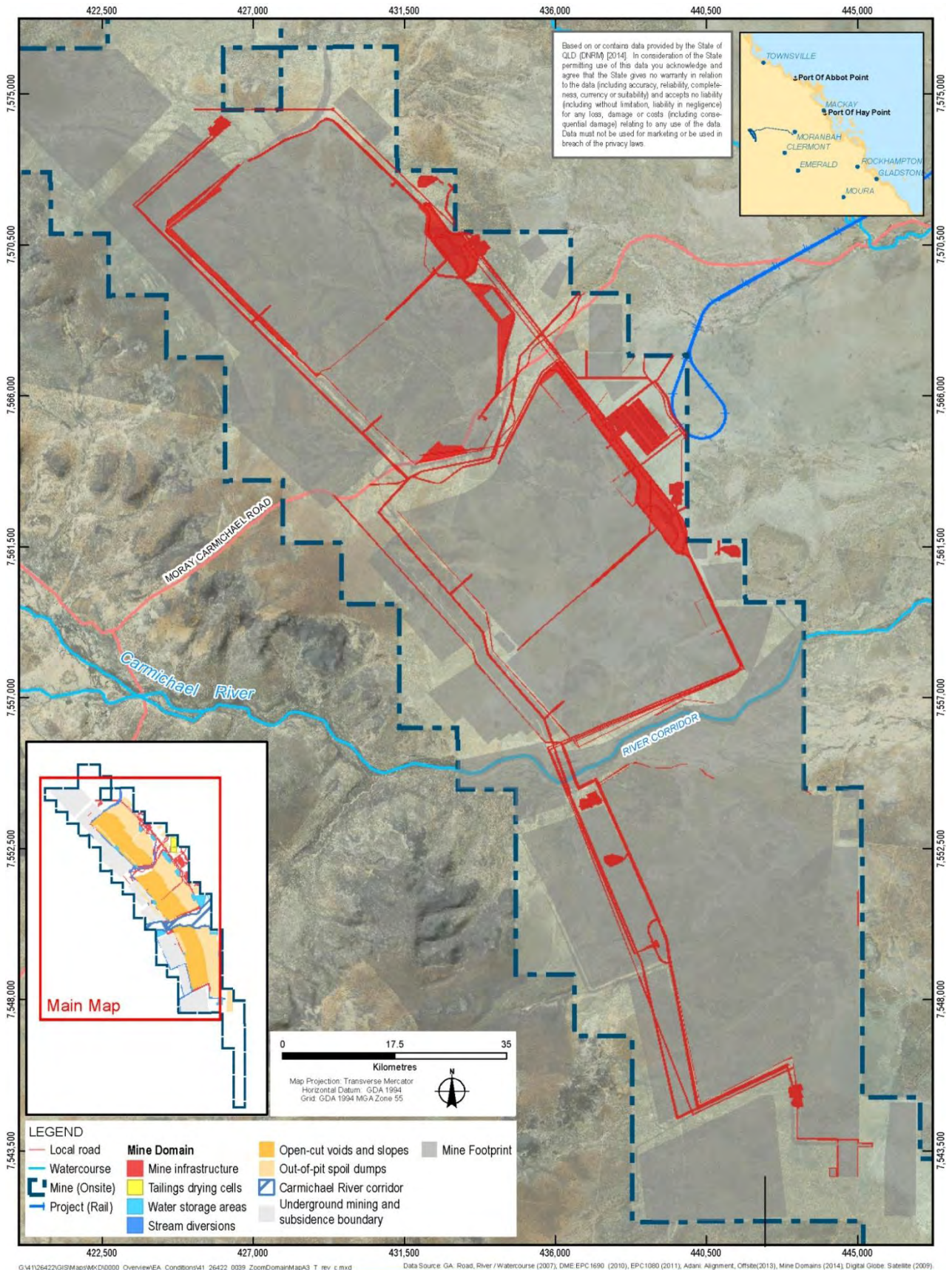


Figure A4. Breakdown of Domain Map 3

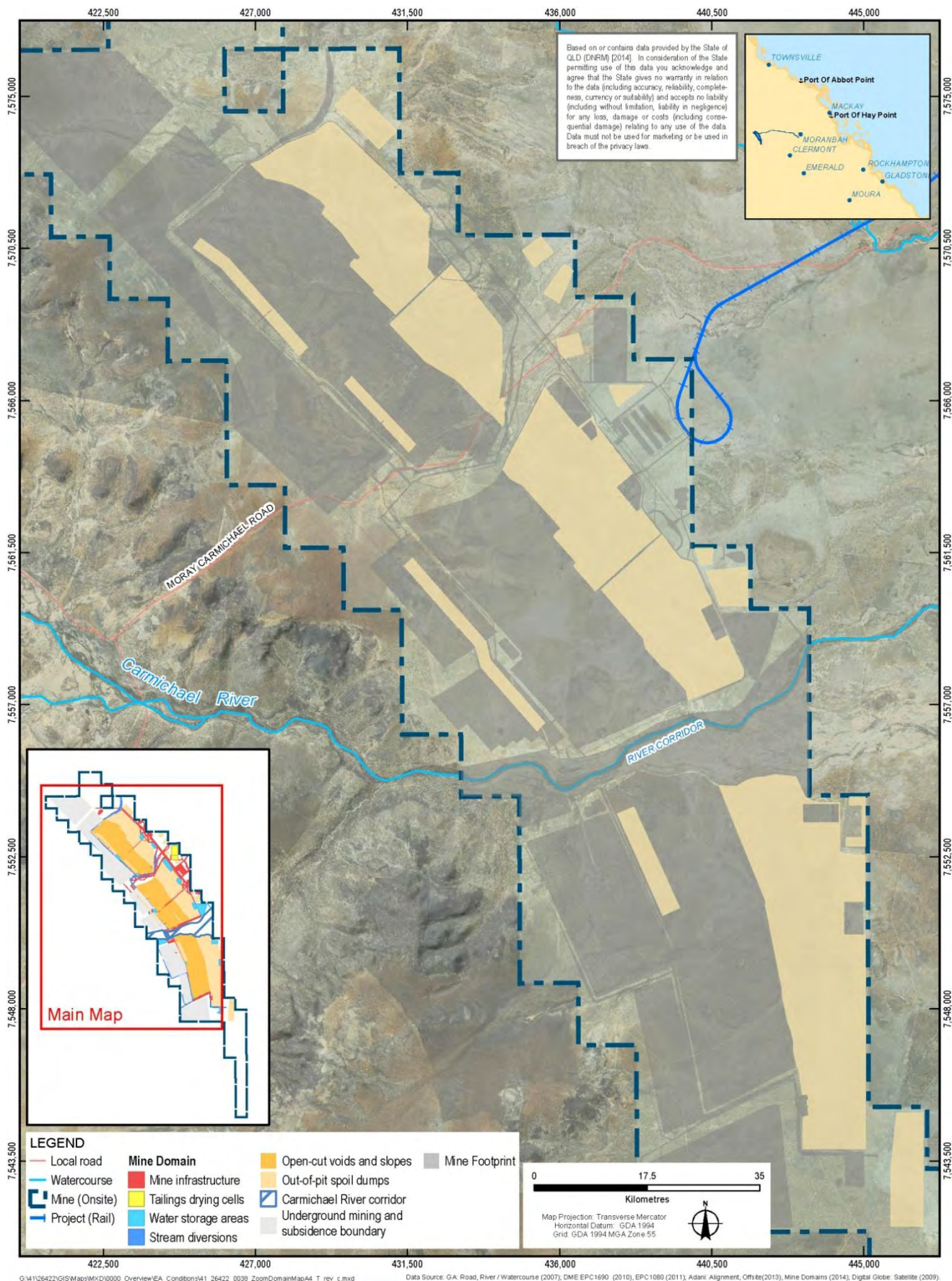


Figure A5. Breakdown of Domain Map 4

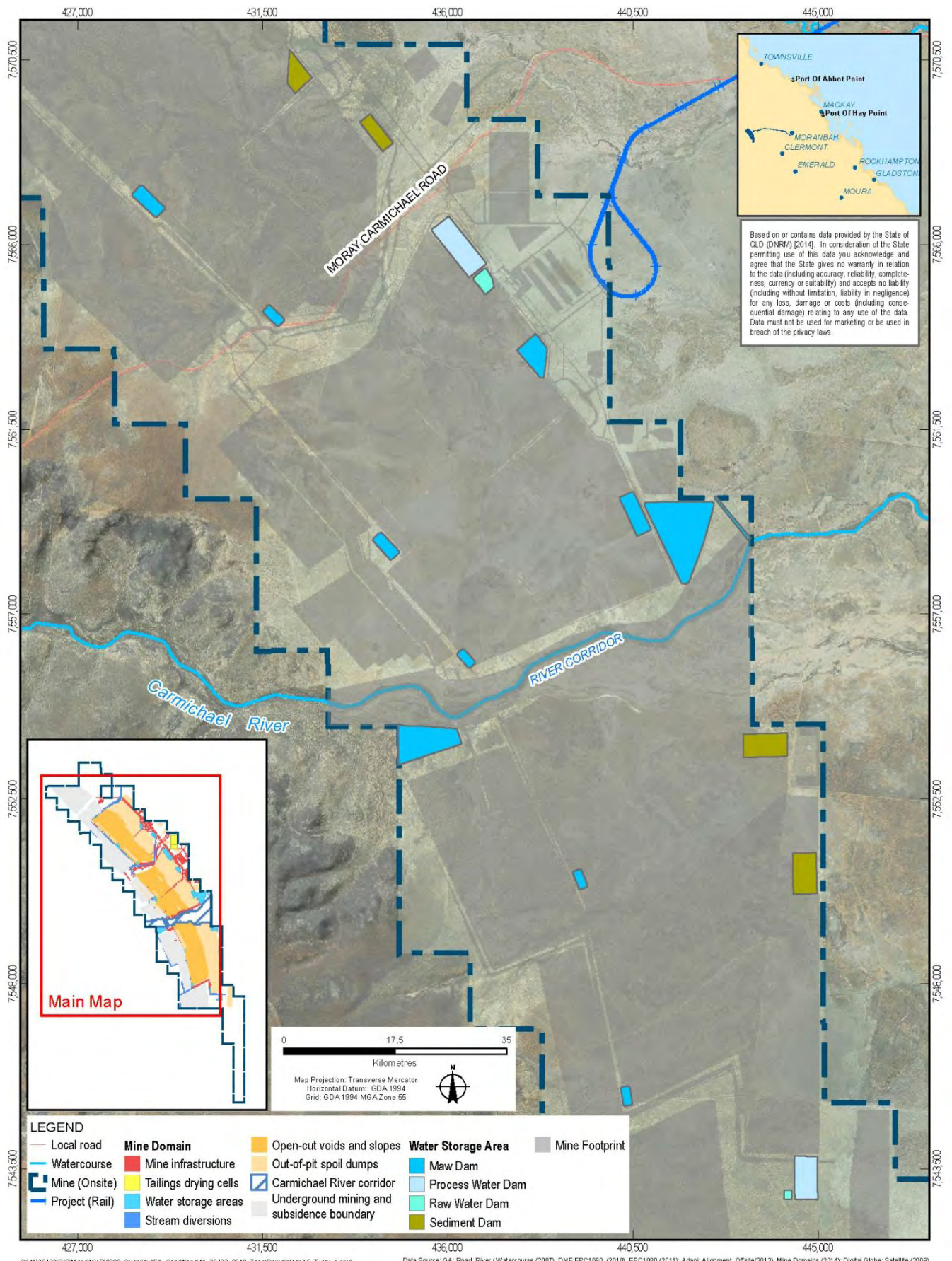


Figure A6. Breakdown of Domain Map 5

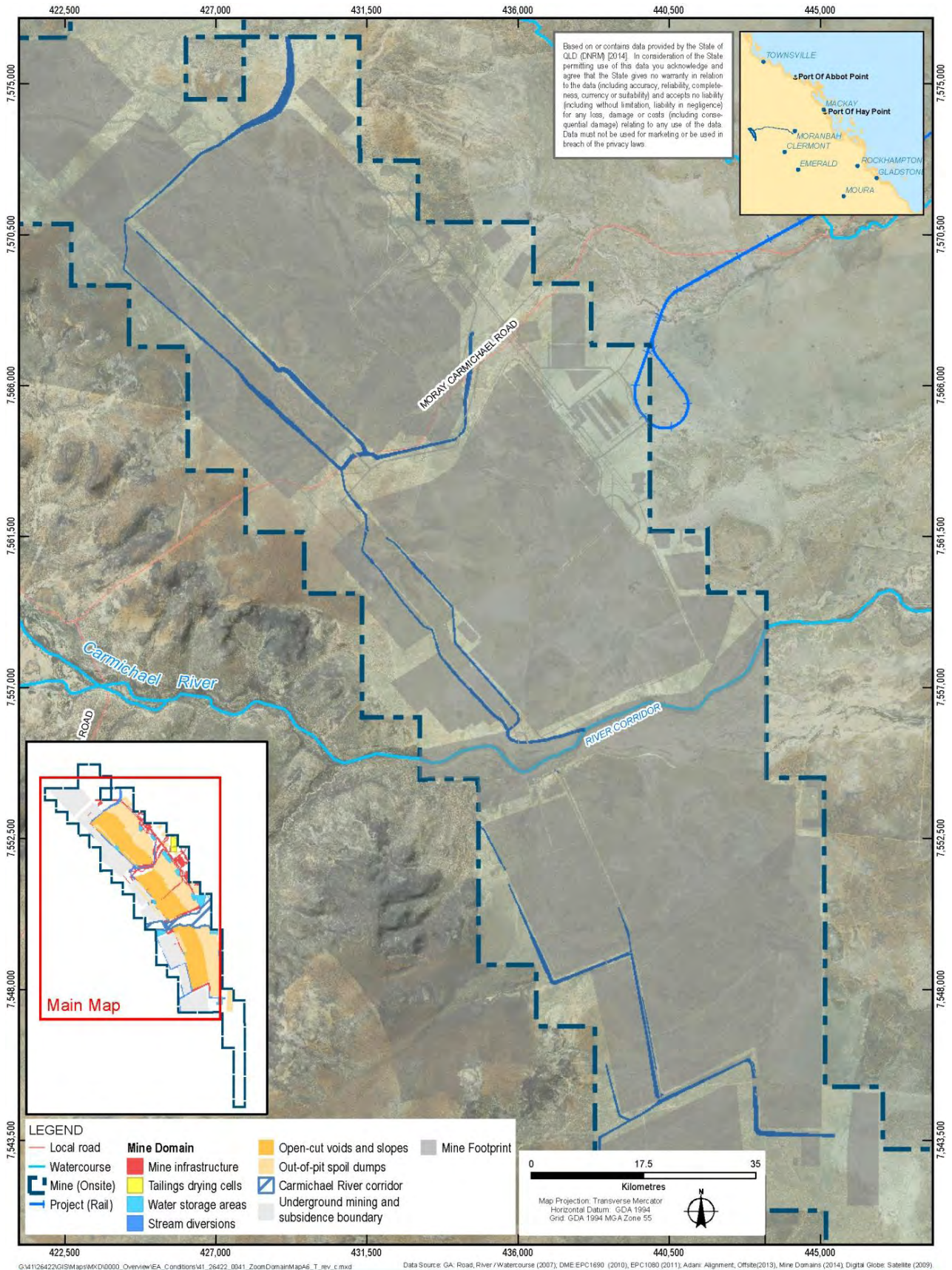


Figure A7. Breakdown of Domain Map 6

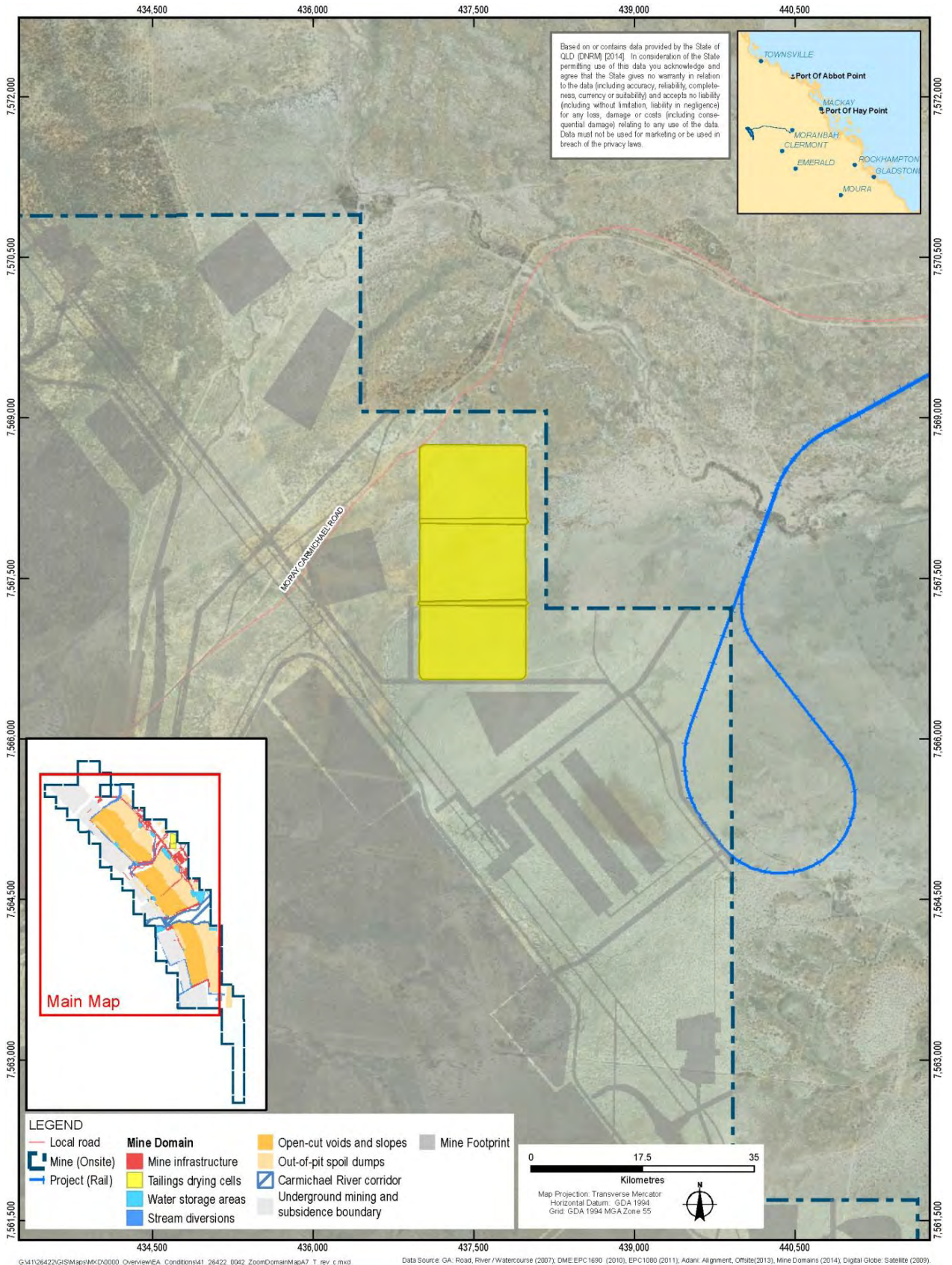


Figure A8. Breakdown of Domain Map 7

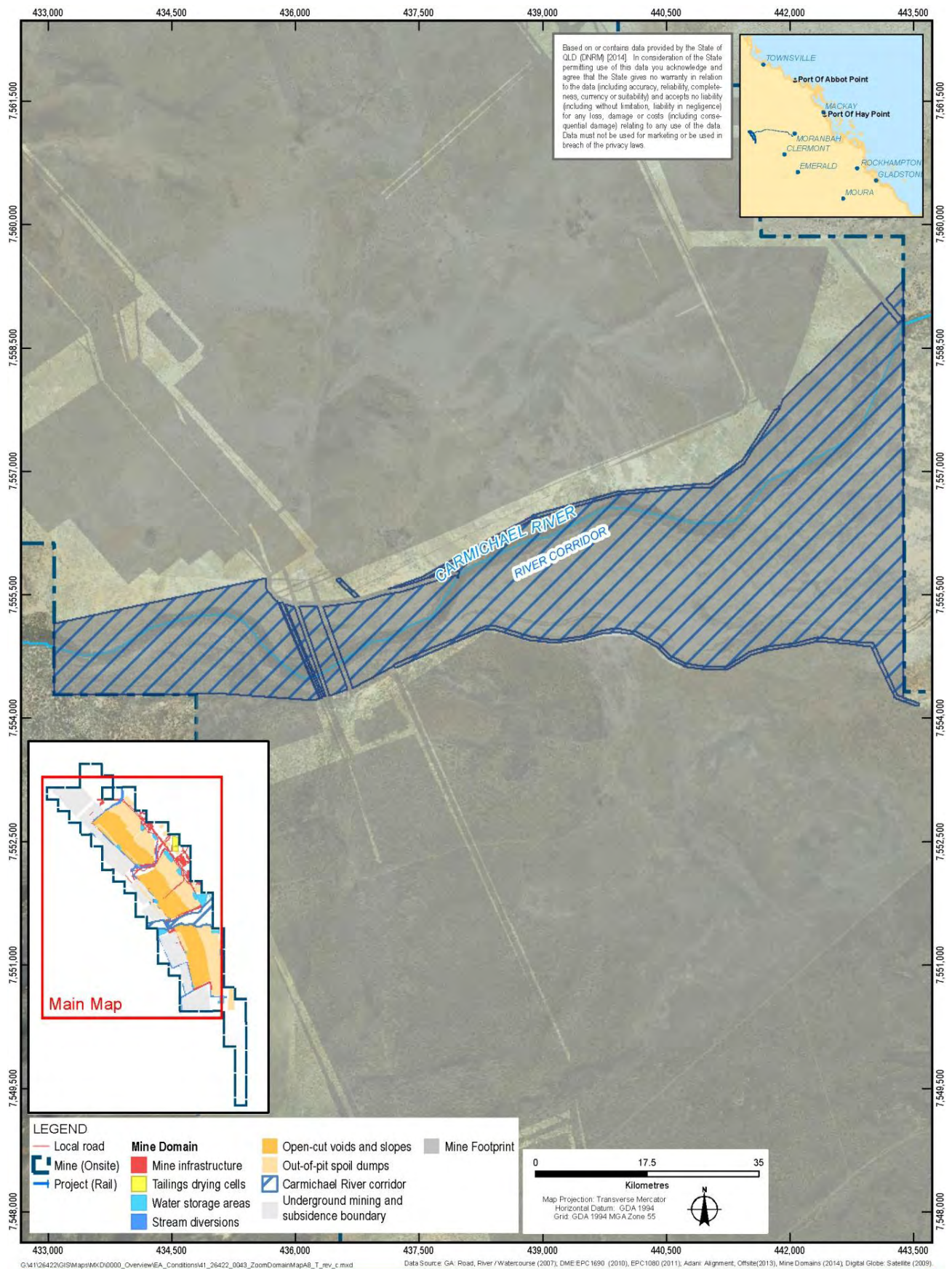


Figure A9. Breakdown of Domain Map 8

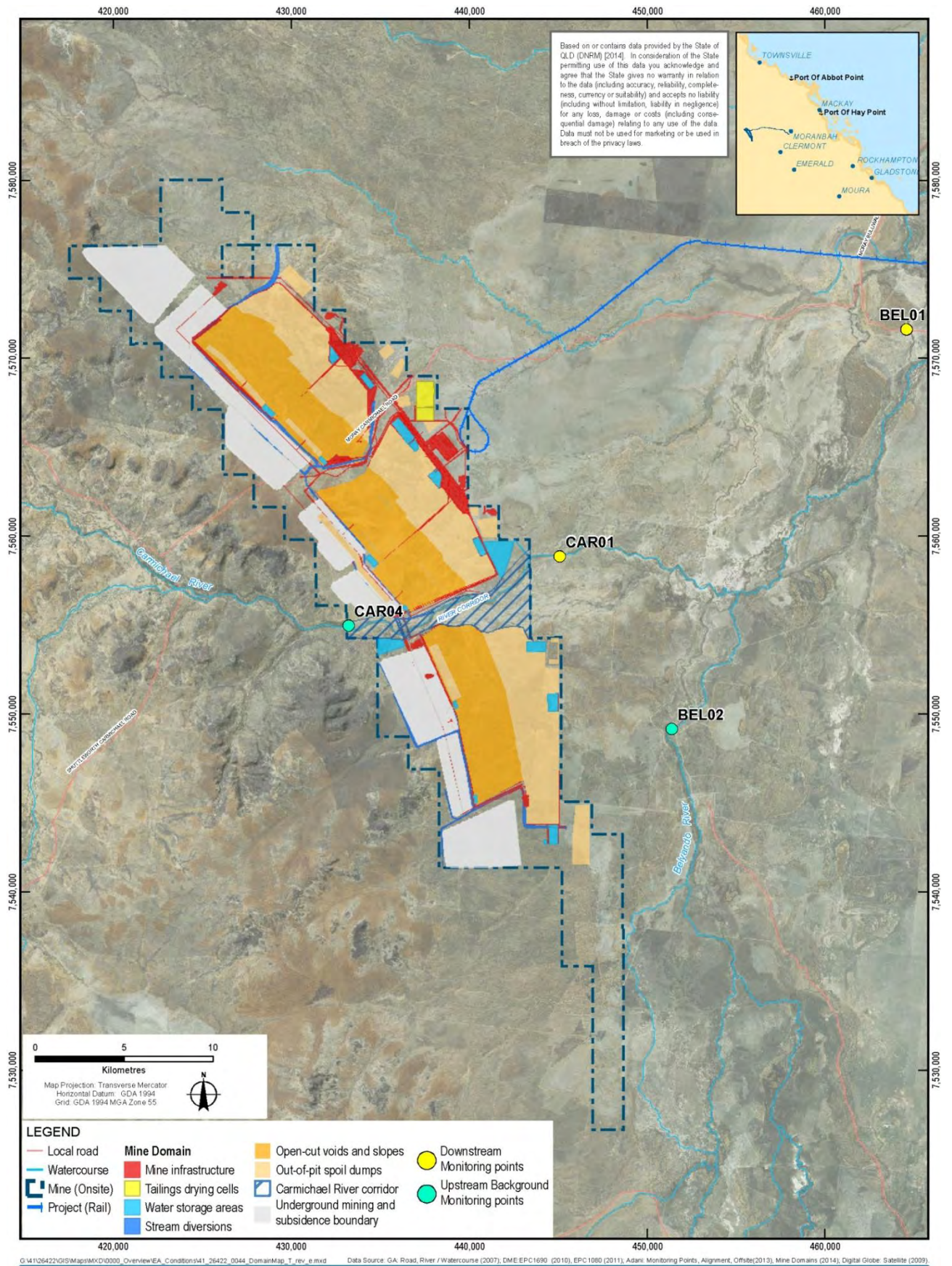


Figure F1: Water release/monitoring locations

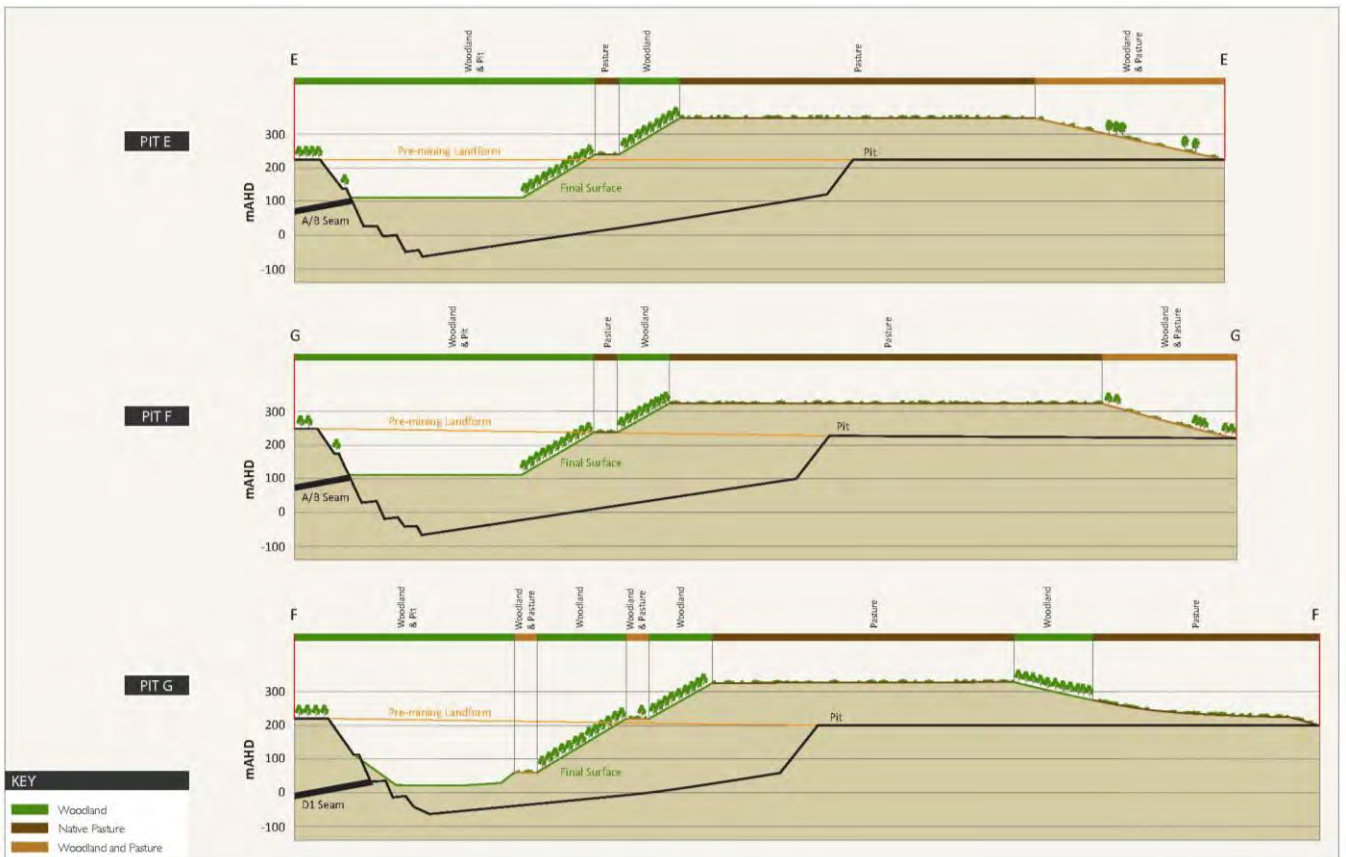
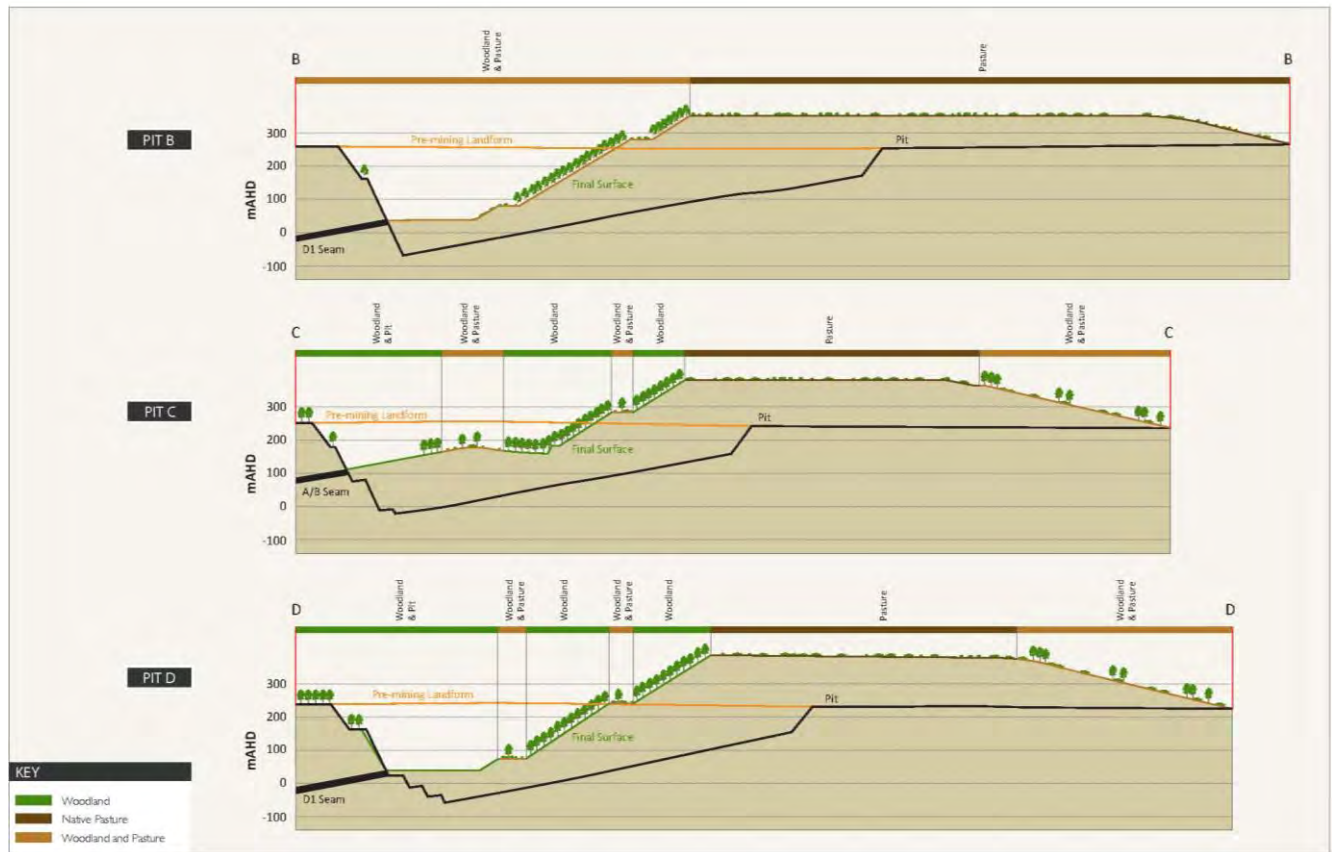


Figure H1: Cross sections of residual voids

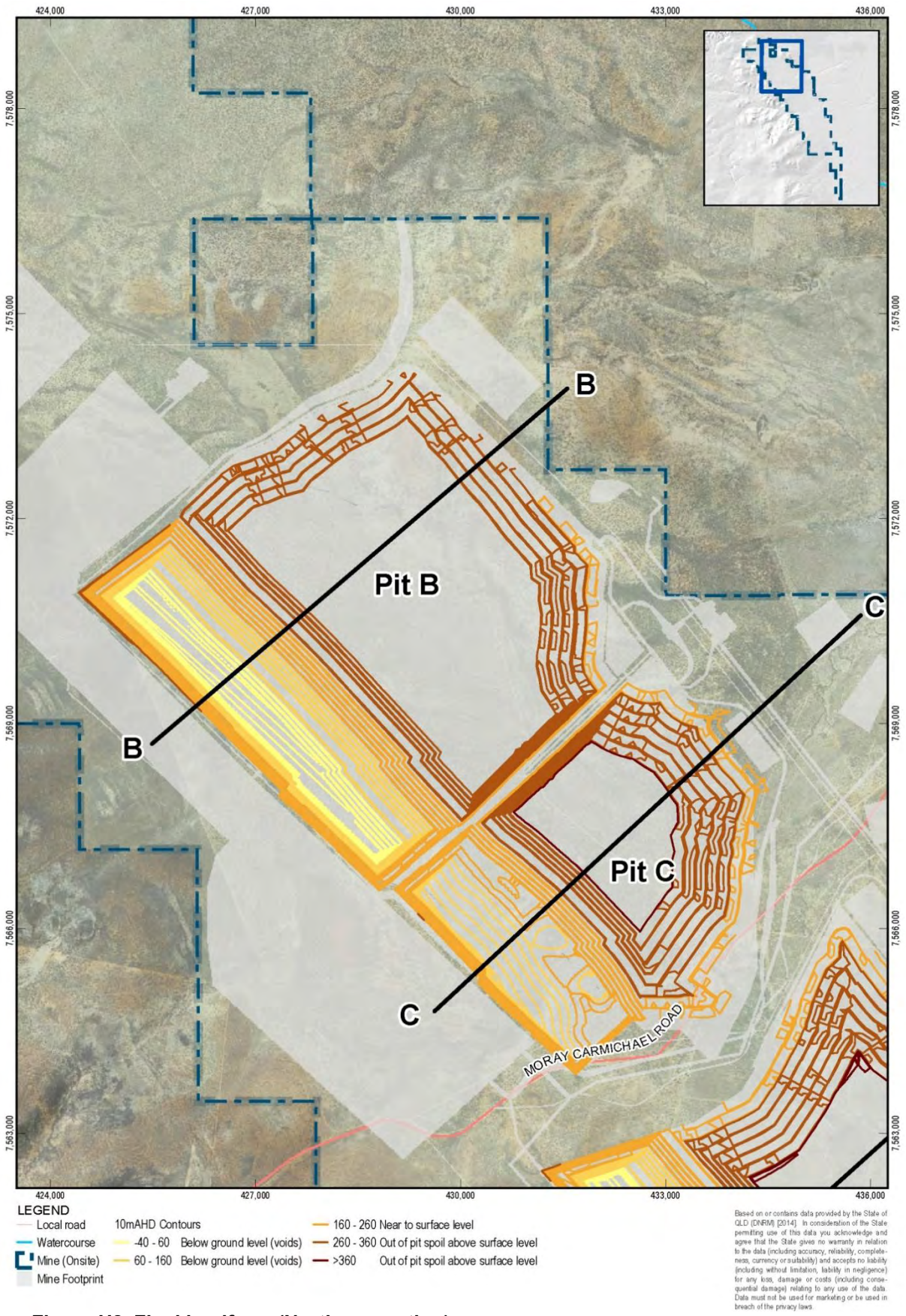


Figure H2: Final landform (Northern section)

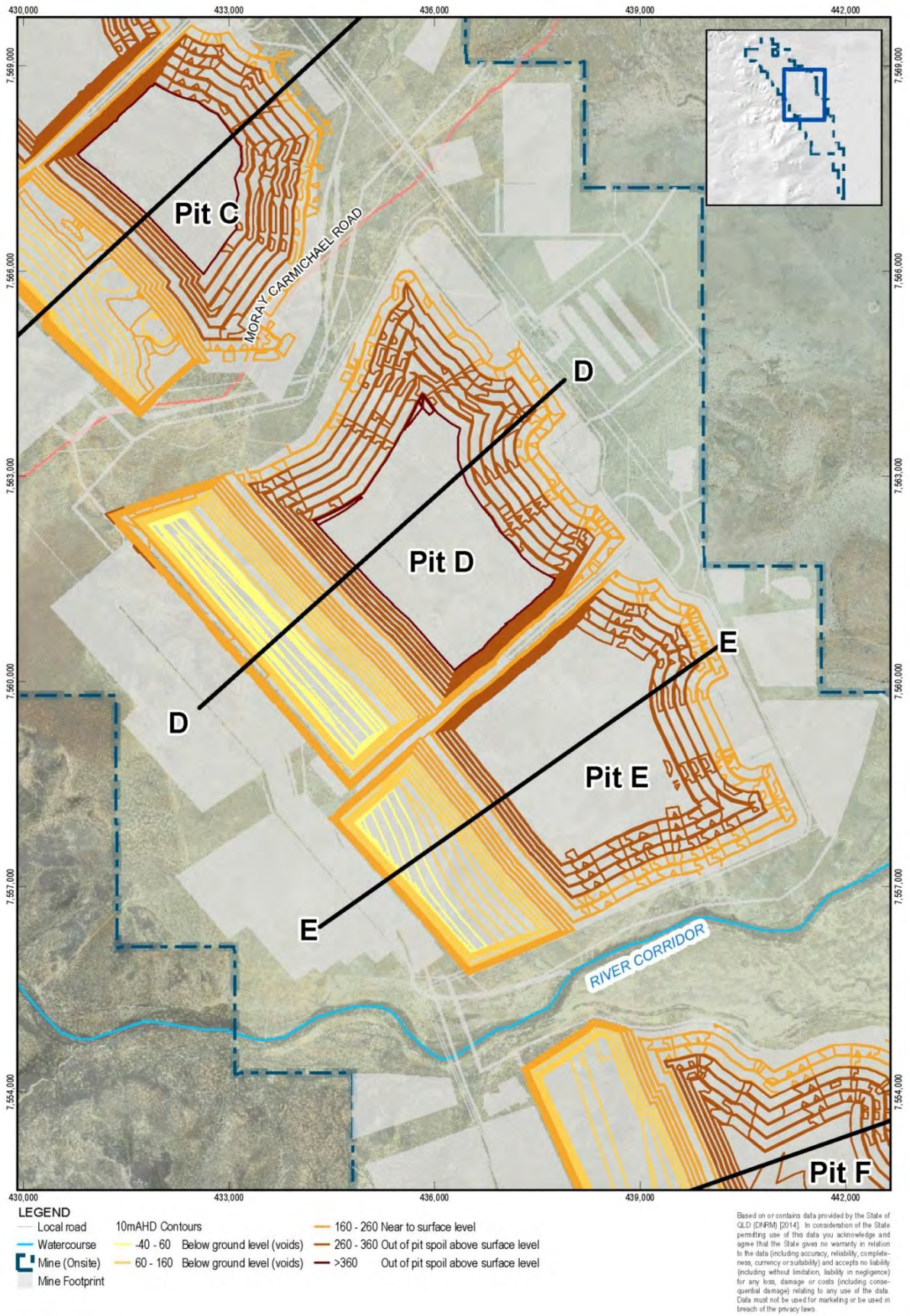


Figure H3: Final landform (Central section)

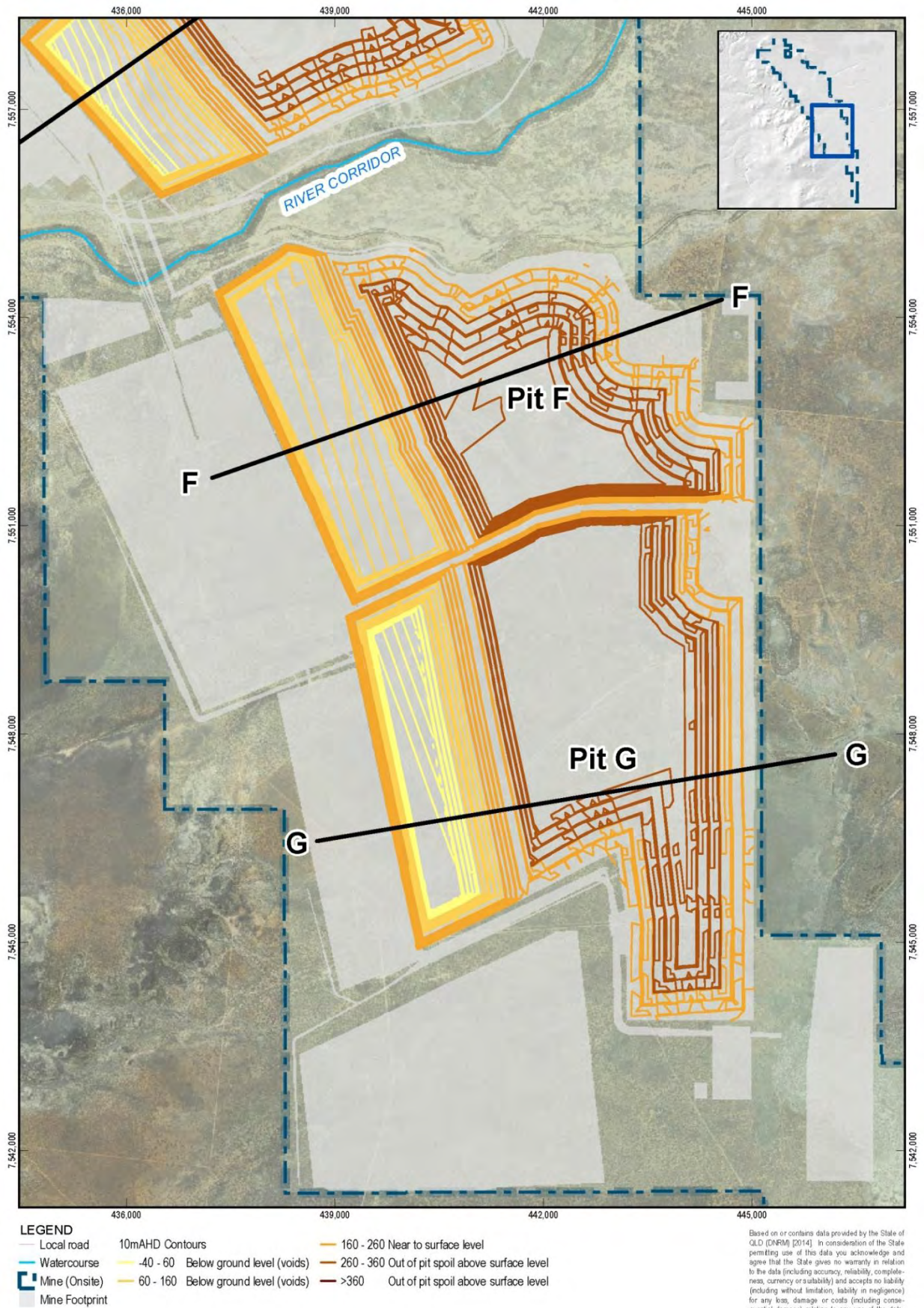
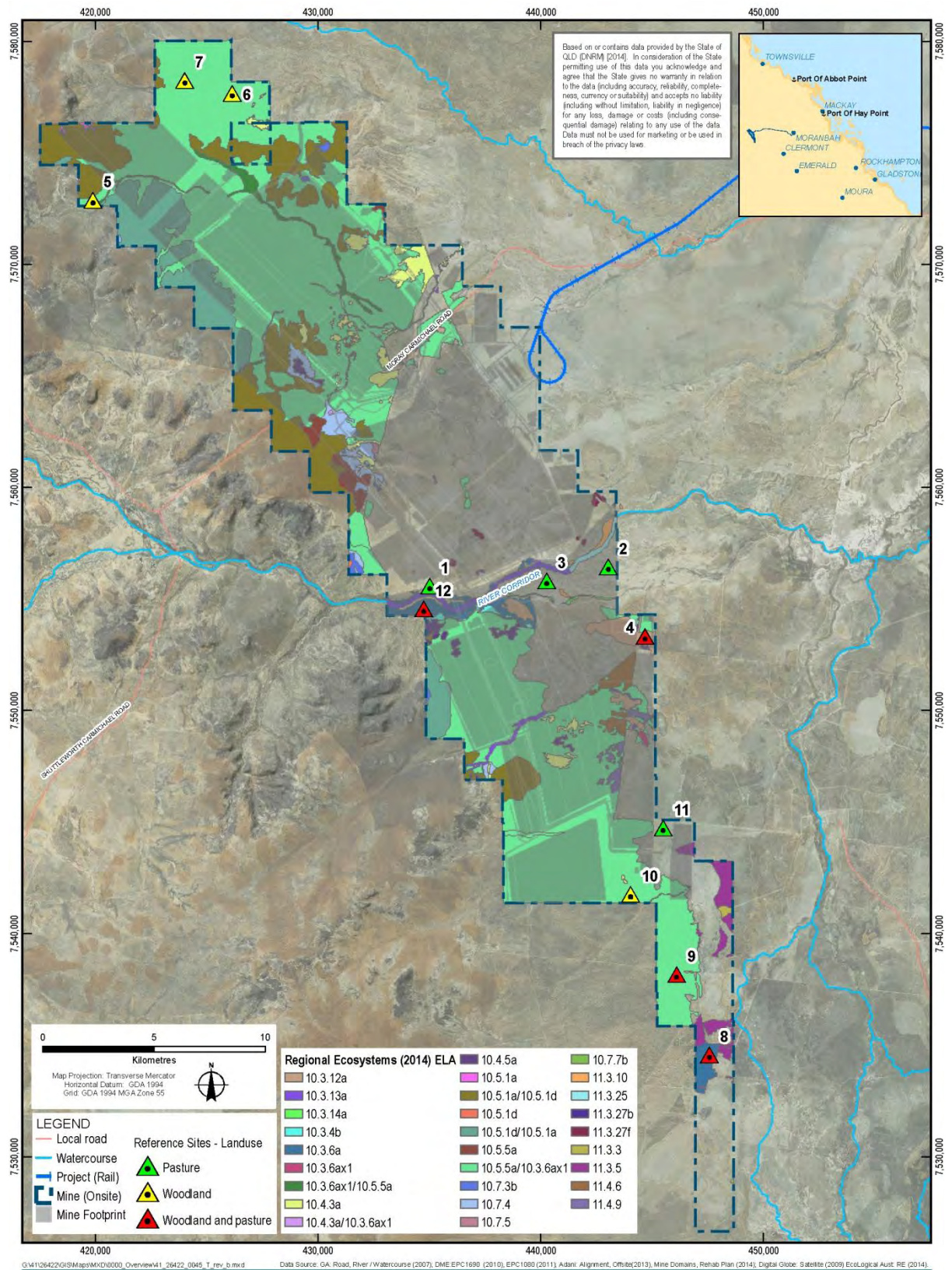


Figure H4: Final landform (Southern section)



Section 2 Coordinator-General's recommendations

Part A Recommendations for other approvals

This section includes recommendations made under section 52 of the SDPWO Act. The recommendations relate to approvals under Acts other than the SP Act or EP Act, Chapter 4A or 5, which require the preparation of an EIS, or a similar statement to address environmental effects, for the project.

While the recommendations guide the assessment managers¹¹¹ in assessing the applications, they do not limit their ability to seek additional information or power to impose conditions on any development approval required for the project.

Each recommendation nominates the entity to be consulted by the proponent.

Recommendations to the Commonwealth Minister for the Environment under the *Environment Protection and Biodiversity Conservation Act 1999*

Condition 1. Matters of National Environmental Significance Management Plan

- (a) To mitigate impacts to EPBC Act listed threatened species and communities arising from the project, the approval holder must submit an MNES Management Plan (MMP) for the management of the species and communities listed in Table XX¹¹² to the Minister for approval at least three months prior to the commencement of Project Stage 1.
- (b) The MMP must be consistent with the Galilee Basin Offset Strategy, relevant recovery plans, threat abatement plans, conservation advice and any plan required under another condition of this approval and must include:
 - (i) a description of the habitat to be impacted
 - (ii) details of the potential impacts to EPBC listed species and communities for each project stage, including impacts from:
 - (1) vegetation clearing
 - (2) subsidence from underground mining
 - (3) mine dewatering impacts
 - (4) ecological function changes to habitat, including habitat connectivity, species function and behaviour, composition and size of populations, and death or injury to individuals,
 - (5) hydrological changes due to stream diversion and flood levees
 - (6) weeds and pests
 - (iii) measures that will be undertaken to mitigate and manage impacts resulting from the action. These measures must include:

¹¹¹ For a definition, refer to the glossary on page 583.

¹¹² Table to be developed by DE following application of the EPBC Act Offsets Assessment Guide to offset information provided by the proponent

- (1) the implementation of measures contained in relevant guidelines, policies and plans (such as recovery plans) to determine measures specific for each species affected by the proposed action
 - (2) the use of fauna spotters prior to and during all clearing activities to ensure impacts on EPBC listed species and communities are minimised
 - (3) measures to prevent stress, injury or and mortality of EPBC listed fauna species during project stages
 - (4) measures to protect EPBC listed species and communities and their habitat located in the project area, including adjacent to cleared areas
 - (5) measures to rehabilitate all areas of EPBC listed species and communities habitat during Project Stages
- (iv) 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
 - (v) a monitoring program to determine the success of mitigation and management measures. The monitoring must:
 - (1) clearly set out trigger levels or criteria for assessing the success of management measures
 - (2) measure the success of the management measures against trigger levels
 - (3) outline how milestones and compliance will be reported on.
 - (vi) corrective measures to be implemented if trigger levels are exceeded.
- (c) The approval holder cannot commence Project Stage 1 of the action until the MMP has been approved by the Minister in writing.
 - (d) The approval holder must publish the MMP on their website within 10 business days from the day of receiving the Minister'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 shorebird 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.

Condition 2. Offset Management Plan

- (a) To compensate for authorised unavoidable impacts on EPBC listed species and communities in Table XX¹¹³, the approval holder must submit an Offset Management Plan to the Minister for approval at least 3 months prior to commencement of Project Stage 1.

¹¹³ Table to be developed by DE following application of the EPBC Act Offsets Assessment Guide to offset information provided by the proponent

- (b) The minimum offset areas determined by the Minister must be secured for unavoidable authorised impacts to EPBC Act listed threatened species and communities.
- (c) The Offset Management Plan must be consistent with the Galilee Basin Offset Strategy, relevant Recovery Plans, threat abatement plans, conservation advice and project species management plans, including the BTF Management Plan (Appendix 1, Schedule I, condition I6 of the Coordinator-General's Report).
- (d) The Offset Management Plan must include:
 - (i) details of the offset areas (including maps in electronic Geographic Information System (GIS) 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 condition of the offset area/s 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 offset/s have been or will be legally secured
 - (iv) a description of the potential risks to the successful implementation of the Offset Management Plan, 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 site/s. The monitoring program must:
 - (1) clearly set out performance indicators
 - (2) measure the success of the management measures against stated performance criteria
 - (3) include monitoring parameters, frequencies, triggers, corrective actions, timing and scope for the duration of 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 Management Plan (if this person is not the approval holder).
- (e) The Offset Management Plan must include, in writing, commitments from the approval holder that demonstrate that the offset area/s required in Table XX¹¹⁴ will be met.

¹¹⁴ Table to be developed by DE following application of the EPBC Act Offsets Assessment Guide to offset information provided by the proponent

- (f) The Offset Management Plan must be approved by the Minister in writing prior to the commencement of Project Stage 1.
- (g) Offsets detailed in the Offset Management Plan must be legally secured within two years of commencement of Project Stage 1 or as required under relevant Queensland legislation, whichever is earlier.
- (h) The approved Offset Management Plan must be implemented.

Offset Management Plan – subsidence impacts

- (i) In the event that residual impacts to EPBC listed species and communities associated with mine subsidence are less extensive than the impacts stated in Table 5.1 (Coordinator-General’s Report for the Carmichael Coal Mine and Rail project dated May 2014), the approval holder may update the Offset Management Plan within 10 years after initial approval of the Offset Management Plan. The approval holder may submit a revised Offset Management Plan for approval of the Minister within 3 months of updating the Offset Management Plan.
- (j) An updated Offset Management Plan must:
 - (i) address the information required in condition (d) (i) to (x) above and demonstrate how any offsets already secured as part of the Offset Management Plan contribute to the offset for ‘whole of Project’ impacts
 - (ii) detail specific potential impacts to EPBC listed species and communities and EPBC listed species habitat within the subsidence footprint
 - (iii) demonstrate the implementation of measures contained in relevant guidelines, policies and plans (such as recovery plans) to avoid, mitigate and manage impacts specific for each species or community affected by subsidence.
- (k) The approved updated Offset Management Plan must be implemented.

Condition 3. BTF management at the Mellaluka Springs

- (a) In the event that the future baseline research required by the Coordinator-General (Appendix 1, Section 3, Condition 1) identifies that the Mellaluka Springs Complex provides high value habitat for the BTF, the approval holder must:
 - (i) Include management measures to address impacts resulting from drawdown at the Mellaluka Springs Complex in the BTF Management Plan
 - (ii) Submit revised offsets for any unavoidable and residual impacts on the BTF in accordance with the EPBC Act Offsets Policy, including a timetable to implement these offsets
 - (iii) Not commence Project Stage 2 prior to the Minister approving in writing the quantity of the offset required for impacts on BTF and a timetable to implement the offsets.

Condition 4. Rewan Formation Connectivity Research Plan

- (a) The proponent must submit for the approval of the Minister a Rewan Formation Connectivity Research Plan ('Research Plan') that characterises the Rewan Formation within the area impacted by the mine. The Research Plan must include but is not limited to the following:
 - (iv) research aims
 - (v) personnel responsible for conducting research and their qualifications
 - (vi) timeframes for research and reporting
 - (vii) 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
 - (viii) an assessment of potential impacts to MNES from surveying activities such as vegetation clearance and the establishment of drilling pads
 - (ix) 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
 - (x) outputs to inform the Groundwater Management and Monitoring Program required by the project's Environmental Authority issued under the *Environmental Protection Act 1994* (Qld).
- (b) The Research Plan must be peer reviewed by a suitably qualified person.
- (c) The peer review and the Research Plan must be submitted together to the Minister for review and approval at least three months prior to the commencement of Project Stage 2.
- (d) Project stage 2 cannot commence until the Research Plan has been approved by the Minister in writing.
- (e) The findings of the research outputs of the Research Plan must be published on the proponent's website and submitted to the administering authority.
- (f) The approved Rewan Formation Connectivity Research Plan must be implemented.

Project stage definitions

Project Stage 1

Project activities within the mining lease carried out prior to commencement of significant ground disturbance including:

- (a) pre-construction surveying and technical assessment including geotechnical, establishment of site security arrangements (including signs, fences, safety barriers, and temporary security personnel facilities) and maintenance of existing roads and tracks;
- (b) installation of facilities for the purpose of environmental monitoring compliance; and
- (c) other works limited to the existing site facilities and access roads
- (d) project activities outside the mining lease including:
 - (i) construction of the rain line, quarries and associated infrastructure
 - (ii) construction of workers accommodation, temporary workers camps, airport, heavy industrial area, water supply infrastructure and road upgrades and realignments.

Project Stage 2

Project activities, other than activities carried out under project stage 1, leading to the production of coal including:

- (a) removal of existing structures, site clearance
 - (b) construction of access roads, potable water treatment and sewage treatment plants, new power plants, mine administrative buildings, water storage infrastructure and hardstanding
 - (c) removal and stockpiling of overburden, and excavation of box cuts for open pit or underground mining
 - (d) commencement of dewatering operations
-

Recommended conditions under the *Water Act 2000*

Condition 5. Great Artesian Basin aquifer threshold levels

- (a) Prior to the commencement of 'active dewatering' of aquifers within the Dunda Beds and Clematis Sandstone and following analysis of groundwater monitoring data obtained from monitoring bores in these geological units (pursuant to condition E8 of the Environmental Authority), the proponent must present a report outlining recommendations for low impact and high impact threshold levels for approval by the relevant administering authority for the *Water Act 2000*. The report must:
 - (i) Provide recommendations for low impact and high impact threshold levels for the Dunda Beds and Clematis Sandstone (pursuant to condition E13 of the Environmental Authority)
 - (ii) Include an assessment of natural seasonal variation in the Dunda Beds and Clematis Sandstone aquifers
 - (iii) Outline the investigation protocol when low impact and high impact threshold levels are exceeded, including any requirements for additional modelling or monitoring required
- (b) If, the low impact threshold level is reached in any Dunda Beds or Clematis Sandstone bore, the proponent must notify the relevant administering authority within 30 business days and provide a report pursuant to (a)(iii)
- (c) If the high impact threshold level is reached in any Dunda Beds or Clematis Sandstone bore, a suitably qualified person must complete an investigation pursuant to (a)(iii) and provide a written report to the relevant administering authority within 60 business days
- (d) If the investigation under (c), concludes that the exceedance of the high impact threshold level is a result of mining activities, the proponent must initiate a review of the latest groundwater model pursuant to condition E6 of the Environmental Authority and a review of the Groundwater Monitoring and Management Plan pursuant to condition E5 of the Environmental Authority and obtain any necessary approvals as a result
- (e) If the high impact threshold level is reached, the proponent may be required to construct additional monitoring bores
- (f) The proponent must offset the predicted take of water from the Great Artesian Basin for the life of the project as determined by the administering authority.

DNRM is designated as the agency responsible for this recommendation.

Condition 6. Water security

- (a) In accordance with condition E3 and E4 of the Environmental Authority, the proponent must collect data that identifies natural groundwater level trends for identification of the water level impact from the mining operation on authorised water users
- (b) Within 3 years following the Coordinator-General's Evaluation Report, the proponent must provide a report to each potentially unduly affected authorised water users and the administering authority. The report must include a

summary of the collected baseline information and address potential impacts to the groundwater supplies of those users

- (c) In the report required by condition (b), the proponent must:
- (i) identify operational bores for each potentially affected authorised water user
 - (ii) for each operational bore:
 - (1) identify natural groundwater levels and water quality;
 - (2) identify the condition and supply capacity of the bore;
 - (3) identify the operational requirements and current use of the bore;
 - (4) clearly outline the predicted decrease in water level at the bore due to the proposed mining operations;
 - (5) provide an initial assessment of the likely water supply impacts to the affected authorised water users, and timing of those impacts, during and following the project activity.
 - (6) outline of the potential future actions (make good measures) which would ensure the potentially unduly affected authorised water users will have access to a reasonable quantity and quality of water for the authorised use and purpose of the bore/s
- (d) The proponent must enter into agreements with all potentially unduly affected water users (as defined in conditions of the water licence or relevant legislation at the time) about the make good measures outlined in condition (c), or other negotiated arrangement
- (e) The agreement must be entered into at least 5 years prior to the time an unduly affected water user is predicted to become unduly affected due to dewatering operations (based on the latest version of the numerical groundwater model at the time).

Note: an operational bore would have a demonstrated use to a landholder

DNRM is designated as the agency responsible for this recommendation.

Definition

Unduly affected	(a) a material reduction in the supply of water from the pre-existing bore relative to the supply available immediately prior to the taking of the water by the proponent, or
	(b) a material increase in the cost of maintaining the supply of water from the pre-existing bore relative to the cost of supply immediately prior to the taking of water by the proponent, or
	(c) the taking of water by the proponent causes a material reduction in the quality of water available to the owner of the pre-existing bore.

Recommended conditions under the *Transport Infrastructure Act 1994*

Condition 7. Transport Infrastructure

- (a) The proponent must implement all necessary measures to mitigate adverse impacts on the safety, condition and efficiency of state-controlled and local roads for all stages of the project.
- (b) An impact mitigation program must be submitted to DTMR for review and approval at least three months prior to the commencement of project construction, or some other time period agreed in writing with DTMR and address one or more of the following:
 - (i) construction of any required works (including site accesses) as and when included in an approved Road Impact Assessment (RIA)
 - (ii) payment of any contributions towards the cost of works, rehabilitation or maintenance as and when included in a RIA
 - (iii) undertaking or implementing any other action as and when stated in an approved Road-use Management Plan (RMP)
 - (iv) actions or payments as otherwise agreed in writing with DTMR and/or the Isaac Regional Council (IRC)¹¹⁵ or in an infrastructure agreement.
- (c) The RIA prepared for (b) must be submitted to DTMR and/or the IRC for review and approval six months prior to the anticipated commencement of the relevant project stage or as otherwise agreed in writing between the proponent and DTMR or IRC and should include but not be limited to the:
 - (i) upgrade of the Gregory Developmental Road/Elgin-Moray Road intersection for access to the rail project site
 - (ii) upgrade of the Gregory Developmental Road/Kilcummin-Diamond Downs Road intersection and maintenance of the unsealed section of Kilcummin-Diamond Downs Road during the construction phase of the project
 - (iii) upgrade of sections of the Gregory Developmental Road carriageway in response to the proponent's pavement impact assessment findings
 - (iv) assessment of road structures such as bridges and culverts identified on the Gregory Developmental Road to ensure they can safely accommodate project traffic increases and address identified safety issues.
- (d) The RMP(s) prepared for (b) should be submitted to DTMR and/or the IRC for review and approval six months prior to the anticipated commencement of the relevant project stage.
- (e) Any infrastructure agreement between the proponent, DTMR or the IRC prepared for (b) should be in place three months prior to commencement of project construction, or as otherwise agreed in writing between the proponent, DTMR and the IRC.

¹¹⁵ For example, mitigation measures or actions related to operational traffic (routes, hours of operation and the like) that would not need to be implemented during the construction phase.

- (f) In the event that agreement cannot be reached between the proponent and the administering authority, the matter may be referred to the Coordinator-General, by either party, for mediation, direction, or necessary action.

DTMR is to have jurisdiction for this condition.

Condition 8. Permits, approvals and traffic management plans

- (a) To ensure efficient processing of the project’s required transport-related permits and approvals, the proponent should undertake the following, no later than three months (or such other period agreed in writing with DTMR and the IRC) 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 to DTMR or the IRC for review and approval.
 - (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) Obtain permits 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, and the relevant LGA(s), as required by the *Transport Operations (Road Use Management) Act 1995*.
 - (iv) Prepare traffic management plan(s) (TMP(s)) in accordance with DTMR’s *Guide to preparing a Traffic Management Plan* for 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).
- (b) The TMP(s) prepared in 8 (a) (iii) 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 or local government road corridor.

DTMR is to have jurisdiction for this condition.

Definitions

Infrastructure agreements	<p>Infrastructure agreement(s) are negotiated between a proponent and DTMR and/or the relevant LGA(s). They are intended to formalise arrangements about transport infrastructure works, contributions and road-use management strategies detailed and required under the impact mitigation program.</p> <p>The infrastructure agreement/s should incorporate the following:</p> <ul style="list-style-type: none"> (a) 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 transport infrastructure by project traffic (b) project-specific contributions towards the cost of maintenance and rehabilitation, to mitigate impacts on state-controlled and/or local
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Definitions

road pavements or other infrastructure

- (c) agreed performance criteria that detail protocols for consultation about reviewing and updating project-related traffic assessments and impact mitigation measures that are based on actual traffic volume and impacts, should previously advised traffic volumes and/or impacts change.

Road impact assessments

An acceptable RIA report is one developed by a suitably qualified person in accordance with the DTMR *Guidelines for Assessment of Road Impacts of Development (2006)* (GARID)¹¹⁶ and includes:

- a) a completed DTMR 'Transport Generation proforma'¹¹⁷ detailing project-related traffic and transport generation information or as otherwise agreed in writing with DTMR and the relevant LGA(s)
- b) use of DTMR's Pavement Impact Assessment tools¹¹⁸ or such other method or tools as agreed in writing with DTMR and the relevant LGA(s)
- c) a clear indication of where detailed estimates of project-related traffic are not available, and documentation of the assumptions and methodologies that have been previously agreed in writing with DTMR and relevant LGA(s), prior to RIA finalisation
- d) details of the final impact mitigation proposals, listing infrastructure-based mitigation strategies, including contributions to road works, rehabilitation, maintenance and summarising key road-use management strategies
- e) ALCAM assessments of all rail crossings.

Development impact is to be projected at 5 year increments for the first 10 years of construction and operation of the project with future reviews and assessments to occur every 5 years thereafter including decommissioning.

Road use management plans

An acceptable Road-use Management Plan (RMP) is one developed by a suitably qualified person in accordance with DTMR's *Guide to Preparing a Road-use Management Plan* for each stage of the project and includes:

- (a) a table listing RMP commitments and provides confirmation that all works and road-use management measures have been designed and/or will be undertaken in accordance with all relevant DTMR standards, manuals and practices
- (b) optimised project logistics and minimised road-based trips on all state-controlled and local roads.

Part B General recommendations

Recommendation 1. Regional water balance model

- (a) To address potential cumulative impacts on water resources in the Belyando-Suttor sub-catchment and the aquifers of the eastern part of the Galilee Basin,¹¹⁹ the authority responsible for administering the *Water Act 2000* must ensure the development and maintenance of a numerical regional water balance model for the Galilee Basin. The regional water balance model should:

¹¹⁶ Available at www.TMR.qld.gov.au/business-industry/Technica-standards-publications.aspx

¹¹⁷ Available from DTMR Planning Management Branch, Brisbane.

¹¹⁸ Available from DTMR Regional Offices.

¹¹⁹ Defined as the outcrop area on the eastern edge of the Galilee Basin, extending a distance to the west.

- (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 proposed 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.

DNRM is designated as the agency responsible for this recommendation.

Recommendation 2. Local water quality objectives

- (a) To address the potential cumulative impacts on surface water quality in the Belyando-Suttor sub-catchment and aquifers of the eastern part of the Galilee Basin,¹²⁰ the authority responsible for administering the *Environmental Protection Act 1994* must:
 - (i) develop Belyando-Suttor sub-catchment environmental values and water quality objectives for the Galilee Basin. Water quality objective development should also have regard to, where available:
 - (1) impact assessment, baseline monitoring and site water balance model data provided by project proponents
 - (2) results of the regional water balance model (Recommendation 1) and any ongoing regional surface water and groundwater monitoring and assessment program (Recommendation 3)
 - (3) relevant key deliverables expected from the Australian Government's proposed Bioregional Assessment for the Lake Eyre Basin
 - (ii) develop model water conditions for coal mines and coal seam gas projects in the Galilee Basin to form the basis of future Environmental Authority conditions and any other related decisions the administering authority under the *Environmental Protection Act 1994* may be required to make in relation to cumulative impacts on water quality.

DEHP is designated as the agency responsible for this recommendation.

¹²⁰ Defined as the outcrop area on the eastern edge of the Galilee Basin, extending a distance to the west.

Recommendation 3. Regional groundwater and surface water monitoring and assessment program

- (a) To address potential cumulative impacts on water resources in the Belyando-Suttor sub-catchment and aquifers of the eastern part of the Galilee Basin,¹²¹ the DNRM must, in consultation with DEHP 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 1
 - (iii) have regard to relevant key deliverables expected from the Australian Government's proposed Bioregional Assessment for the Lake Eyre Basin
 - (iv) based on data provided, impact assessment reports prepared by proponents, and the use of the model results referred to in Recommendation 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:
 - (1) open-cut and underground mining operations
 - (2) mine dewatering
 - (3) mine waste management
 - (4) stream diversions and flood levees
 - (5) 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 data and reports with reference to monitoring and assessment program outcomes.

DNRM is designated as the agency responsible for this recommendation.

Recommendation 4. Black-throated Finch (southern) Bioregional Management Plan

- (a) To address the impacts of mining projects in the Galilee Basin region and maximise the ongoing protection and long-term conservation of the black-

¹²¹ Defined as the outcrop area on the eastern edge of the Galilee Basin, extending a distance to the west.

throated finch (BTF) southern subspecies (*Poephila cincta cincta*), the administering authority responsible for the threatened species provisions of the *Nature Conservation Act 1992* should, in consultation with the BTF National Recovery Team and Galilee Basin mine proponents likely to significantly impact on BTF habitat, ensure the development of a fit for purpose BTF Bioregional Management Plan for the Galilee Basin and Desert Uplands bioregion.

Bioregional survey and assessment

- (b) The BTF Bioregional Management Plan must provide for the bioregional survey and assessment of the BTF population and habitat in the Galilee Basin and Desert Uplands bioregion by:
- (i) Establishing best practice baseline survey methods that report on BTF movement patterns, habitat requirements and population dynamics
 - (ii) Establishing a protocol with Galilee Basin mine proponents for the delivery of BTF species and habitat condition survey data recorded by proponents
 - (iii) Collating baseline and ongoing survey data recorded by proponents
 - (iv) Identifying 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
 - (v) Identifying performance indicators for assessing the success of BTF mitigation and management measures implemented for the management of mining activities and offset areas
 - (vi) Assessing impacts of mining projects on the BTF in the Galilee Basin region, based on the available data including but not limited to:
 - (1) vegetation clearing
 - (2) subsidence from underground mining
 - (3) mine dewatering impacts on groundwater dependent ecosystems
 - (4) ecological function changes to habitat, including habitat connectivity, species function and behaviour, size and composition of populations, and death or injury to individuals
 - (5) hydrological changes due to stream diversions and flood levees
 - (6) weeds and pests.

Reporting

- (c) The BTF Bioregional Management Plan must inform adaptive management of the BTF population and habitat in the Galilee Basin and Desert Uplands bioregion by documenting:
- (i) baseline 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:
 - (1) artificial watering points
 - (2) fire management
 - (3) exotic plant management
 - (4) predator management
 - (5) 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
 - (d) The BTF Bioregional Management Plan must be periodically updated and made available on the administering authority's website.

DEHP is responsible for this condition.

Section 3 Imposed conditions

This section includes conditions imposed by the Coordinator-General under section 54B of the SDPWO Act.¹²² The conditions are relevant for those parts of the project where there is no relevant approval applicable under other legislation.

All of the conditions imposed in this appendix take effect from the date of this Coordinator-General's report.

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, I have nominated several entities to have jurisdiction for the conditions in this schedule.

Pursuant to section 54D of the SDPWO Act, these conditions apply to anyone who undertakes the project, such as the proponent and an agent, contractor, subcontractor or licensee of the proponent, and any public utility providers undertaking public utility works as a result of the project.

Condition 1. Black-throated Finch (southern) baseline research for the Carmichael project

- (a) To increase the knowledge of the ecological requirements of BTF populations likely to be directly and indirectly impacted by the project, the proponent must undertake further baseline research prior to the commencement of Project Stage 2.
- (b) Prior to continuing the baseline research, a suitably qualified person must finalise a baseline research plan to the satisfaction of the authority responsible for administering threatened species provisions of the *Nature Conservation Act 1992* that includes a description of chosen methodologies.
- (c) The baseline research must include:
 - (i) a minimum of two wet season surveys of the project area
 - (ii) a minimum of two dry season surveys of the Mellaluka Springs Complex
 - (iii) the collection of floristic data to enable the identification and mapping of key seasonal (wet and dry season) food sources.
- (d) The baseline research must determine:
 - (i) whether the Mellaluka Springs Complex provides BTF habitat, particularly as a refuge during the dry season
 - (ii) movement patterns, habitat requirements and population dynamics, including dietary requirements, home range, nesting requirements
 - (iii) responses to grazing management, fire management and water body locations.

DEHP is designated as the agency responsible for this condition.

¹²² For a definition of 'imposed conditions', refer to the glossary on page 583.

Condition 2. Proponent contribution to regional water balance modelling, monitoring and assessment programs

- (a) To address potential cumulative impacts on water resources in the Belyando-Suttor sub-catchment and aquifers of the eastern part of the Galilee Basin,¹²³ the proponent must, when requested by the administering authority:
- (i) prepare, to the satisfaction of the administering authority, a groundwater and surface water monitoring and reporting program that takes into account requirements of any regional groundwater and surface water monitoring and assessment program developed in accordance with Recommendation 3, Appendix 1, Section 2, Part B of this report
 - (ii) provide monitoring results in the format and at intervals specified in the protocol for coordination of regional groundwater and surface water monitoring data to the lead agency for the surface water monitoring and assessment program (Recommendation 3, Appendix 1, Section 2, Part B of this report)
 - (iii) contribute to the ongoing operation of the regional groundwater and surface water monitoring and assessment program in Recommendation 3, Appendix 1, Section 2, Part B of this report including pro-rata funding.

DNRM is designated as the agency responsible for this condition.

Condition 3. Apportionment of pro-rata funding—regional water balance modelling, monitoring and assessment programs

- (a) The apportionment of pro-rata funding pursuant to Condition 2(a)(iii) 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 lease or petroleum lease
 - (iii) The Department of Natural Resources and Mines
 - (iv) The Department of Environment and Heritage Protection
 - (v) The Department of State Development, Infrastructure and Planning.

The Coordinator-General is responsible for this condition.

Condition 4. Proponent contribution to BTF Bioregional Management Plan

- (a) To address project impacts and maximise the ongoing protection and long-term conservation of the Black-throated finch (BTF) southern subspecies (*Poephila cincta cincta*), and its habitat in the Galilee Basin and Desert Uplands bioregion, the proponent must, when required by the administering authority responsible for the threatened species provisions of the *Nature Conservation Act 1992*:
- (i) Prepare, to the satisfaction of the administering authority, an ongoing BTF monitoring program that takes into account the relevant

¹²³ Defined as the outcrop area on the eastern edge of the Galilee Basin, extending a distance to the west.

requirements of any BTF Bioregional Management Plan specified in Appendix 1, Section 2, Part B and the outputs of baseline research required in Appendix 1, Section 3, Condition 1

- (ii) Provide baseline and survey results in the format and at intervals specified for the coordination of bioregional survey data to the administering authority for any BTF Bioregional Management Plan
- (iii) Contribute to the operation of any BTF Bioregional Management Plan including pro-rata funding.

DEHP is responsible for this condition.

Condition 5. Apportionment of pro-rata contributions—BTF Bioregional management Plan

- (a) The apportionment of pro-rata contributions pursuant to condition 4(a)(iii) 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 Department of Environment and Heritage Protection
 - (iv) The Commonwealth Department of the Environment.

The Coordinator-General is responsible for this condition.

Definitions for conditions 1-5

Project Stage 1

Project activities within the mining lease carried out prior to commencement of significant ground disturbance including:

- a) pre-construction surveying and technical assessment including geotechnical, establishment of site security arrangements (including signs, fences, safety barriers, and temporary security personnel facilities) and maintenance of existing roads and tracks;
- b) installation of facilities for the purpose of environmental monitoring compliance; and
- c) other works limited to the existing site facilities and access roads
- d) project activities outside the mining lease including:
 - (i) construction of the rain line, quarries and associated infrastructure
 - (ii) construction of workers accommodation, temporary workers camps, airport, heavy industrial area, water supply infrastructure and road upgrades and realignments.

Project Stage 2

Project activities, other than activities carried out under project stage 1, leading to the production of coal including:

- a) removal of existing structures, site clearance
- b) construction of access roads, potable water treatment and sewage treatment plants, new power plants, mine administrative buildings, water storage infrastructure and hardstanding
- c) removal and stockpiling of overburden, and excavation of box

Definitions for conditions 1-5

- cuts for open pit or underground mining
- d) commencement of dewatering operations.

Suitably qualified person 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.

Condition 6. Social impact assessment reporting requirements

- (a) The proponent will provide an annual report to the Coordinator-General from the commencement of construction up to and including the peak construction workforce period, and for two years following the commencement of mining operations describing:
 - (i) the actions to inform the community about project impacts and show how community concerns about project impacts have been taken into account when reaching decisions
 - (ii) the actions to enhance local and regional employment, training and development opportunities.
 - (iii) the actions and adaptive management strategies to avoid, manage or mitigate project-related impacts on local and regional housing markets.
 - (iv) the actions to avoid, manage or mitigate project-related impacts on local community services, social infrastructure and community safety and wellbeing.

Condition 7. Offsets

- (a) The proponent must prepare a Biodiversity Offset Strategy that:
 - (i) Is consistent with the draft Biodiversity Offset Strategy prepared for the project environmental impact statement
 - (ii) Details the offset requirements conditioned by the Commonwealth Minister for the Environment in the approval for the project under the *Environment Protection and Biodiversity Conservation Act 1999*
 - (iii) Details proposed offsets to address significant residual impacts for matters of state environmental significance consistent with (a)(ii)
 - (iv) Takes account of the results of any pre-clearance surveys undertaken in accordance with my recommendation in Appendix 2, Section 2 (Recommendation 1)
 - (v) Includes but is not necessarily limited to:
 - (1) a detailed description of the land to which the strategy relates, the values affected and the extent and likely timing of impact on each
 - (2) evidence that values to be impacted can be offset
 - (3) the offset delivery mechanism(s) comprising one or more of: land-based offsets; direct benefit management plans; offset transfers and/or offset payments

- (4) a legally binding mechanism that ensures protection and management of offset areas
- (b) The Biodiversity Offset Strategy must be provided to the Coordinator-General for approval within 60 days of the approval under the *Environment Protection and Biodiversity Conservation Act 1999* prior to the commencement of construction.
- (c) The approved Biodiversity Offset Strategy must be implemented:
- (i) For the mine site, in accordance with condition I1 of the project environmental authority under the *Environmental Protection Act 1994*.
 - (ii) For other areas, as directed by the Coordinator-General.

The Coordinator-General has jurisdiction for this condition.

Definitions

environmental impact statement	Environmental impact statement documentation prepared for the project in accordance with the provisions of the <i>State Development and Public Works Organisation Act 1971</i> .
Matters of state environmental significance	Defined in the State Planning Policy
project	The Carmichael Coal Mine and Rail Project, declared a Coordinated Project under the <i>State Development and Public Works Organisation Act 1971</i> .
proponent	Adani Mining Pty Ltd
significant residual impact	An adverse impact, whether direct or indirect, of a prescribed activity on all or part of a prescribed environmental matter that: <ul style="list-style-type: none"> (a) remains, will remain, or is likely to remain, (whether temporarily or permanently) despite on-site mitigation measures for the prescribed activity (b) is, will be, or is likely to be, significant.

Appendix 2 Off-lease infrastructure area and rail conditions

Section 1 Stated conditions

This section includes the Coordinator-General's stated conditions under section 39 of the SDPWO Act. These conditions must be included by the assessment manager in the relevant approval. The assessment manager may impose additional conditions not inconsistent with these stated conditions. The assessment manager will be the Chief Executive of the IRC if the approval is to be given under the SP Act or the Coordinator-General if the approvals relate to the activities within an SDA.

Part A Stated conditions for an MCU approval to construct and operate rail transport infrastructure and a water pipeline and related infrastructure

Condition 1. Compliance and auditing of conditions

- (a) The holder of this approval must:
 - (i) within 3 months of the commencement of the approved activities, obtain from a suitably qualified person a certified report on compliance with the conditions of this approval
 - (ii) obtain further such reports at regular intervals, not exceeding 6 monthly intervals during construction and 3 yearly intervals during operation, from the completion of the report specified in condition 1(a)(i)
 - (iii) provide each report in conditions 1(a)(i) and 1(a)(ii) to the administering authority within 30 business days of its completion
 - (iv) take any corrective and/or preventive action necessary to comply with the conditions of this approval.
- (b) The holder of this approval must provide an annual Update Report detailing activities during the previous 12 months to the administering authority detailing:
 - (i) Significant disturbance undertaken
 - (ii) Rehabilitation undertaken
 - (iii) Results and interpretation of any monitoring
 - (iv) Environmental complaints received by the holder of this approval, including the date, source, reason for the complaint and a description of investigations undertaken in resolving the complaint.
- (c) All monitoring must be undertaken by a suitably qualified person.

Condition 2. General

- (a) All plant and equipment must be maintained and operated in proper condition.
- (b) Measures to prevent fauna being harmed from entrapment must be implemented during construction and operation activities.

Condition 3. Environmental nuisance

- (a) Activities must not cause environmental nuisance at any nuisance sensitive place unless specifically authorised by a condition of this approval or where an alternative arrangement is in place.

Condition 4. Air quality

- (a) Notwithstanding condition 3, dust deposition attributable to project activities, when measured at a nuisance sensitive place, must not exceed 120 milligrams per square metre per day, averaged over 1 month.
- (b) Other indicators¹²⁴ that are measured at any nuisance sensitive place must not exceed the air quality objectives specified in Schedule 1 of the Environmental Protection (Air) Policy 2008.

Condition 5. Noise and vibration

- (a) Notwithstanding condition 3, blasting operations must be designed to not exceed an airblast overpressure level of 120 dB (linear peak) at any time, when measured at or extrapolated to any nuisance sensitive place.
- (b) Blasting operations must be designed to not exceed a ground-borne vibration peak particle velocity of 10mm/s at any time, when measured at or extrapolated to any nuisance sensitive place.

Condition 6. Water quality

- (a) Contaminants must not be directly or indirectly released to waters unless authorised by a specific condition of this approval.

Condition 7. Sediment and Erosion Control

- (a) Measures must be implemented and maintained to minimise stormwater entry onto significantly disturbed land.
- (b) Sediment and erosion control measures to prevent soil loss and deposition beyond significantly disturbed land must be implemented and maintained
- (c) The measures required by conditions (a) and (b) must be in accordance, to the greatest practicable extent, with the International Erosion Control Association Best Practice Erosion and Sediment Control document.

Condition 8. Flammable or combustible liquids

- (a) All flammable and combustible liquids must be contained within an on-site containment system and controlled in a manner that prevents environmental harm and maintained in accordance with the current edition of *AS1940—Storage and Handling of Flammable and Combustible Liquids*.

Condition 9. Rehabilitation

- (a) Unless otherwise approved by the administering authority, within 6 months after the completion of an activity, the holder of this approval must commence reinstatement of temporarily disturbed areas that is:
 - (i) a stable landform

¹²⁴ 'Indicator' is defined in Schedule 2 of the Environmental Protection (Air) Policy 2008 as 'a contaminant that may be present in the air environment'.

- (ii) re-profiled to a level consistent with surrounding soils and established drainage lines.
- (b) After decommissioning, all significantly disturbed land caused by the carrying out of the activity(ies) must be rehabilitated to meet the following final acceptance criteria:
 - (i) any contaminated land (e.g. contaminated soils) is remediated and rehabilitated
 - (ii) for land that is not being cultivated by the landholder:
 - (1) groundcover, that is not a declared pest species is established and self-sustaining
 - (2) vegetation of similar species richness and species diversity to pre-selected analogue sites is established and self-sustaining
 - (iii) for land that is to be cultivated by the landholder, cover crop is revegetated, unless the landholder will be preparing the site for cropping within 3 months of petroleum activities being completed.
- (c) Monitoring of performance indicators must be carried out on rehabilitation activities until final acceptance criteria in condition (b) have been met for the rehabilitated area.

Definitions

administering authority	The Coordinator-General if the land is to be included in a State Development Area, or The Chief Executive of the Department of Transport and Main Roads if the land is to be included in a Community Infrastructure Designation, or The Chief Executive of the Isaac Regional Council.
alternative arrangement	A written agreement between the approval holder and the occupier of a nuisance sensitive place about the way in which a particular nuisance impact will be dealt with at a sensitive place, and may include an agreed period of time for which the arrangement is in place. An alternative arrangement may include, but is not limited to, a range of nuisance abatement measures to be installed at the sensitive place, or provision of alternative accommodation for the duration of the relevant nuisance impact.
associated monitoring requirements	Monitoring for noise and blasting levels must be in accordance with the most recent edition of the Department of Environment and Heritage Protection <i>Noise Measurement Manual</i> 2013 and any relevant Australian standard.
certified	A Statutory Declaration by a suitably qualified person accompanying the written document warranting that: all relevant material has been considered in the written document, and the content of the written document is accurate and true, and the written document meets the requirements of the condition.
environmental nuisance	Defined in section 15 of the <i>Environmental Protection Act 1994</i> .

Definitions

measured	<p>The standards used to measure air particulates and contaminants including the most recent version of either:</p> <p><i>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</i></p> <p><i>Australian Standard AS3580.9.9 Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – PM₁₀ low volume sampler – Gravimetric method, or</i></p> <p><i>Australian Standard AS3580.9.8 Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – PM₁₀ continuous direct mass method using a tapered element oscillating microbalance (TEOM) analyser</i></p> <p><i>Australian Standard/New Zealand Standard 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 or</i></p> <p>using an alternative sampling methodology determined in consultation with the Department of Environment and Heritage Protection.</p>
minimise	<p>minimise by taking all reasonable and practical measures to minimise the adverse effect having regard to the following matters:</p> <ol style="list-style-type: none"> (a) the nature of the harm or potential harm (b) the sensitivity of the receiving environment (c) the current state of technical knowledge for the activity (d) the likelihood of successful application of different measures that might be taken to minimise the adverse effects (e) the financial implications of the different measures as they would relate to the type of activity (f) if the adverse effect is caused by the location of the activity being carried out, whether it is feasible to carry out the activity at another location.
monitoring	<p>Monitoring and sampling carried out in accordance with the requirements of the following documents (as relevant to the sampling being undertaken):</p> <ol style="list-style-type: none"> (a) for waters and aquatic environments, the Queensland Government's Monitoring and Sampling Manual 2009— Environmental Protection (Water) Policy 2009 (b) for noise, the Environmental Protection Regulation 2008 (c) for air, the Queensland Air Quality Sampling Manual and/or Australian Standard 4323.1:1995 Stationary source emissions method 1: Selection of sampling positions or the most recent version of Australian Standard AS3580.10.1 <i>Methods for sampling and analysis of ambient air – Determination of particulate matter – Deposited matter – Gravimetric method.</i> (d) for soil, the Guidelines for Surveying Soil and Land Resources, 2nd edition (McKenzie et al. 2008), and/or the Australian Soil and Land Survey Handbook, 3rd edition (National Committee on Soil and Terrain, 2009) (e) for dust, Australian Standard AS3580

Definitions

nuisance sensitive place	Includes: <ul style="list-style-type: none"> • a dwelling (including residential allotment, mobile home or caravan park, other residential premises, motel, hotel or hostel) • a library, childcare centre, kindergarten, school, university or other educational institution • a medical centre, surgery or hospital • a protected area under the <i>Nature Conservation Act 1992</i>. • a public park or garden that is open to the public (whether or not on payment of money) for use other than for sport or organised entertainment • a workplace used as an office or for business or commercial purposes, which is not part of the project activity(ies) and does not include employees accommodation, grazing and farmland, unoccupied buildings or public roads
rail transport infrastructure	As defined in Schedule 6 of the <i>Transport Infrastructure Act 1994</i>
sediment and erosion control measures	Suitable measures are included in the document International Erosion Control Association (Australasia) <i>Best Practice Erosion and Sediment Control</i> .
significantly disturbed	Has the meaning in Schedule 12, section 4 of the Environmental Protection Regulation 2008.
suitably qualified person	A person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis to performance relative to the subject matter using the relevant protocols, standards, methods or literature.
water pipeline and related infrastructure	The component of the Carmichael Coal Mine and Rail Project that includes interception of water from the Belyando River, a storage dam, a pipeline to the mining lease and related infrastructure.
waters	all or any part of a creek, river, stream, lake, lagoon, swamp, wetland, spring, unconfined surface water, unconfined water in natural or artificial watercourses, bed and bank of any waters, non-tidal or tidal waters (including the sea), stormwater channel, stormwater drain, roadside gutter, stormwater run-off, and underground water.

Part B **Stated conditions for an Environmental Authority under the *Environmental Protection Act 1994* for Environmentally Relevant Activities (ERA)**

Sewage Treatment Plants:

Airport STP—ERA 63 1(a)(ii)

MWAV STP—ERA 63 1(d)

Industrial Area STP—ERA 63 1(d)

Rail Construction Camps STPs—ERA 63 1(b)(i)

Condition 1. General

- (a) The activity must be undertaken in accordance with written procedures that:
 - (i) identify potential risks to the environment from the activity during routine operations and emergencies
 - (ii) establish control measures that minimise the potential for environmental harm
 - (iii) ensure plant and equipment is maintained and operated in proper condition
 - (iv) ensure that staff are trained and aware of their obligations under the Environmental Protection Act 1994
 - (v) ensure that reviews of environmental performance are undertaken at least annually.
- (b) The activity must not cause environmental nuisance at any nuisance sensitive place unless specifically authorised by a condition of this approval or where an alternative arrangement is in place.
- (c) All documents and records of monitoring required by conditions of this authority must be kept for at least five years.
- (d) All flammable and combustible liquids must be contained within an on-site containment system and controlled in a manner that prevents environmental harm and maintained in accordance with the current edition of *AS 1940—Storage and Handling of Flammable and Combustible Liquids*. All chemicals and flammable or combustible liquids stored on site that have the potential to cause environmental harm must be stored in or serviced by an effective containment system that is impervious to the materials stored and managed to prevent the release of liquids to waters or land.

Condition 2. Land

- (a) Contaminants from the activity must not be released to land except as authorised under conditions (4a), (4c) and (4d).

Condition 3. Water

- (a) Stormwater contaminated by the activity must be managed to minimise or prevent any adverse effect on the environmental values of the receiving environment.

- (b) Ponds used for the storage or treatment of effluent or wastes must be constructed, installed and maintained to:
 - (i) prevent any release of effluent or wastes from the ponds
 - (ii) ensure the stability of the pond structure.

Condition 4. Disposal of effluent to land

- (a) Treated effluent is permitted to be released to land provided that it is done in accordance with a written procedure that ensures:
 - (i) infiltration to groundwater and subsurface flows of contaminants to surface waters are prevented
 - (ii) surface pondage and run-off of effluent is prevented
 - (iii) degradation of soil structure is minimised
 - (iv) soil sodicity and the build-up of nutrients and heavy metals in the soil and subsoil are minimised
 - (v) spray drift or overspray do not carry beyond effluent disposal areas
 - (vi) effluent disposal areas are maintained with an appropriate crop in a viable state for transpiration and nutrient uptake
 - (vii) the crop on the disposal area is harvested and removed from the disposal area.
- (b) When weather conditions or soil conditions preclude the release of effluent to land, effluent must be directed to wet weather storage or be lawfully removed from the site.
- (c) In addition to the requirements of 4(a), the treated effluent must be evenly distributed over an area stated in Table 1 or a greater area.
- (d) Treated effluent released to land must comply with the limits in Table 2.
- (e) Quarterly monitoring of treated effluent must be carried out in accordance with the Monitoring and Sampling Manual 2009 (EHP) to assess compliance with condition 4(d) and records of the results maintained.

Table 1—Irrigation area requirements

Rainfall	Maximum irrigation rate	Minimum land required (m ²)
<600 millimetres per year (mm/year)	3 millimetres per day (mm/day)	335m ² per m ³ of treated effluent irrigated
>600mm/year to 1000 mm/year	2mm/day	500m ² per m ³ of treated effluent irrigated
>1000mm/year	1mm/day	1000m ² per m ³ of treated effluent irrigated

Table 2—Contaminant release limits to land

Quality characteristics	Release limit	Limit type
Total nitrogen*	60mg/L	maximum
Total phosphorous*	20mg/L	maximum
Electrical conductivity	1600µs/cm	maximum
pH	5.0–8.5	range
Total residual chlorine (if used for disinfection)	1mg/L	maximum
<i>E. coli</i>	<1000cfu/100ml	maximum

*note these limits would typically correspond to long term total nitrogen and total phosphorous concentrations of 30 mg/L and 10 mg/L respectively.

Condition 5. Waste

- (a) Other than effluent released to land in accordance with conditions 4(a), 4(c) and 4(d), all waste generated in carrying out the activity must be reused, recycled or lawfully disposed of offsite.

Quarries (Extraction):

Disney Quarry—ERA 16 2(c)

Borrow 7 Quarry—ERA 16 2 (c)

Moray Quarry—ERA 16 2(b)

North Creek Quarry—ERA 16 2 (b)

South Back Creek Quarry—ERA 16 2 (b)

Condition 6. General

- (a) Activities conducted under this environmental authority must not be conducted contrary to any of the following limitations:
- (i) This environmental authority approves extraction activities at the following locations:
 - (1) Disney Quarry, Lot 4 SP116046
 - (2) Borrow 7 Quarry, Lot 3235 PH752
 - (3) Moray Quarry, Lot 662 PH1491
 - (4) North Creek Quarry, Lot 2 SP119925
 - (5) South Back Creek Quarry, Lot 656 SP 138788
 - (ii) This environmental authority approves extraction activities at the following maximum thresholds:
 - (1) Disney Quarry, 1000000t/yr
 - (2) Borrow 7 Quarry, 1000000t/yr
 - (3) Moray Quarry, 1000000t/yr
 - (4) North Creek Quarry, 1000000t/yr
 - (5) South Back Creek Quarry, 1000000t/yr
- (b) All reasonable and practicable measures must be taken to minimise the likelihood of environmental harm being caused.

- (c) Any breach of a condition of this environmental authority, must be reported to the administering authority as soon as practicable, or at the latest, within 24 hours of the approval holder becoming aware of the breach. Records must be kept including full details of the breach and any subsequent actions undertaken.
- (d) Other than as permitted by this environmental authority, the release of a contaminant into the environment must not occur.
- (e) All information and records that are required by the conditions of this environmental authority must be kept for a minimum of five (5) years. Environmental monitoring results must be kept until surrender of this environmental authority. All information and records required by the conditions of this environmental authority must be provided to the administering authority upon request.
- (f) A suitably qualified person(s) must monitor, record and interpret all parameters that are required to be monitored by this environmental authority and in the manner specified by this environmental authority.
- (g) All analysis required under this environmental authority must be carried out by a laboratory that has NATA certification, or an equivalent certification, for such analysis.
- (h) When required by the administering authority, an investigation must be undertaken in the manner prescribed by the administering authority, in response to a substantial complaint based on verifiable evidence, of environmental nuisance arising from the activity. The investigation results must be provided to the administering authority upon request.
- (i) The activity must be undertaken in accordance with written procedures that:
 - (i) identify potential risks to the environment from the activity during routine operations, closure and an emergency
 - (ii) establish and maintain control measures that minimise the potential for environmental harm
 - (iii) ensure plant, equipment and measures are maintained in a proper and effective condition
 - (iv) ensure plant, equipment and measures are operated in a proper and effective manner
 - (v) ensure that staff are trained and aware of their obligations under the Environmental Protection Act 1994
 - (vi) ensure that reviews of environmental performance are undertaken at least annually.

Condition 7. Air

- (a) Odours or airborne contaminants that are noxious or offensive or otherwise unreasonably disruptive to public amenity or safety must not cause nuisance at any nuisance sensitive place unless specifically authorised by a condition of this approval or where an alternative arrangement is in place.

Condition 8. Water

- (a) Stormwater contaminated by the activity must be managed to minimise or prevent any adverse impacts on the values of the receiving environment.
- (b) Ponds used for the storage or treatment of aqueous waste must be constructed, installed and maintained to:
 - (i) prevent any release of aqueous waste from the ponds other than as authorised under this approval
 - (ii) ensure the stability of the pond structure.
- (c) Erosion and sediment control measures must be implemented and maintained to minimise erosion and the release of sediment.
- (d) The stormwater runoff from disturbed areas, generated by (up to and including) a 24 hour storm event with an average recurrence interval of 1 in 5 years must be retained on site or managed to remove contaminants before release.

Condition 9. Land

- (a) Treatment and management of acid sulfate soils must comply with the current edition of the Queensland Acid Sulfate Soil Technical Manual.
- (b) Land that has been disturbed for activities conducted under this environmental authority must be rehabilitated in a manner such that:
 - (i) suitable species of vegetation for the location are established and sustained for earthen surfaces
 - (ii) potential for erosion is minimised
 - (iii) the quality of water, including seepage, released from the site does not cause environmental harm
 - (iv) potential for environmental nuisance caused by dust is minimised
 - (v) the water quality of any residual water body does not have potential to cause environmental harm
 - (vi) the final landform is stable and protects public safety.
- (c) Rehabilitation of disturbed areas required under condition 9(b), must take place progressively as works are staged and new areas of extraction are commenced.

Condition 10. Waste

- (a) All waste generated in carrying out the activity must be reused, recycled or lawfully disposed offsite.

Quarries (Screening):

Disney Quarry - ERA 16 3(c)

Borrow 7 Quarry—ERA 16 3(c)

Moray Quarry—ERA 16 3(b)

North Creek Quarry—ERA 16 3(b)

South Back Creek Quarry—ERA 16 3(b)

Condition 11. General

- (a) The activity must be undertaken in accordance with written procedures that:
 - (i) identify potential risks to the environment from the activity during routine operations and emergencies
 - (ii) establish control measures that minimise the potential for environmental harm
 - (iii) ensure plant and equipment is maintained and operated in proper and effective condition
 - (iv) ensure that staff are trained and aware of their obligations under the Environmental Protection Act 1994
 - (v) ensure that reviews of environmental performance are undertaken at least annually.
- (b) The activity must not cause environmental nuisance at any nuisance sensitive place unless specifically authorised by a condition of this approval or where an alternative arrangement is in place.
- (c) All documents and records of monitoring required by conditions of this authority must be kept for at least five years.

Condition 12. Air quality

- (a) Notwithstanding Condition 11(b), dust deposition attributable to project activities, when measured at a nuisance sensitive place, must not exceed 120 milligrams per square metre per day, averaged over 1 month.
- (b) Other indicators¹²⁵ that are measured at any nuisance sensitive place must not exceed the air quality objectives specified in Schedule 1 of the Environmental Protection (Air) Policy 2008.

Condition 13. Land

- (a) Contaminants from the activity must not be released to land unless otherwise authorised under this approval.
- (b) Acid sulfate soils, acid-producing rock and marine sediments must not be processed.

Condition 14. Water

- (a) Stormwater contaminated by the activity must be managed to minimise or prevent any adverse impacts on the values of the receiving environment.
- (b) Ponds used for the storage or treatment of aqueous waste must be constructed, installed and maintained to:
 - (i) prevent any release of aqueous waste from the ponds other than as authorised under this approval
 - (ii) ensure the stability of the pond structure.
- (c) Erosion and sediment control measures must be implemented and maintained to minimise erosion and the release of sediment.

¹²⁵ 'Indicator' is defined in Schedule 2 of the Environmental Protection (Air) Policy 2008 as 'a contaminant that may be present in the air environment'.

- (d) The stormwater runoff from the facility generated by a 24 hour storm event with an average recurrence interval of one in five years must be retained on site and treated to remove contaminants before release.

Condition 15. Waste

- (a) All waste generated in carrying out the activity must be reused, recycled or lawfully disposed of offsite.

Definitions	
activity	the environmentally relevant activity to which this environmental authority relates. An activity may be undertaken on the whole or a part of a site.
Administering authority	the Chief Executive of the agency administering the <i>Environmental Protection Act 1994</i> .
alternative arrangement	A written agreement between the approval holder and the occupier of a nuisance sensitive place about the way in which a particular nuisance impact will be dealt with at a sensitive place, and may include an agreed period of time for which the arrangement is in place. An alternative arrangement may include, but is not limited to, a range of nuisance abatement measures to be installed at the sensitive place, or provision of alternative accommodation for the duration of the relevant nuisance impact.
aqueous waste	any aqueous waste including process water, water that has otherwise been used in the carrying out of the activity or sewage, whether or not the waste has been treated, but excluding stormwater and water used for dust suppression that has been treated to remove contaminants.
chemical	as defined in Schedule 12, Part 2 of the Environmental Protection Regulation 2008.
contaminant(s)	as defined in Section 11 of the <i>Environmental Protection Act 1994</i> .
environmental harm	as defined in Section 14 of the <i>Environmental Protection Act 1994</i> .
environmental nuisance	as defined in Section 15 of the <i>Environmental Protection Act 1994</i> .
facility	the area used for carrying out the ERA including any buildings, disturbed areas or any associated infrastructure.
land	land excluding waters and the atmosphere. Land includes land on the authorised place.
minimise	minimise by taking all reasonable and practical measures to minimise the adverse effect having regard to the following matters: (a) the nature of the harm or potential harm (b) the sensitivity of the receiving environment (c) the current state of technical knowledge for the activity (d) the likelihood of successful application of different measures that might be taken to minimise the adverse effects (e) the financial implications of the different measures as they would relate to the type of activity (f) if the adverse effect is caused by the location of the activity being carried out, whether it is feasible to carry out the activity at another location.
NATA accreditation	means accreditation by the National Association of Testing Authorities Australia.

nuisance sensitive place	Includes: <ul style="list-style-type: none"> • a dwelling (including residential allotment, mobile home or caravan park, other residential premises, motel, hotel or hostel) • a library, childcare centre, kindergarten, school, university or other educational institution • a medical centre, surgery or hospital • a protected area under the <i>Nature Conservation Act 1992</i>. • a public park or garden that is open to the public (whether or not on payment of money) for use other than for sport or organised entertainment • a workplace used as an office or for business or commercial purposes, which is not part of the project activity(ies) and does not include employees accommodation, grazing and farmland, unoccupied buildings or public roads
spring	the land to which water rises naturally from below the ground and the land over which the water then flows.
waters	all or any part of a creek, river, stream, lake, lagoon, swamp, wetland, spring, unconfined surface water, unconfined water in natural or artificial watercourses, bed and bank of any waters, non-tidal or tidal waters (including the sea), stormwater channel, stormwater drain, roadside gutter, stormwater run-off, and underground water.
suitably qualified person	A person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis to performance relative to the subject matter using the relevant protocols, standards, methods or literature.
watercourse	as defined in Section 8, Schedule 12 of the Environmental Protection Regulation 2008.
wetland	as defined in Schedule 12 of the Environmental Protection Regulation 2008, means an area shown as a wetland on the map of referable wetlands.

Section 2 Coordinator-General's recommendations

This section includes general recommendations, made under section 35(4) of the SDPWO Act. The recommendations relate to the applications for development approvals for the project.

While the recommendations guide the assessment managers¹²⁶ in assessing the development applications, they do not limit their ability to seek additional information or the power to impose conditions on any development approval required for the project.

Each recommendation nominates the entity to be consulted by the proponent.

Recommendation 1. Pre-clearance Surveys

- (a) Prior to commencement of construction, the proponent must conduct pre-clearance ecological surveys of areas to be impacted, consistent with:
 - (i) Queensland state government survey guidelines
 - (ii) Australian government threatened species guidelines.
- (b) The surveys must be sufficient to identify the extent to which the following will be unavoidably impacted by the project:

¹²⁶ For a definition of 'assessment manager' refer to the glossary on page 583.

- (i) Matters of State Environmental Significance as defined by the State Planning Policy
- (ii) Matters of National Environmental Significance as listed under the *Environment Protection and Biodiversity Conservation Act 1999*.
- (c) Survey results must be included in the Biodiversity Offset Strategy for the project in accordance with imposed Condition 7 (Appendix 1, Section 3).

Recommendation 2. Threatened species

- (a) Prior to the commencement of construction, a suitably qualified person must develop and document impact mitigation and management measures that maximise the ongoing protection and long-term conservation of threatened species known or likely to occur within the project area, outside of the proposed mining lease.
- (b) Mitigation and management measures under recommendation 2(a) must:
 - (i) detail actions and procedures to be followed during the pre-construction, construction, operational and (if appropriate) rehabilitation phases of the project
 - (ii) be supported by a program of monitoring, reporting and review to facilitate adaptive management of the actions and measures, should it be required
 - (iii) detail how the project will comply with all relevant provisions of the *Nature Conservation Act 1992* (Qld).
- (c) All identified impact mitigation and management and reporting and monitoring measures documented in (a) and (b) must be implemented for all stages of the project's construction and operations.

The Department of Environment and Heritage Protection is to have jurisdiction for recommendations 1 and 2.

Recommendation 3. Landholder engagement

- (a) All landholder engagement associated with land access negotiations must be conducted in a manner consistent with the best practice guidelines contained in the Land Access Code.¹²⁷

The Department of Natural Resources and Mines is to have jurisdiction for this condition.

Recommendation 4. Rail Coal Dust Management

- (a) The proponent must develop and implement coal dust management procedures to mitigate the emission of coal dust from loaded and unloaded trains with the objective to:
 - (i) prevent environmental nuisance at any nuisance sensitive place unless specifically authorised by a condition of another approval

¹²⁷ Available from: http://mines.industry.qld.gov.au/assets/land-tenure-pdf/land_access_code_nov2010.pdf

- (ii) minimise damage to rail infrastructure due to coal dust contamination of ballast
- (iii) minimise the loss of ecological values.

The Department of Transport and Main Roads is to have jurisdiction for this condition.

Recommendation 5. Stock Routes

- (a) The proponent must document and implement management measures for stock routes impacted by the project that:
 - (i) provide safe passage across the rail for stock, personnel and the general public
 - (ii) maintain stock routes in accordance with any agreements reached with landholders, the Isaac Regional Council or the administering authority, including for any re-aligned stock routes.

The Department of Natural Resources and Mines is to have jurisdiction for this condition.

Recommendations relating to the contents of an MCU application

Recommendation 6. MCU Application within a State Development Area

- (a) Prior to, or as part of an application to change land use within the State Development Area, the proponent must provide to the Coordinator-General:
 - (i) a detailed description of all components of the project within the State Development Area including maps and drawings at an appropriate scale, delineating which components relate to construction and which relate to operations
 - (ii) detailed information on how all components of the project will address and satisfy the requirements of the development scheme for the State Development Area
 - (iii) documented management measures and procedures prepared in accordance with Recommendation 7
 - (iv) documented evidence that any accommodation components of the project will achieve an acceptable level of amenity for residents
 - (v) copies of any infrastructure agreements with state agencies or the Isaac Regional Council.

The Coordinator-General has jurisdiction for this condition.

Recommendation 7. Management measures and procedure requirements to be included in MCU and development approval applications

- (a) The proponent in any application for an MCU or Development Approval must prepare and document management measures and procedures that will:

- (i) ensure compliance with applicable environmental legislation and any stated conditions under the SDPWO Act
 - (ii) implement relevant commitments made by the proponent in the project's environmental impact statement documentation
 - (iii) minimise adverse impacts to the greatest extent practicable to:
 - (A) the functioning and biodiversity of ecosystems
 - (B) soil structure and quality
 - (iv) minimise the clearing of native vegetation to the greatest extent practicable
 - (v) prevent environmental nuisance from dust, odour light smoke or noise at a nuisance sensitive place
 - (vi) establish rehabilitation objectives, including a rehabilitation schedule
- (b) The management measures and procedures must detail appropriate performance criteria and standards, monitoring and auditing and corrective actions so that all reasonable and practicable measures to prevent or minimise environmental harm are identified
- (c) When approved, the approval holder must:
- (i) implement and make available the management measures and procedures in (b) to all employees, contractors and subcontractors
 - (ii) make the management measures and procedures publicly available on the proponent's website prior to the commencement of any construction work
 - (iii) regularly review and amend as necessary the management measures and procedures in response to monitoring and auditing reports and changes in legislation and standards. Any management measures and procedures must be updated on the proponent's website within 30 business days.

The administering authority is to have jurisdiction for this condition.

Note to the applicant:

Matters to consider in developing management measures and procedures may include but are not necessarily limited to:

- soils (including geotechnical investigations, soil types, salinity, sodicity and acid sulphate potential)
- erosion and sediment control (suggested guideline: International Erosion Control Australasia 2008, Best Practice Erosion and Sediment Control)
- native flora and fauna
- fauna passage, connectivity between populations and prevention of entrapment during construction
- weeds and pests

- progressive rehabilitation of disturbed areas
- surface waters (suggested guideline: Department of Natural Resources and Mines guideline *Activities in a watercourse, lake or spring associated with a resource activity or mining operations* (WAM/2008/3435))
- surface flood waters
- dust and air quality (including coal dust management)
- noise and vibration from construction activities (suggested guideline *Application requirements for activities with noise impacts*, DEHP)
- rail operational noise (suggested guideline NSW Environment Protection Authority Rail Infrastructure Noise Guideline 2013)
- chemical and fuel storage
- waste management
- stock routes
- agricultural land integrity
- lighting and visual amenity
- existing transport and utility infrastructure
- non-indigenous cultural heritage
- decommissioning and rehabilitation
- hazard and risk (including managing any adverse impacts of flood, severe storms, bushfire and landslide).

Note: Should the development require clearing of native vegetation assessable under the *Vegetation Management Act 1999* (VMA), a Property Vegetation Management Plan consistent with section 11 of the *Vegetation Management Regulation 2012* must be prepared as part of an application for MCU/development approval.

Note: Any mapping errors or claims of inaccurate mapping data of the Regulated Vegetation Management map or Regional Ecosystem mapping can be addressed by lodging a Property Map of Assessable Vegetation application under the *Vegetation Management Act 1999* prior to lodgement of any application for development approval.

Definitions

coal dust management procedures

Appropriate procedures would be consistent with the aims, objectives and mitigation measures in the QR Network (2010) *Coal Dust Management Plan* and include reference to:

- wagon loading systems
- load profiling
- coal wagon veneering
- dust monitoring systems
- wagon washing
- periodic removal of dust from ballast and tracks.

environmental impact statement documentation

Environmental impact statement documentation prepared for the Carmichael Coal Mine and Rail Project in accordance with the provisions of the *State Development and Public Works Organisation Act 1971*.

Definitions

environmental nuisance	as defined in Section 15 of the <i>Environmental Protection Act 1994</i> .
minimise	taking all reasonable and practical measures to minimise the adverse effect having regard to the following matters: <ul style="list-style-type: none"> a) the nature of the harm or potential harm b) the sensitivity of the receiving environment c) the current state of technical knowledge for the activity d) the likelihood of successful application of different measures that might be taken to minimise the adverse effects e) the financial implications of the different measures as they would relate to the type of activity f) if the adverse effect is caused by the location of the activity being carried out, whether it is feasible to carry out the activity at another location.
nuisance sensitive place	Includes: <ul style="list-style-type: none"> • a dwelling (including residential allotment, mobile home or caravan park, other residential premises, motel, hotel or hostel) • a library, childcare centre, kindergarten, school, university or other educational institution • a medical centre, surgery or hospital • a protected area under the <i>Nature Conservation Act 1992</i>. • a public park or garden that is open to the public (whether or not on payment of money) for use other than for sport or organised entertainment • a workplace used as an office or for business or commercial purposes, which is not part of the project activity(ies) and does not include employees accommodation, grazing and farmland, unoccupied buildings or public roads
project	The Carmichael Coal Mine and Rail Project, declared a Coordinated Project under the <i>State Development and Public Works Organisation Act 1971</i> .
proponent	Adani Mining Pty Ltd
relevant provisions	Relevant provisions of the <i>Nature Conservation Act 1992</i> include but are not limited to: <ul style="list-style-type: none"> • A Clearing Permit to clear protected plants, except where an exemption applies. The Nature Conservation (Protected Plants) Conservation Plan 2000 outlines how clearing permits, licences and exemptions can be issued to take protected plants. • A Species Management Program will need to be submitted for consideration in relation to tampering with animal breeding places. Section 332(4) of the Nature Conservation (Wildlife Management) Regulation 2006 identifies that the removal of a breeding place may occur under an approved species management program or a damage mitigation permit. • The management principles outlined in Section 73 of the <i>Nature Conservation Act 1992</i>.
State Development Area	Refers to any State Development Area declared by the Governor-in-Council incorporating part or all of the project
state government survey guidelines	<ul style="list-style-type: none"> • Department of Environment and Resource Management (2011) Ecological Equivalence Methodology Guideline: Policy for Vegetation Management Offsets: Queensland Biodiversity Offset Policy or • Department of Environment and Resource Management (2011) Biocondition, a Condition Assessment Framework for Terrestrial Biodiversity in Queensland, Assessment Manual or • equivalent methodology determined in consultation with the Department of Environment and Heritage Protection

Definitions

suitably qualified person	A person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis to performance relative to the subject matter using the relevant protocols, standards, methods or literature.
threatened species	Includes native wildlife that is prescribed under the <i>Nature Conservation Act 1992</i> as— endangered wildlife vulnerable wildlife near threatened wildlife. Or Threatened flora and fauna listed in a category defined in section 179 of the <i>Environment Protection and Biodiversity Conservation Act 1999</i> .

Section 3 Imposed conditions

This appendix includes conditions imposed by the Coordinator-General under section 54B of the SDPWO Act.¹²⁸ The conditions are relevant to applications for development approvals for those parts of the project where there is no relevant approval applicable under other legislation.

All of the conditions imposed in this appendix take effect from the date of this Coordinator-General's report.

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, I have nominated the entity to have jurisdiction for the condition in this schedule.

Pursuant to section 54D of the SDPWO Act, these conditions apply to anyone who undertakes the project, such as the proponent and an agent, contractor, subcontractor or licensee of the proponent, and any public utility providers undertaking public utility works as a result of the project.

Condition 1. Flooding

- (a) A suitably qualified person must document and certify that the design and construction of the rail component of the project:
 - (i) is in accordance with the design criteria in the Department of Transport and Main Roads (March 2010) Road Drainage Manual 2nd edition
 - (ii) meets the following criteria for a two per cent annual exceedance probability rainfall event (50 year Annual Recurrence Interval):
 - (1) not cause, or have the potential to increase flood damage at a residential premises or occupied commercial workplace
 - (2) a maximum increase in afflux of 0.1 m at a residential premises or occupied commercial workplace
 - (3) a maximum increase in afflux of 0.2 m at infrastructure
 - (4) a design objective of an increase in afflux of 0.3m, with a maximum increase in afflux of 0.5 m at other locations
 - (5) a maximum culvert outlet velocity of 2.5 m/s
 - (6) any increase in duration of floodplain inundation is not to exceed 72 hours or 20 per cent of existing flood duration (whichever is greater)
 - (7) any increase in duration of inundation must not alter rural land uses or result in significant impacts upon valued pasture land, other valued agricultural land uses such as cultivated ground or flood-free ground and evacuation access for cattle.
- (b) Relevant land owners likely to be impacted by changes to the existing flooding/drainage system must be consulted prior to completion of the final design for the rail component of the project.

¹²⁸ For a definition of imposed conditions, refer to the glossary on page 583.

- (c) The certified final design and a report on the consultation required in (b) must be provided to the Coordinator-General for approval before the commencement of all construction activities.
- (d) A summary of the information provided to the Coordinator-General in (c) must be provided to relevant land owners within 2 months of the Coordinator-General's approval.

The Coordinator-General is to have jurisdiction for this condition.

Definitions	
annual exceedance probability	Is the probability that at least one event in excess of a particular magnitude will occur in any given year
certify	A Statutory Declaration by a suitably qualified person accompanying the written document warranting that: <ul style="list-style-type: none"> • all relevant material has been considered in the written document • the content of the written document is accurate and true • the written document meets the requirements of the condition.
commercial workplace	A workplace used as an office or for business or commercial purposes, which is not part of the project activity(ies) and does not include employees accommodation, grazing and farmland, unoccupied buildings or public roads
infrastructure	Includes state or local government controlled roads, unoccupied buildings, electricity supply or communication structures and airfields
flood damage	Damage caused by flooding that would adversely affect land and/or premises to an extent likely to have a significant cost.
project	The Carmichael Coal Mine and Rail Project, declared a Coordinated Project under the <i>State Development and Public Works Organisation Act 1971</i> .
rail component	As defined in the Project Supplementary Environmental Impact Statement, Volume 3, Section 2, Rail Project Description
relevant land owners	Includes private freehold and leasehold land owners, and owners of infrastructure assets including public utilities and government agencies likely to be affected by flooding caused by the rail component of the project.
significant construction activities	Construction activities associated with the rail component of the project that involve bulk earthworks, rail line foundations, bridging or drainage structures but does not include establishment of access roads, laydown areas or camps.
suitably qualified person	A person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis to performance relative to the subject matter using the relevant protocols, standards, methods or literature.

Appendix 3 DNRM advice on groundwater flow direction

3/3/2014

Groundwater Flow Direction

Carmichael Project Area

Updated 3/3/2014

GHD, acting for Adani have generally conceptualised a south to north groundwater gradient at the southern end of the model area and a west to east groundwater gradient in the middle of the mine area. They also have a north west to south east gradient in the north of the modelled area.

When officers of DNRM first saw these contours there were concerns about how well this represented what was actually occurring in the area.

Generally in the eastern Galilee Basin area it had been conceptualised that formation outcrops occurring in north-south strips adjacent the Great Dividing Range acted as groundwater intake beds after which each formation dipped from east to west. Therefore groundwater flow would be from east to west. The GHD conceptualisation is investigated further below.

Clematis Sandstone

The shape of the contours change to some extent from one aquifer to another with the gradient in the Clematis Sandstone being more pronounced south to north in the southern half of the model area with gradients all then heading towards the low created by the Doongmabulla springs as represented by the head in monitoring bore HD02.

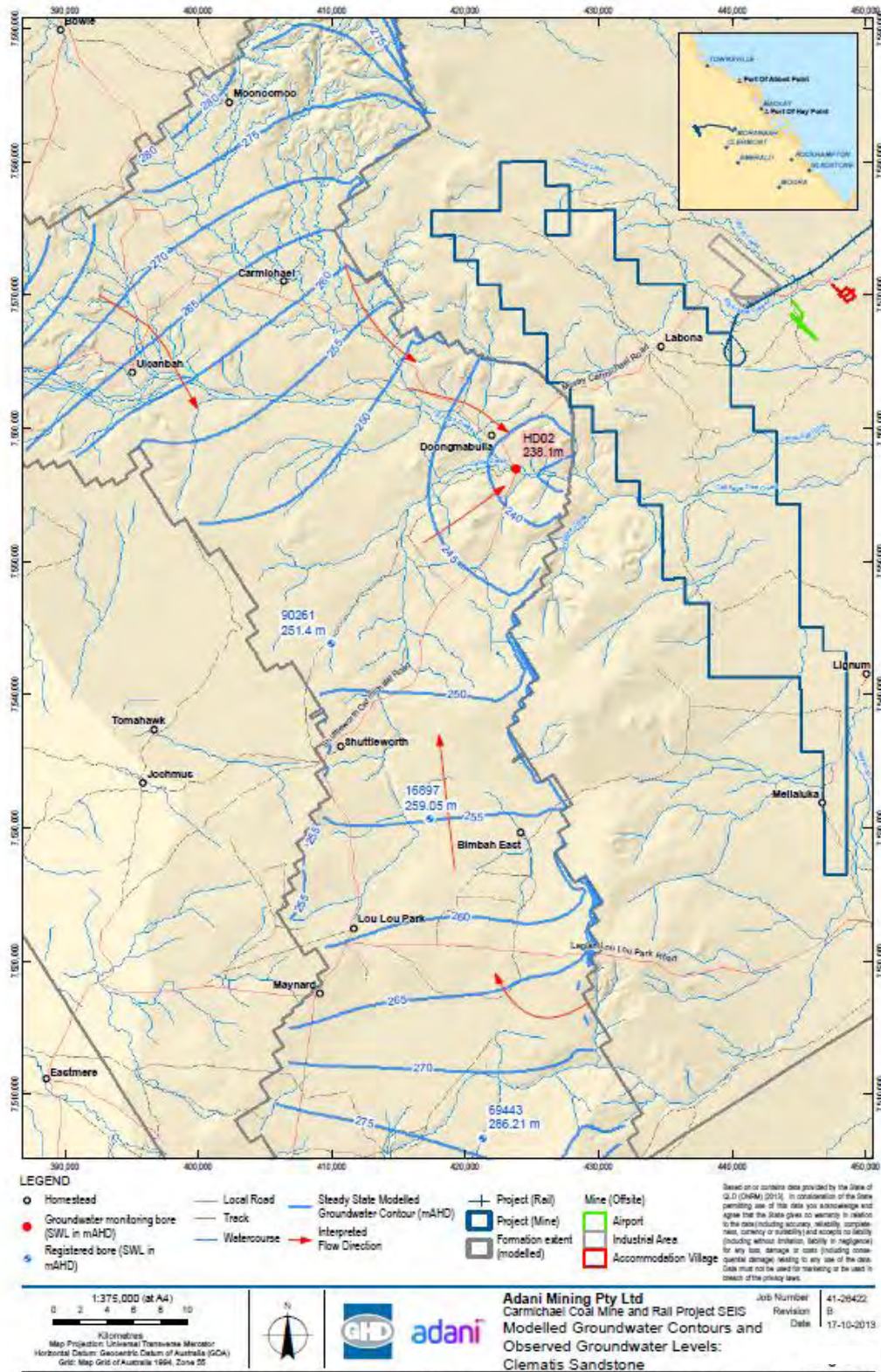
The south to north gradient is shown in Figure 1 (Figure 2 from the Adani SEIS Appendix K6 groundwater addendum). Data from three landholder bores and monitoring bore HD02 are used by GHD to demonstrate a south to north gradient and west to east gradient towards the Doongmabulla springs complex. Note that HD02 is located adjacent the most easterly spring in the complex.

In the south (west of South Galilee, Galilee, Alpha and Kevin's Corner) recharge occurs through outcrops of the Clematis Sandstone. Groundwater heads in the Clematis in the intake beds in these areas is as high as 350 metres above sea level Australian Height Datum (AHD). Ground level elevation is about 450 metres AHD in these areas. From here groundwater will move west down dip away from the recharge area. To the north there are less and less areas where the Clematis Sandstone outcrops (often covered by clayey Tertiary sediments), thus minimising opportunities for recharge. Because groundwater generally moves from areas where recharge is occurring to areas where recharge is not occurring, the poor recharge conditions in the north have the effect of encouraging a south to north groundwater flow as well as the east to west groundwater flow.

There are then areas around Carmichael where the Clematis Sandstone either outcrops (in some limited areas) or is found at shallow depth, at low ground elevations. For example at monitoring bore HD02, the ground elevation is 240 metres AHD. In this area (Doongmabulla spring complex) groundwater in the Clematis Sandstone is flowing out at points where the groundwater head in the aquifer is higher than the ground level elevation and a path (e.g. fractures) exists to the surface. The source for the Doongmabulla springs is the Clematis Sandstone. The springs and the Carmichael River are a discharge area for the Clematis Sandstone aquifer encouraging a local low in the groundwater heads of the Clematis Sandstone aquifer in this area.

Hence there is a groundwater gradient lowering from the south to the north and from the west to the east, resulting in discharge to the Doongmabulla Springs and the Carmichael River. The data supports the GHD conceptualisation.

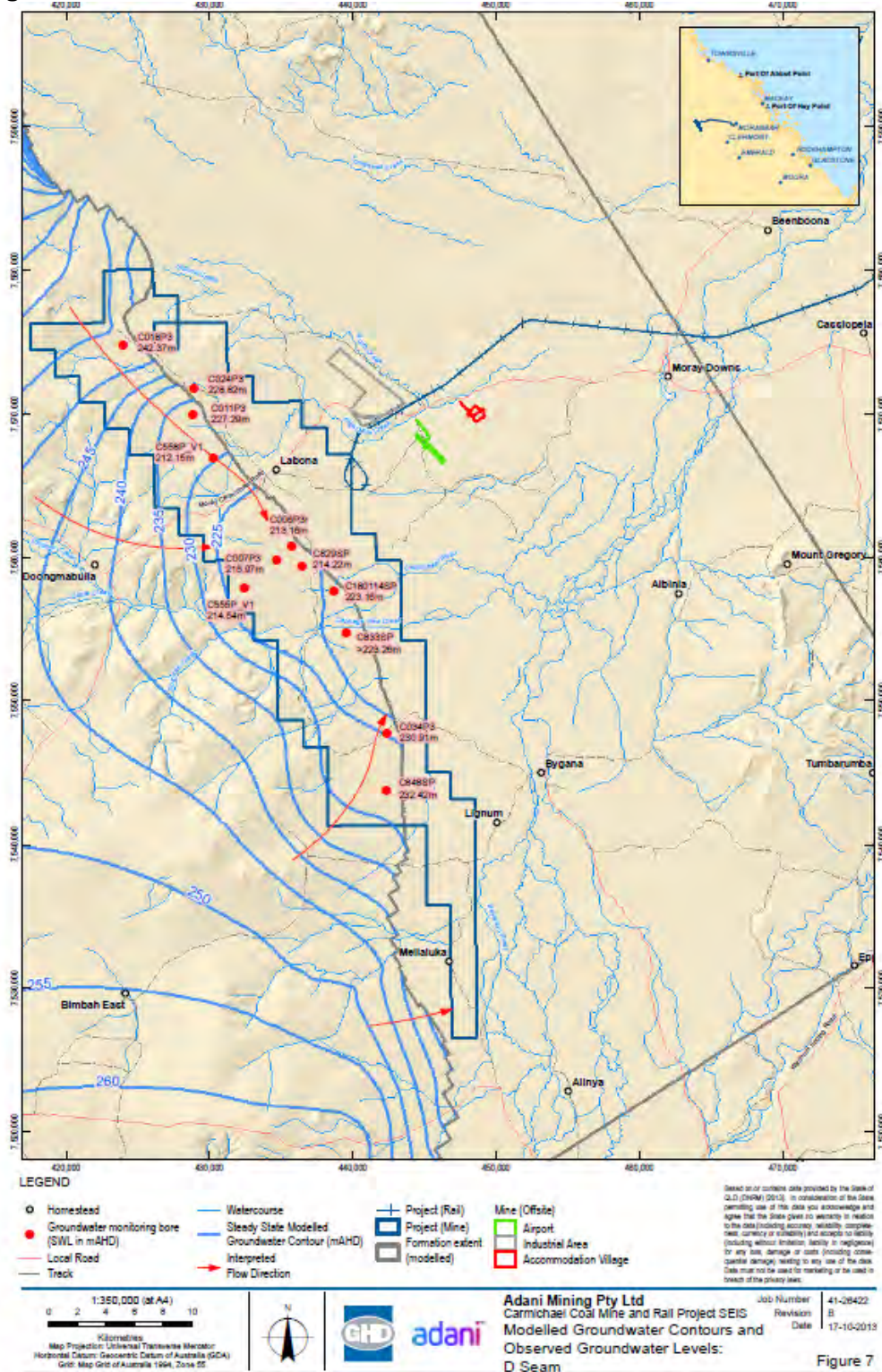
Figure 1



Colinlea Sandstone

In comparison, the D seam contours also have a south to north gradient at the southern end of the model but a much more general west to east gradient for much of the model area. It is considered the lack of data in the D seam at the southern end of the model (particularly west of Mellaluka) contributes to the shape of the contours in the south.

Figure 2



In recent times, DNRM officers have been looking at regional groundwater issues associated with all mines being investigated in the eastern Galilee Basin area from South Galilee (adjacent Alpha township) in the south to Carmichael in the north (with specific details of China Stone, north of Carmichael still yet to be seen).

Of particular interest here is that DNRM have investigated sources of data to assist in understanding groundwater heads in the Colinlea Sandstone and Bandanna formation in areas well west of the proposed mine areas.

Some such data was able to be sourced from old drill stem tests carried out in petroleum exploration wells in the area and more recently in a coal seam gas exploration hole.

Drill stem tests can often provide poor quality information and often these poorer quality tests can easily be identified and discounted. However even in the better tests there remain significant measurement uncertainties. Bearing this in mind any data obtained from these tests can be taken as a guide only.

Within the dataset available for the petroleum exploration wells in the area, data from four wells was selected where the tests were carried out in the Bandanna Formation or Colinlea Sandstone and the data appeared accurate enough to utilise.

Wells chosen were as follows:

Table 1 Petroleum Exploration Wells used for Drill Stem Head Data

Name	GWDB RN	Tested Interval (m)	Formation
Lake Galilee No.1	22367	1010 - 1063	Colinlea Sandstone
Thunderbolt No.1	22595	886 - 915	Bandanna Formation
Carmichael No.1	-	918 - 929	Colinlea Sandstone
Coreena No.1	22658	742 - 783	Colinlea Sandstone

Additionally data was found for a recently completed coal seam gas exploration well, Shoemaker No.1. Two drill stem tests were carried out, one identified to be at the top of the C seam at 590 metres and the other at the bottom of the C seam at 624 metres. Results from these two tests indicate heads within 7 metres of each other which appears to be reasonable correlation. For the purposes of this investigation the results from drill stem test 1 at 590 metres have been used. Details are as follows:

Table 2 Coal Seam Gas Exploration Well used for Drill Stem Head Data

Name	GWDB RN	Tested interval (m)	Formation
Shoemaker No.1	-	589 - 595	Bandanna Formation

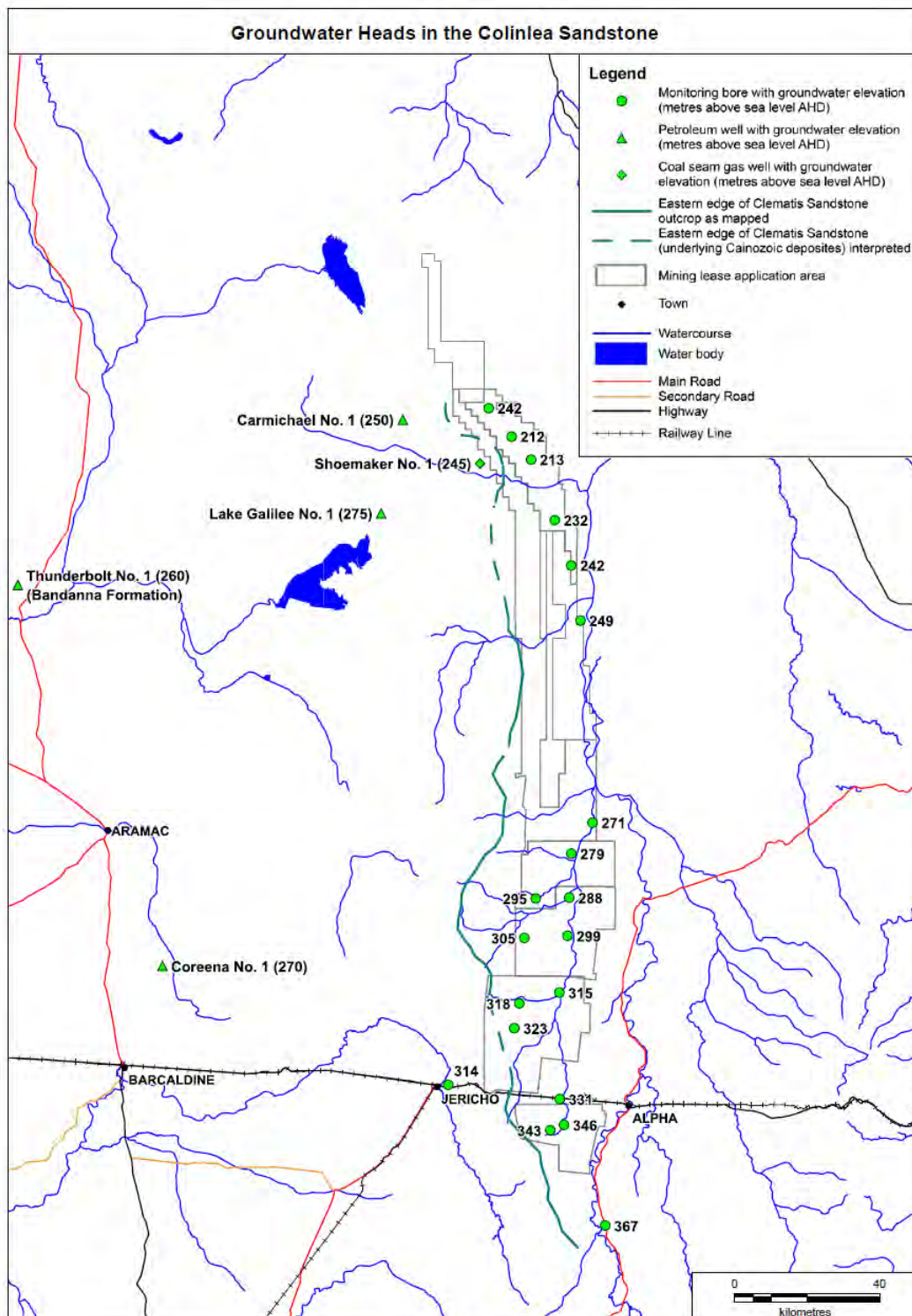
After collecting all the data and allowing a conversion for the units that data was originally collected in, temperature effect on pressure and reference points (where the data was measured from), Table 3 provides a summary of data collected.

Table 3 Calculation of Approximate Heads using Drill Stem Test Data

Well Name	Maximum Head Recorded (psia)	Adjustment for measurement in a vacuum (psia issue)	Adjustment for temperature	Depth at which head measured below Kelly Bushing (m)	Depth of Head below Kelly Bushing (m)	Elevation of Kelly Bushing (m AHD)	Approximate Elevation of Head (m AHD)
Carmichael No.1 (1995)	1274.9	$1274.9 - 14.7 = 1260.2$ psi (887.5m)	$887.5 - 10 = 877.5$ m	922	$922 - 877.5 = 44.5$	293.8	249.3 round off to 250
Lake Galilee No.1 (1964)	1445	$1445 - 14.7 = 1430.3$ (1007.3m)	$1007.3 - 10 = 997.3$ m	1016	$1016 - 997.3 = 18.7$	293.9	275.2 round off to 275
Thunderbolt No.1 (1967)	1329	$1329 - 14.7 = 1314.3$ (925.6m)	$925.6 - 10 = 915.6$ m	885.6	$885.6 - 915.6 = -30$	232	262 round off to 260
Coreena No.1 (1970)	1118	$1118 - 14.7 = 1103.3$ psi (777 m)	$777 - 10 = 767$ m	751.3	-15.7	254	269.7 round off to 270
Shoemaker No.1 (2010)	838 (psig)	None required (590m)	$590 - 4\text{m}$ (42°C) = 586 m	590	$590 - 586 = 4$	251.2	247.2 round off to 245

Data available from monitoring of the Colinlea Sandstone in the southern mine areas and other private bores in the area was then used in combination with the drill stem test data to produce figure 3.

Figure 3



From this it can be seen that the highest recorded heads in the area are south of Alpha adjacent Alpha Creek. It is conceptualised by DNRM that in this area, south of Alpha township, there is a 40 km section of Alpha creek which overlies and recharges alluvium and Tertiary sediments which in turn overlie the Colinlea Sandstone. Alpha

Creek in this area therefore appears to provide recharge to the Colinlea Sandstone acting as a significant recharge source to that formation in the Galilee Basin. Additionally north east of Jericho in the western half of the Galilee Coal proposed mine site area it appears that shallow porous Tertiary sediments overlie the Bandanna Formation and may similarly provide useful recharge to that formation in that area.

From this southern area groundwater flow directions are south to north and east to west. The south to north direction is in line with declining surface topography heading north in the Belyando creek catchment. Despite declining groundwater level elevations heading north, groundwater heads actually become closer and closer to ground level. Just south of Carmichael mine site, a number of artesian bores are noted to exist in a line north to south. Whilst many of these bores were initially considered to be sourced from Tertiary sediments it is now considered likely that they are taking groundwater from the Colinlea Sandstone. Part of the confining layer for this aquifer in this area of artesian bores is likely to be very clayey Tertiary sediments.

At the southern end of Carmichael, the Mellaluka springs complex exists. It also appears to source groundwater from the Colinlea Sandstone. From here there continues to be a groundwater gradient to a point just north of the Carmichael River where an unexplained low area or groundwater 'hole' exists.

The topographically low area of Carmichael where the Colinlea Sandstone is close to outcrop appears to provide a discharge area for the Colinlea Sandstone as the Mellaluka Springs complex demonstrates.

By observing the approximate heads available from the drill stem tests, support can also be seen for a west to east gradient at the Carmichael area. Note that the petroleum wells some 30 km west of Carmichael have a groundwater elevation of between 250 and 275 metres AHD. Similarly the coal seam gas exploration hole, Shoemaker No.1 just west of Carmichael, has a head of some 245 metres AHD. This compares with 212 to 242 metres AHD at Carmichael. The data then generally supports the GHD conceptualisation.

Additional Work required

It is however important for Adani to confirm the source aquifer for the Mellaluka Springs complex. Initially the proponent had suggested that the source was likely to be the early Permian strata (underlying the Colinlea Sandstone) but in the more recent groundwater addendum report it has been suggested that it is more likely to be the base of the Colinlea Sandstone.

They have made estimates of drawdown of 2 to 18 metres in the springs with a predicted figure of 9 metres based on the source being the Colinlea Sandstone. Unfortunately there is no layer in the model for the geological unit below the D seam in the Colinlea (which appears to be the source) and the layer representing the D seam pinches out well west of the Mellaluka springs. Hence once the source has been established by Adani, additional modelling work will be required.

In addition the proponent must ensure that the artesian monitoring bores that they have constructed in the area of the Mellaluka Springs complex are constructed in a manner which ensures that accurate groundwater heads can be monitored.

All of these issues have been raised in DNRM's response to the SEIS for Carmichael.

A. Bleakley

Appendix 4 Independent peer review



Heritage Computing Pty Ltd ● ABN 75 392 967 126 ● T/A HydroSimulations
PO Box 241, Gerringong NSW 2534. Phone: (+61 2) 4234 3802

noel.merrick@heritagecomputing.com

DATE: 31 March 2014

TO: Michelle Rennick
Project Manager
Department of State Development, Infrastructure and Planning
State of Queensland

FROM: Dr Noel Merrick

RE: **CPD-1-2014: A review of the Carmichael Coal Mine
and Rail Project Water Hydrogeology Report**

OUR REF: HS2014/7

1. Introduction

This review is provided in response to your request of 27 February 2014 for Quote No. CPD-1-2014 for the provision of services to undertake a review of the Carmichael Coal Mine and Rail Project Water Hydrogeology Report and our subsequent proposal of 4 March 2014.

A targeted review has been made of the groundwater assessment conducted by GHD and associated documents in accordance with the following limited scope of work. The review was undertaken by Dr Noel Merrick of Heritage Computing Pty Ltd trading as HydroSimulations.

2. Scope of Work

The scope of work is limited to provision of a considered response to the following questions:

1. Is the Groundwater Flow direction in the Triassic and Permian aged sediments, as determined by GHD for Adani Mining at Carmichael and presented as part of the Groundwater Conceptual Model, an acceptable assessment of groundwater flow, based on groundwater data available to the proponent at the current time?
2. Based on this assessment, are the groundwater flow contours provided as part of the model output considered likely to be representative of actual conditions based on existing knowledge?
3. Are the model boundaries, and in particular the western model boundaries, considered to be appropriate?

No other matters are to be addressed in this targeted review.

3. Documentation

The review is based on the following documents provided by you:

1. GHD, 2013, Carmichael Coal Mine and Rail Project SEIS: Report for Mine Hydrogeology Report. Prepared for Adani Mining Pty Ltd, 13 November 2013.
2. GHD, 2013, Carmichael Coal Mine and Rail Project SEIS: Mine Hydrogeology Report Addendum. Prepared for Adani Mining Pty Ltd, 24 October 2013.
3. URS, 2013, Adani Carmichael Coal Project Numerical Model Peer Review. Prepared for Adani Mining Pty Ltd, 14 October 2013.
4. GHD, 2013, Carmichael Coal Project Groundwater Model Peer Review Final Comments. Letter to Hamish Manzi, Adani Mining Pty Ltd from Keith Phillipson, 18 October 2013.
5. IESC, 2013, Advice to decision maker on coal mining project - Proposed Action: Carmichael Coal Mine and Rail Project, Queensland (EPBC 2010/5736) - New Development. Final Advice, 12 December 2013.
6. Bleakley, A. and McKay, A., 2014, Carmichael Mine Response to IESC Advice. 2 January 2014, 6p.
7. Bleakley, A., 2014, Groundwater Flow Direction Carmichael Project Area. 3 March 2014, 9p.
8. GHD, 2014, Carmichael Coal Project Response to IESC Advice. Letter to Hamish Manzi, Adani Mining Pty Ltd from Keith Phillipson, 7 February 2014, 19p + 8 Attachments.

4. Groundwater Flow Directions

Items 1 and 2 in the scope of work relate to groundwater flow directions based firstly on data (observations and inferences) and secondly on simulation (contours).

GHD has conceptualised the flow direction to be:

- A. west to east in the centre of the mine area;
- B. north-west to south-east in the northern part of the mine area; and
- C. south to north in the southern part of the mine area.

The IESC advice on this issue can be summarised as follows:

- A. flow interpretation is "based primarily on shallow groundwater monitoring";
- B. there are insufficient head measurements in the deeper groundwater systems;
- C. the flow direction is contrary to what is expected and accepted in the GAB;
- D. flow conceptualisation is unsubstantiated;
- E. "the Committee questions the application of this flow direction" (toward Carmichael River) "to deeper formations ... noting theoretical research in this regard"; and
- F. groundwater flow should be in the direction of dip which is towards the west.

In their peer review, URS made the following comment on groundwater flow direction:

A. "flow is contrary to the dip of the geology".

Comment F by the IESC and comment A by URS display a surprising lack of scientific understanding. Darcy's Law which underpins hydrogeology shows conclusively that groundwater flow follows the hydraulic gradient. There is no mention of dip in the formula. This perception of "downhill flow" is a common misconception that has its origin in familiarity with surface water flow. Groundwater flows from a region of higher pressure to a region of lower pressure, not from higher elevation to lower elevation as occurs with surface flow. Groundwater pressures are influenced strongly by topography which dictates where recharge and discharge processes are focused. GHD's conceptualisation of recharge in the hills and discharge of deep groundwater in the vicinity of Carmichael River (where springs are observed) is fully consistent with Darcy's Law and with the well established pattern of regional flow paths first promulgated by Toth (1963)¹. This has been known for 50 years, despite the IESC's allusion to apparently contradictory unspecified "theoretical research in this regard" without proper scientific citation.

In Attachment 2 of Document #8, URS subsequently recognised the role of topography in influencing flow direction and agreed with GHD's conceptualisation, largely on the strength of demonstrated flows contrary to dip in other investigated areas of the Galilee Basin (Kevins Corner, Alpha, Galilee, South Galilee).

The other points noted by IESC have no basis in fact and have been summarily dismissed by GHD in Document #8. In particular, the claim that there are insufficient deeper head measurements is exaggerated.

It is true that the head data that were available to GHD are focused in a narrow band confined to the mine area, supplemented by a few regional bores in the Queensland Government database. In Document #1, groundwater head contours based solely on available data were presented for the Dunda Beds, the Rewan Group, Permian overburden, the AB Seam, Permian interburden, the D Seam, and Permian underburden. There were some deficiencies in these maps:

- the contours extended to the east past the outcrop extent of the formation;
- regional database bores were not included; and
- flow was assumed to be along strike.

The last dot point is a reasonable assumption in the absence of other information. Subsequent contours presented in Document #2 clarify that there is a component of the hydraulic gradient vector along strike, but the maximum gradient is at an angle to the strike.

As there are insufficient regional data for broader contouring, GHD chose to display simulated contours in Document #2, with measured heads posted on the maps, to demonstrate that the observed heads and the simulated heads are consistent. The simulated heads are not independent of the conceptualisation and are therefore not *prima facie* evidence of flow directions, but as the model had the freedom to find its own "level" the resulting contours are not biased unduly by the modeller.

Officers of the DNRM (in Document #7) have compiled drill stem head data from petroleum and coal seam gas exploration wells and combined this information with data acquired at other mining projects in the Galilee Basin to give a definitive picture of the Colinlea Sandstone groundwater flow directions in this part of Galilee Basin, covering an area of 160 km (east-west) by 250 km (north-south). This reviewer has taken the liberty of adding approximate water level contours to their map, shown here as **Figure 1**. Very clearly, the dominant flow direction near the Carmichael Project is west to east which supports the GHD conceptualisation. There is a groundwater divide about 40 km to the west, in line with the adopted boundary in the GHD model. On the other side of the groundwater divide, flow is east to west as expected in the GAB away from the recharge beds.

¹ Toth, J., 1963, A theoretical analysis of groundwater flow in small drainage basins. *J. Geophys. Res.*, 68, 4795-4812.

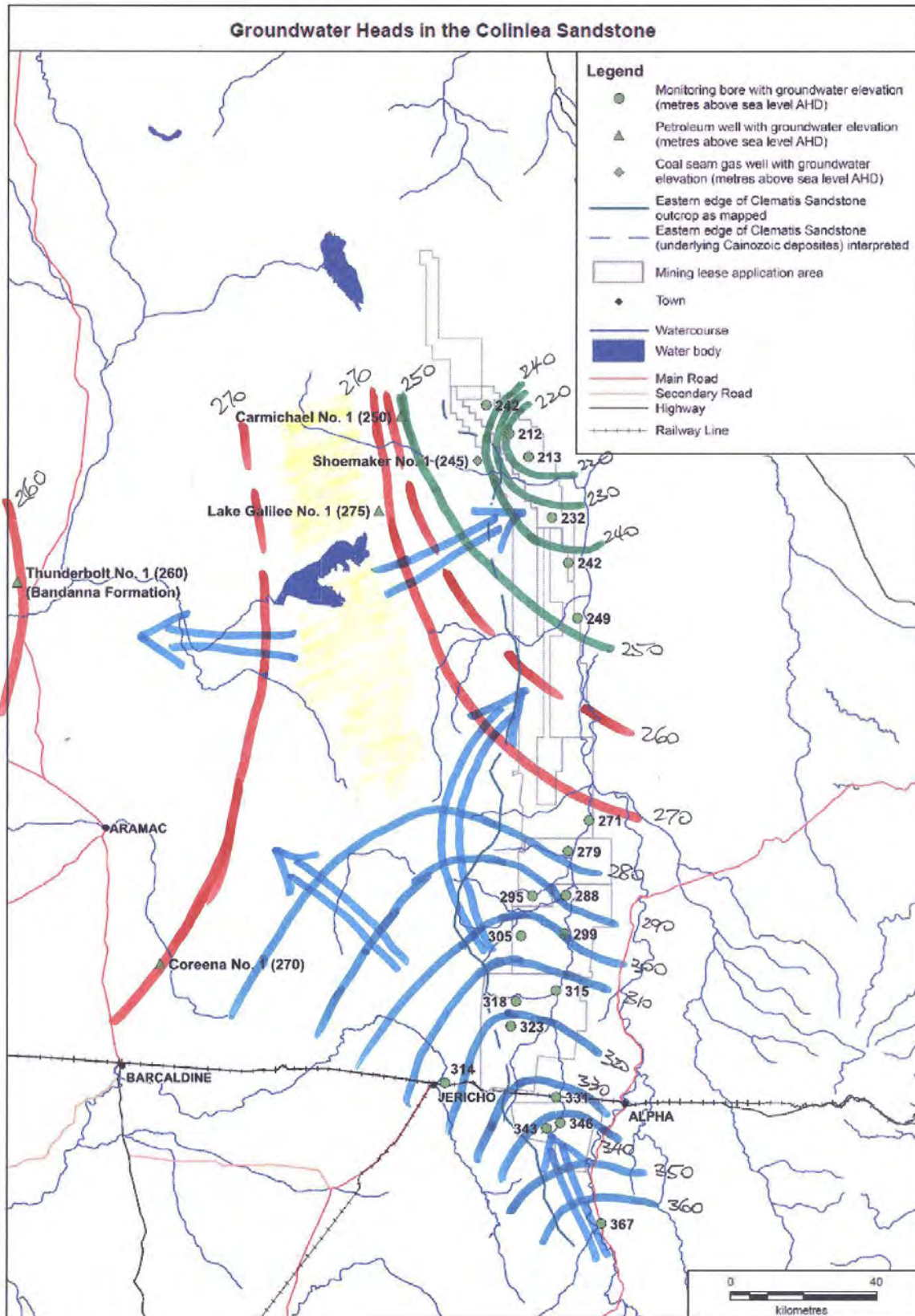


Figure 1. Groundwater Heads and Flow Directions in the Colinlea Sandstone [after Bleakley, 2014]

In Figure 1 there is a pronounced groundwater mound to the south that agrees well with

independent analysis by Heritage Computing (2013)² for the Galilee Coal Project (see **Figure 2**). The hydrogeological conceptualisations for the Carmichael and Galilee projects are consistent.

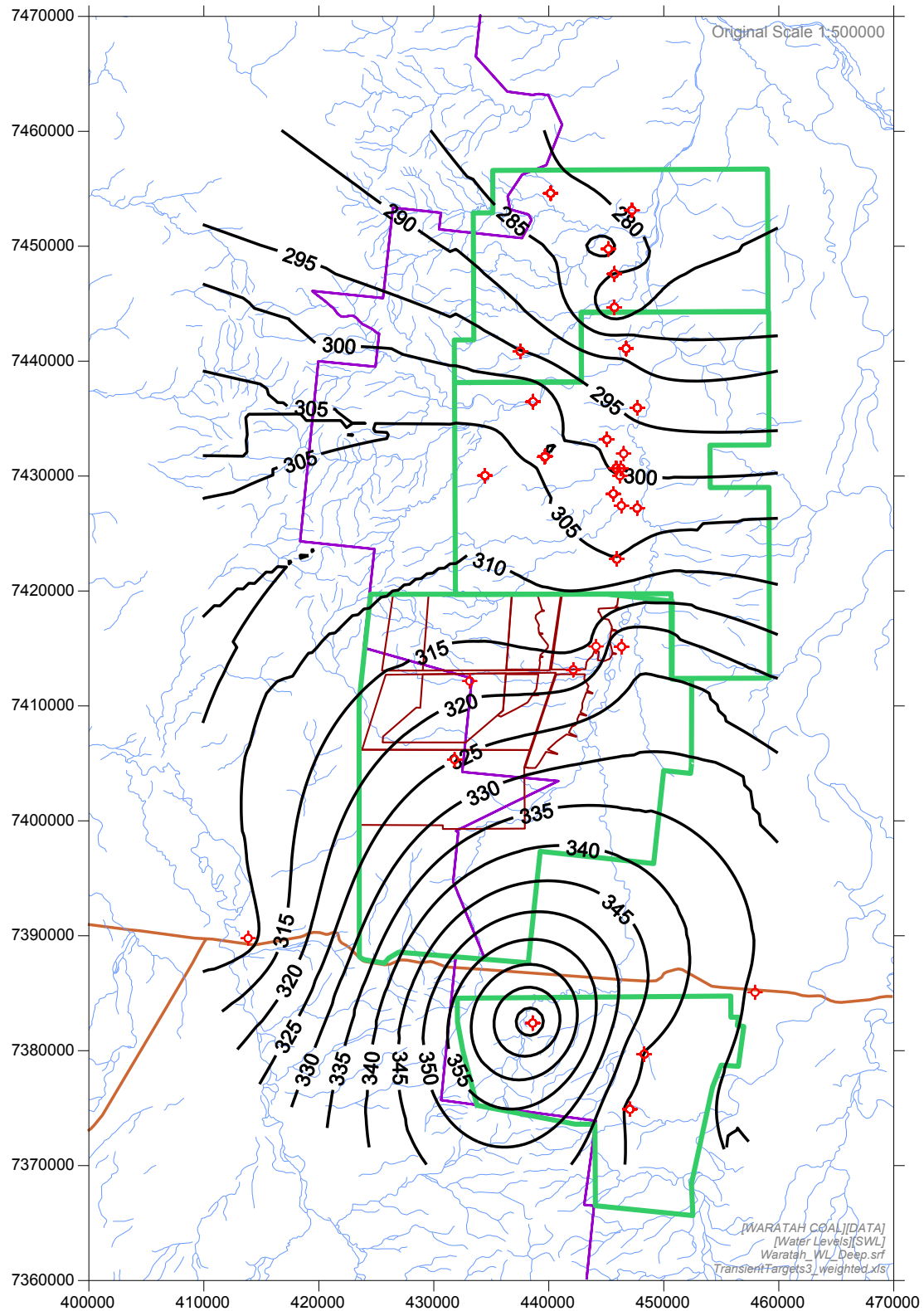


Figure 2. Observed Groundwater Heads in the DU and DL Seams and Interburden (mAHD) [Heritage Computing, 2013]

² Heritage Computing Pty Ltd, 2013, Galilee Coal Project Groundwater Assessment. Report HC2013/7 prepared for Waratah Coal Pty Ltd. Authors N. P. Merrick and M. Alkhatib.

5. Model Boundaries

Item 3 in the scope of work relates to the appropriateness of the model boundaries, particularly the western boundary.

GHD has been guided by the locations of surface water divides (topographic ridges) in the setting of model boundaries. This is normal practice, as topographic ridges more often than not are coincident with groundwater mounds beneath the ridges, which lead to groundwater divides as water is shed from the flanks of the mound. The previous section noted that the western model boundary has been applied in the region of a definitive groundwater divide at the level of the Colinlea Sandstone (below the Permian coal seams).

GHD has applied the following boundary conditions along the topographic ridges:

- A. inflow general head boundaries (GHBs) to the north, west and south in the more permeable Triassic and Permian model layers;
- B. outflow GHBs to the east in Tertiary strata and basement.

Application of GHBs is standard practice in controlling the size of a groundwater model while still accounting for fluxes at a distance unlikely to have an effect on groundwater responses to mining.

The IESC advice on this issue can be summarised as follows:

- A. there are significant concerns over the use of no flow boundaries, as this is "not good practice";
- B. "the use of no flow boundaries in a groundwater flow model can have profound effects on its predictions";
- C. there are significant concerns over the truncation of the Clematis Sandstone (etc.) on the western edge;
- D. as a consequence of the use of no flow boundaries, the Committee has no confidence that the model can provide "reasonable prediction of the impacts of the development";
- E. "Due to inappropriate boundary conditions the Committee has no confidence in the results of the groundwater model"; and
- F. "the model domain should be extended, especially to the west".

The impression that no flow boundaries were applied is false, except for aquitard layers where the lateral flow across a boundary would be extremely low. This is an honest mistake, as Figure 29 in Document #1 does give the impression that no flow cells were used. The GHB cells are displayed as thin orange lines which are barely perceptible. GHD has redressed this matter by providing clearer maps in Document #2 of the GHB locations, to prove definitively that the IESC was misled. However, the text associated with Figure 29 states clearly that GHB cells were applied.

Comment B by the IESC overstates the risk in applying no flow cells. Normal practice is to place boundaries far from the stress, and if that is done the type of boundary condition will not cause "profound effects". In this case, the nearest boundary (on the western side) is 30 km away, well beyond the drawdown extent. Inclusion of the Clematis Sandstone for a greater distance to the west would have no material effect on the model results, given the great distance from the stress. There are real and pragmatic limits to the areal size of groundwater models, due to hardware and software limitations. An accepted rule of thumb is to limit the number of model cells to about one million. The GHD model is already well beyond that (at 4 million cells) and the model should definitely not be made any larger. The IESC should be aware of this aspect of practical modelling.

Comments D and E by the IESC are extravagant reactions to a circumstance that has not

occurred (the application of no flow cells), and even if no flow cells had been applied at distances in excess of 30 km, the dismissal of the credibility of a model on those grounds is unwarranted.

DNRM officers in Document #6 rightly advised that "any discussion of boundary conditions by IESC be ignored".

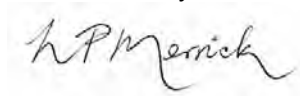
5. Opinion

The opinions of this reviewer on the items in the scope of work are:

1. The Groundwater Flow direction in the Triassic and Permian aged sediments, as determined by GHD for Adani Mining at Carmichael and presented as part of the Groundwater Conceptual Model, is an acceptable assessment of groundwater flow, based on groundwater data available to the proponent at the current time.
2. Based on this assessment, the groundwater flow contours provided as part of the model output are considered likely to be representative of actual conditions based on existing knowledge.
3. The model boundaries, and in particular the western model boundaries, are considered to be appropriate.

This review has been limited to specific questions raised by the IESC. In each case, the declarations of the IESC have been shown to be false.

Yours Sincerely



Appendix 5 Standard dewatering conditions for a water licence under the *Water Act 2000*

1. The Schedule B conditions associated with this licence are attached in Annexure A and are conditions, which the licensee must comply with under authority of this licence.

Annexure A

Recitals

XXXX Coal Pty Ltd (hereinafter "the licensee") is the Principal holder of mining lease numbers ML XXXX and ML XXXX for the XXXX Coal project which proposes to construct and operate an open cut coal mine near XXXX ("the mine") on the mining leases. The licensee will construct works (comprising bores and works that pump groundwater from a sump) accessing the XXXX Coal Measures. These works are referred to as the Dewatering Works. The water taken through the dewatering works may be used for the consumptive purpose/s authorised under this licence.

The operation of the Dewatering Works will impact on the piezometric levels in the region of the mine during the life of the mine and for a period after the mines closure.

The licensee prior to the time of making application for a Licence, prepared an EIS that deals with the hydrology of the area and the effects of the proposed extraction on groundwater. The EIS included predictions of the impact of the Dewatering Works on the aquifers in the region. These predictions, were referenced in the Report titled:

"XXXX Groundwater Impact Assessment – Appendix X of the XXXX Mine Project – Environmental Impact Statement - 2014"

The report "XXXX Mine Groundwater monitoring plan" outlines the proposed groundwater monitoring program.

The conditions set out in Schedule A and Schedule B of this Licence are herewith after referred to as "the Conditions".

DEFINITIONS

In this Licence, unless the context otherwise requires:

"bore owner" means the registered owner of the land on which a bore exists as approved development under the *Sustainable Planning Act 2009* and/or from which water is taken under the authority of the *Water Act 2000*;

"Business day" means a day on which trading banks are open for normal banking business in Brisbane;

"Chief Executive" means the Chief Executive, Department of Natural Resources and Mines.

"Measures to make good" has the meaning ascribed to it in Schedule B condition 3.1;

"Licensee" has the meaning ascribed to it in the Recitals;

"Dewatering Works" has the meaning ascribed to it in the Recitals;

"Monitoring Bores" means the monitoring bores as identified the report "XXXX Mine Groundwater monitoring plan" and any subsequently drilled bores for monitoring purposes;

"Pre-existing bore" has the meaning ascribed to it in Schedule B condition 1.1;

"Restoration measures" has the meaning ascribed to it in Schedule B condition 3.1;

"Conditions" has the meaning ascribed to it in the Recitals; and

"Unduly affected" has the meaning ascribed to it in Schedule B condition 1.2.

INTERPRETATION

In this Licence:

- (a) headings to Conditions are for ease of reference only and shall not in any way affect the meaning of the Conditions;
- (b) a reference to days or months is a reference to Business days and calendar months; and
- (c) words in the singular shall include the plural and vice versa.

NOTICES

- (a) Form of Notice

Any notices, consents, document, invoice or other communication ("notice") required or permitted to be given by this Licence:

- (i) must be in writing; and
- (ii) may be given by being delivered or sent by prepaid registered post (or by facsimile transmission where facsimile transmission facilities are available for receipt of such a communication) to the address of the parties set out below or such other address as may be notified as the appropriate address from time to time for the purposes of this Licence.

The Chief Executive:

The Chief Executive
C /- The Manager

Water Management and Use

Department of Natural Resources and Mines
PO Box 1762
ROCKHAMPTON QLD 4700
Telephone: 1800 822 100
Facsimile: (07) 4999 6904
Email: centralwaterservices@dnrm.qld.gov.au

Licensee:

XXX Coal Pty Ltd
Environmental Superintendent – XXXX Mine
GPO Box XXX
BRISBANE QLD 4001

(b) Time Service Occurs

A notice is deemed to be served on a party, in the case of post, on the third business day after posting and, in the case of facsimile, on the day of transmission if the transmission is before 5.00pm on a business day and in all other circumstances on the business day following transmission of the facsimile provided that the sending party has received a report that there has been a correct and complete transmission.

1 EXISTING WATER SUPPLIES TO BE PROTECTED

1.1 Existing bores

(a) Any bore that:

- is in existence at the date of issue of this licence, and
- is approved development under the *Sustainable Planning Act 2009*; and
- takes water from any aquifer; and
- takes that water under the authority of the *Water Act 2000*;

is a “pre-existing bore.”

(b) Any bore that is constructed to replace a pre-existing bore is taken to be a pre-existing bore.

(c) Any bore that is constructed as a measure to make good the supply of water from a pre-existing bore under the licence is taken to be a pre-existing bore.

1.2 For a pre-existing bore, if at any time, in the opinion of the chief executive:

(a) the taking of water under the licence causes a material reduction in the piezometric level in the pre-existing bore relative to the piezometric level existing immediately before the commencement of the taking of water under the licence; and

(b) that reduction in piezometric level causes, either:

- (i) a material reduction in the supply of water from the pre-existing bore relative to the supply available immediately prior to the taking of water under the licence; or
- a material increase in the cost of maintaining the supply of water from the pre-existing bore relative to the cost of supply immediately prior to the taking of water under the licence;

(c) the taking of water under the licence causes a material reduction in the quality of water available to the owner of the pre-existing bore, then the pre-existing bore will be regarded as being “unduly affected” by the taking of water under the licence.

1.3 The licensee must co-operate with the owner of any pre-existing bore that is unduly affected, or is likely to become unduly affected, to collect piezometric, water supply and water quality information necessary to support conclusions concerning impact of the taking of water under the licence on the supply, reliability, quality or quantity of water available from such pre-existing bore.

2 UNDULY AFFECTED PRE-EXISTING SUPPLIES TO BE MADE GOOD

2.1 Where a pre-existing bore is unduly affected by the taking of water under the licence, the licensee shall, at the cost of the licensee, carry out such measures, or

Appendix 5. Standard dewatering conditions for a water licence under the Water Act 2000

Carmichael Coal Mine and Rail project:

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

cause such measures to be carried out, as are necessary to make good the supply of water to the owner of the unduly affected bore, pursuant to the terms of the licence (the “measures to make good”).

2.2 A water supply to the owner of a pre-existing bore unduly affected by the taking of water under the licence will be considered to be made good if:

- (c) the supply of water available to the owner of the pre-existing bore, whether from the pre-existing bore or another source, is not materially less than that which would have been available from the pre-existing bore but for the taking of water under the licence; and
- the reliability and the quantity of water is equivalent to that which was available from the pre-existing bore immediately before the commencement of the taking of water under the licence; and
- the owner of the pre-existing bore does not suffer increased cost in the operation of the made good water supply; and
- the quality of the water available to the owner of the pre-existing bore is suitable for the purposes for which the owner uses the water.

3 MEASURES TO MAKE GOOD PRE-EXISTING SUPPLIES

3.1 Measures to make good an unduly affected pre-existing bore may include one or more of the following:

- (d) deepening a pre-existing bore;
- replacing a pre-existing bore with another bore;
- replacing or modifying existing water supply equipment;
- providing a water supply of an equivalent quantity of suitable quality by piping from an alternate water source;
- providing a cash settlement to the owner of a pre-existing bore; or
- other measures as may be agreed between the Licensee and the owner of the pre-existing bore.

3.2 If a pre-existing bore is unduly affected by the taking of water under the licence then the licensee shall agree with the owner of the unduly affected pre-existing bore on measures to make good the supply of water from such pre-existing bore.

3.3 If, after advice from the parties that agreement pursuant to Schedule B condition 3.2 cannot be reached, and in the opinion of the chief executive all reasonable attempts have been made to achieve agreement, then the chief executive:

- (e) may give a notice to the licensee to require the licensee to provide to the satisfaction of chief executive any data necessary to determine the measures necessary to make good the supply of water from the pre-existing bore;
- (f) will, in consultation with the licensee and the owner of the pre-existing bore, determine the measures to be taken to make good the supply of water from the pre-existing bore; and

- (g) will, upon determining the measures to be taken to make good the supply of water from the pre-existing bore, give the licensee a notice to inform the licensee of the determination.

3.4 The licensee must implement, at the cost of the licensee, all measures necessary to make good the supply of water from an unduly affected pre-existing bore, either as agreed between the licensee and the owner of such bore under Schedule B condition 3.2 or as determined by the chief executive and notified under Schedule B condition 3.3.

4 URGENT RESTORATION

4.1 If, in the reasonable opinion of the Chief Executive,

- (h) restoration measures agreed pursuant to Schedule B condition 3.2 or as determined pursuant to Schedule B condition 3.3 need to be carried out urgently to maintain an adequate supply of water, and
- (i) the licensee is not responding with appropriate haste to carry out the restoration measures;

then the Chief Executive will issue a notice to the licensee directing the licensee to commence an appropriate program for implementation of restoration measures within forty-eight hours of receipt of the notice.

4.2 If, in the opinion of the Chief Executive, the licensee fails to adequately comply with a notice issued pursuant to Schedule B condition 4.1, the Chief Executive will:

- (j) carry out the necessary restoration measures; and
- notify the licensee of the cost of the restoration measures and direct the licensee to reimburse the Chief Executive for the cost of the restoration measures

The licensee shall pay to the Chief Executive the costs so notified.

5 MONITORING AND ASSESSMENT

5.1 Monitoring will be undertaken in accordance with the recommendations of the report entitled "XXXX Mine Groundwater Monitoring Plan" and any subsequent revisions of this report. Subsequent provisions of this report must be approved by the Chief Executive.

5.2 The Licensee must implement the monitoring program outlined in the report entitled "XXXX Mine Groundwater Monitoring Plan" and any subsequent revisions of this report. Subsequent provisions of this report must be approved by the Chief Executive.

5.3 The licensee must provide monitoring reports to the Chief Executive annually during the operational life of XXXX Mine. These reports must include water level data from those bores mentioned in the report entitled "XXXX Mine Groundwater Monitoring Plan".

5.4 The Licensee must, if directed by the Chief Executive, make any amendments considered necessary to the monitoring report entitled "XXXX Mine Groundwater Monitoring Plan" to ensure that the monitoring program is adequate to assess the effects of the extraction of water authorised under this license.

5.5 The licensee shall provide to the Chief Executive a Performance Review Report in respect of the performance of the XXXX Mine project dewatering works and those monitoring bores as identified in the "Definitions" at the times stated in Schedule B condition 6. One hard copy and an electronic copy shall be furnished to the chief executive. Topics addressed in any Performance Review Report shall include:

- (k) the monthly volume of water extracted from Dewatering Works;
- any changes in water quality in the Dewatering Works and monitoring bores;
 - the piezometric levels on a quarterly basis in the Monitoring Bores;
 - an assessment of the need for adjustment of the model used to assess piezometric impact;
 - details of any adjustment since the previous Performance Review Report to the model used to predict piezometric impact, and if adjustments have been made to the model, plans are to be provided showing:
 - the revised prediction of the total piezometric impact from the commencement of pumping to xx years after the commencement of pumping or such other period as the Chief Executive may determine, made using the adjusted model; and
 - the difference between these predicted piezometric impacts and the piezometric impacts as predicted at the time of application for licences by the licence holder.
 - an assessment of any material departure of the performance of the Dewatering works (including piezometric impact) from the performance predicted for a withdrawal amount of the volumes predicted in the Environmental Impact Statement
 - plans showing the piezometric impact caused by the operation of the Dewatering Works, using the then current model, are to be included in the next scheduled Performance Review Report pursuant to Schedule B condition 6.1;
 - details of any pre-existing bores which are predicted by the then current model to become unduly affected by the Dewatering Works to be included in the next scheduled Performance Review Report; and
 - details of any restoration measures carried out since the commencement of pumping if it is the first Performance Review Report or since the previous Performance Review Report, in respect of pre-existing bores unduly affected by the Dewatering works including details of piezometric drawdown, bore description and licence number

5.6

- (l) In conjunction with the second Performance Review Report, the licensee will provide the Chief Executive with a Peer Review Report (PRR) of the model used by XXXX Coal Pty Ltd to predict piezometric drawdown and associated impacts of the Dewatering Works. The peer review must be undertaken external to XXXX Coal Pty Ltd and the models developing consultants. The PRR must at least review the following:
- the assumptions about the hydrogeology of the aquifers;

- impacts on the physical integrity of the aquifers;
- the ability of the geological formation to contain the piezometric drawdown and impacts due to the extraction of the water;
- any other matter the Chief Executive considers reasonable;

(m) The name and contact details of the reviewers who undertake the PRR in Schedule B condition 5.6(a) must also be provided to the Chief Executive.

6 FREQUENCY OF REPORTING

6.1 The first water year shall be defined as the period covering the period from the commencement of extraction (under the authority of this licence) of water from the Dewatering Works to the end of the next following June. Thereafter the water year shall commence on 1 July of any year and end on 30 June the year following. The first Performance Review Report shall cover the period as defined by the first water year. Thereafter scheduled Performance Review Reports shall then be provided in respect of the relative intervening periods, at the end of the 2nd, 3rd, 4th, 5th, 7th water years and thereafter every three years. The Chief Executive may call for a Performance Review Report at any other time during the currency of the Licence (unscheduled Performance Review Report) if he is of the reasonable opinion that the piezometric impact of the Dewatering Works is greater than the most recent prediction of piezometric impact reported by the licensee.

6.2 An unscheduled Performance Review Report will cover the period from the date of the immediately preceding Performance Review Report, be it an unscheduled or a scheduled Performance Review Report, and the date notified by the Chief Executive as the date of the unscheduled Performance Review Report, or such other period as the Chief Executive may determine. The scheduled Performance Review Report next following an unscheduled Performance Review Report will cover the period from the date of that unscheduled Performance Review Report and the date of the scheduled Performance Review Report.

6.3 A Performance Review Report will be due three months after the end of the relevant water year, or three months after notification of requirement of an unscheduled report.

6.4 The Chief Executive will advise the licensee of the acceptability of a Performance Review Report or Monitoring Report within 60 days of the date of receipt of same. If the Chief Executive reasonably considers a report unacceptable, he will notify the licensee in writing of the deficiencies. The licensee will then submit a further report within 60 days of such notification, or such longer period as determined by the Chief Executive and the same procedure shall be followed as with the original report.

7 Closure Of XXXX Mine PROJECT OPERATIONS

7.1 One year prior to the closure of the mine, the licensee will:

- (n) In the case of a pre-existing bore that has become unduly affected since the commencement of pumping from the Dewatering Works and where the restoration measures carried out by the licensee depend on matters beyond the control of the bore owner, enter into arrangements with the bore owner, to the

reasonable satisfaction of the bore owner, to maintain a supply at the affected bore in accordance with Schedule B condition 3.2;

- Provide to the Chief Executive a XXXX Mine Project Operation Pre-Closure Report

7.2 It shall be acceptable for the bore owner entering into an arrangement with the licensee pursuant to Schedule B condition 7.1 to require that the arrangement reasonably provides the bore owner with independent control over restored water supply.

7.3 A XXXX Mine Project Operation Pre-Closure Report pursuant to Schedule B condition 7.1 shall contain:

- (o) the piezometric levels in the Monitoring Bores and the Dewatering Works;
- an assessment of the need for adjustment of the model used to assess piezometric impact;
- details of any adjustment since the previous Performance Review Report to the model used to predict piezometric impact;
- details of any restoration measures carried out since the last Performance Review Report;
- plans showing the prediction, using the then current model, of the total piezometric impact from the commencement of pumping to XXX years after commencement of pumping or such other period as the chief Executive may determine;
- details of any unduly affected bores for which arrangements could not be successfully made pursuant to Schedule B condition 7.1;

7.4 The Chief Executive will advise the licensee of the acceptability of a XXXX Mine Project Operation Pre-Closure Report within 60 days of the date of receipt of the same. If the Chief Executive considers the report unacceptable, he will notify the licensee in writing of the deficiencies. The licensee will then submit a further report within 30 days of such notification or such longer period as determined by the Chief Executive and the same procedure shall be followed as with the original report until the final report is reasonably accepted by the Chief Executive.

7.5 The licensee will fully implement arrangements pursuant to Schedule B condition 7.1 at least 90 days before XXXX Mine Project Operation closure.

7.6 Schedule B condition 7 will operate even if this licence has expired at the relevant time unless a licence is then in place and otherwise regulates closure.

8 GENERAL PROVISIONS

8.1 The taking of water under the authority of this water licence is only permitted for the express purposes listed on this licence and only during the mining operation authorised on ML XXXX and ML XXXX.

8.2 This licence expires on the day stated in the licence, or the day stated in any subsequent renewal of the licence, or upon the closure of the mine referred to in Schedule B condition 8.1.

Appendix 6 Proposed management of social and economic impacts

Community and stakeholder engagement

Management objectives	<ul style="list-style-type: none">• Impacts on landholdings are minimised• Impacts on landholders and their activities in the property are minimised• Positive ongoing landholder relations• Identify and inform stakeholders about the project's scope, timing and potential impacts and benefits• Engage stakeholders through a variety of channels and capture their concerns and opinions about the project to inform the project team's decision making process• Ensure early identification of potential stakeholder issues and implement timely and appropriate mitigation strategies• Create awareness and acceptance of the project with stakeholders• Manage land access and acquisition processes to minimise project delays• Position Adani as a good corporate neighbour that values community input
Mitigation approach	<ul style="list-style-type: none">• Land access protocols, including (but not limited to) permissions to enter the property, accessing different parts of the property, opening and closing of fence gates, speed of Adani vehicles on private properties, protocols relating to weed management• Statutory requirements in relation to land acquisition and compensation are followed• Close consultation with landholders regarding project design measures to minimise impacts• Ongoing program of landholder liaison during pre-construction, construction and operation in Stakeholder Engagement Strategy• Develop programs to foster integration between the Adani project workforce and the local community• Fire and dust management programs implemented through the Project EMP• The Stakeholder Engagement Strategy will focus on developing and maintaining partnerships• Adani will continue to work with the Clermont Preferred Futures Group in line with Isaac Regional Council's (IRC) preference for this group to represent the Northern Galilee Basin and will continue to work with local businesses, IRC and relevant state agencies in the development of the group to address stakeholder interests in the North Galilee Basin• Engagement undertaken and relationships developed during the EIS stage of the project will continue and all conditions within the EIS approval will be incorporated into the Stakeholder Engagement Strategy• Adani will work in partnership with affected landowners and develop a communication approach to suit both parties• All contact with landholders will be coordinated and a single point of contact for landholders will be provided through a landholder liaison officer• Adani is actively in discussions with other mining proponents in the North Galilee Basin to discuss potential for a coordinated approach to a range of infrastructure
Preliminary performance indicators	<ul style="list-style-type: none">• Evidence of regular interfacing with landholders• Satisfaction with acquisition and compensation process, as measured through complaints and appeals

Monitoring and reporting framework	<ul style="list-style-type: none"> • Compliance with agreed land access protocols • Key partnerships are identified and established • Stakeholders are accurately informed of project activities • Project feedback mechanisms are in place and operating effectively • Evidence that statutory processes have been adhered to from compensation and acquisition records • Evidence of timely response to complaints and enquiries from Consultation Manager database • Quantitative Monthly Reports via Consultation Manager database • Note that outcomes of compensation and acquisition negotiations will remain confidential between Adani and landholders • Reporting in relation to key stakeholder communication activities • Evidence of timely response to enquiries, issues and complaints from Consultation Manager database • Reporting on partnership initiatives and outcomes
Stakeholders	<ul style="list-style-type: none"> • Adani • Landholders • Regional Councils (Isaac, Charters Towers, Whitsunday and Mackay) • State departments and agencies (DSDIP, QPS, QFRS, QAS, DHPW, DATSIMA) • Local communities • Industry groups (AusIndustry, QRC)
Timeframe	<ul style="list-style-type: none"> • Pre-construction/design development • Mine construction and operation • Rail construction and operation

Workforce management

Management objectives	<ul style="list-style-type: none"> • A positive, tolerant and safety-oriented culture is established amongst the workforce • Recruitment and training programs address skills shortages and sustainably maintain a reliable, skilled workforce • Recruitment and training programs address potential hurdles to traditionally under-represented groups joining the mining industry • Worker health, safety and wellbeing are recognised as fundamental to successful operations
Mitigation approach	<ul style="list-style-type: none"> • A code of conduct will be in place with clear consequences for employees and contractors if the code is not followed • Workers security, behaviour and offending issues will be managed through ongoing engagement with QPS for advice to manage security, behaviour and offending issues at the workers accommodation village • All construction and operation workers to be accommodated in worker accommodation village/temporary accommodation camps • Revised workforce data will be provided to the Department of Education, Training and Employment (DETE) at the time of Financial Investment Decision (FID) • Develop a workforce contracting strategy for operations phase • A recruitment, education and training plan will be developed in consultation with DETE to address skill shortages by both Adani and contractors, this will include among other things engagement with FIFO Coordinators from potential source communities in Queensland • Specific training targets will be developed by FID for Adani and contractor

	workforce
Preliminary performance indicators	<ul style="list-style-type: none"> • Work with DETE to provide information on the type and skills of overseas workers in case required • Engage in ongoing consultations with Aboriginal and Torres Strait Islander and Multicultural Affairs (DATSIMA) and local Indigenous community through the Cultural Heritage Management Plan (CHMP) and native title processes to develop suitable training and cultural awareness programs • Develop a structured apprentice and trainee program to work with existing training providers to employ and train apprentices and trainees. The first stage of that plan has been implemented with Adani having made a commitment to commence with a total of 6 apprentices by early 2013 through programs such as the 'Unified to Qualified' program based in the Whitsunday region • Commitment to adhere to requirements of the <i>Coal Mining (Safety and Health) Act 1999</i> and <i>Work Health and Safety Act 2011</i> • Health and safety plans will include a wellbeing program, including safe work practices, fatigue management, management of medical conditions, fitness and emotional and mental health and programs for financial planning • A final Workforce Management Plan will be developed by FID
Monitoring and reporting framework	<ul style="list-style-type: none"> • Development and compliance with the final Workforce Management Plan • Training targets achieved by Adani and contractors • Proportion of traditionally under-represented groups recruited and trained • Proportion of workers from regional study area and from Queensland • Number of employees undertaking or completed traineeships, apprenticeships and other training activities • Results of annual worker health and wellbeing survey • Workforce retention rates
Stakeholders	<ul style="list-style-type: none"> • Adani • Workers • Training and recruitment providers • DETE • FIFO Coordinators from potential source communities in Queensland – Cairns, Gold Coast and Wide Bay • DATSIMA • QPS • Health services providers
Timeframe	Mine construction and operation

Housing and accommodation

Management objectives	<ul style="list-style-type: none"> • Utilisation of Adani accommodation village/temporary construction camps by construction and operations workforce • Respond to housing and accommodation issues in local and regional communities if required
Mitigation approach	<ul style="list-style-type: none"> • Provision of accommodation in village/temporary construction camps for all construction and operation workers • All mine workers reside in worker accommodation village while on roster • Integrated Housing Strategy to be updated as project planning progresses. Draft Integrated Housing Strategy is included in Appendix B - Appendix D2 of the EIS • Collaboration with Clermont Preferred Futures Group, the Isaac Affordable Housing Trust, regional councils of Isaac, Townsville, Charters Towers, Whitsunday, Mackay and Central Highlands, Department of State

	<p>Development, Infrastructure and Planning (DSDIP) and active industry networks in the region to monitor changes to population, housing demand in the region, verify the assessment of potential housing impacts in the SIA and consider any potential cumulative impacts of multiple rail and port projects in the Bowen and Mackay regions</p> <ul style="list-style-type: none"> • Additional measures if impacts attributable to the project are identified
Preliminary performance indicators	<ul style="list-style-type: none"> • Utilisation of Adani worker accommodation village/temporary accommodation camps • Worker satisfaction with worker accommodation village/temporary accommodation camps • Further mitigation if project-related population growth in local and regional communities exceeds population forecasts
Monitoring and reporting framework	<ul style="list-style-type: none"> • Rail construction workforce accommodation statistics • Growth in employee numbers in local businesses due to project-related contracts and demand on local and regional housing • Worker satisfaction surveys regarding accommodation
Stakeholders	<ul style="list-style-type: none"> • Adani • Workers • Clermont Preferred Futures Group • IRC • Townsville City Council • Charters Towers Regional Council • Whitsunday Regional Council • Central Highlands Regional Council • DSDIP • QPS • QFRS • Regional housing agencies • DHPW
Timeframe	<ul style="list-style-type: none"> • Pre-construction (to establish baseline data) • Mine construction and operation • Rail construction and operation

Local business and industry content

Management objectives	<ul style="list-style-type: none"> • Maximise opportunities for businesses in the regional area to provide local employment, goods and services to the project • Comply with Adani Local Buying Policy (refer to Appendix C) • Comply with the Queensland Resources and Energy Sector Code of Practice for Local Content (the Code) • Comply with Adani's Australian Industry Participation Plan (AIP Plan)
Mitigation approach	<ul style="list-style-type: none"> • Adani will provide full, fair and reasonable opportunity to capable local industry to participate in its project by implementing the strategies outlined in its AIP Plan and the Code • Prepare an Indigenous Participation Plan in consultation with DATSIMA, local Indigenous Community and involvement in the CHMP and native title processes • Collaborate with Central Highlands, Isaac, Townsville, Whitsunday and Charters Towers regional councils, Clermont Preferred Futures Group, and local businesses in conjunction with the Office of Advanced Manufacturing and the Industry Capability Network (ICN) in identifying eligible local businesses and providing these businesses with full, fair and reasonable opportunity to supply the project • Adani will appoint an Australian Industry Opportunity Officer to further

Appendix 6. Proposed management of social and economic impacts Carmichael Coal Mine and Rail project:

	<ul style="list-style-type: none"> identify opportunities for local engagement
Preliminary performance indicators	<ul style="list-style-type: none"> Adani has a Local Buying Policy (see Appendix C) in place and has committed to implementation of its Australian Industry Participation Plan and the Code Adani will monitor and evaluate local content strategy effectiveness and will report annually on the effectiveness of the Code's implementation Under its AIP Plan commitments, Adani will report to AusIndustry on activities undertaken to further local industry involvement in the project Any gaps in Australian industry capability activities undertaken to further local industry engagement
Monitoring and reporting framework	<ul style="list-style-type: none"> Number, proportion and value of contracts for business based in Clermont Number, proportion and value of contracts for business based in the Isaac, Charters Towers, Central Highlands, Townsville, Mackay and Whitsunday regions Adherence to Local Buying Policy and its Australian Industry Participation Plan and the Code
Stakeholders	<ul style="list-style-type: none"> Adani Regional businesses Isaac, Charters Towers, Central Highlands, Townsville, Whitsunday and Mackay regional councils Clermont Preferred Futures Group Office of Advanced Manufacturing ICN AusIndustry Queensland Resources Council
Timeframe	<ul style="list-style-type: none"> Mine operation Rail operation

Health and community wellbeing

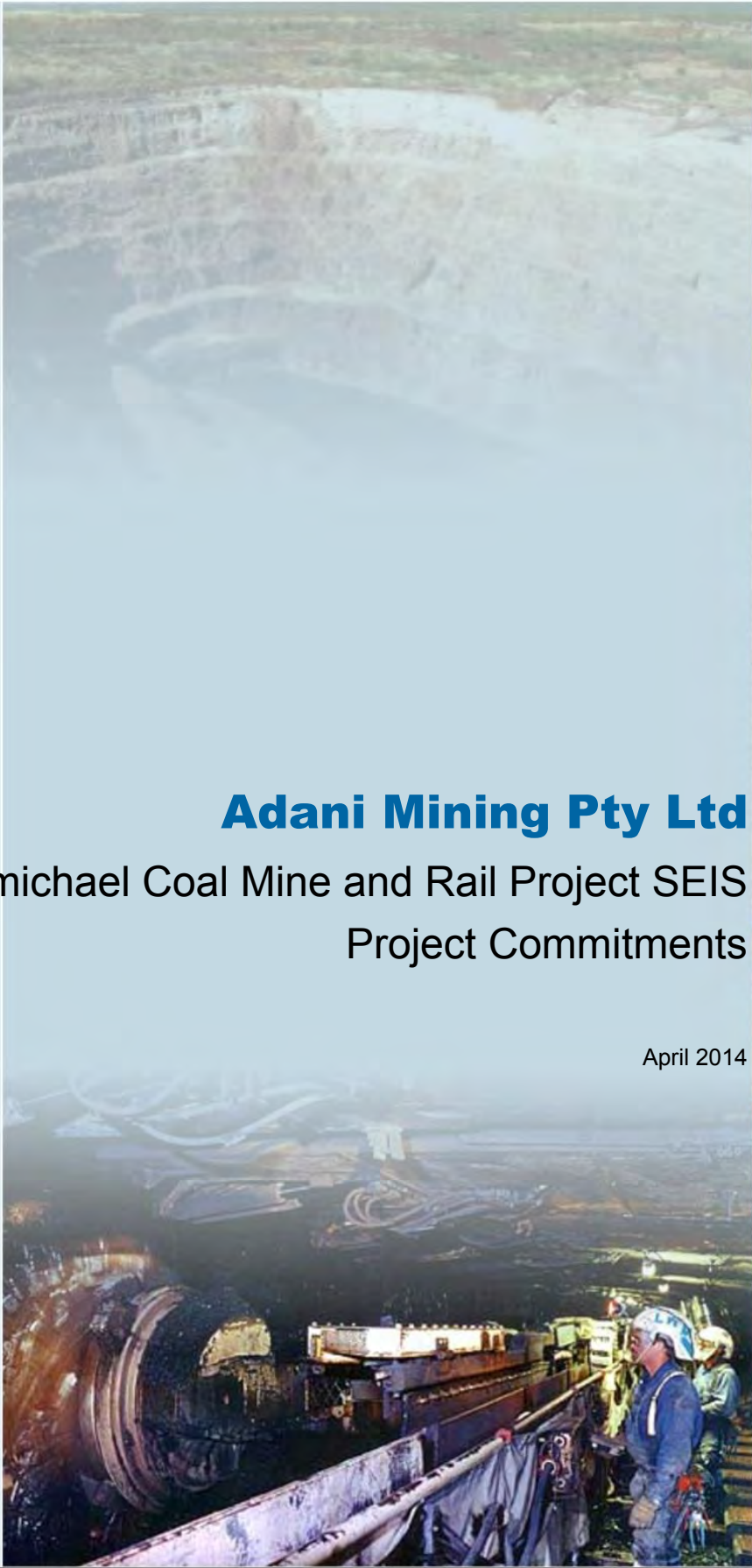
Management objectives	<ul style="list-style-type: none"> No increase in risk of accidents to landholders and road users Provide medical, security and fire fighting services to minimise additional pressure on health and emergency services Proactively engage with emergency services in relation to emergency response planning and provision of information required to allow forward planning by emergency services
Mitigation approach	<ul style="list-style-type: none"> Design measures including fencing of the railway, grade separation of all but minor road crossings and provision of occupational and stock crossings for landholders Adherence to Australian standards and all legislative requirements in relation to safe operation of the rail component Preparation and implementation of traffic management plans in consultation with Queensland Department of Transport and Main Roads, IRC and emergency service providers Communication with road users regarding potential traffic changes and delays Road and intersection upgrades as required to address increased traffic volumes Stock routes managed through agreement with landholders, IRC and Department of Transport and Main Roads (DTMR) Initial and ongoing consultation with Queensland Ambulance Service, Queensland Fire and Rescue Service (QFRS) and Queensland Police Service in relation to emergency response planning Involvement of emergency services in the development of the Site

	<p>Emergency Management Plan, including evacuation procedures, collaboration between site and emergency services personnel, patient transport and emergency response</p> <ul style="list-style-type: none"> • Provision of information regarding workforce size, activities being undertaken and emergency response services and facilities at the mine site • Ongoing consultation with Queensland Health regarding medical services provision and project demand on health services in the region and develop health management plan for project workforce • Making resources available to emergency service providers when at the mine site, ranging from office space to use of equipment • Registration of the proposed airstrip with the Royal Flying Doctor Service (RFDS)
Preliminary performance indicators	<ul style="list-style-type: none"> • Incidents involving members of the public • Design criteria are met • Accreditation gained and maintained as Railway Infrastructure Manager and a Railway Operations Manager under the provisions of the <i>Transport (Rail Safety) Act 2010</i> • To be agreed with emergency services during consultation
Monitoring and reporting framework	<ul style="list-style-type: none"> • Incident reporting in relation to incidents involving members of the community through construction and operation, with frequency and manner of reporting to be determined in consultation with key stakeholders during the finalisation of the SIMP • Design checklist • Information releases regarding traffic changes and potential delays • As required in relation to Railway Operations and Infrastructure Manager accreditation • Reporting to emergency services on agreed indicators (for example workforce numbers, on-site facilities, upcoming activities)
Stakeholders	<ul style="list-style-type: none"> • Adani • Road users • Landholders • DTMR • IRC • QPS • QAS • QFRS • Queensland Health • RFDS
Timeframe	<ul style="list-style-type: none"> • Contractors and sub-contractors • Mine construction and operation • Rail construction and operation

Appendix 7 Proponent commitments



Adani Mining Pty Ltd



Adani Mining Pty Ltd

Carmichael Coal Mine and Rail Project SEIS Project Commitments

April 2014





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This Carmichael Coal Mine and Rail Project SEIS: Project Commitments (the Report) has been prepared by GHD Pty Ltd (GHD) on behalf of and for Adani Mining Pty Ltd (Adani) in accordance with an agreement between GHD and Adani.

The Report may only be used and relied on by Adani for the purpose of informing environmental assessments and planning approvals for the proposed Carmichael Coal Mine and Rail Project (Purpose) and may not be used by, or relied on by any person other than Adani.

The services undertaken by GHD in connection with preparing the Report were limited to those specifically detailed in Section 1.3 of the Report.

The Report is based on conditions encountered and information reviewed, including assumptions made by GHD, at the time of preparing the Report.

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- *any error in, or omission in connection with assumptions, or*
- *reliance on the Report by a third party, or use of this Report other than for the Purpose.*



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1. Introduction

The Project ToR requires a list of all commitments made by Adani in the Project EIS and SEIS, together with a reference to the relevant section of the EIS.

The commitments below add to those provided in Volume 1 Section 10 of the EIS. They have been presented under each relevant Project area and aspect. Importantly, mitigation measures have been detailed under management plans prepared for the EIS and SEIS. These plans should be read alongside this commitment register and include:

- Multiple site-based management plans and species management plans – Rail (SEIS Volume 4 Appendix C3)
- Offsite infrastructure site-based management plans (refer to SEIS Volume 4 Appendix C4)
- Quarry site-based management plans (refer to SEIS Volume 4 Appendix C5)
- Social Impact Management Plan (SEIS Volume 4 Appendix D2)
- Offsets Strategy (SEIS Volume 4 Appendix F)
- Draft Subsidence Management Plan (SEIS Volume 4 Appendix I2)
- Mine Waste Management Strategy – Mine (SEIS Volume 4 Appendix O2)
- Environmental Management Plan – Mine (SEIS Volume 4 Appendix Q1)
- Environmental Management Plan – Offsite (SEIS Volume 4 Appendix Q2)
- Closure and Rehabilitation Strategy – Mine (SEIS Volume 4 Appendix R1)
- Closure and Rehabilitation Strategy – Offsite (SEIS Volume 4 Appendix R2)
- Bushfire Management Plan (SEIS Volume 4 Appendix S2)
- Fauna Crossing Strategy – Rail (SEIS Volume 4 Appendix U)
- Emergency Management Plan – Rail (SEIS Volume 4 Appendix V)
- Environmental Management Plan – Rail (SEIS Volume 4 Appendix W)
- Closure and Rehabilitation Strategy – Rail (SEIS Volume 4 Appendix X1)
- Closure and Rehabilitation Strategy – Quarries (SEIS Volume 4 Appendix X2)

Additionally, a number of relevant plans have been prepared and/or revised since the Supplementary EIS and are available on Adani's website (http://www.adanimining.com/Australia_Carmichael_coal). These plans and reports include:

- Black-throated Finch Management Plan (Draft)
- Groundwater Dependant Ecosystem Management Plan (Draft)
- Subsidence Management Plan (Revised)
- Offsets Strategy (Revised)
- Closure and Rehabilitation Strategy – Mine (Revised)



- Environmental Management Plan – Mine (Revised)
- Environmental Management Plan – Offsite (Revised)
- Environmental Management Plan – Rail (Revised)
- Social Impact Management Plan (Revised)

Important mitigation measures have been included in this revised Commitment Register. A brief summary of each of the above listed plans and strategies is provided in Section 3.



2. Project commitments

2.1 Project commitments (Project wide)

2.1.1 Social Impacts Management Strategies

Refer to SEIS Volume 4 Appendix D2 for the Social Impact Management Strategies which consolidate the various mitigation and management measures developed in the Project SIA report (SEIS Volume 4 Appendix D1) into key/overarching management strategies that will be implemented by Adani. The strategies also outline the monitoring mechanisms and stakeholders who will be involved in the finalisation and implementation of the strategies. The strategies will be finalised in consultation with key stakeholders prior to the commencement of construction (refer SEIS Volume 4, Appendix D1 Figure 5 for more details)

Proponent Commitment	
P1.1	Development of recruitment and training programs that address skills shortages and sustainably maintain a reliable, skilled workforce, and address potential hurdles to traditionally underrepresented groups joining the mining industry.
P1.2	Development of a Local Industry Participation Strategy that complies with Adani's Local Buying Policy and maximises opportunities for businesses in the district and regional areas to provide goods and services to the project.
P1.3	Adani will comply with the Queensland Resources and Energy Sector Code of Practice for Local Content (the Code) and its Australian Industry Participation Plan (AIP Plan).
P1.4	Working collaboratively with IRC and other representative bodies, such as the Clermont Preferred Futures Group, to provide strategic direction and investment for whole of community benefit, including establishing a community fund providing financial support targeting community activities, capacity and services.
P1.5	Development of a Workforce Management Strategy that includes a comprehensive employee induction programme addressing, among other things, a Code of Conduct for Employees and contractors regarding behaviour, alcohol and drug use, cultural awareness and safety.
P1.6	Development of a Housing and Accommodation Strategy that provides a workers accommodation village and temporary construction camps for the construction and operations workforce and responds to housing and accommodation issues in local and regional communities.
P1.7	For properties impacted by the project (Rail), where required, Adani will relocate fences, fully fence the rail corridor and construct occupational crossings and additional stock holding yards.
P1.8	An Emergency Management Plan will be developed for all components of the Project in consultation with relevant emergency service providers (including the relevant regional health service) and this will include response to injuries and medical evacuations as well as fire response and response to road accidents.
P1.9	Development of Workforce Health and Safety Plans within the Workforce Management Strategy that will include a wellbeing program, including safe work practices, fatigue management, management of medical conditions (including communicable diseases), fitness, emotional and mental health and programs for financial planning.
P1.10	Ongoing consultation with DATSIMA during the development of Indigenous Participation Plan.
P1.11	Establishment of an emergency services consultative committee with representation from Queensland Health and the relevant emergency service providers to coordinate the management of potential impacts on emergency services.

P1.12	Adani will work with stakeholders, including DETE to develop recruitment and training programmes with appropriate performance indicators that address skills shortages in a sustainable manner.
P1.13	Finalisation of the stakeholder engagement strategy to guide ongoing communication and consultation with all stakeholders including affected landholders,

2.1.2 Indigenous and non-indigenous cultural heritage

Commitments and mitigation measures are detailed under Cultural Heritage Management Plans prepared in consultation with Native Title/Aboriginal parties and approved through the State government and as such are not able to be reproduced in the SEIS.

Proponent Commitment	
P2.1	Adani will continue to carry out full cultural heritage surveys of all Project areas with relevant Aboriginal Parties in accordance with the provision of approved CHMPs
P2.2	Adani will maintain communication with the Wangan and Jagalingou and Jangga Peoples through the established CHMP implementation committees, and other relevant Aboriginal parties through the establishment of implementation committees made up of representatives of both Adani and relevant Aboriginal parties.
P2.3	Ongoing cultural awareness training will continue to be provided to personnel with the intention of training people involved in the Project in avoidance and protection of known cultural heritage sites and management procedures in the event of a cultural heritage find not previously identified during the cultural heritage surveys.

2.1.3 Economics

Proponent Commitment	
P3.1	Adani has purchased the leasehold for the Moray Downs property and a package of compensation will be provided for impacts to the properties affected by the Mining Lease.
P3.2	Adani will work with landowners to agree on the location of easements to reduce impacts e.g. outside property boundaries and/or along fence lines, rather than through middle of property where practicable.
P3.3	Adani will develop appropriate biosecurity protocols including, but not limited to; potentially restricted access and vehicle/plant wash down. Information will also be provided on road closures/detours and alternative routes provided in appropriate media and with signage during railway construction.
P3.4	Adani will work with both Councils, Clermont Preferred Futures Group, and local businesses in conjunction with government agencies (Office of Advanced Manufacturing) and the Industry Capability Network (ICN) in developing a plan to provide robust, integrated and sustainable local business participation opportunities.
P3.5	Whilst there will predominantly be a FIFO workforce, Adani will identify opportunities for Drive in Drive Out and Bus in Bus Out employment options.

2.1.4 Cumulative impacts

Proponent Commitment	
P4.1	No specific commitments.

2.1.5 Offsets

Please refer to SEIS Volume 4 Appendix F for the Offsets Strategy which includes specific commitments.



2.1.6 Matters of national environmental significance

Proponent Commitment	
P6.1	Detailed design and layout for construction will further consider opportunities to avoid sensitive habitat, including aquatic habitat, and make use of non-remnant/cleared land. Clearance extent will be restricted to only that necessary for the Project. Rehabilitation of cleared areas is to occur as soon as practically possible after cleared areas are no longer required. Areas to be cleared are to be identified onsite and clearance operations are to be supervised by a suitably experienced ecologist to monitor compliance to clearance extents and for avoidance of impacts to fauna.
P6.2	Vegetation clearing will be undertaken in a sequential manner to allow mobile fauna to disperse away from clearing areas. Prior to clearing, all demarcated habitat features will be checked for fauna by a fauna spotter-catcher and at risk, species will be relocated. A Fauna Species Relocation and Salvage Plan (part of the Rail and Offsite Infrastructure Threatened Species Management Plans (SEIS Volume 4, Appendix C3)) will be developed to facilitate relocation of fauna individuals according to species requirements (particularly if conservation significant fauna species are encountered during clearing activities). A fauna mortality register will be maintained to document the location and frequency of mortality and the fauna species most susceptible to injury and death, to enable on-going modifications to fauna conservation management strategies where necessary.
P6.3	Design will work to minimise impacts as far as practical by avoiding fragmenting habitat, including suitable watercourse crossings and fauna passages. Measures to mitigate and ameliorate potential impacts that may occur during the operation of the rail will, therefore, be implemented during construction.
P6.4	Fauna corridors will require revegetation, fencing and grids/gaps to promote fauna use. Consideration will be given to fauna/fish passage requirements and design will adopt criteria, which promote fauna use.
P6.5	Fauna underpasses within important habitat areas will be incorporated into the design of the rail corridor, where possible. Appropriate fencing and revegetation is required to encourage use by fauna species.
P6.6	Fencing, waste management, speed limits, fire controls, pest and weed controls, vehicle maintenance and pollutant and waste/hazardous substance management, to be coordinated under the EMP (operation), will be utilised onsite to minimise direct or indirect impacts to flora or fauna or pollution of the environment.
P6.7	Incidents of fauna strike and mortality are to be monitored during operation. Dead carcasses are to be disposed of away from the rail corridor to reduce the occurrence of predators, such as raptors and pest fauna, also being struck by moving trains.
P6.8	The rail will be fenced to restrict ability of fauna to move across the rail line.
P6.9	Site specific, risk specific, management plans will be developed to control for potential impacts associated with matters including, but not restricted to, fire, pollution, introduction or spread of weeds or pests and release of contaminants. These management actions seek to avoid or reduce impacts and will be implemented and controlled through an EMP for the Rail Project.
P6.10	Landscape permeability will be retained where possible. Where fencing is required around cleared areas, it will be designed such that fauna can move through it excluding those instances where fenced areas seek to protect fauna from threats such as trenches. Consideration will be given to not using barbed wire on the top strand of wire fences.
P6.11	Prior to construction and mining operation, baseline field surveys to identify initial weed populations and ongoing monitoring of these populations and for any new occurrences are to be undertaken. Any weed populations identified are to be actively managed with the goal to reduce the spread of and eradicate weed species from the Study Area. This will be detailed in the Project Weed and Pest Management Plan.

Proponent Commitment	
P6.12	All vehicles and plant associated with vegetation clearing will adhere to site rules relating to speed limits. Speed limits will be developed, and clearly signposted so as to minimise the potential for road kill.
P6.13	Landscape permeability will be retained where possible. Staged Mine development should seek to maintain east-west connectivity where possible throughout the Mine's operational life. The strip of land to be protected on either side of the Carmichael River will be managed so as to maintain and provide biodiversity values.
P6.14	Work areas are to be checked regularly for fauna that may have entered the work area or become trapped and fauna are to be relocated. Management of work areas should seek to avoid attracting fauna. All vehicles and plant will adhere to designated tracks/roads to avoid unnecessary habitat impacts and will adhere to site rules relating to speed limits to minimise potential for road kill.
P6.15	Vegetation clearing will be undertaken in a sequential manner to allow more mobile fauna species the opportunity to disperse away from clearing areas. Employees will be made aware of environmental management requirements for vegetation clearing and fauna management and all employees will adhere to requirements at all times.
P6.16	Management actions seeking to avoid or reduce impacts will be implemented, under the guidance of key strategies including the Project Land Management (Flora and Fauna) Plan and the Draft Closure and Rehabilitation Strategy – Mine (SEIS, Volume 4, Appendix R1 and the Draft Closure and Rehabilitation Strategy – Offsite (SEIS Volume 4, Appendix R2). Standardised monitoring and auditing of the application and performance of management and mitigation strategies will be undertaken, with corrective actions implemented where required.
P6.17	Design and sequencing of site use to incorporate stormwater management infrastructure and mechanisms to manage runoff. Stormwater management mechanisms and monitoring requirements will be developed prior to any operational activities for each operational area of the Study Area (as it is progressively developed) and incorporated in the Water Quality Management Plan.
P6.18	Watercourse diversion required will be achieved prior to any clearing to manage impacts to downstream habitats. Activities that affect watercourse path, including stormwater flow paths or creation of dams, are not to commence until suitable diversion and management of flows is achieved to avoid unnecessary interruption of flows, erosion and water quality degradation.
P6.19	Vegetation clearing activities will, where possible, seek to avoid alteration to waterways such that the impacts to water quality and downstream flows are minimised to the greatest extent possible. Dust suppression activities to be undertaken where appropriate.
P6.20	Management of erosion and sedimentation will be undertaken in accordance with a Project Erosion and Sediment Management Plan. This plan will identify all practices to be implemented prior to, during, and post-construction to minimise the potential for erosion to occur, including (but not limited to) timing of clearing activities, sediment and erosion control measures to be implemented, performance criteria and corrective actions. Monitoring and reporting protocols will be detailed within this plan, and responsible parties for implementing the plan's actions should be identified.
P6.21	Management of potential contaminant or waste release, or emergency response to such, to be documented within the EMP (operation). Regular water quality monitoring to be completed to confirm adequacy of management and mitigation measures. Monitoring requirements, water quality targets, corrective actions and reporting requirements to be clearly articulated in an Operational Water Quality Management Plan, embedded within the EMP (operation).
P6.22	No water will be sourced from the Carmichael River.
P6.23	Sewage will be treated to Class A+ standard such that value and quality of aquatic habitats is not adversely impacted.
P6.24	Flow monitoring will occur at the outlet at Joshua Spring to monitor changes in output, and in the Carmichael River immediately adjacent to Joshua Spring, to monitor contributions to surface water flow and seasonal changes.
P6.25	Mapping and measurement data (using GPS equipment capable of sub-metre



Proponent Commitment	
	accuracy) of the „vegetated area’ perimeter of the main wetland areas at the Moses Spring group quarterly (there are five main wetland areas) will occur.
P6.26	Mapping and measurement (using GPS equipment capable of sub-metre accuracy) of selected isolated mound springs (those discrete mounds outside the wetland areas) at Moses Spring group will be conducted on a seasonal basis by a suitably qualified botanist prior to and during the predicted drawdown impact. At least 10 will be selected over the entire spring group (these same 10 to then be resurveyed at each repeat survey), focussing on differing sized mounds and gaining a good geographic spread over the entire group. This will include a complete species list of the mound vegetation, a photographic record (taken from at least two locations consistently), diameter, height and perimeter measurements (diameter taken from the same places each time), and flow measurements. If a mound should disappear during the Mine life, a nearest neighbour replacement will be selected.
P6.27	Ecological studies of the two threatened species listed under the EPBC Act that occur at Moses Spring – blue devil and salt pipewort – will be conducted annually. This will be done in consultation with the Queensland Herbarium using an appropriate survey method for small herbs (the latter of which is a clumping species). Consideration will be given to changing the frequency of surveys if population changes are noted.
P6.28	A baseline survey of aquatic invertebrates at Moses Spring will be conducted by a suitably qualified ecologist/entomologist prior to mining operations commencing, to determine the presence of endemic species.
P6.29	A baseline water level will be established at a reference location for the springs, and water levels will be measured against this baseline on a quarterly basis during mining operations.
P6.30	Monitoring events will commence at least one year before mining operations (in order to continue a baseline understanding of existing conditions), and continue for at least two years after mining operations are completed.
P6.31	At the conclusion of baseline surveys (after at least one year of surveys prior to commencement of mining operations) a Baseline Ecological Condition report will be prepared for the springs.
P6.32	An annual report on the spring condition, including statistical comparison to baseline condition, will be provided including reporting on any change from baseline conditions and planned actions.
P6.33	Spring surveys will utilise data gained from studies into groundwater levels conducted by the Mine in the vicinity.
P6.34	Adani will further investigate the source aquifer for the Mellaluka spring complex and provide a report outlining the hydrogeological conceptual model for the spring and a description of the associated hydrogeology. Ongoing monitoring of Mellaluka Springs will be focused on groundwater studies and is outlined in the Mine Hydrogeology Report (GHD, 2013r).
P6.35	Pumping groundwater to the surface may act to offset the loss of some sections of the Mellaluka Spring wetland, and Adani will consider installing electric submersible pumps when drawdown commences for this purpose. A wetland remediation and management plan will be prepared at this time in consultation with the Mellaluka owner. If required, a pump will be installed to ensure the continuation of water to the Mellaluka homestead.
P6.36	All surveys and other works will be conducted in consultation with the Doongmabulla and Mellaluka property owners.
P6.37	A detailed „ecological features’ map will be made for the Carmichael River to assist in dieback and river health monitoring, identifying priority management areas including the locations of waxy cabbage palms, rubber vine infestations, riparian composition and health, areas of connectivity/disconnection with the groundwater based on the modelling, gaining/losing areas of the river relative to the groundwater, as a minimum.
P6.38	In order to reduce the likelihood that canopy dieback will result in the excessive

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	growth of weeds, and so as to safeguard existing populations of waxy cabbage palm, the infestation of rubber vine present within the river bed (that is still at a manageable stage) will be removed and ongoing management measures will be implemented to monitor any resurgence. In addition, the existing pig population, which is damaging waxy cabbage palm habitat and seedlings, will be controlled.
P6.39	Permanent CORVEG primary monitoring transects will be established at regular intervals along the river for the purpose of establishing a riparian community health baseline. In the initial development/operational phases of the Mine monitoring of the plots will be seasonal, reflecting high flow/low flow variability in the Carmichael River (twice annually). This monitoring will continue into the mid operational life of the Mine, and increase to a quarterly frequency when drawdown is at its maximum. If possible, depth to groundwater data will be incorporated.
P6.40	Monitoring of the health of the waxy cabbage palm population will be undertaken on a bi-annual basis, preferably at the start of the wet season and the start of the dry season (December and May). Cabbage palms are able to be transplanted, and where practical and feasible (given that large machinery is required, gaining access may do more damage to the river than is practical), advice will be sought from the relevant agency at the time to transplant as many of these as possible to other locations, should there be evidence of stress that can be directly related to reductions in river base flows. If possible, this will be done in partnership with a university or the Queensland Herbarium.
P6.41	Long-term research on the waxy cabbage palm will be conducted, preferably in partnership with a university, on the population on the Carmichael River and its response to observed changes in groundwater depth and base flow volume and frequency. This will include long-term flow monitoring and measurements of groundwater depth changes at least three locations along the river where adult waxy cabbage palms are located (preferably, chosen to contrast different change regimes). Complete mapping of the Carmichael River waxy cabbage palm population (particularly downstream of the Mine Area, where base flow reductions will have an impact) will be undertaken.
P6.42	Vegetation monitoring will be undertaken having regard to groundwater monitoring/base flow monitoring. Locations for monitoring bores will be chosen with respect to selected environmental features along the Carmichael River (such as deep pools, particular riparian communities, areas with waxy cabbage palm) to enable more meaningful interpretation of potential direct interactions between these features and the groundwater.
P6.43	Monitoring the base river flow, including the establishment of gauging stations, will be undertaken in areas of particular ecological interest. Flow data will be monitored on an ongoing basis prior to construction, during operation and post operation upstream, downstream and within the Mine Area.
P6.44	Detailed monitoring of groundwater levels and surface water flows at the Carmichael and Belyando Rivers prior to construction, during operation and post operation upstream, downstream and within the Mine Area will be undertaken to measure changes to groundwater and surface flows.
P6.45	A Project Waste and Resources Management Plan and Hazardous Substances Management Plan will be implemented, and include waste management and disposal protocols and procedures. This plan will incorporate protocols relating to the: <ul style="list-style-type: none"> • Disposal of vegetation waste (in a manner that minimises potential for spread of weeds) • Disposal of food scraps and the like (to minimise potential for pest animals to access food wastes).
P6.46	All construction machinery and materials brought onto site will be certified as free of weeds and weed seeds. Records are to be kept of compliance with this requirement.
P6.47	Additional field studies will be undertaken, prior to clearance during the post EIS phase, to determine the presence of individuals, populations/colonies and/or important habitat areas for threatened species not detected during field surveys for the EIS, which are considered likely to occur at the Study Area (i.e. yakka skink). The findings of such studies will be a component of Project Species Specific



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	Management Plan(s) (SEIS Volume 4, Appendix C3, Rail Applications) for these animals, and the outcomes will be directly linked to the Revised Offset Strategy Report (see SEIS Volume 4, Appendix F).
P6.48	The Revised Project Offset Strategy (SEIS Volume 4, Appendix F) will provide a framework for the identification of measures designed to provide regional biodiversity benefits, where onsite impacts cannot be avoided.
P6.49	Data gathered from onsite and offsite monitoring of koala populations, densities and habitats will be incorporated into the National and State database of koala population distribution, density and habitat mapping data.
P6.50	With respect to koalas, monitoring of pest dog populations in the Study Area and implementation of an eradication program will occur if necessary.
P6.51	The loss of habitat for the black-throated finch (southern) will occur in stages, in accordance with the staged development of the operational components of the Mine Area. Management actions to encourage dispersal away from areas that will be cleared for staged Mine operations will also be developed.
P6.52	Management actions for black-throated finch will seek to maintain and where possible enhance habitats and populations (e.g. through pest control, provision of water sources, appropriate grazing and fire management) in unmined parts of the Mine Area, as well as in offset areas.
P6.53	Important population, movement and habitat information for black-throated finch will be collected, particularly with respect to seasonal use, key areas, nest sites, important feeding areas and management of threatening processes.
P6.54	Adani will provide a Draft Black-throated Finch Management Plan for approval prior to the commencement of mine construction. The Plan will include the following: <ul style="list-style-type: none"> • A management framework that aligns with the other project management plans • Clear statements regarding the intent, approval requirements, objectives and actions • Details of how the management plan will be applied across the project phases – pre construction / construction / operation / post operations, offset areas • Details of the current and proposed adaptive monitoring program to support the plan objectives. • Details of how experts will be used in a review capacity to inform ongoing monitoring and management • Incorporates all proposed management and mitigation measures, including reference to how these will align with the Significant Impact Guidelines and the National Recovery Plan. • Specific performance targets and how these will be measured and reported.
P6.55	Black-throated finch surveys will continue over time to provide data on temporal and spatial variation of habitat use in the Mine Area and will contribute significant local data for incorporation into the Black-throated Finch Species Management Plan for the Mine Area, which will assist in refinement of species recovery actions and mitigation of impacts on the Mine Area. In the case of subsidence, which will occur gradually and in a complex and partly unpredictable manner, the data being collected by this monitoring will provide information regarding the best strategies over time to mitigate negative effects and manage key resources for black-throated finch on the Mine Area.
P6.56	The onsite and offsite (offset areas) habitat management and complementary monitoring program, as described above, will be developed and implemented in consultation with relevant stakeholders (i.e. Black-throated Finch Recovery Team, Commonwealth and State governments).
P6.57	Adani's overarching commitments in regards to the Black-Throated Finch are:

Proponent Commitment

	<ol style="list-style-type: none"> 1. Implementing management measures across the Project Mining Lease where there are indirect impacts including land management activities, water management, habitat maintenance, pest control, fire management, survey and recording. This commitment would continue through the duration of mining operations. 2. Implementing management measures across a proposed like for like mitigation area within those property areas mapped in Figure 1 below, including land management activities, water management, habitat maintenance, pest control, fire management, survey and recording. This commitment would continue for a period of 20 years. 3. Securing and maintaining appropriate offsets including land management activities, water management, habitat maintenance, pest control, fire management, survey and recording. This commitment would continue for the duration of the offset agreement, nominated as 20 years. 4. Ongoing monitoring programs locally, and contributing to regional monitoring programs including utilising and assisting where possible monitoring effort from the BTFRT. This commitment would continue for a period of 10 years, commencing from 2014. 5. Contributing time and resources to a government-led regional management program. In the order of an in-kind contribution of \$100,000 per year, over a period of 10 years, commencing from Mining Operations.
P6.58	<p>Project Land Management (Flora and Fauna) Plan</p> <p>Key actions</p> <p>Undertake mapping on and offsite to identify areas to be managed under this plan. This should be done in consideration of staged Project operations.</p> <p>Identify parts of the Study Area that should be targeted for ecological management, so as to enhance the value of these areas. This should be done in consideration of staged Project operations.</p> <p>Develop monitoring programs, research projects and natural resource management trials to inform flora and fauna management.</p> <p>Incorporate the findings of onsite research and monitoring into management activities.</p> <p>Timeframes</p> <p>This overarching management plan (and the component sub-plans) listed will be prepared prior to the commencement of Mine operations.</p> <p>The actions detailed in this overarching management plan (and its component sub-plans) will be implemented throughout the Mine's operation phase.</p> <p>Five yearly revision and updating of this plan (and its component sub-plans) will be undertaken to reflect regulatory and environmental circumstances, and will incorporate the most up to date scientific information, including that collected from ongoing research and monitoring programs at and near the Study Area.</p>
P6.59	<p>Project Vegetation Management Plan</p> <p>Key actions</p> <p>Map areas of remnant vegetation to be managed, in for each of the staged Project operations.</p> <p>Develop and implement a monitoring protocol, involving demarcated sites in managed areas within the Study Area, and reference sites outside of the Study Area.</p> <p>Collaborate with research institutions to determine a program to identify remnant vegetation changes resulting from subsidence, with the objective of informing management of this process and retaining environmental values.</p> <p>Timeframes</p>



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	<p>Management plan to be prepared prior to commencement of Project operations.</p> <p>Plan's actions to be implemented throughout life of Mine operations.</p> <p>Five yearly revisions and updating of this plan based on currency of information available.</p> <p>Initiate program at commencement of underground mining operations.</p>
P6.60	<p>Project Species Specific Management Plan(s)</p> <p>Key actions</p> <p>Develop and implement programs to provide a greater level of detail on the ecology of threatened species at the Study Area – to be undertaken in collaboration with applicable research organisations, conservation groups and government agencies.</p> <p>Implement a monitoring program to review the efficacy of management actions.</p> <p>Timeframes</p> <p>Project Species Specific Management Plan(s) (SEIS Volume 4 Appendix C3 Rail Applications) has been prepared.</p> <p>Implement targeted ecology and threatened species programs prior to and during Mine operations.</p> <p>Five yearly revisions and updating of this plan based on currency of information available.</p>
P6.61	<p>Project Weed and Pest Management Plan (weeds)</p> <p>Key actions</p> <p>Identification of weed infested areas at the Study Area (Year 1 of Project life)</p> <p>Development and implementation of protocols for eradicating weeds at the Study Area (Year 2 of Project life).</p> <p>Implementation of industry accepted measures to minimise the introduction and spread of weeds at the Study Area (i.e. provision of weed wash down facilities, requirement for weed-free certification of vehicles entering Study Area) – throughout life of Mine. The objective is to seek no net increase in weeds over the life of the project.</p> <p>Development and implementation of a weed monitoring program for the Study Area – throughout life of Mine.</p> <p>Timeframes</p> <p>Management plan to be prepared prior to commencement of Project operations.</p> <p>Five yearly revisions and updating of this plan based on currency of information available.</p>
P6.62	<p>Project Weed and Pest Management Plan (introduced animals)</p> <p>Key actions</p> <p>Development and implementation of species specific and industry accepted, protocols for eradicating/controlling introduced animals at the Study Area (Year 1 and 2 of Project life). The objective is to seek no net increase in pest animals over the life of the project.</p> <p>Development and implementation of an introduced animals monitoring program for the Study Area – throughout life of Mine.</p> <p>Timeframes</p> <p>Management plan to be prepared prior to commencement of Project operations.</p>

Proponent Commitment	
	Five yearly revisions and updating of this plan based on currency of information available.
P6.63	<p>Project Erosion and Sediment Management Plan</p> <p>Key actions</p> <p>Identify and map erosive soils and potential erosion areas across Study Area – Year 1 of Mine life.</p> <p>Implement standard erosion control measures wherever operations have the potential to facilitate erosion – throughout life of Mine.</p> <p>Monitor the efficacy of erosion control measures, such that measures can be constantly improved – throughout life of Mine.</p> <p>Timeframes</p> <p>Management plan to be prepared prior to commencement of Project operations.</p> <p>Plan's actions to be implemented throughout life of Mine operations.</p> <p>Five yearly revisions and updating of this plan based on currency of information available.</p>
P6.64	<p>Project Waste and Resource Management Plan and Project Hazardous Substances Management Plan</p> <p>Key actions</p> <p>Design storage and handling facilities of hazardous and waste materials, such that potential for accidental release (i.e. leaks, spills, explosions) is minimised to the greatest extent possible.</p> <p>Develop a protocol for the management of hazardous material/waste products in instances where spills, leaks or explosions occur.</p> <p>Timeframes</p> <p>Management plan to be prepared prior to commencement of Project operations.</p> <p>Plan's actions to be implemented throughout life of Mine operations.</p> <p>Five yearly revisions and updating of this plan based on currency of information available.</p>
P6.65	<p>Project (Mine and Offsite Infrastructure) Bushfire Management Plan</p> <p>Key Actions</p> <p>Develop a plan for fire management at the Project Area (Mine and Offsite Infrastructure). Ecological considerations, informed by onsite studies and input from relevant stakeholders should be incorporated into this plan, to the extent that Mine operations and safety are not compromised.</p> <p>Timeframes</p> <p>Management plan to be prepared and in place prior to commencement of Project operations. Additionally, a Rail Bushfire Management Plan has been developed (refer to SEIS, Volume 4, Appendix S2) to address Rail specific fire risks.</p> <p>Plan's actions to be implemented throughout life of Mine operations.</p> <p>Five yearly revisions and updating of this plan based on currency of information available.</p>
P6.66	<p>Draft Closure and Rehabilitation Strategy – Mine (SEIS, Volume 4, Appendix R1 and the Draft Closure and Rehabilitation Strategy – Offsite (SEIS Volume 4, Appendix R2)</p> <p>Key actions</p> <p>Review existing literature relating to Mine rehabilitation, and consult with applicable organisations (universities, government agencies) to determine a detailed</p>



Proponent Commitment

	<p>procedure for rehabilitation of land post-disturbance.</p> <p>Where required, undertake/contribute to onsite and offsite research (including trials) relating to post-mining rehabilitation, so as to increase the knowledgebase on this subject, and inform the design of the rehabilitation protocol to be implemented at the Study Area.</p> <p>Develop and implement a monitoring protocol to assess rehabilitated areas.</p> <p>Timeframes</p> <p>Draft Closure and Rehabilitation Strategy – Mine (SEIS, Volume 4, Appendix R1 and the Draft Closure and Rehabilitation Strategy – Offsite (SEIS Volume 4, Appendix R2) prepared – to be finalised prior to conclusion of the first stage of mining operations at the Study Area.</p> <p>Research trials to commence with mining operations.</p> <p>Rehabilitation to commence immediately following conclusion of staged mining operations, and continue to such time that pre-determined rehabilitation targets/benchmarks have been achieved (as revealed through on-going monitoring of rehabilitated areas).</p>
P6.67	<p>Project Biodiversity Offsets Package</p> <p>Key actions</p> <p>Prepare a framework for the identification of opportunities to enhance biodiversity values within the Study Area and in the region.</p> <p>Secure offsets as identified through the Revised Project Offset Strategy (SEIS Volume 4, Appendix F), and undertake all management and research obligations committed to through the securement of these offsets.</p> <p>Timeframes</p> <p>Revised Offset Strategy Report has been prepared (SEIS Volume 4, Appendix F). Identified offsets (in accordance with staging of Mine operations) to be secured/committed to prior to commencement of staged mining operations, such that net loss of ecological values is prevented or minimised.</p>
P6.68	<p>Regular, standardised monitoring will be a core component of the successful implementation of these plans, and provide the means for adaptive management to maintain relevance of proposed actions across the life cycle of the Project.</p>
P6.69	<p>A comprehensive monitoring program will be developed as part of the site water management plan. The site water management plan will include the following monitoring measures as outlined in SEIS Volume 4, Appendix Q1 Environmental Management Plan for the Mine:</p> <ul style="list-style-type: none"> • Surface flows will be monitored on an ongoing basis prior to construction, during operation and post operation upstream, downstream and within the Study Area to measure changes • All regulated water management infrastructures (dams, levees, diversion dams) will be annually inspected at a minimum by a suitably qualified and experienced person. A report will be produced with any recommendations required to ensure the structural integrity, as recommended in the DEHP (2012) guidelines Structures which are dams or levees constructed as part of environmentally relevant activities (EM634) • Dam capacity must be reviewed annually to ensure that sufficient capacity exists to meet the design storage allowance as determined by the Manual for assessing hazard categories and hydraulic performance of dams (EM635) • Diversion drains, floodplains and discharge points to downstream waterways will be inspected regularly during the wet season and after any flow event to identify any scouring, instability or erosion. Corrective action

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	will be taken promptly.
P6.70	All Project Environmental Management Plans will be informed by monitoring works to be completed pre-construction and during delivery of the Project. They will be adaptable and include provision for revision and update based on monitoring feedback, changes in operational or construction work plans, changes in legislation and to maintain currency against political, social and environmental circumstances.

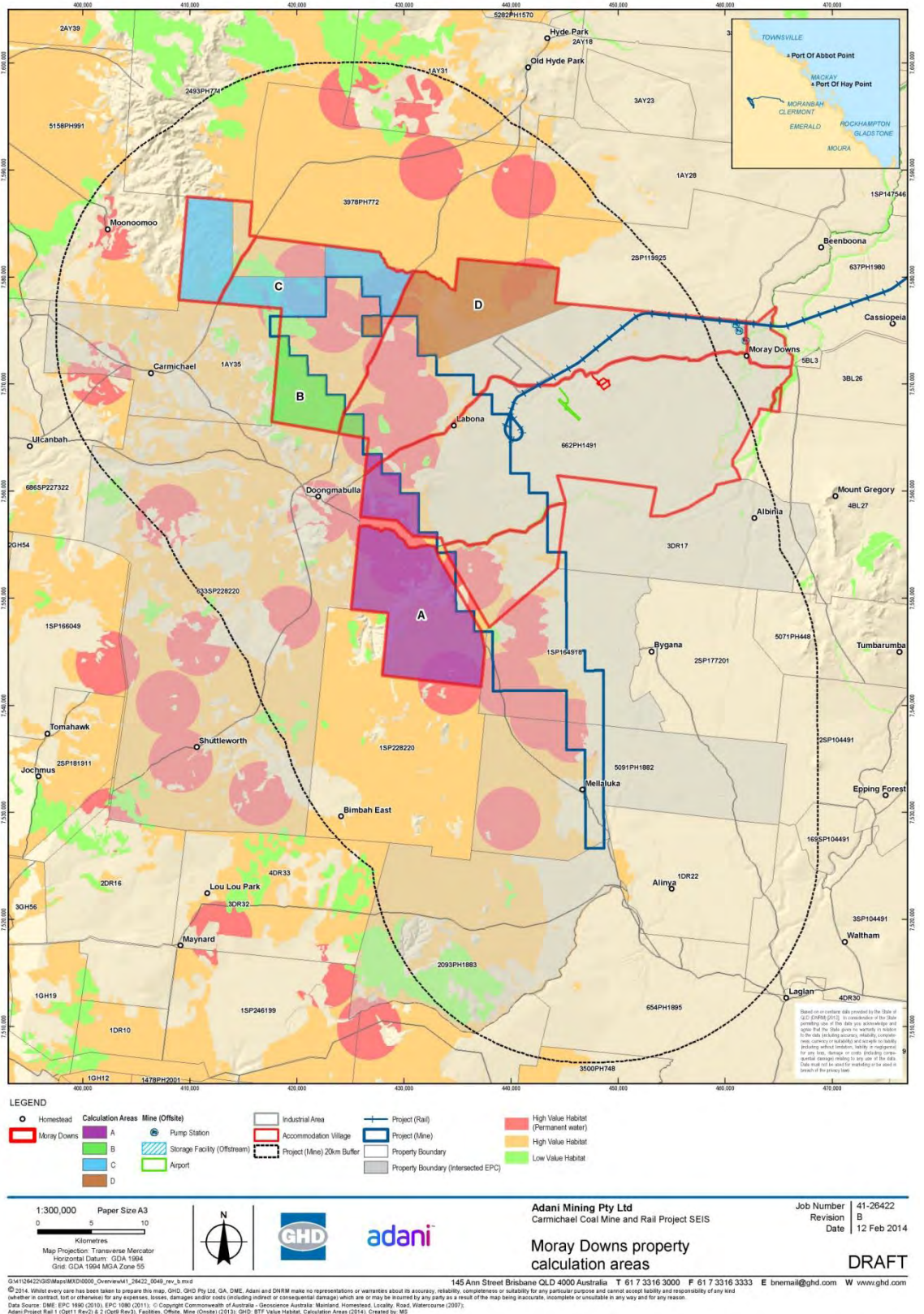


Figure 1: Moray Downs property - Identified Potential for BTF Mitigation Area



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2.2 Project commitments (Rail)

2.2.1 Project Description

Proponent Commitment	
R1.1	Relevant approval applications for the Rail and Quarries will be prepared and submitted by Adani.
R1.2	A Decommissioning and Rehabilitation Plan will be developed with the overall aim of minimising the amount of land disturbed at any one time during the life of the Project (Rail).

2.2.2 Climate, Natural Hazards and Climate Change

Proponent Commitment	
R2.1	Sufficient hydraulic capacity to allow conveyance of natural flows with minimal increase in velocity or afflux are to be maintained in the advent of causeway construction.
R2.2	Low flow channels and culverts throughout the study area are to be kept free of debris.
R2.3	A detailed scour assessment is to be conducted to determine the appropriate depth of cover or scour protection measures to be adopted at each crossing. The detail design of the creek crossings will incorporate works and measures to minimise the following: <ul style="list-style-type: none"> • The risk of damage to the creek banks during construction • Change in the sediment transport regime at the crossing • The risk of creek bank collapse or erosion during flood events.
R2.4	Continued and iterative flood modelling through detailed design will determine afflux values in association with refinement in bridge and culvert crossing design and will determine flood inundation duration.
R2.5	Further work will be undertaken to catalogue the impacts of afflux on the floodplain, properties, assets and infrastructure.
R2.6	Ongoing consultation with affected landowners and asset owners to assist in further refinement of project design and ongoing flood modelling.
R2.7	Selectively raising farm roads by placing fill material, will reduce the impact on farm roads subject to negotiations and agreements with landholders and asset owners.
R2.8	Where appropriate, compensation will be negotiated with land and asset owners affected by excessive afflux from the railway.
R2.9	Maintain adequate firebreaks on either side of the rail corridor, particularly during prolonged dry periods. Negotiate land management practices with adjacent landholders to maintain firebreaks.
R2.10	Develop a plan for recovery of Adani rail equipment from third party infrastructure including rollingstock.
R2.11	Develop an Emergency Response Plan (ERP) for construction, operations and decommissioning phase, which will incorporate the requirements for workplace health and safety, community and environmental hazard management. The ERP will include responses for natural events such as cyclones, flooding and earthquake.

2.2.3 Land

Proponent Commitment	
<i>Scenic Amenity and Lighting</i>	
R3.1	Vegetation will be planted around maintenance facilities and alongside the Project (Rail) corridor in sensitive locations where landowner permission is granted.
R3.2	Light spillage from artificial night-lighting used during night works will be designed such that the site is not over-lit unnecessarily and light spillage into adjacent areas is minimised. Minimise security lighting to reduce additional sky glow.



Proponent Commitment	
	<p>Specify appropriate luminaires to reduce light spill, sky glow and glare.</p> <p>Minimise any potential increase in light pollution within the natural environment by sensitive placement and specification of lighting.</p> <p>Directional lighting will be used and shields provided to minimise spill outside the working area. This includes the sensitive placement and specification of lighting to minimise any potential increase in light pollution.</p> <p>Fauna-sensitive lighting will be considered during construction camp design.</p>
R3.3	Develop and implement a traffic management plan to control road usage routes and traffic speed to reduce the visual impact of vehicle movements and dust generation.
R3.4	Progressive rehabilitation of temporary infrastructure sites and non-operational areas. This will assist in providing texture and contrast in the visual landscape.
Topography, Geology and Soils	
R3.5	Further soil surveys will be developed and undertaken to determine the actual presence of strategic cropping land (SCL) prior to construction. This survey will evaluate soils within the western cropping zone and in particular those mapped as SCL against eight criteria prescribed by the legislation. An appropriate soil survey methodology will be developed in consultation with DNRM according to criteria of SCL in the Western Cropping Zone.
R3.6	Maintain the integrity of topsoil resources (associated with construction and temporary disturbances outside of the rail corridor) as close to pre-disturbance conditions as possible, which may require the addition of ameliorants.
R3.7	Maintain the overall catchment gradients as close to that of pre-disturbance condition.
R3.8	An Erosion and Sediment Control Plan (ESCP) will be developed to manage areas of steep slopes, areas to undergo significant landform change and areas with problematic soils. Appropriate erosion and sediment controls, such as sediment fences, will be implemented in these areas.
R3.9	Clearing will be confined to the Project (Rail) corridor and infrastructure areas and minimised wherever possible, particularly in areas where temporary infrastructure is to be established. Existing trees and shrubs, particularly in discharge and just above the discharge areas, will be retained as far as is practicable. Retention of vegetation assists in maintaining groundwater levels at sufficient depths below ground level.
R3.10	Temporarily disturbed areas will be stabilised as soon as practical by reinstating topsoil and subsoil and compacting replaced soils. Any bare ground associated with temporary infrastructure (e.g. construction camps) after the completion of the Project will be re-vegetated in line with pre clearing conditions, such as suitable pasture or native vegetation.
R3.11	Limit vehicle movements to designated access tracks during construction.
R3.12	Limit overall areas of disturbance during construction.
R3.13	Maintain surface drainage patterns through design of culverts and cut/fill areas. Where changes in flows cannot be avoided, soil stabilisation to prevent salinisation or other forms of soil degradation will be considered.
R3.14	Ongoing consultation with landholders regarding specific management measures contained within Environmental Risk Management Plans (ERMPs) will be undertaken.
Land Contamination	
R3.17	Sewage will be treated on-site with a package sewage treatment plant. Disposal options will be assessed during the design phase of the Project.
R3.18	Undertake a Site Contamination Assessment (SCA) in accordance with the National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPM, 1999).

Proponent Commitment	
R3.19	Where contamination is identified, will be managed and/or remediated via a DEHP approved Site Management Plan (SMP) and/or a Remediation Action Plan (RAP).
R3.20	A spill response plan will be prepared and incorporated into an incident response plan, including requirements for spills to be reported, contained and cleaned.
R3.21	Potential for spillage of hydrocarbons will be minimised through implementation of standard operating procedures for transport, handling and storage of hydrocarbons. Hydrocarbons will be stored and handled in accordance with the bunding requirements of AS 1940:2004.
R3.22	Chemical storage areas will be suitably bunded and constructed to minimise the potential for leaks. Chemicals will be stored, handled and used in accordance with the Material Safety Data Sheets. Small quantities of chemicals, fuels and oils will be stored within a bunded area within workshops or in a bunded container.
Land Use and Tenure	
R3.23	Adani will comply with the requirements outlined in the <i>Mineral Resources Act 1989</i> regarding construction on a granted Mining Tenure.
R3.24	Holding yards will be established at either side of stock crossings as necessary.
R3.25	Private tracks will be joined to local roads or grade separated where possible to preserve their utility. Occupational crossings will be constructed to provide access typically under the Project (Rail). The design of the Project (Rail) may be further modified based on the outcomes from Adani's consultation with landholders.
R3.26	Ongoing consultation will be undertaken with landholders and government agencies regarding land access, occupational crossings of the rail corridor, decrease in land values and usability and access to water on severed parcels. Consultation will also include discussions with landholders and IRC regarding the safe management of cattle on at grade railway crossing access during construction and operations.
R3.27	Where there is direct loss of agricultural production, purchasing the property (ies) in part or whole will be considered where impact is likely to be significant.
R3.28	Impacts on infrastructure and facilities will be avoided by as far as possible and, where impacted, will be replaced on a like-for-like basis
R3.29	Surface drainage patterns will be preserved (where possible) with the design of culverts and cut/fill areas.
R3.30	Considerations such as the raising of farm roads and additional bridges or culverts will be informed by the iterative design process in order to reduce the impacts of afflux.
R3.31	Compensation will be negotiated with owners of land or infrastructure adversely impacted by residual afflux.
R3.32	Routine maintenance of the rail corridor will be undertaken to ensure the operation of all drainage structures, including removal of obstructions where required, during construction and operation.
R3.33	A stock route agreement will be developed in consultation with key stakeholders which specifies the final treatment for each stock route, designs of the stock route crossings (including drainage, ramps and stockyards) and ongoing maintenance arrangements.
R3.34	Where closure of Stock Routes is required Adani will conduct discussions with DNRM, IRC and landholders regarding re-alignment.
R3.35	Clearing of REs with Threatened Ecological Communities or REs of special conservation significance will be avoided where possible. Where clearing of REs is unavoidable, vegetation offsets may apply.
R3.36	The Project will develop and implement ESCPs and Construction Management Plan (CMPs) to minimise erosion and avoid sedimentation of existing water storages.



Proponent Commitment	
R3.37	Ongoing consultation with landholders regarding specific management measures contained within Environmental Risk Management Plans (ERMPs) will be undertaken.
R3.38	Adani will consult with utilities providers such as Powerlink to ensure no impacts on existing transmission lines during construction and operations.

2.2.4 Nature Conservation

Proponent Commitment	
R4.1	Design and layout of the temporary and permanent structures and infrastructure within the construction footprint (including construction areas, such as site offices, construction stockpile locations, machinery/equipment laydown areas and storages, access tracks and accommodation camps) will as far as possible avoid areas of remnant vegetation (in particular endangered, of concern and threatened REs) and make use of previously cleared, non-remnant land.
R4.2	Where clearing TECs and REs of conservation significance is absolutely unavoidable, offsets will be provided in accordance with the offset strategy.
R4.3	The extent of vegetation clearing must be clearly identified on construction plans and in the field. Areas that must not be cleared or damaged are to also be clearly identified on construction plans and in the field. Clearing extents are to be communicated to all necessary construction personnel involved.
R4.4	Vegetation clearing operations are to be supervised by a suitably qualified ecologist to monitor compliance of vegetation clearing with the defined clearing extents.
R4.5	Clearing within areas of high ecological value, such as riparian corridors, must be undertaken with care, and rehabilitated to restore connectivity to the highest realistic extent following clearing (i.e. to a level that considers the requirements of maintaining permanent infrastructure but rehabilitates in all areas no longer required in a way that facilitates the movement of fauna).
R4.6	Land clearing activities will, where possible, seek to avoid alteration to waterways such that the impacts to water quality and downstream flows are minimised to the greatest extent possible. Management of erosion and sedimentation in and adjacent to cleared areas must be undertaken in accordance with a Project Construction Environmental Management Plan (Section 13 Environmental Management Plan (AEIS version)).
R4.7	Vegetation clearing will be undertaken in a sequential manner to allow more mobile fauna species the opportunity to disperse away from cleared areas and clearing activities.
R4.8	Landscape permeability will be retained where possible. Where fencing is required around cleared areas, it will be designed such that fauna can move through it (excluding those instances where fenced areas seek to protect fauna from threats such as trenches, human contact). Consideration will be given to not using barbed wire on the top strand of wire fences.
R4.9	Fauna underpasses/culverts will be incorporated into the design within suitable habitats and mapped bioregional corridors (often at watercourses) to promote fauna movement and reduce the ecological impacts that the rail corridor incurs. Fauna underpasses should be vegetated, sized and fenced appropriately to encourage fauna use. The use of underpasses by fauna will be monitored.
R4.10	Disturbance to wildlife corridors, particularly within riparian vegetation and at watercourses will be minimised. Operational activities in the vicinity of watercourse crossings will be minimised and riparian habitat below infrastructure will be reinstated where possible.
R4.11	Prior to vegetation clearing, trees and habitat features (i.e. log piles) that may be used by fauna for nesting or shelter will be marked. During clearing activities, a qualified fauna spotter-catcher will supervise the activity and recommend provisions for the relocation of fauna. Pre-demarcated habitat features will be thoroughly checked by

Proponent Commitment	
	fauna spotter-catcher prior to clearing. Provisions for the relocation of fauna should be made prior to the commencement of clearing.
R4.12	Habitat features such as hollows and log piles will be salvaged, where possible, and placed in nearby (retained) habitat areas. Where this is not possible, the loss of habitat features will be supplemented in adjacent habitat areas with artificial habitat (i.e. nest boxes, artificial water sources).
R4.13	Weeds in and adjacent to cleared areas will be managed in accordance with a Project Weed Management Plan. This plan should include details relating to the monitoring, management and where necessary, eradication of weeds, disposal of green waste, and vehicle/plant weed wash down protocols (refer Volume 3 Section 13).
R4.14	All plant and equipment brought onto site will be cleaned and weed free. Wash downs between construction areas (as appropriate) will be undertaken during construction and in accordance with landholder agreements.
R4.15	Management of fauna pest species during construction in and adjacent to cleared areas in accordance with a Project Fauna Pest Species Plan. This plan should include details relating to the monitoring and management of pest animals (refer Volume 3 Section 13). Camps and laydown areas to be fenced to prevent encroachment of feral species. Waste material to be appropriately sealed and stored to discourage encroachment by feral species.
R4.16	Staff involved with the construction activities must be educated on weed management procedures and protocols and restrictions placed on bringing domestic animals to the Study Area.
R4.17	Avoid and minimise human and vehicle access to river and creek bed and banks. Construction of river/watercourse crossings ahead of rail construction (as far as is possible) will reduce the need for personnel, equipment, machinery and plant to traverse the river/watercourse and limit disturbance to bed and banks.
R4.18	Temporary stream or channel diversion may be required to facilitate activities in wet periods. Stream flow is maintained to provide connectivity between aquatic habitats and facilitate aquatic fauna passage.
R4.19	Clear, on-ground demarcation of areas to be cleared adjacent to watercourse crossing locations will be undertaken prior to clearing to avoid accidental clearing or stockpiling of cleared vegetation in sensitive areas. Identification of this area for protection where possible will minimise the potential for unnecessary impact to the creek and consequently downstream areas.
R4.20	Regular, standardised monitoring will be a core component of the successful implementation of actions pertaining to watercourses, with corrective actions to be undertaken at the earliest opportunity should monitoring reveal a detrimental change in floodplain hydrology.
R4.21	A fauna species relocation plan will be developed to facilitate relocation of fauna individuals according to species requirements (particularly if conservation significant fauna species are encountered during clearing activities).
R4.22	Install fencing along the rail corridor. Consideration will be given to reducing the chance of fauna mortality by avoiding the use of barbed wire on the top strand of wire fences.
R4.23	A fauna mortality register will be maintained to document the location and frequency of mortality and the fauna species most susceptible to injury and death, to enable on-going modifications to fauna conservation management strategies where necessary.
R4.24	Site inductions for all staff are to include education sessions regarding the local fauna that may be present on the site and protocols to be undertaken if fauna are encountered.
R4.25	Work areas are to be inspected daily prior to commencement and fauna trapped or present are to be relocated or moved.
R4.26	If any pits/trenches are to remain open after daily site works have been completed, they will be fenced, covered by an impenetrable barrier, or if possible, fauna ramps should be put in place to provide a potential means of escape for trapped fauna.
R4.27	Reduce the number of construction vehicles mobilising to and from site daily – retain vehicles within the construction zone and transfer personnel by means of bus to and from the work front daily to reduce the exposure for animal strike in areas away from



Proponent Commitment

	the construction footprint.
R4.28	An offset strategy will be prepared which clearly identifies the Project impacts and associated offset requirements, and proposes various offset options that meet relevant legislative requirements.

2.2.5 Water Resources

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R5.1	A surface water monitoring program will be developed and implemented for the Belyando River in accordance with the Australian Guidelines for Water Quality Monitoring and Reporting (NWQMS 2000) for the construction phase of the Project (Rail).
R5.2	Incorporate into the detail design scour protection measures at all locations where analysis of the <i>in situ</i> material and modelled flow velocities suggest the potential for scour. Erosion prevention measures include: rip-rap pads, wing walls on embankments, shotcrete, rip rap and/or gabion bed protection.
R5.3	Conduct a detailed scour assessment to determine the appropriate depth of cover or scour protection measures to be adopted at each crossing. The detail design of the creek crossings will incorporate works and measures to minimise the following: <ul style="list-style-type: none"> • The risk of damage to the creek banks during construction • Change in the sediment transport regime at the crossing • The risk of creek bank collapse or erosion during flood events.
R5.4	A hydrological/hydraulic report will be prepared to identify drainage structure dimension requirements based on the proposed design basis including afflux limitations, velocity limitation and stakeholder requirements in order that the construction of the railway and associated infrastructure has an acceptable effect on the hydrological behaviour of the associated region in its current state. In production of this report, a field work component is described.
R5.5	Minimise any runoff and sedimentation from the construction to waterways. Before commencement of earthworks, install perimeter catch drains to prevent upslope clean water runoff from entering the site and bunding and basins downslope to confine dirty water within the site. Design and manage the installation of such controls in accordance with IECA guidelines (IECA 2008).
R5.6	Minimise the area of vegetation disturbance and bare ground within the floodplain and conduct rehabilitation of disturbed ground progressively as soon as construction activities are complete in any area.
R5.7	Use bridges in preference to causeways as temporary building platforms/vehicle access as they involve less disturbance to the bed of the low flow channel.
R5.8	Do not permit stockpiling of soil in the bed of the low flow channel or floodplain.
R5.9	Laydown areas for vehicles and machinery and storage areas for chemicals, oils and fuels will be contained in appropriately designed facilities. Containment may include: sealed/lined surfaces and hard stand areas; bunded areas; containerised storage. In addition, chemicals, oils, fluids and other hazardous substances will be stored in accordance with the specifications of the material safety data sheet, as appropriate.
R5.10	Spill kits will be available to all personnel in the event of a spill or leak. Booms and spill kits will be on-site at refuelling facilities. Refuelling will only occur at designated sites away from watercourse and sensitive receptors. All machinery will have its own designated spill kit.
R5.11	During detailed design, fill and capping material details will be defined and water demand curves formulated. A range of water sources will be investigated and developed.
R5.12	Laydown and storage areas will not be placed in the vicinity of creeks or rivers or close-by to sensitive receptors (i.e. groundwater bores or GDEs).

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R5.13	Do not permit spillages of concrete or wash down to enter water courses.
R5.14	Do not permit refuelling or servicing of vehicles and plant within the low flow channel. Clean up spills immediately and dispose of contaminated soil and clean-up materials off site at an appropriate facility.
R5.15	Set the invert of culverts below the ground surface.
R5.16	If a causeway is used provide sufficient hydraulic capacity to allow the conveyance of natural flows with minimal increase in velocity or afflux.
R5.17	Any boring or similar activity during construction will utilise drilling fluids and chemicals that are environmentally neutral and biodegradable. Machinery and equipment will be maintained in accordance with manufacturer requirements and regularly maintained to minimise breakdown and decrease risk of contamination.
R5.18	Dewatering of shallow groundwater, if required for bridge pylons and/or culverts construction, will be of a short duration and no long-term impacts are expected. However, if extended dewatering is identified during detailed design and major drawdown of the alluvial aquifer is expected, a groundwater management plan may be required. The management plan will include objectives and targets to be met and detail monitoring requirements.
R5.19	Pylon structures, culverts and filling activities are designed and will be constructed to minimise the loading and compaction of alluvial sediments, which may alter shallow groundwater regimes and recharge.

2.2.6 Air Quality

Proponent Commitment

R6.1	Vehicles, plant and equipment will be regularly serviced and comply with manufacturers'. Specifications during construction and operation activities to minimise impacts of particulate impacts, minor air pollutants, amenity impact of dust deposition and impacts on flora, fauna, pasture and crops.
R6.2	Watering of construction site and access roads will be undertaken as required using water sprays.
R6.3	The coal train operators will maintain clear and regular communication with community groups, councils, forums and individuals by listening to and discussing issues. Information on train-related coal dust mitigation initiatives being undertaken will be provided to the appropriate forums.
R6.4	Adani will prepare a Coal Dust Management Plan identifying control measures to mitigate the emission of dust from loaded and unloaded coal trains. The plan will be consistent with the aims, objectives and mitigation measures stated in the QR Network (2010) Coal Dust Management Plan. Please refer to SEIS Volume 4, Appendix W for the Rail EMP, section 6.5.3 for Rail Operations related to coal dust.
R6.5	Quarry operations will be undertaken in accordance with the relevant DA and EA conditions in regards to air quality management, including the securing and use of water for dust suppression.

2.2.7 Greenhouse Gas Emissions

Proponent Commitment

R7.1	Identify the significant energy consuming equipment and recognise opportunities where technical efficiencies in plant and equipment can be applied
R7.2	Adani will investigate the applicability of the following options in regards to a wider fuel management strategy applying technical efficiencies in train operations and more efficiency in operations: <ul style="list-style-type: none">• Use of newer locomotives, or old locomotives with new engines to improve operational efficiency.• Fitting electronically controlled pneumatic (ECP) braking to locomotives and wagons, enabling all wagons to brake simultaneously, reducing fuel



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	<p>consumption.</p> <ul style="list-style-type: none"> Improving the aerodynamics of locomotives and wagons. Use of anti-idling engine management software to balance energy demand and fuel consumption. Similar technologies such as automatic engine stop start (AESS) systems, which shuts down the engine if it has been idling for more than 10 minutes.
R7.3	<p>Commitments to energy management will be developed as part of a detailed energy efficiency assessment. Monitoring and implementation of energy efficient improvements are also required under the <i>Energy Efficiency Opportunities Act 2006</i> (EEO Act). Regular energy audits and reviews of railway operations will identify possible energy efficiency improvement opportunities which will be implemented to progressively improve operations and subsequent energy efficiency.</p>
R7.4	<p>Adani have committed to ensuring that all quarry related vehicles will be suitably fitted with exhaust systems that minimise gaseous and particulate emissions to meet vehicle design standards.</p>

2.2.8 Noise and Vibration

Proponent Commitment

R8.1	<p>Locate mobile plant (e.g. compressors, generators), concrete batching plants and construction camps as far as practicable away from the nearest potential sensitive receptors.</p>
R8.2	<p>Fitting of equipment with effective and properly maintained noise suppression equipment consistent with the requirements of the activity, where possible.</p>
R8.3	<p>Maintenance activities and potential noise from maintenance facilities will be managed through operational controls developed specifically for the sites (e.g. maintenance yard, bad order sidings) and documented in a Noise Management Plan.</p>

2.2.9 Waste

Proponent Commitment

R9.1	<p>A project procurement plan will outline requirements to avoid the purchase of excess materials: quantities of materials will be carefully managed during procurement to avoid ordering and delivery of excess materials which may be wasted.</p>
R9.2	<p>Prior to the commencement of construction, operation and decommissioning phases a Waste Management Plan (WMP) will be developed that will include waste management measures controls, monitoring and other safeguards, in line with the relevant legislation and government waste reduction strategies. The plan will form one of the issue specific sub-plans as part of the EMP.</p>
R9.3	<p>Cleared material will be mulched, chipped and stockpiled for rehabilitation and revegetation works on-site. Larger vegetation materials like hollow logs and hollow bearing trees will be reused in rehabilitation activities where possible or in adjoining bushland to provide habitat for fauna.</p>
R9.4	<p>Putrescible wastes will be separated and stored in allocated waste disposal bins for collection by a licensed contractor for disposal to a licensed facility.</p>
R9.5	<p>Recycling bins will be provided around the construction camps. Recyclable materials such as glass, aluminium, plastic and paper will then be taken offsite for recycling.</p>
R9.6	<p>Non-recyclables will be taken offsite for disposal by a licenced contractor for disposal to a licensed facility.</p>
R9.7	<p>All chemicals, fuels and oils will be stored in bunded areas in accordance with Australian Standards to minimise potential for any spills. Oily water generated at interceptors or in the event of a spill involving oil or diesel will be treated to separate oil from water. The separated water will be directed for evaporation or reused on-site for dust suppression. Spilled oil will be removed by a licensed vacuum truck contractor and</p>

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	disposed of at a licensed facility. Oil drums will be drained of all remaining product and stored on-site within a bunded facility for collection by a licensed contractor and recycler.
R9.8	Sewage and grey water will be treated on-site prior to disposal and site specific wastewater management plans will be developed and implemented to ensure compliance with effluent treatment and discharge requirements.
R9.9	Maintenance of vehicles, plant and machinery will be implemented to ensure efficient operation which will reduce unnecessary exhaust emissions.
R9.10	Any transfers of waste will take place in accordance with legislated docket tracking systems that ensure waste reaches the appropriate destination. Only licensed contractors and drivers will be utilised. Any transporters will be expected to meet legislative requirements for spill control and be equipped with emergency equipment.
R9.11	A designated waste management area will be constructed for waste sorting and waste storage prior to transport offsite. The waste management area will be a hardstand area and bunded or have a suitable containment system in place for the type of waste to be stored. The area will have appropriate drainage and leachate collection system in place to assist with the drainage and collection and storage of any potential leachate.
R9.12	Engage with both waste transporters and waste disposal operators to ensure adequate waste capacity planning, particularly for waste streams such as concrete, metals and waste oils which are in relatively large volumes. Preferentially engage private waste specialists to ensure these wastes are managed and reprocessed by private industry rather than council facilities.

2.2.10 Transport

Proponent Commitment

R10.1	Traffic management issues will be addressed through the preparation and implementation of a Construction Traffic Management Plan, which will be developed during the detailed design phase. The TMP will consider impacts on bus school routes and other relevant impacts and will propose management and mitigation procedures outlining emergency response times for emergency.
R10.2	Final treatment options of grade separated crossings will be developed during detailed design in accordance with DTMR and IRC specifications.
R10.3	Ongoing consultation with DTMR, IRC and Queensland Police Services will be undertaken during the construction period.
R10.4	Specific warning signs at access roads to the construction corridor will be installed to warn road users of entering and exiting traffic. Adequacy of signposting will be continually reviewed and new measures implemented.
R10.5	Advance notice of road/lane closures and advice on alternative routes will be provided to local users.
R10.6	Logistics technology will be used to plan heavy vehicle movements and the loading of equipment on these vehicles to address the appropriate Queensland Police Service and Pilot support when delivering equipment.
R10.7	Traffic management will focus on vehicle crossings at major and minor road intersections, safety risks brought about by increased heavy vehicle traffic and movement of stock, lane closures and the use of single-lane access roads.
R10.8	Adani will consult with DTMR, QPS and other proponents (where applicable) regarding the need for additional 'park up' rest areas and road signage. Relevant management and mitigation measures regarding fatigue management will be identified from consultation and will be incorporated into the revised traffic management plan for the Project (Rail).
R10.9	Adani will continue consultation with and undertaking agreements with IRC, QPS and DTMR in regards to impacts to road infrastructure on the local and SCR network.
R10.10	Adani is currently in discussions with IRC to draft an infrastructure agreement regarding the long term maintenance of impacted local roads.
R10.11	Upgrade the existing Carmichael – Elgin Road to become a sealed, single lane carriageway so as to provide a trafficable road under most rain event conditions and



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	minimise the risk of closure.
R10.12	Upgrade the existing Carmichael – Elgin Road/Gregory Developmental Road intersection – as part of the upgrade works for the Carmichael – Elgin Road it is recommended that the existing intersection be upgraded to include protected right turn and left movements at this intersection.
R10.13	Signage at the Gregory Developmental Road/Kilcummin Downs Road – it is recommended that during the course of the construction period (2014 and 2015), including the life of the Rail Camp 1, “Trucks Turning” signage be installed at the intersection so as to advise road users of the potential for heavy vehicles to be negotiating this intersection.
R10.14	Upgrade Kilcummin Downs Road/Rail Camp 1 Site access – it is recommended that the proposed site access location be upgraded to allow for a protected right turn into the site access.
R10.15	Signage located at the intersection of the Peak Downs Highway with the Gregory Developmental Road and also north of the proposed Disney Quarry along the Gregory Developmental Road to advise motorists of the construction activities along this road section.
R10.16	The Gregory Developmental Road and Peak Downs Highway are not approved for HML vehicles. Should these routes be required to be used by HML a separate application will be required for these routes. This will go through to DTMR for their review and is subject to their approval.
R10.17	A bus fleet will be required to support both the construction and operational phases of the Project. The buses will primarily transport the workforce to/from the Airport(s) (FIFO) and each work site.
R10.18	Adani will grade separate the Gregory Development Road and the Carmichael Coal rail corridor. This will be subject to an infrastructure agreement which will be reached prior to the commencement of construction of the grade separation.
R10.19	In regards to the road crossing of the Gregory Development Road for the purposes of rail construction traffic. Adani will reach agreement with DTMR regarding access and crossing at this point prior to the commencement of construction at this location.

2.2.11 Hazard and Risk

Proponent Commitment	
R11.1	The Project will develop and implement water supply management plans to address water usage, treatment of the recycled water and compliance with the requirements of Queensland Water Recycling Guidelines.
R11.2	A geotechnical investigation will be conducted to assess potential for landslides especially during and after heavy rains. Detailed design will consider issues around landslides.
R11.3	The Project will develop a fire management system (FMS) for the prevention, early detection and suppression of fires at their coal mines and accommodation village. A Fire Management Plan (FMP) will be developed during the detailed design phase with an approach to safety.
R11.4	The Project will ensure compliance with the QFRS guidelines for rail infrastructure.
R11.5	All buildings, structures and fixed plants will be protected with a suitable water supply, water reticulation and hydrant system. For buildings and occupied facilities, a fire hose system or a fire hydrant system, and/or pump sets will be in compliance with the Building Code of Australia (BCA).
R11.6	The fire safety systems installed in a building will be any one or combination of the methods in a building to warn people of emergency, provide for safe evacuation, restrict the spread of fire and extinguish fire.
R11.7	An adequate supply of water for fire fighting purposes will be provided at the rail

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	maintenance facility. The acceptable sources of water supply will be in accordance with Section 4 Water Supplies of Australian Standard AS 2419.1-2005 Fire hydrant installations Part 1: System design, installation and commissioning (AS 2419.1), as applicable.
R11.8	Water storage tanks and their capacities will be in accordance Section 5 Water Storage of AS 2419.1, as applicable. Maintenance of onsite storages will be carried out during periods of least risk, e.g. nonproduction and kept to a minimum time frame
R11.9	Fire protection pump sets will be installed in accordance with Australian Standard AS 2941-2008 Fixed fire protection installations - Pumpset systems. All fire extinguishers will be maintained in accordance with Australian Standard AS 1851-2005 Maintenance of Fire Protection Systems and Equipment.
R11.10	A fire station, fully equipped with fire truck and other fire fighting equipment will be constructed at the Mine, and will be available to attend to emergencies within the Project (Rail). During the detailed design phase, the Project will consult the emergency services (including QFRS) to comply with their requirements.
R11.11	Provision of adequate and safe access for fire fighting/other emergency vehicles and safe evacuation. Adani will work closely with QPS, DCS and other emergency service providers with regards to services and emergency responses.
R11.12	First aid equipment will be available with each Project related vehicle.
R11.13	A risk management plan (RMP) has been developed for the risks that have been identified through the PHA. The RMP will be periodically updated and expanded throughout the life cycle of the Project (Rail) as more information is available, design progresses and risks further defined. Adani will implement management measures proposed in the hazard analysis as part of an overarching risk management plan.
R11.14	The Project (Rail) will develop and implement a Health & Safety Management System (RHSMS) for the mitigation of risk so far as is reasonably practicable (SFAIRP). The RHSMS will provide a systematic way to identify hazards and control risks while maintaining assurance that the risk controls are effective, to provide a safe and healthy work environment to its employees, contractors and visitors.
R11.15	Untreated sewage tanks and pipes will be monitored for leaks. Design, storage, pumping and transmission systems of untreated sewage tanks will be designed to Australian standards.
R11.16	Design and construction of diesel storage tanks will comply with AS 1692-2006 Steel tanks for flammable and combustible liquids. These tanks will be installed on impervious surfaces and fully bunded. The storages will comply with the requirements of AS 1940 – The storage and handling of flammable and combustible liquids.
R11.17	As part of the spill response plan, emergency services will be notified in the case of diesel spills on public roads.
R11.18	As part of the spill response plan, DEHP will be notified of spills as required under the Environmental Authority conditions.
R11.19	Oils will be stored in above ground tanks and will be fully bunded. Activities involving oils will be undertaken on a hard stand area, and drip trays will be provided during transfer operations. Controls and management procedures will be adopted for servicing of machinery.
R11.20	As part of the spill response plan, spillages will be prevented from entering drains or water courses and absorbent material will be placed on spillages which will be collected for disposal and any contaminated soil removed for treatment and disposal.
R11.21	As part of the spill response plan, a licenced contractor will be used for removal and disposal of spilled waste oil and clean-up material.
R11.22	Fatigue management strategies for drivers will be developed.
R11.23	Emergency services are to be notified of any vehicle accidents on Bowen Developmental Road, Gregory Developmental Road, Suttor Developmental Road, Flinders Highway, Peaks Down Highway, primary access roads or other public roads.
R11.24	Designated travel routes for heavy vehicles will be designed through townships.



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R11.25	Rail safety accreditation will be obtained and maintained.
R11.26	Tracks will be routinely inspected and maintained.
R11.27	Speed restrictions are to be followed at all times.
R11.28	Wagons and locomotives will be routinely inspected and maintained.
R11.29	Signalling equipment will be routinely inspected and maintained.
R11.30	The Project (Rail) will install either passive or active controls at level crossings.
R11.31	Grade separators will be constructed at identified crossings as required by DTMR
R11.32	Proper signalling systems will be installed.
R11.33	Train speeds will be reduced to 60 km/hr when crossing roads at level crossings.
R11.34	The Project (Rail) will provide radio communication systems, transponders/GPS, rail track signalling systems and in-vehicle communications as per Australian Standards.
R11.35	A central first aid room equipped with response facilities such as oxygen cylinder, defibrillators and basic medical supplies will be available to support incident response.
R11.36	Air quality at the nearby sensitive receptors will be monitored in accordance with the DEHP guidelines and Australian Standards and limit “trigger level” events. A register of complaints will be maintained with information on corrective actions.
R11.37	Zero tolerance for drug and alcohol use will be enforced.
R11.38	Road markings and signage will minimise impact and improve road safety.
R11.39	If installed, rainwater tanks will be maintained and include checks.
R11.40	Refer to the Mosquito/Biting Midge Management Plan for control measures to avoid ponding of water that promotes local populations of potential mosquitoes and biting midges. The plan will be implemented prior to the start of Construction.
R11.41	Kitchen facilities at the construction camps will be provided in accordance with statutory requirement, which will be operated in compliance with food legislation by qualified contractors. Appropriate publications regarding personal hygiene will be provided. Operations will be undertaken in accordance with the QLD Food Act 2006.
R11.42	Adani will develop a Disaster Management Plan in consultation with emergency service providers, as required, prior to commencement of work onsite.
R11.43	Adani will develop and implement all management plans/systems/strategies as per the management plans and systems hierarchy in the commitment register at the appropriate project stage.

2.3 Project commitments (Mine)

2.3.1 Project Description

Proponent Commitment

M1.1	Relevant approval applications will be prepared and submitted by Adani.
M1.2	<p>In the event that the significant impacts to regional groundwater is observed due to final voids Adani is committed to taking any further steps necessary to reduce post closure impacts on groundwater levels and/or flows to acceptable levels. Potential mitigation measures which may reduce and/or mitigate impacts during the post closure phase include:</p> <ul style="list-style-type: none"> • Reviewing and revising the extent, location and/or timing of the proposed mine workings • Reviewing the backfilling level of final voids in order to minimise or prevent ongoing losses due to evaporation • Entering into make good agreements with neighbouring landholders where residual impacts cannot be mitigated • Offsetting impacts to MNES and SSBV under relevant policies where residual

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	impacts cannot be mitigated
M1.3	An ongoing programme of geological and geotechnical investigations will be carried out to further define the coal resources and refine the Mine Plan as mining progresses. This will include lease-wide coverage as well as more intense drilling of the sub-crop in the area of early production, covering both the open cut mine areas and underground mine. This drilling program will increase knowledge of the deposit for resource estimation, washability testing, hydrogeological and geotechnical evaluation. These investigations will also provide further detail on ground conditions and enable detailed design of all infrastructure and structures associated with the Project (Mine).
M1.4	A corridor, at a minimum of 500 m will be retained either side of the centre line of the Carmichael River to protect it and the riparian zone from mining operations.
M1.5	All maintenance facilities will be contained such that any oil leaks or spills are captured.
M1.6	The vehicle wash facilities will allow for capture and recirculation of water or return of water to the mine water system.
M1.7	The MIA will include emergency response equipment including a fire station and ambulance as well as mine rescue equipment.
M1.8	The MIA will include a stormwater collection system. It is proposed that mine affected water, being water from coal stockpiles, the CHPP area and any other potentially dirty water areas will be collected and transferred to the nearest mine affected water dam. Clean water will be diverted around the MIA, and water from uncontaminated areas will be captured and drained to a sediment pond.
M1.9	Subject to detailed design investigations into dust levels, conveyors are expected to be partially enclosed and will be roofed. Belt cleaning facilities and enclosure of any towers (where conveyors change direction) will also minimise dust and coal spillage from conveyors. Conveyors will also be fitted with heat and smoke detectors and fire suppression systems.
M1.10	Stockpiles will also be visually monitored for signs of spontaneous combustion. If spontaneous combustion occurs, the affected coal will be spread out using earthmoving equipment and sprayed with water to cool it down. The coal will then be replaced in the stockpile and compacted to prevent oxygen ingress.
M1.11	Stockpiles will also be fitted with pole mounted water sprays to control dust. These will rotate to ensure coverage of the entire stockpile. The product coal stackers will also be fitted with luffing booms which adjust to minimise the drop height of coal from the stacker to the stockpile limit dust generation and also formation of coal fines from break up of lumps of coal landing on the stockpile.
M1.12	The above ground tailings storage facility will be an engineered structure with hydraulic capacity as required by the Manual for Assessing Hazard Categories and Hydraulic Performance of Dams (Queensland DERM 2012).
M1.13	The above ground tailing storage facility will be lined with a very low permeability liner.
M1.14	Water will evaporate and decant from tailings placed in the tailings storage facility. Decanted water will be collected, treated to remove suspended solids and adjust pH if necessary and returned to the mine water management system.
M1.15	The train loading system will be fitted with a wagon derailment detector and spillage pit, with a sump and pump for removal of any rainwater or dust suppression water, which will be returned to the mine water management system.
M1.16	An upgrade of the Moray-Carmichael Road will take place in the main construction period. This will include some minor realignment, including realignment to remove two crossings of North Creek, and reforming of the road to allow heavy vehicle traffic.
M1.17	Construction of access roads from Moray-Carmichael Road to the workers accommodation village, airstrip and industrial area will take place in the main construction period. These will be bitumen sealed provided year round access.
M1.18	Installation of sewage treatment systems at the workers accommodation village and also the industrial area and airport will take place in the main construction period. The type of sewage treatment facilities and whether treated wastewater will be reused or disposed of by irrigation is to be determined in the detailed design stage.
M1.19	The temporary and final roads will meet the relevant rural road design standards that are in place at the time from IRC and Department of Transport and Main Roads (DTMR).
M1.20	The Belyando River storage dam is an off-stream storage and will be located on the



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	footprint of an old quarry. Any excess spoil will be transported to the mine site for later disposal with mine waste. A liner will be installed using either compacted clay material which will be imported or a high density poly-ethylene (HDPE) liner.
M1.21	The pump station structure in the Belyando River will be cast in situ during non-flood periods. The excavation of the channel and pump station invert river level will be done in phases, with connection to the river made late in the construction period as the river level is higher in this area due to the retarding effect of the downstream causeway.
M1.22	Permanent, long-term and/or high volume access roads will be constructed from bitumen or gravel and will have drainage provided to prevent concentration of flows across or along road alignments.
M1.23	For permanent, long-term and/or high volume access roads, culverts will be used with flood immunity design criteria. Codes and guidelines will be followed as closely as possible, particularly in relation to minimising damage to the bed and banks of watercourses and maintaining flows and fish passage.
M1.24	For minor access roads, crossings will either be at bed level, or with a low flow pipe installed under a slightly elevated crossing. Again, locations will be selected to minimise clearing of riparian vegetation or in-stream vegetation and codes and guidelines will be followed as far as practicable. Crossing locations will be stabilised such that erosion and scouring does not occur.
M1.25	The bridge will span the main channel of the Carmichael River, with no pylons or supports within the low flow channel.
M1.26	Flood levees will be constructed to protect the open cut pits and underground mine portals from flooding from the Carmichael River and possibly Eight Mile Creek. While geotechnical investigations have not yet been undertaken, it is expected that levees will be able to be constructed from locally available materials. Flood levees will meet hydraulic design criteria and structural and hydraulic requirements.
M1.27	For mine infrastructure, temporary construction and laydown areas have been located in areas that will be required for mine operations to minimise the overall disturbance footprint. Hence, rehabilitation of these areas will not be required. Areas that are not to be used immediately will be stabilised by placement of gravel or seeding with grass if necessary to minimise erosion risk.
M1.28	For the off-site infrastructure, temporary construction and laydown areas have been located in areas already cleared of native vegetation. If any areas are not required once construction is completed these will be ripped, topsoil replaced, and grass sown to provide ground cover. Erosion and sediment controls will be left in place until 70 percent ground cover is achieved.
M1.29	Topsoil will be stripped prior to mining or dumping in each area. Topsoil stripping depth will be determined prior to stripping as will the need for single or two phase stripping. The topsoil will be stockpiled until it is required for rehabilitation, or hauled directly for respreading on the completed and re-profiled mining areas. Depending on requirements to be specified in the Rehabilitation Management Plan, some amelioration of topsoil may take place prior to or at the time of stripping and replacement. A topsoil register will be retained to track the origin, interim storage and final destination of topsoil.
M1.30	Vegetation clearing will be undertaken using bulldozers or similar equipment. In areas of high ecological value, pre-clearing surveys will be undertaken to identify conservation significant flora and fauna and determine appropriate methods to avoid or minimise harm. The clearing method and whether vegetation is stockpiled, mulched or otherwise treated will depend on the type of vegetation in a particular area, and the level of weed infestation.
M1.31	Sediment basins will be constructed prior to the commencement of operations within the corresponding spoil areas to treat stormwater runoff from these areas. Diversion drains will be installed to prevent any water from undisturbed areas from entering into sediment basins.

2.3.2 Climate, natural hazards and climate change

Proponent Commitment	
M2.1	The Proponent will prepare an Emergency Response Plan (ERP) for construction, operations and decommissioning phase, which will incorporate the requirements for workplace health and safety, community and environmental hazard management. The ERP will include responses for natural events such as cyclones, flooding and earthquake.
M2.2	Staff will be educated in relation to bushfire prevention, including possible ignition sources. Staff will also be trained in procedures for welding and any other activities with high risk of starting fires.
M2.3	A fire management system for prevention, early detection and suppression of fires at the Project (Mine) and workers accommodation village will be implemented. The Project (Mine) will aim to ensure the safety of personnel and assets for all structures within the Project including buildings at the mine site, accommodation village and airstrip for event like fire or hazardous material spills/emergencies. Building fire safety will be incorporated into the design of Project (Mine) infrastructure, including adherence to QFRS guidelines and provision of a water supply, water reticulation and hydrant system.
M2.4	Maintain adequate firebreaks around the Project (Mine), particularly during prolonged dry periods. Negotiate land management practices with adjacent landholders to maintain firebreaks and consult with DCS in the development.

2.3.3 Land

Proponent Commitment	
Scenic Amenity and Lighting	
M3.1	The Project will aim to achieve construction without causing undue visual disruption to existing receptors. The following mitigation measures will be employed in regard to changes in the landscape character for the Project (Mine): <ul style="list-style-type: none"> • Removal of hoardings, barriers and traffic management signage when no longer required • Minimisation of dust emissions onto retained areas outside the Project (Mine) footprint • Limiting vegetation clearance to required areas only
M3.2	The Project will aim to achieve construction without causing undue visual disruption to existing receptors. The following mitigation measures will be employed in regard to changes in the landscape character for the Project (Mine): <ul style="list-style-type: none"> • Removal of hoardings, barriers and traffic management signage when no longer required • Minimisation of dust emissions onto retained areas outside the Project (Mine) footprint • Limiting vegetation clearance to required areas only
Topography, Geology and Soils	
M3.3	A detailed topsoil management plan will be developed for the Project (Mine). The aim of any such plan should be to ensure optimal allocation of available primary and secondary growth media reserves across all future rehabilitation activities proposed for the mine.
M3.4	More detailed surveys will be conducted over specific areas to be disturbed by mining operations to more accurately define topsoil management plans and depth of useable soil material.
M3.5	Stormwater will be diverted around final voids so that the only inflows are groundwater and incident rainfall. Once the final landform has been achieved, topsoil will be replaced on disturbed areas and these areas revegetated.
M3.6	In any topsoil stripping, stockpiling and replacement operation, planned activities will carefully follow actions outlined in a detailed topsoil management plan. The aim of any such plan will be to ensure optimal allocation of appropriate media reserves across all future rehabilitation activities proposed for the mine.



Proponent Commitment	
M3.7	Soil material with poor physical properties (such as slaking and sealing) will only be utilized on very gentle slopes to minimise erosion risk.
M3.8	Stockpiles containing soil material for reuse will ideally be formed no more than 1.5 m in height and will be ripped and seeded (with species selection based on the desired outcome of rehabilitation) as soon as practical following stockpile laydown.
M3.9	Stripped materials will be segregated into stockpiles, which have similar reuse characteristics.
M3.10	Soils with good surface physical characteristics will not be stockpiled with soils with poorer physical attributes.
M3.11	<p>Erosion and sediment control will be based on a hierarchy of controls as follows:</p> <ul style="list-style-type: none"> • Avoid disturbance of very steep slopes, drainage lines and watercourses wherever possible • Avoiding works in watercourses in flow conditions wherever possible • Divert surface flows around disturbed areas. This will include permanent diversion of minor watercourses that currently pass through the proposed open cut and overburden dump areas • Minimise exposure of soils to erosive forces. This is largely achieved by clearing vegetation progressively with minimal time lag between clearing and construction or mining works, and stabilising and/or rehabilitating cleared areas and stockpiles as quickly as possible • Detain sediment laden runoff using sediment fences, check dams and sediment dams to allow sediment to settle out • For permanent or long term facilities, install permanent stormwater control works as quickly as possible <p>Selection of particular controls will then depend on the nature of works being undertaken and the erosion risk.</p>
M3.12	For the relatively flat workers accommodation village, airport, off-site industrial area and on-site infrastructure areas, erosion control will require capture of overland flow in sediment fences and, for larger areas, sediment basins. As these areas are to remain as permanent features of the proposed mine, stormwater collection systems will be installed as early as possible during construction to capture and control runoff.
M3.13	Water supply pipeline alignments will be stabilised and revegetated after construction so that these do not become preferential flow paths. Topsoil will be replaced and the pipeline alignments will be sown with pasture species or small shrubs as larger plants cannot be placed directly over pipelines.
M3.14	Haul roads and other roads will have drainage systems to capture and control runoff from the road surfaces.
M3.15	Runoff from overburden stockpiles will be captured in sediment basins designed in accordance with IECA 2008 guidelines.
M3.16	<p>A subsidence management plan will be developed, setting out:</p> <ul style="list-style-type: none"> • Monitoring locations and methods • Detailed baseline and performance criteria, drawing on baseline monitoring results • Management responses to failure to meet performance criteria • A system for recording monitoring data, required management responses and confirmation that management responses have been implemented effectively • Rehabilitation success criteria for subsided areas.
M3.17	Humans and cattle will be excluded from underground mining areas until subsidence has occurred and any cracks or other hazards are made safe.
M3.18	<p>A subsidence baseline monitoring program will be undertaken including:</p> <ul style="list-style-type: none"> • Stream monitoring points immediately upstream, at mid-point and immediately downstream of underground footprint on each mapped watercourse • Vegetation characteristics and health monitoring transects and control points

Proponent Commitment

	<ul style="list-style-type: none"> • Habitat value transects • Topographical survey transects • Establishment of photo-monitoring points corresponding with each of the above monitoring locations.
M3.19	Soil survey assessment will be undertaken on EPC 1080 and off lease infrastructure areas.

Land Contamination

M3.20	Sewage will be treated on-site with a package sewage treatment plant. Disposal options will be assessed during the design phase of the Project.
M3.21	It is intended that neither phase of the Project will lead to land contamination requiring registration in the CLR. Furthermore, any notifiable activities under Schedule 3 of the EP Act, such as the storage of hazardous material, will be reported to DEHP. Sites notified under this process will be registered on the EMR.
M3.22	If site contamination is incidentally found to occur or a previously existing contaminated site is encountered, then the site will be assessed and managed in accordance with the contaminated land provisions of the EP Act, National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPM, 1999) and Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland (DoE, 1998; now administered by DEHP).
M3.23	Contaminated materials will be placed within waste landforms where the likelihood of contacting runoff water would be reduced. Stormwater will be diverted away from disturbed areas. Sediment laden water will be treated on site.
M3.24	The storage of overburden is a notifiable activity under the Schedule 3 of the EP Act and will be reported to DEHP for registration on the EMR.
M3.25	In the event that spills and leaks occur to soils, the contaminated material will be removed as soon as practicable after the spill, unless the quantity is very small and the spill occurred in a location where there is a low risk of any further environmental impacts occurring. Contaminated soil material will either be stockpiled and bio-remediated or disposed of as a regulated waste.
M3.26	Sewage will be treated on-site with package sewage treatment plants to Class A+ in relation to pathogens. Reuse and disposal options will be assessed during the design phase of the Project.

Land Use and Tenure

M3.27	Adani will undertake ongoing consultation with the holder of the EPC1957 in regards to project timing and progress in order to minimise where possible any sterilisation of coal resource which may be present.
M3.28	The alignment of the Moray Carmichael Road running through the Mine may move from time to time to accommodate mining activity, however it will continue to be open to the public and meet a required engineering standard.
M3.29	Ultimate road closure of the Moray Carmichael Road will not be considered and the utility of Moray Carmichael Road as a public road link will be maintained at all times.
M3.30	Progressive rehabilitation of the Project Area will be undertaken. Upon completion of the Project (Mine) life, decommissioning of the Project Area will be undertaken.
M3.31	Where closure of Stock Routes is required Adani will conduct discussions with DNRM, DTMR, IRC and landholders regarding re-alignment.

2.3.4 Nature Conservation

Proponent Commitment

M4.1	Pre-clearance surveys will be undertaken in areas identified as potential habitat for threatened species, prior to commencement of clearing. In areas where these surveys indicate the presence of habitat features observed to (or with the potential to) provide habitat for these species, a fauna spotter catcher will be engaged to accompany clearing crews.
M4.2	Unavoidable loss of vegetation and fauna habitat will be offset in accordance with relevant Queensland and Commonwealth policies, as detailed in the Project Offset



Proponent Commitment	
	Strategy.
M4.3	Landscape permeability will be retained where possible. Where fencing is required around cleared areas, it will be designed such that fauna can move through it (excluding those instances where fenced areas seek to protect fauna from threats such as trenches). Consideration will be given to avoiding the use of barbed wire on the top strand of wire fences.
M4.4	Vegetation clearing will be undertaken in a sequential manner to allow more mobile fauna species the opportunity to disperse away from clearing areas.
M4.5	Mitigation measures will be detailed in the Mine and Offsite Environmental Management Plans, which will include erosion and sediment control requirements to be implemented and monitored throughout the construction phase of the Project.
M4.6	To limit the degradation of downstream aquatic habitat during construction activities, mitigation and management will focus on reducing the potential mobilisation of sediments or pollutants, diversion of stormwater flows from disturbed areas and limiting sediment transport from exposed areas. This will be achieved from the following: <ul style="list-style-type: none"> • Clearing of vegetation is not to be undertaken during overland flow events and is to be done in a staged manner as construction progresses to minimise the disturbance footprint at all times • Construction across the Carmichael River will only be undertaken during dry conditions to limit localised erosion in construction areas • Adani will install and maintain appropriate standards for sediment fences and other sediment control devices, in particular for areas near earthworks, watercourses and key stormwater flow paths • All soil and mulch stockpiles will be located away from watercourses and key stormwater flow paths to limit potential for transport of these substances into the watercourses via runoff • Spill kits will be available at regular intervals across the construction phase footprint to allow for timely response to uncontained spills and all staff to be familiar with their use • Vehicles will be maintained in good working order to limit potential for hydrocarbon leaks to occur and enter waterways.
M4.7	The design of the MIA, workers accommodation village, industrial precinct and airport will incorporate stormwater management infrastructure and mechanisms to manage runoff.
M4.8	The design and layout of the offsite water supply infrastructure will minimise the width of disturbance to the riparian zone. Sensitive areas in the vicinity of all construction will be clearly demarcated prior to construction to avoid accidental clearing or disturbance. A suitably qualified ecologist will be required to provide advice on the location of sensitive areas for demarcation. These measures will be incorporated into the Mine and Offsite Environmental Management Plans to be prepared prior to any construction at the site.
M4.9	Potential to further reduce disturbance to stream habitats by infrastructure will be reviewed in the detailed design phase, including consideration of: <ul style="list-style-type: none"> • Selection of crossing locations to avoid or minimise disturbance to important areas of aquatic flora, waterholes, watercourse junctions and watercourses with steep banks • Opportunities to use existing access tracks and other previously disturbed areas wherever possible • Further opportunities to consolidate infrastructure alignments to minimise the number of crossings • Design of pipeline crossings such that the level of the stream bed is not altered
M4.10	Mitigation strategies for aquatic habitats will be based on compliance with the relevant DEHP Guidelines for carrying out activities in a watercourse, lake or spring and, if a riverine protection permit is required for any of the works, the conditions of this permit.

Proponent Commitment

M4.11	To avoid potential mortality of aquatic fauna during construction within riparian zones and within the bed and banks of ephemeral creeks, construction activities will be undertaken during dry or controlled conditions.
M4.12	The management and mitigation of changes to water will include (but are not limited to): <ul style="list-style-type: none"> • Development of emergency response protocols and procedures for implementation in the event of a contaminant spill or leak and provision of spill response equipment • Storage of fuels, chemicals, wastes and other potentially environmentally hazardous substances in bunded or otherwise contained areas away from watercourses • Refuelling in areas away from watercourses • Regularly checking vehicles and equipment for oil leaks
M4.13	The design of the MIA, workers accommodation village, industrial precinct and airport will incorporate stormwater management infrastructure and mechanisms to manage runoff. Stormwater management mechanisms and monitoring requirements will be developed prior to any construction activities and incorporated in the Environmental Management Plan.
M4.14	Stormwater monitoring will include: <ul style="list-style-type: none"> • Regular checks of fuel, chemical and waste storage areas for leaks or improper storage • Regular checks, including checks prior to forecast rain events, of erosion and sediment control devices to make sure these are in good working order • Pre-rain checks of erosion and sediment control devices • Inspections of streams for scouring and sediment deposition • Ongoing water quality monitoring
M4.15	Non-remnant areas within the Study Area that are to remain unmined will be rehabilitated and managed (including monitoring) with the objective being to gradually achieve regrowth and remnant status to vegetation communities that are associated with similar land zones in the local landscape. This active management will occur to contribute to the maintenance of ecological values of the local landscape in which the Study Area occurs, though it is recognised that cleared lands are generally seeded with exotic pastures and restoration of a native ground cover may be difficult to achieve, or a very long term outcome. A component of active management will be the removal of cattle, or the implementation of ecologically sensitive grazing strategies.
M4.16	The ecological values within the buffer area surrounding the Carmichael River are to be enhanced through a revegetation and active vegetation and habitat management program. The program will focus on providing habitat for key threatened species, and on providing east-west connectivity. A monitoring program will be implemented to monitor success of the revegetation and enhancement program as well as presence and utilisation by fauna, including threatened fauna.
M4.17	The extent of vegetation clearing is to be restricted to the minimal amount necessary for mining operations. Areas that must not be cleared or damaged will be clearly identified on operation plans and in the field. Clearing extents are to be communicated to all necessary personnel involved.
M4.18	Unavoidable (staged) loss of vegetation will be offset in accordance with Commonwealth and Queensland policies, with the objective of maintaining, and where at all possible, enhancing local biodiversity values. Identification of offsets will seek to realise opportunities to enhance local and regional biodiversity values, for example, through the procurement and management of areas that contribute to corridors in the region. Furthermore, these areas will be identified with a view to achieving a 'no net loss' of local biodiversity values, in consideration of the types of vegetation that will be cleared, and the conservation status of those vegetation communities.
M4.19	Vegetation clearing for discrete phases of the Project operations will be undertaken in a manner that maximises the potential for fauna to disperse away from habitats within the clearing footprint, to adjacent areas, including onsite and offsite (offset) areas that are being actively managed for biodiversity outcomes. Vegetation clearing within the clearing footprint will be undertaken sequentially, in a manner that encourages animals



Proponent Commitment	
	to disperse towards adjacent habitats that will remain intact.
M4.20	The extent of vegetation clearing is to be restricted to the minimal amount necessary for the development of each applicable operational component of the Mine.
M4.21	The extent of vegetation clearing is to be clearly identified on construction plans and in the field. Areas that must not be cleared or damaged are to also be clearly identified on construction plans and in the field. Clearing extents are to be communicated to all necessary construction supervisors.
M4.22	Pre-clearance surveys will be undertaken in areas identified as potential habitat for threatened species, prior to commencement of clearing. In areas where these surveys indicate the presence of habitat features observed to (or with the potential to) provide habitat for these species, a fauna spotter catcher will be engaged to accompany clearing crews. Habitat features identified during the pre-clearance survey will be thoroughly checked by fauna spotter-catcher prior to clearing. Provision for the relocation of fauna will be made prior to the commencement of clearing.
M4.23	Impacts to the waxy cabbage palm will be managed and mitigated through: <ul style="list-style-type: none"> • The supplementary introduction of surface water to the channel near the upstream Mine Area boundary through controlled discharges • Intensive monitoring of riparian condition, base flows and groundwater levels • Removal of weeds and pest animals • Possible translocation of individual plants (if deemed viable), seed collection and planting programs • Research and monitoring to understand distributional range, water dependency requirements and threatening process triggers
M4.24	Flow and groundwater level monitoring, mapping and measurements of the perimeter of the main wetland areas and selected isolated mound springs to monitor changes to the springs.
M4.25	Ecological studies of aquatic invertebrates, blue devil, salt pipewort and stygofauna will be conducted in the springs with associated reporting of results.
M4.26	Pumping groundwater to the surface may act to offset the loss of some sections of the Mellaluka Spring wetland, and the proponent will install electric submersible pumps when drawdown commences for this purpose. Additional detail will be presented in the Draft GDE Management Plan.
M4.27	Adani will provide a Draft Groundwater Dependant Ecosystem (GDE) Management Plan for approval prior to the commencement of construction. This plan will address impacts to the following GDE's: <ul style="list-style-type: none"> • Doongmabulla Springs Complex • Mellaluka Springs Complex • Carmichael River , particularly the Waxy Cabbage Palm <p>The Plan will include the following:</p> <ul style="list-style-type: none"> • A management framework that aligns with the other project management plans • Clear statements regarding the intent, approval requirements, objectives and actions • Details of how the management plan will be applied across the project phases – pre construction / construction / operation / post operations, offset areas • Details of any proposed adaptive monitoring program to support the plan objectives. • Details of how experts will be used in a review capacity to inform ongoing monitoring and management • Incorporates all proposed management and mitigation measures, including reference to relevant State and Federal Guidelines of relevance to these GDE's. <p>Specific performance targets and how these will be measured and reported.</p>
M4.28	Detailed design of the Central MAW Dam North will take into account the location of

Proponent Commitment

	GBR WPA 1. Any loss of the GBR WPAs will require an offset. It is suggested that the wetlands contained on the Moray Downs property be rehabilitated to offset the GBR WPAs.
M4.29	Management actions will seek to maintain and where possible enhance black-throated finch habitats and populations (e.g. pest control, water source, grazing and fire management) in unmined parts of the Mine Area, as well as in offset areas.
M4.30	Black-throated finch surveys will continue so as to provide data on temporal and spatial variation of habitat use in the Mine Area and will contribute significant local data for incorporation into the Black-throated Finch Species Management Plan for the Mine Area, which will assist in refinement of species recovery actions and mitigation of impacts on the Mine Area.

2.3.5 Water Resources

Proponent Commitment

M5.1	Construction of a flood protection levee along either side of the Carmichael River designed to withstand with a 1,000 year ARI immunity.
M5.2	Construction of watercourse diversions around open cut pits to divert clean water from entering the site, maintain existing flows in waterways as practicable, and minimise disturbance to existing waterways. These diversions link existing sections of waterway to minimise changes to existing hydrology downstream of the mine site.
M5.3	Potential impacts on groundwater quality due to the discharge of potentially contaminated runoff will be prevented through the development and operation of a suitable surface water management system and associated management plan (SWMP). The overall aim of the system and plan would be to ensure that all water leaving the operational mine site is captured, treated and recycled (where possible).
M5.4	Prior to the commencement of construction activities, the status of each of the existing registered bores that could be significantly affected by the proposed Project (Mine) will be confirmed and a baseline assessment undertaken at each of the active bores in order to establish their pre-operational condition. Where operational registered bores are identified, which may be impacted by the development, then consideration would be given to incorporating them into the Project (Mine) monitoring network and/or installing observation bores in the area between the mine and the bores in order to identify the development of the mine cone of depression in the direction of the bores. Any monitoring of registered bores will be incorporated into the EMP.
M5.5	All pipelines will include flow meters and all pumps will be controlled remotely to ensure that permitted groundwater extraction volumes are not exceeded.
M5.6	Storage extension works will be undertaken offline from the existing storages to minimise the duration of lowered water levels. During initial fill of the storages, low flows will be released to ensure local flow conditions are maintained downstream.
M5.7	In the event that groundwater level and/or surface water flow impacts are identified post development, Adani will work with relevant parties to compensate the water balance for identified losses.
M5.8	Belyando River flood harvesting station will be constructed during non-flood periods to minimise impact to water quality. Belyando River Flood harvesting station will operate according to operating rules developed using the IQQM to limit impacts to downstream users.
M5.9	Prior to the commencement of construction activities the status of each of the existing registered bores that could be significantly affected by the proposed Project (Mine), including the bores installed close to the Mellaluka, Storie's and Lignum springs, should be confirmed and a baseline assessment undertaken at each of the active bores in order to establish their pre-operational condition.
M5.10	Where operational registered bores are identified, which may be impacted by the development, then consideration would be given to incorporating them into the Project (Mine) monitoring network and/or installing further observation bores in the



Proponent Commitment	
	area between the mine and the bores in order to identify the development of the mine cone of depression in the direction of the bores. This will be determined in consultation with landholders.
M5.11	Given the potential for a reduction in surface water flows in the Carmichael River, supported by numerical modelling, continued detailed monitoring of groundwater levels and flows in the Carmichael River corridor will be undertaken. In particular, further manual gauging will be undertaken at upstream and downstream level monitoring sites so that a reliable pre-development flow record can be developed for these gauges.
M5.12	Establishment and operation of a dedicated groundwater monitoring network around the perimeter of the proposed above ground tailings dam, comprising a minimum of four locations, prior to commencement of the operation of the dam.
M5.13	Leach testing of tailings generated from coal washing (or other processing activities) and materials proposed for disposal in the in pit and above ground tailings facilities prior to the start of mining, in order to identify any contaminants that might leach to groundwater. This will assist with the development and implementation of suitable treatment and, or, management measures in order to minimise impacts on groundwater quality from disposal.
M5.14	Location of in-pit and above ground facilities in the northern half and towards the eastern edge of the site and more than five kilometres from the Carmichael River (i.e. areas thought to be characterised by a relatively thick unsaturated zone and as far as possible from any Triassic-age GAB units).
M5.15	Post closure capping of in-pit and above ground tailings facilities.
M5.16	Treatment of spoil and tailings prior to disposal, if necessary, in order to minimise acid generation from any materials with AMD potential.
M5.17	As far as possible, the location and elevation of the diversion system will be designed to minimise areas where the drain invert is below the current water table. Where this cannot be achieved, due to practical or other constraints, then the impacts of the final design will be assessed by completing further numerical modelling work and implementing additional mitigation measures to further reduce potential impacts on groundwater resources.
M5.18	The water balance and proposed site water management infrastructure will undergo refinement during future design stages in order to adequately represent the mine development.
M5.19	If treated waste water is not reused onsite the water must be managed appropriately such as disposal via an irrigation system downwind of the mine site.
M5.20	Operational dam management solutions will be embedded as part of the mine water management plan and releases will be made when required to avoid uncontrolled overtopping during larger events. Regular inspection and servicing of all water management infrastructure will be part of the management strategy. Ongoing monitoring of the discharge water quality will be required to confirm the efficacy of the water management infrastructure. Monitoring requirements will form part of the receiving environment monitoring program and include sites upstream and downstream of the discharge point.
M5.21	Clean-out frequencies for the sediment dams will form part of the site EMP. Frequent clean-outs will reduce the risk of sediments being resuspended in the event of an overflow, thereby reducing the risk of high sediment loads being released to the environment.
M5.22	A warning threshold indicator will be established for flooding of operational areas. This threshold could be an agreed flow or water level in the Carmichael River or rainfall intensity at the nearest gauge. Should this threshold be reached, works onsite will cease and workers will be evacuated prior to flooding occurring. Works will not recommence until all relevant impact management infrastructure has been inspected and re-established to good working order.

Proponent Commitment	
M5.23	The design of the MAW dams will be based on the water balance assessment with sufficient capacity to manage MAW not reused in operational processes such as dust suppression (refer to SEIS Volume 4 Appendix K2 for details on preliminary dam sizing requirements). This will manage the potential for overtopping and uncontrolled releases from the MAW dams.
M5.24	Contaminants that have the potential to cause environmental harm will not be released to the environment except under environmental authority permit conditions.
M5.25	Regular inspection and servicing of all water management infrastructure. Ongoing monitoring of the receiving environment will be required to confirm the efficacy of the water management infrastructure. Monitoring requirements will form part of the Receiving Environment Monitoring Program.
M5.26	A hazard assessment for all dams on site will be required during future design stages. Note that for dams without an actual catchment, like the MAW transfer dams, allowing for the DSA will be a matter of increasing the storage depth.
M5.27	Runoff within the mine footprint will be managed via a number of management and engineering solutions including: <ul style="list-style-type: none"> • Development and maintenance of clean water diversion drains to be established along the western boundary of the lease, and separating clean inflows from dirty water areas • Management of clean water through sediment basins/traps prior to discharge • Management of dirty water from operations through capture in sediment ponds for reuse • Overflows of water from sediment ponds to nearest drainage line only to occur in accordance with environmental authority conditions • Sewage waste will be treated to Class A+ standard and preferentially recycled onsite. • Contaminants that have the potential to cause environmental harm will not be released to the environment except under environmental authority conditions. Waters to be released to the environment must comply with the contaminant release limits which will be identified in a Receiving Environment Monitoring Program • Identifying and implementing enhancement opportunities in newly created aquatic habitats that may arise as a result of subsidence.
M5.28	The design of the workers accommodation village, industrial precinct and airport will incorporate stormwater management infrastructure and mechanisms to manage runoff. This may include holding tanks and/or gross pollutant traps or other stormwater management techniques. Stormwater management mechanisms and monitoring requirements will be developed prior to any construction activities and incorporated in the Mine and Offsite Environmental Management Plans.
M5.29	Drinking water will comply with Australian Guidelines for Water Recycling - managing health and environmental risks (Phase 1) (2006) and (Phase 2) as released by the National Environmental Protection Council.
M5.30	New bores will be designed and built in accordance with the Minimum Construction Requirements for Water Bores in Australia, 3rd Edition (NWC, 2012) and the Minimum Standards for the Construction and Reconditioning of Water Bores that Intersect the Sediments of Artesian Basins in Queensland (DERM, 2010).
M5.31	At a time no later than 24 months after operations commencement, to conduct a transient model calibration as part of a predictive model review and update which includes a review of hydrogeological conceptualisation, model structure, including all boundary and recharge conditions. Consideration should be given to providing an additional layer of the model to represent the Colinlea Sandstone, below the D seam (potential source aquifer for M-springs and make-good)
M5.32	During wet season inundation, mine affected water will be moved between dams to minimise the risk of overflow. Controlled discharges will be undertaken in accordance with the Mine Environmental Authority.



2.3.6 Air Quality

Proponent Commitment

M6.1	In order to monitor background dust levels, a system of dust monitors will be installed upwind and downwind of the Project (Mine). Dust deposition gauges have already been established at several nearby homesteads to establish a background. This pre-mining network will be augmented by monitoring at sensitive receptors, predicted to receive dust levels close to or reaching the EPP Air objectives, at the workers accommodation village for example. Dust monitoring of PM10 may also be performed at any post-mining offsite sensitive receptors identified as being 'at risk'. By monitoring dust upwind of the Project (Mine), downwind of the Project (Mine) and at sensitive receptor locations, dust impacts can be quantified. The Carmichael AWS will record local wind conditions at the Project (Mine) that can be used to assess high-dust events. Management measures will be applied to mitigate emissions impacts wherever a criterion is shown to be exceeded.
M6.2	If off-site ambient dust levels are demonstrated to be significantly detrimental due to mining operations beyond the site boundary, additional options for reducing emissions will be investigated and implemented where required.

2.3.7 Greenhouse Gas Emissions

Proponent Commitment

M7.1	Adani is committed to managing its greenhouse gas emissions to reduce the impacts identified above on the surrounding environment and its people.
M7.2	Site offices and accommodation buildings will be designed and constructed in accordance with the Australian BCA requirements for insulation, building materials and energy efficiency and include energy efficient lighting, energy efficient appliances (4 star and above); and the use of solar/gas hot water systems.
M7.3	Site offices and accommodation will include water efficiency measures, water efficient appliances and fittings, rainwater harvesting and plumbing to toilets, grey water recycling and onsite reuse. Energy efficient pumps and equipment will also be utilised associated with water and wastewater treatment infrastructure.
M7.4	A comprehensive greenhouse gas emissions inventory will be developed prior to operation that provides greater detail on the operation emissions as an opportunity to identify areas for increased efficiency and hence, reduced greenhouse gas emissions.
M7.5	A fuel management strategy will be developed prior to operation commencing and incorporated in the EMP, which considers Project (Mine) planning, logistics, driver education and maintenance

2.3.8 Noise and Vibration

Proponent Commitment

M8.1	Monitor vibration levels during construction to prevent sustained vibration levels causing unacceptable loading.
M8.2	A complaint system will be implemented during construction of the Project (Mine).

2.3.9 Waste

Proponent Commitment

M9.1	A project procurement plan will outline requirements to avoid the purchase of excess materials: quantities of materials will be carefully managed during procurement to avoid ordering and delivery of excess materials which may be wasted.
M9.2	Prior to the commencement of construction, operation and decommissioning phases a Waste Management Plan (WMP) will be developed that will include waste management

Proponent Commitment

	measures controls, monitoring and other safeguards, in line with the relevant legislation and government waste reduction strategies. The plan will form one of the issue specific sub-plans as part of the EMPs.
M9.3	Cleared material will be mulched, chipped and stockpiled for rehabilitation and revegetation works on-site. Larger vegetation materials like hollow logs and hollow bearing trees will be reused in rehabilitation activities where possible or in adjoining bushland to provide habitat for fauna.
M9.4	All chemicals, fuels and oils will be stored in bunded areas in accordance with Australian Standards to minimise potential for any spills. Oily water generated at interceptors or in the event of a spill involving oil or diesel will be treated to separate oil from water. The separated water will be directed for evaporation or reused on-site for dust suppression. Spilled oil will be removed by a licensed vacuum truck contractor and disposed of at a licensed facility. Oil drums will be drained of all remaining product and stored on-site within a bunded facility for collection by a licensed contractor and recycler.
M9.5	Sewage and grey water will be treated on-site prior to disposal and site specific wastewater management plans will be developed and implemented to ensure compliance with effluent treatment and discharge requirements.
M9.6	Maintenance of vehicles, plant and machinery will be implemented to ensure efficient operation which will reduce unnecessary exhaust emissions.
M9.7	Any transfers of waste will take place in accordance with legislated docket tracking systems that ensure waste reaches the appropriate destination. Only licensed contractors and drivers will be utilised. Any transporters will be expected to meet legislative requirements for spill control and be equipped with emergency equipment.
M9.8	A designated waste management area will be constructed for waste sorting and waste storage prior to transport offsite. The waste management area will be a hardstand area and bunded or have a suitable containment system in place for the type of waste to be stored. The area will have appropriate drainage and leachate collection system in place to assist with the drainage and collection and storage of any potential leachate.
M9.9	Wastewater would be treated using package collection and treatment systems that comply with Queensland standards and regulations.
M9.10	Suitable precautions will be undertaken to prevent water contact with dispersive materials Soils, clays and weathered mudstone, claystone and siltstone which show a high potential for dispersion will be stored within the core of the overburden storage areas.
M9.11	A mine waste management plan will be developed and will clearly define mine waste validation sampling, analysis and reporting throughout the life of the mine.
M9.12	Mine tailings will undergo geochemical assessment as they become available.
M9.13	Potentially acid forming materials including tailings should be placed in clay lined encapsulation cells within overburden dumps and located at least 5 m below the dump surface. During dump and cell construction, contact between UC, PAF and dispersive materials should be avoided. In the short term, surface and percolate water would need to be managed.
M9.14	Design and operation of the tailings storage facilities in accordance with appropriate legislation to minimise impacts to surface and groundwater resources.
M9.15	Establishment and operation of a surface and groundwater monitoring network for the proposed tailings dams, and out of pit overburden storage areas.
M9.16	Leach testing of tailings generated from coal washing proposed for disposal in cells in out of pit storage emplacements at pits D and E prior to the commencement of mining, in order to supplement the findings of the SRK acid and metalliferous drainage report (refer SEIS Volume 4, Appendix O2). Due to the unavailability of tailings at the SEIS stage, coal was used as a tailings surrogate. This will assist with the development and implementation of suitable treatment and, or, management measures to minimise impacts on surface and/or groundwater quality from tailings disposal.
M9.17	Continuing with the geochemical kinetic leach column tests that commenced in May 2013 for a minimum of 6 months to assess the longer term risk of acid and metalliferous drainage generation from the higher risk lithological units.



Proponent Commitment

M9.18	Appropriately designed MAW dams at out of pit storage emplacements at pits D and E.
M9.19	Recycling of recoverable MAW from the tailings back into the CHPP.
M9.20	Disposal of tailings in engineered, clay lined containment cells within out of pit overburden storage areas D and E.
M9.21	Post closure capping and rehabilitation of the out of pit overburden storage facilities. Additional work being undertaken by Landloch in July 2013 will add knowledge to determining stable final landform slopes at the Project, and would be incorporated into the conceptual rehabilitation strategy.
M9.22	Engage with both waste transporters and waste disposal operators to ensure adequate waste capacity planning, particularly for waste streams such as concrete, metals and waste oils which are in relatively large volumes. Preferentially engage private waste specialists to ensure these wastes are managed and reprocessed by private industry rather than council facilities.
M9.23	Adani will work with relevant industry associations (such as the Australian Coal Association Research Program) to achieve continual improvement in tailings management outcomes.

2.3.10 Transport

Proponent Commitment

M10.1	Traffic management issues will be addressed through the preparation and implementation of a Construction Traffic Management Plan, which will be developed during the detailed design phase. The TMP will consider impacts on bus school routes and other relevant impacts and will propose management and mitigation procedures outlining emergency response times for emergency.
M10.2	Advance notice of road/lane closures and advice on alternative routes will be provided to local users.
M10.3	Logistics technology will be used to plan heavy vehicle movements and the loading of equipment on these vehicles to address the appropriate Queensland Police Service and Pilot support when delivering equipment.
M10.4	Traffic management will focus on vehicle crossings at major and minor road intersections, safety risks brought about by increased heavy vehicle traffic and movement of stock, lane closures and the use of single-lane access roads.
M10.5	Adani has made a commitment to install meteorological monitoring stations, and flow gauging stations on the key watercourses that would affect flooding in proximity to the Mine and Offsite Infrastructure.
M10.6	Adani will consult with DTMR, QPS and other proponents (where required) regarding the need for additional 'park up' rest areas and road signage. Relevant management and mitigation measures regarding fatigue management will be identified from consultation and will be incorporated into the revised traffic management plan for the Project (Rail).
M10.7	Adani will continue consultation with and undertaking agreements with IRC, QPS and DTMR in regards to impacts to road infrastructure on the local and SCR network.
M10.8	Adani is currently in discussions with IRC to draft an infrastructure agreement regarding the long term maintenance of impacted local roads.
M10.9	Upgrade the existing Carmichael – Elgin Road to become a sealed, single lane carriageway so as to provide a trafficable road under most rain event conditions and minimise the risk of closure.
M10.10	Upgrade the existing Carmichael – Elgin Road/Gregory Developmental Road intersection – as part of the upgrade works for the Carmichael – Elgin Road it is recommended that the existing intersection be upgraded to include protected right turn and left movements at this intersection.
M10.11	Signage at the Gregory Developmental Road/Kilcummin Downs Road – it is

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	recommended that during the course of the construction period (2014 and 2015), including the life of the Rail Camp 1, “Trucks Turning” signage be installed at the intersection so as to advise road users of the potential for heavy vehicles to be negotiating this intersection.
M10.12	Upgrade Kilcummin Downs Road/Rail Camp 1 Site access – it is recommended that the proposed site access location be upgraded to allow for a protected right turn into the site access.
M10.13	Signage located at the intersection of the Peak Downs Highway with the Gregory Developmental Road and also north of the proposed Disney Quarry along the Gregory Developmental Road to advise motorists of the construction activities along this road section.
M10.14	The Gregory Developmental Road and Peak Downs Highway are not approved for HML vehicles. Should these routes be required to be used by HML a separate application will be required for these routes. This will go through to DTMR for their review and is subject to their approval.
M10.15	A bus fleet will be required to support both the construction and operational phases of the Project. The buses will primarily transport the workforce to/from the Airport(s) (FIFO) and each work site.
M10.16	The Traffic Management Plan which will identify management and mitigation procedures in events where increased traffic on road cause delays for QFRS and other emergency services response.

2.3.11 Hazard and Risk

Proponent Commitment

M11.1	The Project will develop and implement water supply management plans to address water usage, treatment of the recycled water and compliance with the requirements of Queensland Water Recycling Guidelines.
M11.2	The Project will develop a fire management system (FMS) for the prevention, early detection and suppression of fires at their coal mines and accommodation village. A Fire Management Plan (FMP) will be developed during the detailed design phase with an approach to safety.
M11.3	All buildings, structures and fixed plants will be protected with a suitable water supply, water reticulation and hydrant system. For buildings and occupied facilities, a fire hose system or a fire hydrant system, and/or pump sets will be in compliance with the Building Code of Australia (BCA).
M11.4	The fire safety systems installed in a building will be any one or combination of the methods in a building to warn people of emergency, provide for safe evacuation, restrict the spread of fire and extinguish fire.
M11.5	Water storage tanks and their capacities will be in accordance Section 5 Water Storage of AS 2419.1, as applicable. Maintenance of onsite storages will be carried out during periods of least risk, e.g. nonproduction and kept to a minimum time frame.
M11.6	Fire protection pump sets will be installed in accordance with Australian Standard AS 2941-2008 Fixed fire protection installations - Pumpset systems. All fire extinguishers will be maintained in accordance with Australian Standard AS 1851-2005 Maintenance of Fire Protection Systems and Equipment.
M11.7	A fire station, fully equipped with fire truck and other fire fighting equipment will be constructed at the Mine. During the detailed design phase, the Project will consult the emergency services (including QFRS) to comply with their requirements.
M11.8	First aid equipment will be available with each Project related vehicle.
M11.9	A risk management plan (RMP) has been developed for the risks that have been identified through the PHA. Adani will implement management measures proposed in the hazard analysis as part of an overarching risk management plan.
M11.10	The Project will develop and implement a Health & Safety Management System (HSMS) for both the mine and offsite components for the mitigation of risk so far as is reasonably practicable (SFAIRP). The HSMSs will provide a systematic way to identify hazards and control risks while maintaining assurance that the risk controls



Proponent Commitment

	are effective, to provide a safe and healthy work environment to its employees, contractors and visitors
M11.11	Untreated sewage tanks and pipes will be monitored for leaks. Design, storage, pumping and transmission systems of untreated sewage tanks will be designed to Australian standards.
M11.12	Design and construction of diesel storage tanks will comply with AS 1692-2006 Steel tanks for flammable and combustible liquids. These tanks will be installed on impervious surfaces and fully bunded. The storages will comply with the requirements of AS 1940 – The storage and handling of flammable and combustible liquids.
M11.13	Emergency Services will be notified in the case of diesel spills on public roads
M11.14	DEHP will be notified of diesel spills as required under the Environmental Authority conditions.
M11.15	Oils will be stored in above ground tanks and will be fully bunded. Activities involving oils will be undertaken on a hard stand area, and drip trays will be provided during transfer operations. Controls and management procedures will be adopted for servicing of machinery.
M11.16	As part of the spill response plan, spillages will be prevented from entering drains or water courses and absorbent material will be placed on spillages which will be collected for disposal and any contaminated soil removed for treatment and disposal.
M11.17	A licenced contractor will be used for removal and disposal of spilled waste oil and clean-up material.
M11.18	Fatigue management strategies for drivers will be developed.
M11.19	Designated travel routes for heavy vehicles will be designed through townships.
M11.20	Tracks will be routinely inspected and maintained.
M11.21	Speed restrictions are to be followed at all times
M11.22	A central first aid room equipped with response facilities such as oxygen cylinder, defibrillators and basic medical supplies will be available to support incident response.
M11.23	Air quality at the nearby sensitive receptors will be monitored in accordance with the DEHP guidelines and Australian Standards and limit “trigger level” events. A register of complaints will be maintained with information on corrective actions.
M11.24	Zero tolerance for drug and alcohol use will be enforced.
M11.25	Road markings and signage will minimise impact and improve road safety.
M11.26	If installed, rainwater tanks will be maintained and include checks.
M11.27	Kitchen facilities at the construction camps will be provided in accordance with statutory requirement, which will be operated in compliance with food legislation by qualified contractors. Appropriate publications regarding personal hygiene will be provided. Operations will be undertaken in accordance with the QLD Food Act 2006.
M11.28	The Project will develop a fire and evacuation plan with adequate instructions to people concerning the action to be taken by them in the event of fire will be provided in a building as required under the <i>Fire and Rescue Service Act 1990</i> .
M11.29	The Project will establish and implement a Health & Safety Management System (HSMS) for the management of risk to a level that is as low as is reasonably practical.
M11.30	The Project will develop a fire management system (FMS) for the prevention, early detection and suppression of fires at their coal mines and accommodation village.
M11.31	A fire station, fully equipped with fire truck and other fire fighting equipment will be constructed at the mine site. During the detailed design phase, the Project will consult the emergency services (including QFRS) to comply with their requirements.
M11.32	Provision of adequate and safe access for fire fighting/other emergency vehicles and safe evacuation. Adani will work closely with QPS, DCS and other emergency service providers with regards to services and emergency responses.
M11.33	An Emergency Response Team will be established at the mine site to ensure trained

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	and equipped personnel are available in the event of an incident.
M11.34	Adani will prepare an Emergency Response Plan (ERP) for construction, operations and decommissioning phase.
M11.35	Adani will develop a Disaster Management Plan in consultation with emergency service providers, as required, prior to commencement of work onsite.
M11.36	Adani will develop a Mosquito/Biting Management Plan. The plan will be implemented prior to the start of Construction.
M11.37	<p>To manage potential impacts on emergency services Adani will engage in ongoing consultations with the regional service providers to further investigate and monitor resourcing requirements. This includes investigating vehicles and staff requirements, through liaising with QPS at a State and local level. This process will be supported through the formation of an Emergency Services Consultative Committee. Adani has further committed to:</p> <ul style="list-style-type: none"> • 1 x office • 2 x workstations • Access to a meeting room • 1 x vehicle • Accommodation at the village • Upgrade to existing communication towers for secure network. This would also accommodate other services such as QRFS and QAS.
M11.38	Adani will develop and implement all management plans/systems/strategies as per the management plans and systems hierarchy in the commitment register at the appropriate project stage.



3. Project management plans and strategies

3.1 Multiple site-based management plans and species management plans – Rail

Please refer to Volume 4 Appendix C3 of the SEIS for further details on:

- Material change of use applications for rail laydown areas
- Operational works applications for excavation and filling for the Rail corridor
- Updated application forms for Rail camps 1 to 3
- Vegetation reports for the Project (Rail) west rail line and laydown areas
- Waterway barrier works applications for the Project (Rail) west
- Vegetation reports for the Project (Rail) east rail line
- Species management plans for the Project (Rail)
- Watercourse determination review for the Project (Rail)

3.2 Offsite infrastructure site-based management plans

Please refer to Volume 4 Appendix C4 of the SEIS, which provides further details on the approvals applications and processes (including impacts assessments) for a Preliminary Approval Affecting a Local Planning Instrument for a Material Change of Use (s.242 of the *Sustainable Planning Act 2009*).

3.3 Quarry site-based management plans

Please refer to Volume 4 Appendix C5 of the SEIS for further information on the approvals applications and processes (including impacts assessments) for Material Change of Use applications for each quarry (including ERAs and vegetation clearing) and disturbance to threatened species habitat.

3.4 Social Impact Management Plan

Please refer to Volume 4 Appendix D2 of the SEIS, which details the Social Impact Management Plan, including the action plans, monitoring and reporting requirements, in addition to the stakeholder engagement strategy.

3.5 Offsets Strategy

Please refer to Volume 4 Appendix F of the SEIS, which documents the Environmental Offsets Strategy for the Project. The Environmental Offsets Strategy identifies the initial residual impacts on environmental values, the offset requirements under relevant Australian and Queensland Government policies and provides an overview of potential offset areas and delivery methods.

3.6 Mine Waste Management Strategy – Mine

Please refer to Volume 4 Appendix O2 of the SEIS for the Mine Waste Management Strategy. This document details the predicted waste volumes, the tailings management strategy, and the waste mitigation and management measures (including objectives).

3.7 Environmental Management Plan – Mine

Please refer to Volume 4 Appendix Q1 of the SEIS for the Environmental Management Plan – Mine which includes monitoring and management measures and commitments applicable to the construction, operation and decommissioning of this aspect of the project. The EMP includes commitments made during the EIS.

3.8 Environmental Management Plan – Offsite

Please refer to Volume 4 Appendix Q2 of the SEIS for the Environmental Management Plan – Offsite which includes monitoring and management measures and commitments applicable to the construction, operation and decommissioning of this aspect of the project. The EMP includes commitments made during the EIS.

3.9 Closure and Rehabilitation Strategy – Mine

Please refer to Volume 4 Appendix R1 of the SEIS for the Closure and Rehabilitation Strategy – Mine which includes monitoring and management measures and commitments.

3.10 Closure and Rehabilitation Strategy – Offsite

Please refer to Volume 4 Appendix R2 of the SEIS for the Closure and Rehabilitation Strategy – Offsite which includes monitoring and management measures and commitments.

3.11 Bushfire Management Plan – Rail

Please refer to Volume 4 Appendix S2 which details the Rail Safety – Bushfire Management Plan, and specifically prevention and mitigation measures, preparation objectives and the response and recovery strategies and processes.

3.12 Fauna Crossing Strategy – Rail

Please refer to Volume 4 Appendix U of the SEIS for the Fauna Crossing Strategy. This document provides further information on the potential impacts, mitigation and design considerations and commitments (including guidelines).

3.13 Emergency Management Plan – Rail

Please refer to Volume 4 Appendix V of the SEIS. This document details the objectives and commitments to rail safety standards, specifically for emergency procedures, plans and structures.

3.14 Environmental Management Plan – Rail

Please refer to Volume 4 Appendix W – the Carmichael Coal Mine and Rail Project Environmental Management Plan – Rail. This document has been developed to provide a comprehensive framework for environmental management goals and activities within the Project (Rail). This plan details the Environmental Management Framework for the Project (Rail), and the monitoring, reporting and reviewing requirements and processes. The Environmental Management Plan details the specific legislative framework, environmental values and



management processes (including potential impacts and prevention measures) of ecological values pertinent to:

- Surface water
- Groundwater
- General and hazardous waste management
- Flora and fauna management
- Emergency management and response

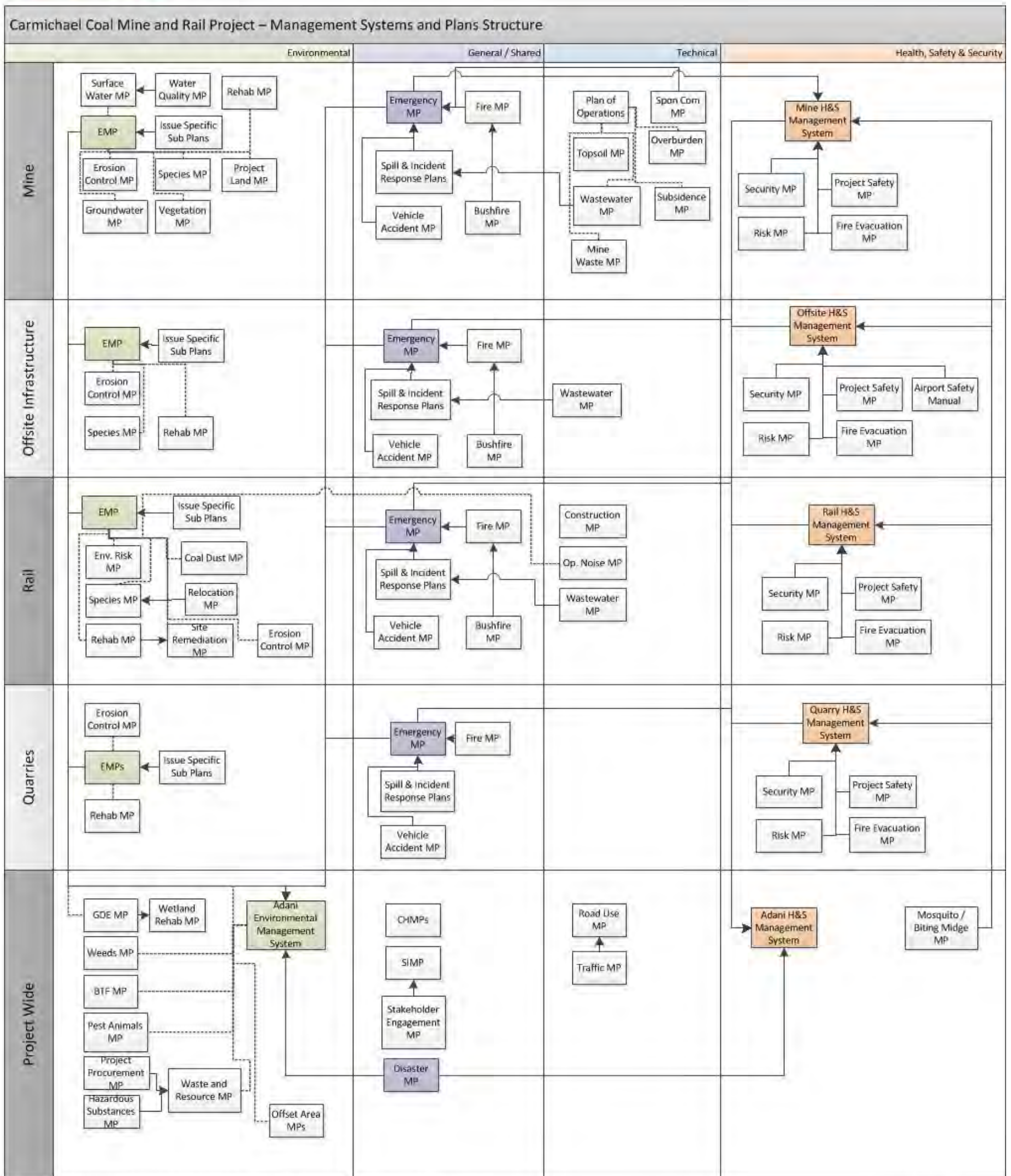
3.15 Closure and Rehabilitation Strategy – Rail

Please refer to Volume 4 Appendix X1 of the SEIS for the preliminary closure and rehabilitation management strategy for the Project (Rail). This strategy details the rehabilitation process, objectives and commitments for the Project (Rail). The document also provides further information on the completion criteria, monitoring and maintenance procedures for closure and rehabilitation.

3.16 Closure and Rehabilitation Strategy – Quarries

Please refer to Volume 4 Appendix X2 of the SEIS for the preliminary closure and rehabilitation management strategy for the Moray, North Creek, Disney, Borrow 7 and Back Creek South quarries. This strategy details the rehabilitation process, objectives and commitments for the Project. The document also provides further information on the completion criteria, monitoring and maintenance procedures for closure and rehabilitation.

3.17 Management Plans and Systems Hierarchy



Note, Solid lines represent directly related plans, dashed lines reflect related but stand alone plans.

March 2014

Appendix 8 Disturbance area maps

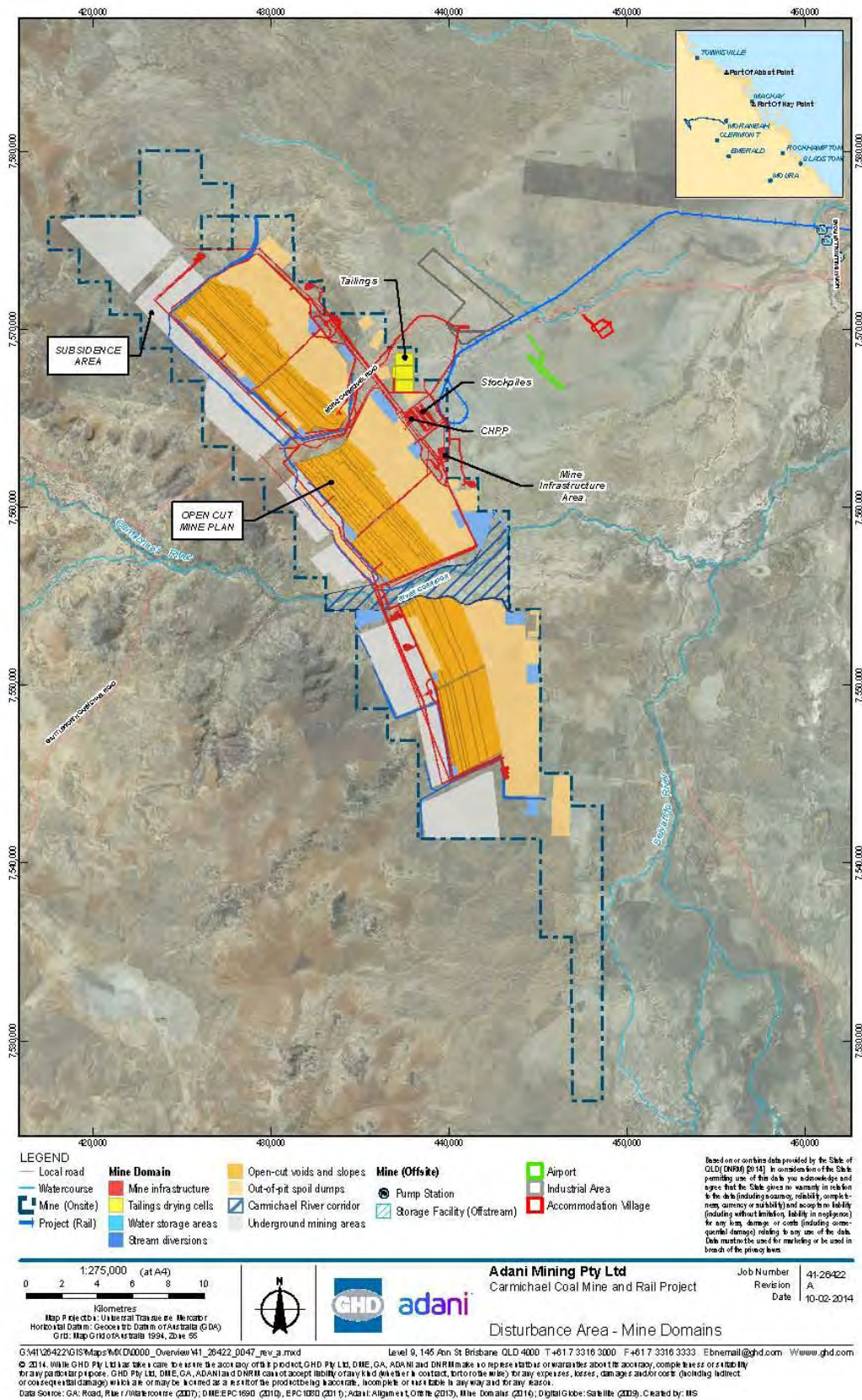


Figure 1—Mine disturbance areas

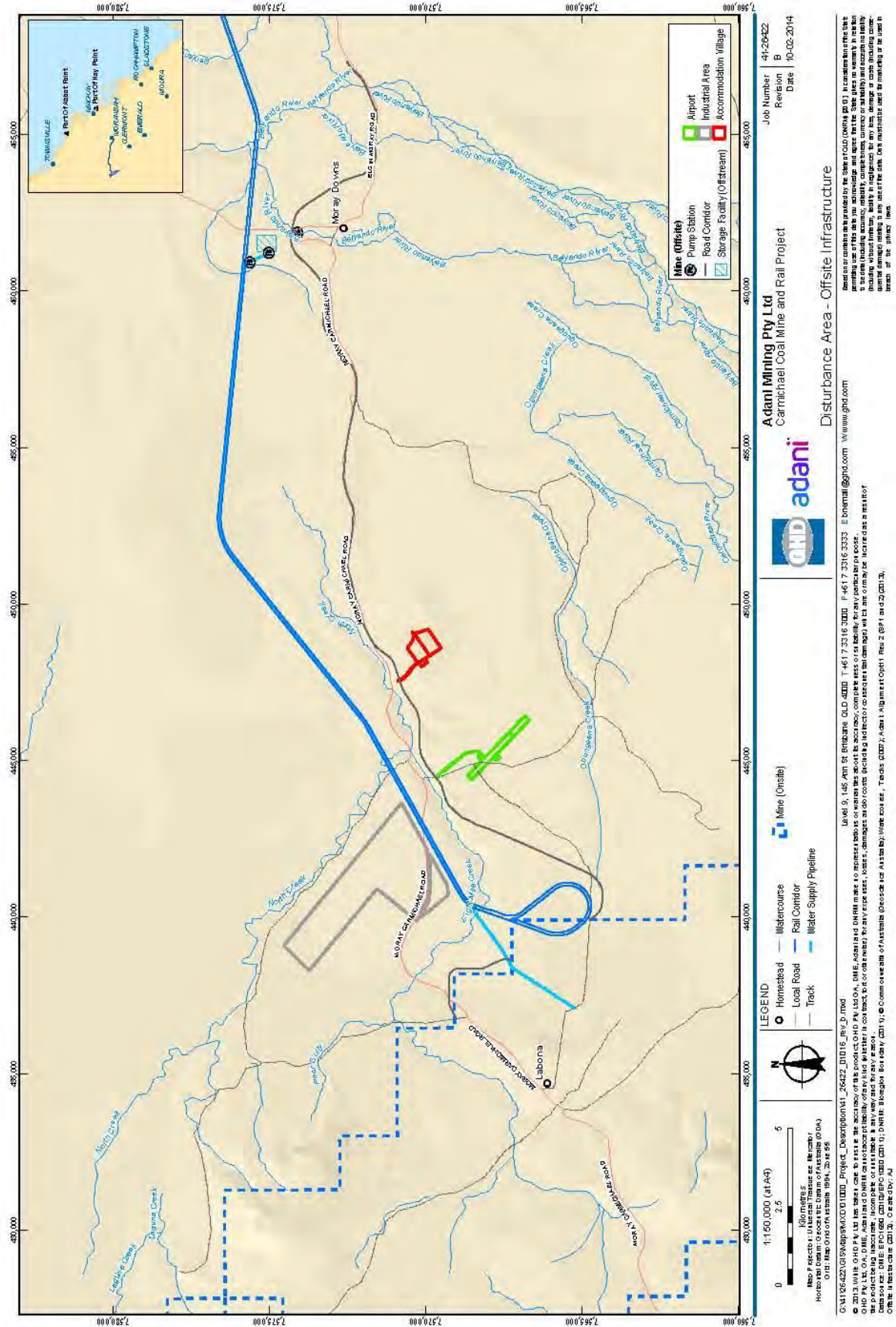


Figure 2—Off-lease infrastructure disturbance areas

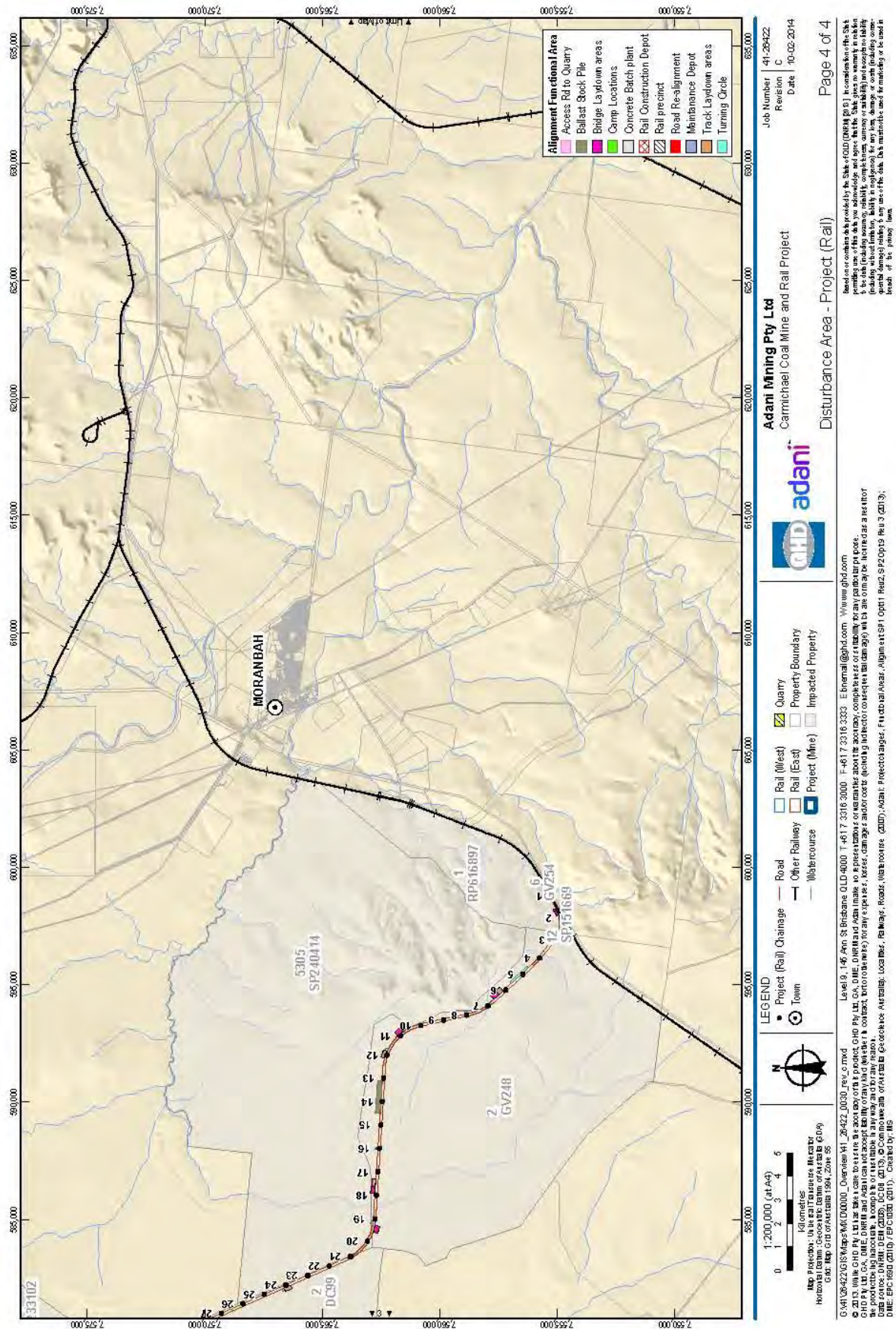


Figure 6—Rail disturbance areas (part 4)

Acronyms and abbreviations

Acronym	Definition
µg/m ³	microgram per cubic metre
ACH Act	<i>Aboriginal Cultural Heritage Act 2003</i>
Adani APT	Adani Abbot Point Terminal Pty Ltd
AEIS	additional information to the EIS
AHD	Australian Height Datum
ALCAM	Australian Level Crossing Assessment Model
AMD	acid metalliferous drainage
ARI	average recurrence interval
AR&R	Australian Rainfall and Runoff Manual
AS/NZS	Australian and New Zealand Standard
bcm	bank cubic metres
BIBO	bus-in-bus-out
BTF	Black-throated finch (southern) (<i>Poephila cincta cincta</i>)
BTMP	Black-throated Finch Management Plan
BTFRT	Black-throated Finch Recovery Team
CAMBA	China–Australia Migratory Bird Agreement
CASA	Civil Aviation Safety Authority
CDMP	Coal Dust Management Plan
CHMP	Cultural Heritage Management Plan
CHPP	coal handling and processing plant
CID	Community Infrastructure Designation
cm	centimetres
CMSH Act	<i>Coal Mining Safety and Health Act 1999</i>
COAG	Council of Australian Governments
CTRC	Charters Towers Regional Council
DAFF	Department of Agriculture, Fisheries and Forestry
DATSIMA	Department of Aboriginal and Torres Strait Islander and Multicultural Affairs
DCCSDS	Department of Communities, Child Safety and Disability Services
DCS	Department of Community Safety
DE	Department of the Environment
DEHP	Department of Environment and Heritage Protection
DERM	Department of Environment and Heritage Protection
DETE	Department of Education, Training and Employment
DEWS	Department of Energy and Water Supply
DHPW	Department of Housing and Public Works
DIDO	drive-in-drive-out
DNRM	Department of Natural Resources and Mines
DNPRSR	Department of National Parks, Recreation, Sport and Racing

Acronym	Definition
DSDIP	Department of State Development, Infrastructure and Planning
DTMR	Department of Transport and Main Roads
EA	Environmental Authority
EEO Act	<i>Energy Efficiency Opportunities Act 2006</i>
EIS	environmental impact statement
EMP	Environmental Management Plan
EMR	Environmental Management Register
EP Act	<i>Environmental Protection Act 1994</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPC	Exploration Permit for Coal
EPP (Air)	Environmental Protection (Air) Policy 2008
EPP (Noise)	Environmental Protection (Noise) Policy 2008
ERA	Environmentally Relevant Activity
ESCP	Erosion and Sediment Control Plan
EV	environmental values
EVNT	Endangered, Vulnerable and Near Threatened
FIFO	fly-in-fly-out
g/m ² /month	gram per square metre per month
GAB	Great Artesian Basin
GARID	Guidelines for Assessment of Road Impacts of Development
GBDS	Galilee Basin Development Strategy
GBOS	Galilee Basin Offset Strategy
GBR	Great Barrier Reef
GBRP	Galilee Basin Rail Policy
GBRMP	Great Barrier Reef Marine Park
GBRNHP	Great Barrier Reef National Heritage Place
GBRWHA	Great Barrier Reef World Heritage Area
GBSDA	Galilee Basin State Development Area
GDE	groundwater dependent ecosystem
GDEMP	Groundwater Dependent Ecosystem Management Plan
GHG	greenhouse gas
GHB	general head boundary
GL	gigalitres
GLC	ground-level particulate concentrations
GQAL	Good Quality Agricultural Land
GRP	gross regional product
ha	hectares
HSMS	Health and Safety Management System
HVR	High Value Regrowth
IAS	initial advice statement

Acronym	Definition
ICH	Indigenous cultural heritage
IESC	Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development
IIESC	Interim Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development
ILUA	Indigenous Land Use Agreement
IQQM	Integrated Quantity and Quality Hydraulic Models
IRC	Isaac Regional Council
ISO 31000	<i>AS/NZS ISO31000:2009 Risk management – Principles and guidelines</i>
JAMBA	Japan–Australia Migratory Bird Agreement
kL	kilolitres
km	kilometres
LAIP	Local Area Infrastructure Program
LGA	Local Government Area
LG Act	<i>Local Government Act 2009</i>
LP Act	<i>Land Protection (Pest and Stock Route Management) Act 2002</i>
m	metres
m ³ /day	cubic metres per day
m ³ /s	cubic metres per second
MAW	mine affected water
MCU	Material Change of Use
MDL	Mineral Development Lease
ML	megalitres
MLA	Mining Lease Application
mm	millimetres
MNES	Matters of national environmental significance
MSES	Matters of state environmental significance
MR Act	<i>Mineral Resources Act 1989</i>
MRC	Mackay Regional Council
mtpa	million tonnes per annum
MWAV	mine workers accommodation village
NAF	non-acid forming
NC Act	<i>Nature Conservation Act 1992</i>
NGBR	North Galilee Basin Rail project
NGER Act	<i>National Greenhouse and Energy Reporting Act 2008</i>
NGO	non-government organisation
NICH	non-Indigenous cultural heritage
NPA	National Partnership Agreement on Coal Seam Gas and Large Coal Mining Development
NGBP	North Queensland Bulk Ports Corporation
NT Act	<i>Native Title Act 1993</i>

Acronym	Definition
OUV	Outstanding Universal Value
pa	per annum
PAF	potentially acid forming
PM ₁₀	particulate matter with equivalent aerodynamic diameter less than 10µm
PM _{2.5}	particulate matter with equivalent aerodynamic diameter less than 2.5µm
PMAV	Property Map of Assessable Vegetation
PVMP	Property Vegetation Management Plan
PWHSMS	Project-wide Health and Safety Management System
PWPMP	Project Weed and Pest Management Plan
QFRS	Queensland Fire and Rescue Service
QH	Queensland Health
QPS	Queensland Police Service
QRC	Queensland Resources Council
QTT	Queensland Treasury and Trade
RE	Regional Ecosystem
RFB	Rural Fire Brigade
RHSMS	Rail Health and Safety Management System
RIA	road impact assessment
ROKAMBA	Republic of Korea–Australia Migratory Bird Agreement
ROM	run-of-mine
RMP	Road-use Management Plan
RTN	right to negotiate
RWBM	regional water balance model
SAG	Queensland Government Scientific Advisory Group
SCL	strategic cropping land
SCL Act	<i>Strategic Cropping Land Act 2011</i>
SCR	state-controlled roads
SDA	State Development Area
SDPWO Act	<i>State Development and Public Works Organisation Act 1971</i>
SDPWO Regulation	State Development and Public Works Organisation Regulation 2011
SEWPaC	Department of Sustainability, Environment, Water, Population and Communities
SIA	social impact assessment
SIMP	Social Impact Management Plan
SMP	Subsidence Management Plan
SP Act	<i>Sustainable Planning Act 2009</i>
STP	sewage treatment plant
TAP	Threat Abatement Plan
TEC	Threatened Ecological Community
TI Act	<i>Transport Infrastructure Act 1994</i>

Acronym	Definition
TIA	traffic impact assessment
TMP	Traffic Management Plan
TOR	terms of reference
tpa	tonnes per annum
TSP	total suspended particles
UGM	underground mine
VM Act	<i>Vegetation Management Act 1999</i>
WVP	vibrating wire piezometers
WHO	World Health Organisation
WHS Act	<i>Workplace Health and Safety Act 2011</i>
WMP	Waste Management Plan
WPA	Wetland Protection Areas
WQO	water quality objectives
WRC	Whitsunday Regional Council
WTWHA	Wet Tropics World Heritage Area

Glossary

Term	Definition
assessment manager	For an application for a development approval, means the assessment manager under the <i>Sustainable Planning Act 2009</i> (Qld).
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).
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 'significant projects'.
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.
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 effects	Defined in Schedule 2 of the SDPWO Act as the effects of development on the environment, whether beneficial or detrimental.
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).
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)	<p>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:</p> <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 • possible measures to mitigate adverse effects.
matters of national environmental significance (MNES)	<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"> a) world heritage properties b) national heritage places c) wetlands of international importance (listed under the Ramsar Convention) d) listed threatened species and ecological communities e) migratory species protected under international agreements f) Commonwealth marine areas g) the Great Barrier Reef Marine Park h) nuclear actions (including uranium mines).
properly made submission (for an EIS or a proposed change to a project)	<p>Defined under section 24 of the SDPWO Act as a submission that:</p> <ol 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.
proponent	<p>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.</p>
sensitive receptor	<p>A nuisance sensitive place. Includes:</p> <ul style="list-style-type: none"> • a dwelling (including residential allotment, mobile home or caravan park, other residential premises, motel, hotel or hostel) • a library, childcare centre, kindergarten, school, university or other educational institution • a medical centre, surgery or hospital • a protected area under the Nature Conservation Act 1992. • a public park or garden that is open to the public (whether or not on payment of money) for use other than for sport or organised entertainment • a workplace used as an office or for business or commercial purposes, which is not part of the project activity(ies) and does not include employees accommodation, grazing and farmland, unoccupied buildings or public roads

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'.
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> • 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.
works	<p>Defined under the SDPWO Act as the whole and every part of any work, project, service, utility, undertaking or function that:</p> <ul style="list-style-type: none"> f) the Crown, the Coordinator-General or other person or body who represents the Crown, or any local body is or may be authorised under any Act to undertake, or g) is or has been (before or after the date of commencement of this Act) undertaken by the Crown, the Coordinator-General or other person or body who represents the Crown, or any local body under any Act, or h) is included or is proposed to be included by the Coordinator-General as works in a program of works, or that is classified by the holder of the office of Coordinator-General as works.

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