

E. Executive Summary

E.1 Introduction

Adani Mining Pty Ltd (Adani) is the Proponent for the Carmichael Coal Mine and Rail Project (the Project). Adani is an Australian subsidiary of Adani Enterprises Limited, a company based in Ahmedabad, India. Adani established in Australia in mid-2010 with the intent of engaging in exploring for, mining, and exporting coal resources. This was the initiation of development of the Carmichael Coal Mine and Rail Project (the Project).

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Adani is proposing to develop a 60 million tonne (product) per annum (Mtpa) thermal coal mine in the north Galilee Basin approximately 160 kilometres (km) north-west of the town of Clermont, Central Queensland. All coal will be railed via a privately owned rail line connecting to the existing QR National rail infrastructure near Moranbah, and shipped through coal terminal facilities at the Port of Abbot Point and/or the Port of Hay Point (Dudgeon Point expansion). The Carmichael Coal Mine and Rail Project (the Project) will have an operating life of approximately 90 years.

The Project is comprised of two major components:

- The Project (Mine): a greenfield coal mine over EPC1690 and the eastern part of EPC1080, which includes both open cut and underground mining, on mine infrastructure and associated mine processing facilities (the Mine) and offsite infrastructure.
- The Project (Rail): a greenfield rail line connecting the Mine to the existing Goonyella rail system to provide for export of coal via the Port of Abbot Point and/or the Port of Hay Point (Dudgeon Point expansion).

Figure E-1 shows the Project location. Detailed descriptions of the Project are provided in Volume 1 Section 2 Description of the Project, Volume 2 Section 2 Project (Mine) and Volume 3 Section 2 Project (Rail).

The primary objective of the Project is to produce 60 Mtpa (product) of thermal coal product for export to meet demand for coal in India. India is one of the world's fasted growing economies is one of Australia's fastest growing export markets (accessed January 2012 http://export.business.vic.gov.au). Adani Enterprises Limited is the largest private power generation company in India and plays a critical role in the supply of power for India. Adani Enterprises Limited sees supply from Queensland coal resources as key to meeting its target of generating 20,000 MW of power from its power plants by 2020. If the Project does not proceed it would likely lead to Adani's demand for coal being met outside of Australia and the benefits of significant economic investment would not be realised.





The Project has been declared a 'significant project' under the *State Development and Public Works Organisation Act 1971* (SDPWO Act) and as such an Environmental Impact Statement (EIS) is required. The Project is also a 'controlled action' and requires assessment and approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Commonwealth Government has accredited the EIS process, to be conducted under the SDPWO Act, under a bilateral agreement between the Commonwealth and Queensland governments. This EIS has been prepared to meet the impact assessment requirements under both Commonwealth and Queensland legislation and before the Project can proceed, approval will be required from both the Coordinator-General and the Commonwealth Minister for the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC).

The Project EIS has been developed with the objective of identifying potential environmental, social and economic impacts of the Project and prescribe mitigation measures to avoid or mitigate such impacts. Since establishing in Australia, Adani has sought to deliver community benefit from its business involvement and is committed to environmental protection and sustainable management of its operations and activities.

E.2 Project Description

E.2.1 Project (Mine)

The Project (Mine) is comprised of the following main components:

- Mine and onsite infrastructure
- Offsite infrastructure

The Mine and onsite infrastructure includes the open cut and underground mines and supporting infrastructure within the boundary of EPC1690 and the eastern part of EPC1080. The Mine covers a total area of approximately 44,700 ha; 26,000 ha within EPC1690 and 18,700 ha within EPC1080, these areas will be subject to mining leases and approximately 1,820 ha for the offsite infrastructure.

The Carmichael Macro-conceptual Mining Study (Runge Limited, 2011) identified that a coal deposit underlies most of EPC1690. Further development of the mine design identified the need for out of pit waste dumps and supporting infrastructure requirements which cover the eastern part of EPC1080 included in the Project Area.

With a production rate peaking at 60 Mtpa (product), it is planned that the operational mine life will be approximately 90 years, which will extract most of the coal resources existing in the currently defined economic seams.

The Mine and onsite infrastructure includes:

- Open cut Mine (located within EPC1690)
- Underground Mine (northern, central and southern) (located within EPC1690)
- Mine Infrastructure Area (MIA), including the rail balloon loop (located within EPC1080)
- Out of pit waste dumps (mostly located within EPC1080)
- Mine water management dams (located within EPC1080)



The open cut mine has a projected capacity of 40 Mtpa (product) and will be located along the eastern side of EPC1690. The open cut mine will be predominantly truck shovel/excavator operation, supplemented by draglines and dozers for primary waste removal. A total of 16 open cut pits will be progressively mined. During the early stage of development of each pit, overburden will be transported to out of pit dumps on EPC1080, where it will be profiled and rehabilitated .

The underground mine will operate concurrently with the open cut pits, to provide for coal blending and ensure continuity of production. The underground mine comprises three independent underground longwall mines, producing up to approximately 20 Mtpa (product), commencing from drifts located down dip of the final high wall of the open cut mine. Each underground mine is serviced by above ground infrastructure.

The MIA and out of pit dumps are located within EPC1080. The need for the inclusion of EPC1080 was identified during mine planning, to avoid dumping of overburden over underground mining areas. All run of mine (ROM) coal will be transported by truck and/or overland conveyor to a centralised coal handling facility, where any high-ash (greater than 25 per cent ash) portion will be washed for blending with the bypass coal (un-washed coal). Coal will be stockpiled prior to loading to trains for transportation by rail.

The channel and riparian zone of the Carmichael River will be preserved with a one kilometre wide buffer where no activities will occur and the adjacent pits will be protected from flooding events by a levee.

Offsite infrastructure for the Project (Mine) is required for the successful construction and operation of the Mine. All Project (Mine) offsite infrastructure will be situated on the Moray Downs cattle station, Lot 662 on PH1491, to the east of the Mine site, this includes:

- Workers accommodation village and associated facilities
 - Heavy industrial area
 - Rail siding
- Permanent airport
- Offsite water supply infrastructure

The planned workers accommodation village will be located approximately 12 km east of the Mine and accessed via the Moray Carmichael Road. The village will have a capacity of up to 2,000 beds to accommodate construction and operational workforces for the Project (Mine). All supporting recreational, health and safety requirements for workers will be provided in the village.

The permanent airport is located between the Mine and workers accommodation village and will provide access for fly-in-fly-out workers.

E.2.2 Project (Rail)

The Project (Rail) has a track length of approximately 189 km. Rail infrastructure comprises below rail and above rail components. The Project (Rail) alignment is located within a nominal 95 m wide corridor that runs from the terminal facilities at the Mine eastwards to connect with the Watonga Blair Athol Branch Railway of the existing QR National Goonyella Coal Rail System (Goonyella rail system), south of Moranbah. The design response to key environmental features has been



developed in line with engineering constraints for a feasible Project (Rail) design. The Project (Rail) concept design is based on:

- Minimising environmental impacts
- Minimising disturbance to existing infrastructure
- Limiting fragmentation of land holdings
- Meeting engineering design criteria

The Project (Rail) concept design is sufficiently robust to allow for interfaces with existing and proposed rail systems. The Project (Rail) provides a greenfield west-east link between the Mine Site and existing or proposed rail systems linking to port facilities at Port of Hay Point (Dudgeon Point Coal Terminals) and Port of Abbot Point. The existing rail systems are the QR National owned and operated Goonyella rail system and the Newlands rail system.

The objectives of the Project (Rail) are to:

- Support the Project (Mine)
- Support co-use and co-location with existing and proposed developments and third party users and in accordance with Queensland Government policy regarding the provision on rail infrastructure within the Galilee Basin
- Enable haulage of up to 100 Mtpa product from the Mine and third party users in the Rail (West) rail infrastructure corridor
- Enable haulage of up to 60 Mtpa product on the Rail (East) infrastructure corridor

Below rail components include the following elements:

- Terminus facilities located within the mine infrastructure area (on the Mine site) and comprising:
 - A dual gauge reception line of 4.5 km length
 - Balloon loop loading line (18.7 km) when coal production reaches the order of 29 Mtpa and more than nine trains per day require loading, a second balloon loop will be required. The balloon loop accommodates a simultaneous operation of one train loading, one train held awaiting loading and one loaded train awaiting clearance prior to departure.
 - Weighbridge/overloaded removal device
 - Dual gauge 4.5 km length departure line
 - Bad order siding
 - A control room for the train loading operator
 - Dragging equipment detector
 - Overload detector instrument
 - Derailment detector
 - Telecommunication system
- Track which will total approximately 247 km (total track length) comprising both narrow and standard gauge along the length of the Project (Rail). This includes the mainline, passing loops, bad order sidings, loading balloon, etc. (excluding the maintenance yard)



- Passing loops: To provide for operational regimes with a capacity to haul up to 100 Mtpa a total of eight passing loops will be constructed.
- Proposed Maintenance facilities located near the Mine site comprising:
 - Traffic and workshop tracks
 - Locomotive provisioning for up to 18 consists
 - Locomotive and wagon workshops
 - Administration and train crew depot for up to 100 employees
- Holding yards for consists to be kept while not in operation. Based on conceptual track design when the target capacity of 60 Mtpa is reached, it is anticipated that train stowage will be required as follows:
 - Eight consist stowed on the Project (Rail) mainline
 - Three consist stowed at the Project (Rail) load-out balloon
 - Two stowed at the Project (Rail) maintenance facility
 - Five stowed at either, or between, Dudgeon Point and the Port of Abbot Point (which will influence loop design and future expansion)

Above rail components including the following elements:

- Rolling stock per train comprises three to four diesel electric locomotives (83 class) with 120 NH class wagons (bottom dump coal hopper, electronically controlled pneumatic brakes, Kwik-Drop door mechanism, coupled in packs of two). The number of trains operating within the rail system reflecting the production of coal from the Project (Mine) comprises:
 - Ten trains per day each way to transport up to 30 Mtpa product, consisting of three locomotives and 120 narrow gauge wagons
 - Twelve trains per day each way to transport up to 60 Mtpa product, consisting of four locomotives and 164 narrow gauge wagons
 - Eighteen trains per day each way, including standard gauge wagons, to transport up to 100 Mtpa product, to be sourced from the Project (Mine) and third party users

Trains are expected to run 24 hours per day, seven days per week throughout the year.

Signalling and communications consisting of a series of remote control signalling (RCS) systems utilising signalling equipment currently in use within Queensland.

E.3 Social Impact Assessment

As part of the Project EIS, Adani undertook a robust social impact assessment (SIA). The purpose of the SIA was to identify social benefits and impacts and their significance arising from the Projects activities. Impact identification, stakeholder engagement and expert advice assisted in developing the mitigation strategies. Community engagement for the SIA was integrated with the EIS consultation process. The SIA was undertaken in consultation with the Department of Economic Development and Innovation Social Impact Assessment Unit (DEEDI SIAU), Isaac Regional Council (IRC), Charters Towers Regional Council and service providers in the region. Information provided during land negotiations undertaken between Adani and landholders was used in lieu of case studies as the response rate for case study participation by affected landholders was low.



Adani has developed a number of management and mitigation measures and commitments in order to address both the positive and negative potential impacts of the Project. A high level summary is provided below. Further detail regarding management and mitigation measures is presented in Volume 1 Section 7 which provides a summary of the Social Impact Management Plan (SIMP).

Stakeholder input will be critical to the implementation of these measures which will be carefully developed in collaboration with relevant organisations, agencies and individuals. Some of these measures include:

- Recruitment and training programs that address skills shortages and sustainably maintain a reliable, skilled workforce, and address potential hurdles to traditionally under-represented groups joining the mining industry
- Development of a Local Industry Participation Plan 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
- Development of a Workforce Management Plan 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.
- Development of a Housing and Accommodation Strategy that provides a workers accommodation village and temporary construction camps for the construction and operational workforces and responds to housing and accommodation issues in local and regional communities
- Provision of medical, security and fire fighting services to minimise additional pressure on emergency services and proactive engagement with emergency services in relation to emergency response planning along with provision of information required to allow forward planning by emergency services.
- Entering into a road maintenance and management agreement with IRC for the upgrade and maintenance of local roads, along with agreements with the Department of Transport and Main Roads (DTMR) regarding state controlled roads and intersections.
- 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.

The various impact management initiatives detailed in the SIMP will be led by Adani in partnership and collaboration with various partners as outlined in the management strategies and the action plans. The SIMP will be reviewed on an annual basis, with a rolling life of 10 years. The annual reviews will be based on stakeholder engagement and feedback enabled through the various stakeholder engagement and reporting processes. To ensure that that Project is delivered in line with the commitments in the EIS, an overall Project Commitments Register will be developed and maintained.

E.4 Indigenous and Non-Indigenous Cultural Heritage

The Project affects four native title/Aboriginal party areas. During the course of 2011 and 2012, Adani engaged with each of the relevant groups and established the agreements with each party. Under the terms of the early works agreements and CHMPs, representatives of the Aboriginal parties have



been involved in providing cultural heritage clearances for early/investigative works within the Project Area. Cultural heritage surveys will be undertaken in line with the scope of the work program, particularly ongoing agreed practices regarding cultural heritage finds. This process will allow for practical project design responses, particularly avoidance, when modification to the concept design is practical.

A search of cultural heritage registers has not identified any areas of non-indigenous cultural heritage value within the Project Area. Two areas of national heritage significance are identified through searches of relevant databases. The Great Barrier Reef (also listed as a World Heritage Place) and the Tree of Knowledge. Both these places are in excess of 200 km from the Project Area. The Great Barrier Reef is downstream of the Project via the Belyando River and will not be impacted by the Project. Further details of the potential impact of the Project to the world heritage and national heritage values of the Great Barrier Reef are included in Volume 1 Section 11 Matters of National Environmental Significance Report. The Project will not impact the Tree of Knowledge.

The Project is not expected to impact matters of state heritage significance as such, no mitigation measures are proposed. Where items of archaeological importance are identified during construction or operation of the Project the procedures identified in the Queensland government publication *Onsite Procedures for Historical Archaeology* will be implemented.

E.5 Economics

An economic assessment of the Project on has been undertaken, measured through a range of economic indicators namely: Gross Regional Product (GRP); household income and employment. The capital investment for the life of the Mine is expected to total \$21.5 billion.

Construction of the Project (Mine) is expected to generate on average over the construction years \$78.2 million per annum in direct and indirect impacts on the Mackay regions GRP, a considerable proportion of which will be direct benefits such as purchase of local materials or services. For the State as a whole, impacts on average over the construction period are estimated to be \$203 million per year. The construction phase also provides considerable benefits to household income and employment. On average, construction will generate an additional 378 full time equivalent (fte) jobs per year within the Mackay region and 1,192 fte jobs for Queensland.

The operational phase of the Project (Mine) sees benefits that increase in line with production rates for coal. At the point of full production (60 Mtpa) total impacts on GRP, for that year, in the Mackay region reach an estimated total of \$3,795 million and at a State level \$4,170 million. Benefits to household incomes within the region will total \$372.2 million and State wide \$573.5 million. Employment levels locally will see an increase of 4,093 fte and State wide 6,789 fte.

Construction of the rail infrastructure is expected to generate on average over the construction years \$145 million per annum in direct and indirect impacts on the Mackay regions GRP. For the State as a whole, this is estimated to be \$229 million per year. The construction phase also presents considerable benefits in terms of household income and employment. On average construction will generate an additional 1,451 fte jobs within the Mackay region and 2,481 fte jobs for Queensland over the construction period. Benefits during the construction period will be felt most vigorously during years one and two.

The operational phase of the Project (Rail) sees impacts that increase in line with production rates of the Mine. At the point of full production (60 Mtpa) total impacts per year on GRP, for that year, in the



Mackay region reach an estimated total of \$176.6 million and at a State level \$274.1 million. Benefits to household incomes within the region will total \$107.2 million and State wide \$157.9 million. Employment levels locally will see an increase in fte of 1,215 and State wide 2,025.

The distribution of the impacts on the local and State economies are mostly positive, with further positive impacts felt nationally and internationally. In order to ensure the local and State economies reap the maximum possible benefit from development of the Project and to mitigate the potential adverse impacts on the region, policies and measures will be put in place to ensure these economies retain as many of the benefits as possible. Such measures include strategies for increasing local participation in regional and Queensland based industry as well as for encouraging the participation and up-skilling of disadvantaged groups.

E.6 Consultation

A consultation program has been implemented as an integral and ongoing part of the Project, the overall aim of which was to inform stakeholders and the broader community of the Project, actively seek their involvement in the EIS and report back on how this input was considered in the Project's outcomes. Stakeholders involved in the consultation process have included Commonwealth, State and Local Government representatives, potentially affected landowners, local business and residents, community interest groups, industry representatives, environmental and cultural heritage groups, media and surrounding communities. A Consultation Plan was developed and implemented for the EIS phase of the Project.

Plans for consultation as part of the Project's construction and operational phases will be included in the EMP and SIMP. Ongoing consultation will continue throughout the life of the Project to ensure due consideration of all project-related opportunities and concerns.

E.7 Cumulative Impacts

The Project is located within the Galilee Basin and as such is closely related to other projects currently under investigation or expected to commence investigations in the next five years. The following projects have been identified as having particular relevance in terms of cumulative impacts associated with project development or that offer the opportunity for co-location of infrastructure, and / or are a consequential development and provide necessary supporting infrastructure for the export of product coal.

The following projects are relevant in terms of cumulative impacts associated with project development and are currently under assessment and have been included in the cumulative assessment:

- Alpha Coal Project (EPBC 2008/4648, 2008/4647): Mine element
- Kevin's Corner (EPBC 2009/5033)
- Galilee Coal (Northern Export Facility) (EPBC 2009/4737): Mine element
- South Galilee Coal Project (EPBC 2010/5496)

Adani is also aware of the following proposals within the region; however insufficient information is available at the time of writing (November 2012) to enable inclusion in the cumulative assessment:



MacMines: development of two open cut and two underground mines with ultimate production and export of 30 Mtpa via a rail spur line linking into the proposed Project (Rail) corridor to export coal through the Port of Abbot Point.

The following projects are relevant as they offer the opportunity for co-location of infrastructure:

- Galilee Coal (Northern Export Facility) (EPBC 2009/4737): Rail element
- Alpha Coal Project (EPBC 2008/4648, 2008/4647): Rail element
- Goonyella to Abbot Point Rail Project (EPBC 2011/6082)
- QR National Central Queensland Integrated Rail Project (EPBC 2012/6321)

The following projects are relevant to consequential development as they provide necessary supporting infrastructure for the export of product coal:

- Abbot Point Terminal 0 Project (EPBC 2011/6194)
- Port of Hay Point (Dudgeon Point Expansion) (EPBC 2012/6240)

Using impact assessments within Volume 2 and Volume 3 of the Project EIS, a concise list of potential Project impacts has been developed in relation to related projects. The cumulative assessment defined to the spatial and temporal boundary for assessment and reviewed stated impacts from other projects and utilising a relevance factor and significance impacts were determined.

In summary the cumulative impacts having a low risk, include:

- Aquatic ecology
- Air quality
- Greenhouse gas emission
- Noise
- Waste
- Cultural Heritage (Non-Indigenous)

The cumulative impacts having a medium risk include:

- Land use
- Landscape character (Rail)
- Surface water
- Groundwater
- Traffic and transport
- Cultural heritage (Indigenous)
- Social and community
- Economics

The cumulative impacts having a high risk include:

Terrestrial ecology



Implementation of the proposed Project offsets (as described in Volume 1 Section 9) it is considered that the overall impact of the Project can be managed.

E.8 Draft Offset Strategy

A draft offset strategy has been developed to outline the initial strategy to offset unavoidable impacts to biodiversity values as a result of the Project. This strategy provides a review of the relevant State and Commonwealth government offset policies, summarises anticipated Project impacts to important biodiversity values, identifies the Projects offset requirements and outlines an action plan to identify offset options that may meet the Project offset requirements.

Three key Commonwealth and State Government offsets policies apply to the Project and include:

- The Commonwealth EPBC Act Environmental Offsets Policy (DSEWPaC, 2012) -applicable to Project (Mine) and Project (Rail)
- The Queensland Policy for Vegetation management Offsets (Version 3) (DERM, 2011a) applicable to Project (Rail)
- The Queensland Biodiversity Offsets Policy (QBOP) (Version 1) (DERM, 2011b) applicable to Project (Mine)

A number of potential direct and indirect impacts have been identified within the Project footprint under both Commonwealth and State offset policies and include the direct loss of protected vegetation communities, habitat for threatened species and resources as a result of vegetation clearing. The delivery of offsets must meet the specific offset requirements outlined in each environmental offset policy. In general there are two primary options for delivering offsets, these being either land-based offsets (direct or indirect) and/or offset payments.

There is scope for most of the offset obligations associated with impacts to Commonwealth and State environmental values to be met through the delivery of a combined offset approach that addresses impacts to environmental values protected under both areas of legislative jurisdiction. Offset options that nominate a complimentary approach will need to be negotiated with DSEWPaC and DEHP to ensure that these options satisfy the requirements of both Commonwealth and State offset policies.

To date preliminary assessment of potential offset areas has been undertaken utilising RE mapping to identify areas potentially suitable within the local and regional environment. An area totalling 79,935 ha on Moray Downs was assessed to determine its offset potential. It was determined that Moray Downs may meet a significant portion of offset requirements for Brigalow TEC, squatter pigeon (southern), black throated finch (southern), ornamental snake and yakka skink, RE 11.3.3, RE 11.4.5, RE 11.4.11, threshold RE 11.3.5, HVR, watercourse and wetland RE areas, and potential habitat for black-necked stork, cotton pygmy-goose and grey falcon (refer to Table 24 in Volume 4 Appendix AH Environmental Offset Strategy). Further ground truthing and species habitat factors and ecological equivalence will be necessary to confirm offset values.

A desktop assessment was conducted to determine the offset potential within the Brigalow Belt and Desert Uplands Bioregions. Due to the position of the Project (Mine) on the border of the Brigalow Belt and Desert Uplands, both regions were considered suitable targets for offset acquisition. Only the Brigalow Belt was considered for the Project (Rail).

For RE 10.7.4, listed as of concern under the VM Act, there are only 41 ha of potential offset areas available within the Desert Uplands Bioregion. Given the impact on this RE is estimated to be 88 ha,



field surveys will be undertaken to identify additional offset availability in the landscape. For eight values impacted by the mine it is likely that the delivery of direct offsets will require the securing of offsets across multiple lots to fulfil Queensland Government offset requirements. It was determined that sufficient potential existed in the Brigalow Belt bioregion to offset Project (Rail) impacts.

On approval of this draft strategy, an Environmental Offset Package will be developed to present the proposed solutions to fulfil the offset requirements of the project based on Queensland and Australian Government legislation and offset policies in place at the time that the package is prepared. The package is likely to include a combination of direct and indirect offsets, offset payments and offset transfers.

E.9 Matters of National Environmental Significance

The Project was determined to be a 'controlled action' and assessment against the EPBC Act has been undertaken. Assessment of the potential to affect matters of NES has been achieved by integrating knowledge from desktop and field surveys. This has enabled a description of the existing environment to be developed and confirm the presence and prevalence of any matters of NES within the Project Study Area. Where limited data exists potential habitat mapping has informed likelihood of species occurrence within the mine and rail Study Areas.

Potential impacts arising from construction and operational works may include:

- Loss of remnant vegetation in the form of REs, flora habitat and vegetation community extents
- Loss of habitat (roosting, shelter, foraging, breeding) for native fauna including conservation significant fauna
- Degradation of terrestrial and aquatic habitat adjacent to and downstream of cleared areas
- Landscape fragmentation, reduction in connectivity and reduced capacity for fauna dispersal
- Fauna mortality

How these may affect matters of NES of relevance to the Project has been assessed in detail. Potential impacts have been considered with regard to whether an important population of protected species occurs at the site and whether impacts may be significant or not. The significance of residual impacts, post-mitigation, was evaluated with consideration to the DSEWPaC significance criteria, which are provided in the *Matters of National Environmental Significance Significant impact guidelines 1.1.*

In considering impact to listed taxa and communities, assessment was also made to identify relevant matters for impact assessment in relation to the following:

- An important population for listed vulnerable threatened species
- Habitat critical to survival for listed threatened species
- Important habitat for migratory species

Mitigation measures to avoid/minimise/offset impacts to identified matters of NES resulting from the construction and operational activities associated with the Project have been proposed and offset commitments have been identified. Findings of the assessment are summarised against the controlling provisions for the Project.



World Heritage Properties, National Heritage Places and the Great Barrier Reef Marine Park

The DSEWPaC Projected Matters Search Tool did not identify any world heritage properties or National Heritage Places of relevance to the Project. The Wet Tropics World Heritage Area is located over 300 km north of the Study Area with no direct terrestrial, aquatic or biodiversity links to the Study Area. No influences from the Project are predicted to occur on the Wet Tropics World Heritage Area and this area has not been considered further within this assessment. The Tree of Knowledge and curtilage at Barcaldine is the closest National Heritage Place to the Study Area. It is located approximately 200 km south-west of the western extent of the Study Area. No direct or indirect influences on this Place will occur as a consequence of the Project and this Place has, therefore, not been considered further.

The Great Barrier Reef World Heritage Area and the Marine Park, are located over 300 km downstream of the Study Area and although connected aquatically via watercourses, substantial watercourse and overland barriers exist between the ocean and the Study Area, including the Burdekin River dam. Significant controls will be established to manage onsite and offsite water and sediment quality impacts. These measures will mitigate potential for offsite impacts to aquatic values that could affect the downstream reefal environment. The distance from the GBR and the extant barriers would impede site conditions from having an influence on the values for which the reef is protected. Accordingly no impacts to the ecological, cultural or social values which the Great Barrier Reef is recognised will occur as a result of the Project.

The Project will not impact upon any World Heritage Areas, National Heritage Places or the Great Barrier Reef Marine Park.

Wetlands – Ramsar

No areas of Ramsar wetland are predicted to be impacted by this Project. The closest Ramsar wetland is 380 km from the site, disconnected from the Study Area by substantial barriers. No areas of internationally important wetland will be lost, destroyed or substantially modified as a result of the Project nor will the hydrological regime of those distant wetlands be interfered with. Accordingly, no impacts to Ramsar wetlands are predicted to occur as a result of this Project.

Listed Threatened Species and Communities

Impacts to Brigalow threatened ecological community (TEC) will result from unavoidable vegetation clearing, however, large areas of these TEC are protected in the surrounding landscape and losses equate to less than 1 per cent of the subregional extent of each TEC. Losses are not expected to affect the ongoing prevalence or genetic diversity of these TEC within the subregion. Offsets will be proposed to address these losses in accordance with the relevant Commonwealth and State offset policies (refer Volume 1 Section 10 Draft Offsets Strategy).

Based on current knowledge assessment the Project will likely realise significant impacts to the Blackthroated finch (southern). Staged clearing will occur over the 90 year life of the Mine, thereby allowing for adaptive management to be implemented, underpinned by site-specific information about the ecology of the black-throated finch (southern). The onsite and offsite habitat management and research program to be implemented will be informed by the *National Recovery Plan for the Blackthroated Finch Southern Subspecies* (Black-throated Finch Recovery Team, 2007), and developed in consultation with the Black-throated Finch Recovery Team, and other relevant stakeholders (i.e. Commonwealth and State governments, natural resource management groups, landholders etc.).



Recovery actions to be incorporated into the Project Species Specific Management Plan (on and offsite) are described in Volume 1, Section 11 Matters of National Environmental Significance.

Operational works may realise groundwater draw down impacts to the Doongmabulla Springs, a regionally important Great Artesian Basin discharge spring ecosystem listed as a TEC under the EPBC Act. Predicted drawdowns at all springs in the Doongmabulla system are between 0.05 m and 0.12 m, less than 0.2 m throughout the operational period with the majority of predicted impacts lower than 0.05 m. The predicted drawdown potential at the Doongmabulla springs is not considered significant, being 60 per cent of the level considered to be potentially significant (0.2m) and will occur approximately 60 years into the life of the mine.

Listed Migratory Species

A desktop and field assessment was undertaken to identify EPBC Act listed migratory species that have the potential to occur within the Mine and Rail Study Areas. Three species, eastern great egret (*Ardea modesta*), rainbow bee-eater (*Merops ornatus*) and satin flycatcher (*Myiagra cyanoleuca*) were confirmed present within the Study Area. An additional 11 species are considered likely to occur while four species may occur.

It is recognised that, in spite of the recommended management and mitigation measures, and the active rehabilitation of disturbed areas that will occur through the Project's operational life, unavoidable loss of habitat for migratory species will occur.

The potential to realise a significant impact upon migratory species within the Study Area has been considered against criteria identified by DSEWPaC. Based on current knowledge the assessment identifies that the Project is not expected to have a significant impact upon any migratory species. This finding is on the basis that:

- The Project Area does not support an important population of any of these species
- The Project Area does not support an ecologically significant proportion of the population of a migratory species
- Mitigation and management measures are expected to manage the potential to directly or indirectly impact these species
- The species are well represented in landscapes that surround the Project Area, where suitable alternative habitat is prevalent and will persist
- The species are not considered to be dependent upon any habitat within the Project Area for any particular lifecycle stages.

As such, while large tracts of habitat suitable for these protected matters will be affected, alternative habitat suitable for these species exists adjacent to the Project Area and within the region. Accordingly the Project is not predicted to adversely impact migratory species.

E.10 Project Mine Studies

E.10.1 Climate, Natural Hazards and Climate Change

The Project (Mine) has the potential to increase the severity or frequency of natural hazards. Moreover, natural hazards may present a risk to the operation of the Project (Mine). Climate change predictions such as an increase in temperature, severe flooding, evaporation and wind speed



associated with cyclone, may exacerbate this relationship between the Project (Mine) and natural hazards. The management and mitigation measures employed through the construction, operational and decommissioning of the Project (Mine) adequately safeguard against risks associated with natural hazards and climate change

E.10.2 Land

With regard to scenic amenity, while the change in land use and resultant change in landscape character is described as a significant modification having a permanent impact, the sensitivity of receivers is low. It is expected that the Project (Mine) will result in the moderate illumination of the night sky, however, all of the receptors are of low sensitivity. It is predicted that night lighting impacts will be of minor significance.

The main impacts in relation to topography, geology and soils associated with the Project (Mine) will be in relation to the disturbance of land. Mining operations will allow for progressive rehabilitation over the 90 year life of the Mine. Pits will be remediated by pushing the highwalls to a geotechnically stable angle, and profiling the low wall to an erosionally stable slope that can be revegetated and rehabilitated in the same manner as the main body of the backfill. This will minimise the amount of land disturbed at any one time. Progressive rehabilitation of the Project Area will be undertaken, with the first round of rehabilitation planned to be undertaken from 2018. The final voids will be left in an internally draining condition, to minimise potential discharge of accumulating groundwater and surface precipitation. All rehabilitated landforms will be regraded to a safe and sustainable stable slope, spread with topsoil, seeded and maintained until a self-sustaining vegetative cover is established.

The underground mines may exhibit subsidence over the longwall areas, however, a range of design factors may act to modify the actual subsidence. An average of 7.5 m of subsidence at the surface over the shallow longwalls is predicted with the total subsidence decreasing with depth. The final arrangement of overlying panels and pillars will act to locally modify strata response and result in potentially lower values of vertical subsidence.

A review of the presence and potential for land contamination within the Project (Mine) Study Area has concluded no existing land contamination exist in the area: the study did not identify any lots registered on the CLR and EMR. The construction and operation of the Project (Mine) may increase human exposure to pre-existing contaminated land that may not be registered, or mobilise those contaminants into the water column and sediments, or into soil. However, it is intended that neither of the construction or operational phases of the Project will lead to land contamination requiring registration in the CLR. Any potential impacts can be managed effectively by implementing the appropriate mitigation measures.

The Project (Mine) will have a direct impact upon the current land use and tenure of the Project Area. A progressive shift from the current cattle grazing land use to a mining related land use will occur throughout the life time of the Project (Mine). These Project (Mine) impacts are unavoidable due to the location of the coal deposit. However, the Project Area will be decommissioned upon completion of the Project (Mine) life and will be rehabilitated progressively to a state consistent with the surrounding habitat.

The construction of the Project (Mine) will require closure of the stock route traversing the northern portion of the Project Area. However, no significant impacts are likely to be generated upon the use of the route if a stock route deviation is created outside of the Project Area. The stock route



traversing the south-western boundary of the Project Area is likely to be affected by subsidence as this area to be used for underground mining operations. This stock route will be realigned during underground mining operations and reintroduced once mining is complete, subsidence has occurred and the land surface is stable.

Road access to properties will be maintained at all time during operations. The Moray Carmichael Road will be re-aligned as required during operations but will remain open providing public access west of the Mine. Re-alignment of the road is not expected to impact road users. Existing public roads will be enhanced to cater for current traffic, and traffic generated by the Project (Mine). Public roads leading to, and running through, the Project (Mine) will be upgraded by Adani in accordance with agreements with IRC. No other existing infrastructure is located within or in the vicinity of the Project Area and as such no other impacts are likely to be generated.

E.10.3 Nature Conservation

The Project Area occurs in an agricultural landscape, where historic and current land use practices associated with cattle grazing have altered the extent, connectivity and ecological integrity of vegetation communities and the fauna habitat they provide. Furthermore, disturbances associated with introduced plant and animal species are a feature of this agricultural landscape. The Project Area itself comprises a mix of remnant vegetation, regrowth vegetation and cleared areas, with cattle grazing the primary land use. Remnant vegetation occurs over approximately 60 per cent of the Project Area.

The primary potential impacts of the Project (Mine) include:

- Vegetation clearing
- Direct disturbance of surface water courses and water bodies
- Degradation of downstream aquatic habitats as a result of sedimentation
- Fauna mortality during construction and operation
- Introduction of weeds and pest species
- Altered exposure of species to disturbance
- An alteration to the ground/surface water interaction in the vicinity of the Carmichael River

Approximately 24 ha of remnant vegetation and 1,921 ha of non-remnant vegetation is proposed to be cleared for construction of the MIA, and approximately 86 ha of remnant vegetation and 3,227 ha of non-remnant vegetation (including 9 ha of high value regrowth vegetation) is proposed to be cleared for construction of the offsite infrastructure.

The operation phase of the Mine is expected to result in the disturbance of approximately 12,586 ha of remnant vegetation. In addition to the area of remnant vegetation required to be disturbed, an additional 7,321 ha of non-remnant vegetation (approximate) will be cleared through the operation phase. In accordance with the proposed development of the coal resource, open cut mining and associated vegetation clearing will occur sequentially throughout the mining footprint over the life of the Mine. Due to the operational layout of the Mine, much of the western half of the Project Area will not be cleared. The parts of the Project Area where vegetation clearing is not proposed to occur contain both remnant (approximately 16,055 ha, 56 per cent of remnant vegetation within the mining



footprint) and non-remnant vegetation (approximately 6,824 ha). However, some of these areas not impacted by clearing may be subject to subsidence as a result of underground mining.

Potential impacts arising from vegetation clearing for mining operations include loss of TECs, loss of Category B Environmentally Sensitive Areas, loss of endangered, of concern and least concern regional ecosystem, loss of high value regrowth and the direct loss of 1,301 ha of remnant vegetation within the Bygana West Nature Refuge. Vegetation clearing also has the potential to result in habitat degradation of adjacent and downstream habitats.

The operation of the Project (Mine) has the potential to result in the loss of habitat for the following EPBC Act listed fauna species.

Black-throated finch

Unavoidable vegetation clearing and resultant habitat loss (pre-management and mitigation) is considered to constitute a significant impact on the black-throated finch (southern), as a result of the (staged) loss of 9,862 ha of potential habitat within identified 'important areas' for the subspecies within the mining footprint.

Squatter pigeon

The proposed mining footprint to be cleared over the life of Mine operations incorporates 12,391 ha of the 29,716 ha of identified as potential habitat for the squatter pigeon (southern). Based on the availability of similarly suitable habitat in the landscape surrounding the Project Area including grazing land characterised by open grassy woodlands, and the stable nature of the subspecies' population at present, it is not considered that the Project Area represents habitat critical to the survival of the (sub)species. Whilst local habitat availability will be reduced through staged mining operations, this loss is not considered to constitute a significant impact to an EPBC Act listed vulnerable species.

Koala

The proposed mining footprint to be cleared over the life of Mine operations incorporates 10,609 ha of the 21,801 ha of identified as potential habitat for the koala (based on field verified REs). Based on the low estimated density of koalas within the Brigalow Belt and the availability of similarly suitable habitat in the landscape surrounding the Project Area, it is not considered that the Project Area represents habitat critical to the survival of the species. Whilst local habitat availability will be reduced through staged mining operations, this loss is not considered to constitute a significant impact to an EPBC Act listed vulnerable species.

Yakka Skink

The mining footprint that is proposed to be cleared over the life of Mine operations incorporates 12,282 ha of the 27,027 ha of identified potential habitat for the yakka skink (based on field verified REs). Based on the fact that the species was not detected at the Project Area despite targeted surveys, and that similarly suitable habitat for the species is present in the landscape surrounding the Project Area, it is not considered that the Project Area represents habitat critical to the survival of the species for the yakka skink. Whilst local habitat availability will be reduced through staged mining operations, this loss is not considered to constitute a significant impact to an EPBC Act listed vulnerable species.



Ornamental Snake

The mining footprint that is proposed to be cleared over the life of Mine operations incorporates 1,368 ha of the 2,540 ha of identified potential habitat for the ornamental snake (based on field verified REs). Based on the fact that the species was not detected at the Project Area despite targeted surveys, and that similarly suitable habitat for the species is present in the landscape surrounding the Project Area, it is not considered that the Project Area represents habitat critical to the survival of the species for the ornamental snake. Whilst local habitat availability will be reduced through staged mining operations, this loss is not considered to constitute a significant impact to an EPBC Act listed vulnerable species.

• Red goshawk, Australian painted snipe

The regional extent of potentially suitable habitat for red goshawk, Australian painted snipe, that may occur at the Project Area based on the presence of suitable habitat and known distribution, will be reduced. Potentially suitable habitat for these species will still be present at the Project Area during the Mine's operation phase, and occurs in the surrounding landscape.

Migratory birds

Land clearing for the Project's operation phase will reduce the local availability of habitat resources for the three EPBC Act listed migratory birds confirmed present at the Project Area, as follows.

- Rainbow bee-eater progressive loss of approximately 19,917 ha of potential habitat
- Eastern great egret progressive loss of approximately 34 ha of potential habitat
- Satin flycatcher progressive loss of approximately 17 ha of potential habitat

The eastern great egret, rainbow bee-eater and satin flycatcher are widely distributed species. Habitat at the Project Area is likely to be used on a temporary to permanent basis by these species. As these species are widespread, and suitable habitat is likely to occur over much of the surrounding landscape, habitat at the Project Area for the eastern great egret, rainbow bee-eater and satin flycatcher is not considered to constitute 'important habitat' as defined in the Significant Impact Guidelines (DEWHA, 2009c).

Eleven EPBC Act listed migratory birds that were not recorded at the Project Area but are considered likely to occur, as determined through the likelihood of occurrence assessment, are similarly widespread and abundant, with suitable habitat widely available in the landscape in which the Project Area occurs. The localised (staged) loss of potentially suitable habitat is not considered to constitute a significant impact to these species.

- Common sandpiper progressive loss of approximately 17 ha of potential habitat
- Fork-tailed swift progressive disturbance to approximately 19,917 ha of potential habitat this species is predominantly aerial and thus habitat disturbance relates to overfly foraging habitat
- Curlew sandpiper progressive loss of approximately 17 ha of potential habitat
- Latham's snipe progressive loss of approximately 34 ha of potential habitat
- White-bellied sea-eagle progressive loss of approximately 34 ha of potential habitat
- White-throated needletail (likely to occur at Project Area) progressive disturbance to approximately 19,917 ha of potential habitat – this species is predominantly aerial and thus habitat disturbance relates to overfly foraging habitat



- Caspian tern progressive loss of approximately 17 ha of potential habitat
- Black-tailed godwit progressive loss of approximately 17 ha of potential habitat
- Glossy ibis progressive loss of approximately 17 ha of potential habitat
- Common greenshank progressive loss of approximately 17 ha of potential habitat
- Marsh sandpiper progressive loss of approximately 17 ha of potential habitat

The eleven migratory species that were not recorded at the Project Area but are considered likely to occur are similarly widespread and abundant, with suitable habitat widely available in the landscape in which the Project Area occurs. The localised (staged) loss of potentially suitable habitat is not considered to constitute a significant impact to these species.

NC Act Listed Fauna

The operation of the Project (Mine) has the potential to result in the loss of the following habitat for NC Act listed fauna species confirmed present at the Project Area.

- Little pied-bat progressive loss of approximately 12,562 ha of potential habitat
- Black-necked stork progressive loss of approximately 45 ha of potential habitat
- Cotton pygmy-goose progressive loss of approximately 45 ha of potential habitat
- Echidna progressive loss of approximately 12,586 ha of potential habitat
- The operation of the Project (Mine) has the potential to result in the loss of the following habitat for NC Act listed fauna species likely to occur at the Project Area, as determined through the likelihood of occurrence assessment.
 - Square-tailed kite (likely to occur at Project Area) progressive loss of approximately 10,609 ha of potential habitat
 - Black-chinned honeyeater (likely to occur at Project Area) progressive loss of approximately 10,609 ha of potential habitat

Impacts associated with a change in the relationship between surface and groundwater environments have the potential to reduce the availability of aquatic habitats during dry periods when rainfall does not provide volumes to sustain isolated pools in the Carmichael River.

The approach to mitigating and managing operation phase impacts will include a combination of prevention or reduction of all avoidable impacts to the greatest extent possible, active management to maintain and where possible enhance habitats that will not be impacted during staged operations, and active management of areas that will be disturbed during staged mining operations such that they retain their existing values until such time that they are disturbed. Research and monitoring will be a fundamental component of the impact management approach, with a dual objective of informing management of environmental impacts at and near the Project Area, as well as contributing to the understanding and protection of ecological values in the Galilee Basin.

As unavoidable impacts are an inherent aspect of this Project, given the location of its operations is dictated by the location of the coal resource within the mining lease, offsets will form a substantial component of the impact management approach. Whilst all reasonable efforts will be made to minimise impacts to flora and fauna values within the operation phase footprint, vegetation loss, fauna habitat loss and fauna mortality will occur. The overarching objective of managing impacts during the operation phase will be to maintain and where at all possible enhance the ecological values that



characterise the Project Area and the surrounding landscape, with a view to achieving no-net-loss of regional biodiversity values.

E.10.4 Water Resources

Hydrologic (rainfall-runoff) and hydraulic modelling was undertaken to determine existing and developed conditions. The Project (Mine) offsite water supply infrastructure is proposed to be located within the Belyando River catchment, which takes up approximately 70 per cent of the Belyando Suttor sub catchment. The catchment suffers significant water losses due to natural breakouts and periods of no flow. North Creek and Obungeena Creek systems run for less than 20 kms and end in natural breakouts. These systems and associated drainage lines are ephemeral and, when in flow, suffer significant transmission losses before joining Belyando River.

The Project (Mine) has the potential to impact on the surrounding water resources. Many of these potential impacts are insignificant as a result of the water management system which involves the development of a drain diversion system and levees that protect water quality and environmental flows downstream. Levees will run parallel to either side of the Carmichael River and extend to wrap around open cut pits and out-of-pit waste rock dump areas.

A conceptual groundwater model was developed to model the behaviour of the groundwater system and its interactions with surface water within the catchment. The conceptual groundwater 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. The groundwater flow model was used to predict:

- Groundwater inflows to the proposed open cut and underground mine workings for mine planning and water balance purposes;
- Groundwater level changes in the various hydrogeological units present within the area in response to dewatering of the proposed mine workings; and
- Potential baseflow impacts on local water courses.
- Impacts on local hydrological features of environmental or economic importance and which may be sensitive to groundwater level decline including:
 - The Carmichael River which bisects the site and other local watercourses;
 - A Great Artesian Basin spring system close to Doongmabulla around eight kilometres west of the lease area, which supports flow in the Carmichael River particularly during dry periods;
 - The two non-GAB springs which are mapped to the north of Mellaluka around 10 km south of the Study Area ;
 - The Clematis Sandstone which occurs at outcrop to the west of the site and as one of the main aquifers of the GAB forms an important regional aquifer;
 - 21 licensed extraction bores within the modelled area; and
 - A further 25 other registered bores which are within 10 km of the Study Area

Predicted drawdowns of greater than one metre are anticipated at five registered bores which may significantly impact ground water levels however, the significance of these predicted drawdowns will depend on a range of localised factors. A detailed assessment of individual bores will be carried out



prior to development and in consultation with landholders with the aim to maintain the existing water production rates and quality with augmentation and make good arrangements.

Predicted drawdowns at all springs in the Doongmabulla system are between 0.05 m and 0.12 m, less than 0.2 m throughout the operational period with the majority of predicted impacts lower than 0.05 m. The predicted drawdown potential at the Doongmabulla springs is not considered to be significant, being 60 per cent of the level considered to be potentially significant (0.2m) and will occur approximately 60 years into the life of the mine. Any reduction in the flow from the springs will also impact flows in the Carmichael River downstream. No significant impacts on flows in the various ephemeral minor creeks which drain the Project area are anticipated as these are not thought to currently receive substantial recharges from groundwater.

The potential impact of the groundwater regime may generally be mitigated through project design processes, however further monitoring is required.

E.10.5 Air Quality

An air quality impact assessment has been carried out according to the Project (Mine) ToR, using industry recognised emission calculation and dispersion modelling techniques, to predicted ground-level concentrations of important air pollutants associated with emissions from the Mine. The most important air pollutant associated with the Mine was found to be particulate matter generated through the disturbance, handling and transportation of crustal matter including coal and overburden. Particulate matter concentrations at sensitive receptors identified in areas surrounding the Mine have been assessed as TSP, PM₁₀, PM_{2.5} and deposited dust against the air quality objectives of the Environmental Protection (Air) Policy.

The assessment of impacts to humans at existing sensitive receptors found that, with the inclusion of background levels, there are no exceedences of the air quality objectives predicted at sensitive receptor locations for PM_{10} (24-hour average), $PM_{2.5}$ (24-hour average and annual average), TSP (annual average) and deposited dust (monthly average) during the start-up, full operations and maximum emissions scenarios. However results indicated that the PM_{10} (24-hour average) criterion is equalled at receptor 32 (Lignum) in the maximum emissions scenario and the $PM_{2.5}$ (annual average) criterion is equalled at receptor 6 (Doongmabulla) in the full operations scenario. The assessment of future sensitive receptors found that the industrial zone exceeded the PM_{10} (24-hour average) criterion in the start-up scenario. Both the industrial zone and airport terminal exceeded the $PM_{2.5}$ (24-hour average) criterion and PM_{10} (24-hour average) criterion in the full operations and maximum emissions scenarios. The PM_{2.5} (24-hour average) criterion in the start-up scenario. Both the industrial zone and airport terminal exceeded the $PM_{2.5}$ (24-hour average) criterion and PM_{10} (24-hour average) criterion in the full operations and maximum emissions scenarios. The $PM_{2.5}$ (annual average) criterion in the start-up scenario. Both the industrial zone and airport terminal exceeded the $PM_{2.5}$ (24-hour average) criterion and PM_{10} (24-hour average) criterion in the full operations and maximum emissions scenarios. The $PM_{2.5}$ (annual average) criterion, the TSP annual objective and the deposited dust objective were not exceeded at any future sensitive receptor in any scenario.

The assessment of impacts to flora and fauna found that the predicted levels of deposited dust were well below levels that may affect crop growth and livestock feed palatability.

Monitoring at this site will be undertaken during the commencement of operations to verify the model predictions. Management measures will be applied to mitigate emissions impacts wherever a criterion is shown to be exceeded.



E.10.6 Greenhouse Gas Emissions

The Project (Mine) has the potential to contribute to the greenhouse effect through emissions produced in the underground and open cut mining activities. The emissions for the Project (Mine) have been estimated to be:

- Approximately 2,286 kilotonnes CO₂-e per annum for Scope 1 and 2 emissions, with Scope 1 at 782 kilotonnes CO₂-e per annum and Scope 2 at 1,504 kilotonnes CO₂-e per annum, based on average annual emissions.
- Approximately 206 million tonnes CO₂-e for the 90 year life of the Project (Mine) (refer to Appendix A of Volume 4 Appendix T Greenhouse Gas Emissions Report for calculations)

Electricity usage has been identified as the largest emission source (66 per cent of total emissions), with diesel consumption as the next largest (30 per cent of total emissions).

The Draft EMP includes commitments aimed at avoiding and reducing greenhouse gas emissions, energy costs and energy consumption for the Project. A greenhouse gas emissions inventory has been developed; however, a more comprehensive inventory will be developed prior to construction that provides a greater level of detail on construction emissions. A number of GHG mitigation and management measures have been identified as part of the GHG assessment, while other measures are being considered by Adani for future implementation. Management of adverse impacts from the construction of the Project (Mine) has been addressed on the basis of the hierarchy of avoidance, mitigation and offsetting of adverse impacts.

E.10.7 Noise and Vibration

Baseline noise monitoring was conducted at two locations (A and B) in the vicinity of the proposed Project Area. Locations selected were considered representative of the acoustic environment for the nearest sensitive receptors to the Mine. While noise levels at monitoring Location A were generally higher due to the influence of birdlife and cattle, both locations were dominated by natural noise sources including insects and birds.

Construction noise during normal hours is not expected to cause adverse impacts at noise receptors. However, in order to reduce the risk of noise impact, it is recommended that the mitigation measures outlined above be taken into consideration during construction of all infrastructures associated with the Project (Mine). Results indicate that predicted construction noise levels outside of normal hours are expected to be well under the 55 dB(A) WHO criteria at all sensitive receptors. Nonetheless, it is recommended that particularly noisy activities such as pile driving, drilling or blasting are conducted during daytime hours to minimise the potential noise impact at sensitive receptors.

Operational noise modelling results indicate that predicted noised levels for year 2016, 2037 and 2103 are expected to be compliant with the most stringent night-time noise criteria at all assessed surrounding sensitive receptors under neutral and adverse weather conditions, except for receptor 4 (Lignum homestead). The highest predicted operational noise level is expected to occur at receptor 4 with 29 dB(A) during year 2067, causing a marginal exceedance of the most stringent night-time criteria. It is acknowledged that this exceedance is based on worst-case Project (Mine) operations.

Noise model results indicate the predicted low frequency noise levels are expected to be under the low frequency noise criteria of 50 dB(linear) at all assessed surrounding sensitive receptors. Given



the relatively low projected traffic volumes, traffic noise was predicted to be below the relevant DTMR criteria at the nearest sensitive receptor or monitoring location.

The proposed off-site infrastructure has been conservatively assessed and included in the operational noise models. Noise impacts associated with the proposed industrial precinct, rail siding and water pumping stations are not expected to cause adverse noise impacts at sensitive receivers.

Based on typical site constants, predicted airblast overpressure and ground vibration levels are expected to be under the criteria. However, overpressure levels at sensitive receptors 4 (Lignum) and 6 (Doongmabulla) are predicted to be within 2 to 3 dB of the 115 dB(L) criteria.

Based on available literature, it is concluded unlikely that potential noise associated with the Project (Mine) will adversely impact livestock and native fauna. As such, no specific management measures are required. Although Project (Mine) operations are generally not expected to cause adverse noise impacts, mitigation measures have been identified in the event that exceedance of the noise criteria occurs, or a complaint is received and validated.

E.10.8 Waste

General Waste Management

Waste will be generated during the construction, operation and decommissioning phases of the Project (Mine). The waste management hierarchy for the Project (Mine) follows a framework for prioritising waste management practices to achieve the best environmental outcomes possible. This waste management hierarchy follows a strategy of:

- Avoid unnecessary resource consumption
- Reduce waste generation and disposal
- Re-use waste resources without further manufacturing
- Recycle waste resources to make the same or different products
- Recover waste resources, including the recovery of energy
- Treat waste before disposal, including reducing the hazardous nature of waste
- Dispose of waste only if there is no viable alternative

The characterisation of waste streams for the Project (Mine) is based on its concept design during the construction and operational phases, and are generally defined as either construction or demolition waste, or commercial and industrial waste under the *Waste Reduction and Recycling Act 2011*

The waste management measures associated with waste streams is as follows:

- Vegetation clearing will be carefully undertaken and phased to minimise green waste production, and where possible cleared vegetation will be reused for rehabilitation and habitat
- Spoil will be reduced through the design of earthworks to maximise a balance of cut to fill, thereby minimising excess spoil. Where excess spoil is generated, it will be utilised within the Project (Mine) area as general fill, and fill for the construction of road and bund areas. Bund areas may include that required for water management and works required to protect the Carmichael River.



- Overburden will be managed through the implementation of a policy of in-pit disposal of overburden materials and/or use in rehabilitation, bund construction or other onsite management activities. Where in-pit disposal cannot be achieved out-of-pit disposal will be required.
- Domestic waste will be recycled or composted where possible, with as little waste going to land fill as possible.
- Commercial materials will be purchased through a considered procurement process, reducing excess material and associated waste. Materials such as paper, computer and printer waste and equipment will be recycled where possible.
- Plant and equipment waste will be recycled where possible, and stored and disposed of in accordance with regulatory requirements.
- Wastewater will be treated and reused where possible, or disposed of in accordance with regulatory requirements.

Mine Waste

There will be three key mine waste streams generated from the Project (Mine); being:

- Over / interburden from the open cut pits
- Coarse rejects from initial screening and the CHPP
- Fine tailings from the CHPP

Based on the available results the majority of the overburden and interburden materials (not immediately adjacent to the coal seams) and roof and floor wastes are not likely to be a source of acid immediately after mining. Nor would most of these materials be expected to be an immediate source of salinity; however, some portion could be a source of salinity. The clay materials of the overburden and interburden could have a markedly higher potential to release salts and metals to contact water even though the pH may remain alkaline. Typically however, the concentrations of metals in water contacting the waste would be expected to be low while waters remain circum-neutral.

While the majority of the overburden and interburden waste from all lithological groups is likely to be non-acid forming in the longer term, some clay, claystone, mudstone and sandstone components of the overburden and interburden may be acid forming in the long term and there may be a requirement to manage these materials to prevent or limit the longer-term development of acid mine drainage.

There was variability in dispersion results within each lithological group. The fresh rocks were typically non-dispersive, however, there was a very low potential for dispersion for some lithological groups. The clays, weathered mudstone, claystone, carbonaceous mudstone and siltstone generally may exhibit dispersive behaviour. Slightly weathered siltstone and fresh mudstones may show a very slight potential for dispersivity. The weathered sandstone did not show any indication of dispersive behaviour. 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.

Weathered rock (all lithological units), fresh siltstone and fresh sandstone showed potential for deterioration and breakdown after exposure to water. The fresh siltstone showed a moderate rate of deterioration, and the fresh sandstone showed slow deterioration. This may indicate that although the



fresh rock units are not dispersive, they are not durable, and with time may degrade to sand, silt or clay. The degraded material may be more prone to physical erosion than the original fresh rock.

In addition to the over and interburden, the coarse rejects and CHPP tailings can pose environmental risks if incorrectly managed. The risks are similar to those of the over and interburden, in that, should any potentially acid generating material be incorrectly managed, there remains the potential to adversely impact receiving water quality. This would be realised through lowered (acidic) pH values, and elevated sulphate (salinity) and metal concentrations.

A mineral waste management plan will be developed and will clearly define mine waste validation sampling, analysis and reporting throughout the life of the mine. To further define the geochemical risk of AMD and/or saline drainage, additional coal samples will be analysed from the late November 2012 sampling and assessment program. Additionally, mine tailings will undergo geochemical assessment as they become available.

E.10.9 Transport

Road access to the Mine will be via approximately 90 km of currently unsealed local roads off the Gregory Developmental Road. Adani has entered into an agreement with IRC regarding the long-term maintenance and development of the entire lengths of the Elgin Moray and the Moray Carmichael Roads, which run from the intersection of the Gregory Developmental Road westerly through the Mine to intersect with the Shuttleworth Carmichael Road. The roads will be upgraded in stages and maintained to a similar engineering standard as the Gregory Developmental Road.

Construction of the Project (Mine) is expected to occur over a period of approximately ten years between 2013 and 2022 (these date align with the schedule within the Macro Conceptual Plan). The volume and intensity of truck movements will vary over the construction period. The worst-case construction period was identified to occur during 2013 (year 1) and generate 25,000 trips or 68 daily trips on the external road network. The volume and intensity of the operation's vehicle movements would increase over the operation period, peaking three years after the target output production of the Mine is reached (60 Mtpa), which is planned to be by 2022. In 2025 the operation of the Mine is expected to generate approximately 52,000 trips on the external road network, which is equal to 142 daily trips.

The peak traffic generation occurs in 2025 which consists of traffic associated with the Mine operations only. The analysis of the road network during this period indicates that the expected increase in traffic associated with the both the construction and operation of the Mine can be adequately accommodated and does not impact the operating performance of the road network. However, the estimated traffic generated by the Mine operations will exceed the threshold of a five per cent increase in AADT along Flinders Highway and Gregory Developmental Road. Therefore, the assessment shows that the predicted increase in traffic does not meet the GARID criteria and that Adani will have discussions with DTMR to establish how this should be managed. However, it should be noted that the assessment is based on the worst-case scenario and would not impact on midblock level of service (LOS) performance of either road, which are expected to operate with LOS A (free, unrestricted flow). Adani will continue to liaise with DTMR regarding management and mitigation measures if this worst case scenario should eventuate.

The delivery of materials and equipment will be managed in order to minimise impact on the local community. Traffic management issues would be addressed through the preparation and



implementation of construction and operation Traffic Management Plans (TMPs), which will be developed during the detailed design phase. The TMPs would be developed in consultation with the relevant DTMR Regional offices, police and local authorities.

E.10.10 Hazard and Risk

The hazard and risk assessment for the Project (Mine) identified a range of hazards and risks that might occur during the construction, operation and decommissioning phases: Forty one potential hazard events were identified. A range of preventative and response measures were identified and assessed to mitigate the risks associated with the 41 hazard events from an uncontrolled scenario of 8 low, 18 medium and 15 high risks to a controlled scenario of 29 low, 9 medium and 3 high residual risks

A range of prevention and response measures have been identified and will be implemented accordingly. Dam failure for both MAW and sediment basins has been undertaken in accordance with DEHP guidelines. The MAW dams are identified as significant risk for failure and as such a 5 per cent annual exceedance probability has been added to the design, resolving the risk to an acceptable level.

The range of hazards and risks identified also impact on the health and safety of the Project (Mine) workforce and the general community. The implementation of workplace health and safety procedures and the mitigation measures identified will minimise the potential risks to acceptable levels. Based on the studies conducted, it is concluded that there are no hazards during normal operations which have offsite impacts from mine construction, operation or decommissioning. The proposed controls identified and outlined in this assessment adequately safeguard against risks associated with the Project (Mine).

E.11 Project Rail Studies

E.11.1 Climate, Natural Hazards and Climate Change

Climatic parameters such as an increase in temperate extremes, extreme precipitation/flooding, evaporation, wind speed and humidity all have the potential to impact on the Project (Rail) structures and processes. The construction and operation of rail bridge crossings over waterways is considered the most significant infrastructure likely to change the flow of waterways and overland flow paths, in particular the rise in flood levels (afflux). Preliminary modelling indicates that construction of rail bridges and/or culverts across water courses traversed by the Project (Rail) may impact on afflux levels.

The principal effect on the operating railway crossings is likely to be changes to the flows of waterways and overland flow paths, and particularly the rise in flood levels (afflux). Current hydrology and hydraulic modelling is being refined with base afflux limits being used as a basis for determining an acceptable afflux and to refine the assessment of potential impacts on infrastructure, landholdings and ecosystems. Through this process, more detailed management and mitigation measures can be developed and employed to adequately safeguard against risks.



E.11.2 Land

Landscape and visual impacts of the Project (Rail) range from moderate significance through minor significance to not significant for the ten viewing locations assessed. Potential sensitive receptors are at a distance of between 1.6 and 4 km from the Project (Rail) and many have a good screen of vegetation / topography in the direction of the view to the Project (Rail). Due to the nature of the Project (Rail) there will be a permanent impact on the visual landscape and amenity for some viewing locations within the Project (Rail) area.

The landscape and visual impacts of the Project (Rail) will occur both during the construction and operation phases and measures to minimise these impacts will be implemented. Lighting impacts during operations are negligible as the rail line will not be lit. Some lighting will be required at the maintenance facility. Construction lighting is restricted to the construction camps and security lighting.

The main potential impacts in relation to topography, geology and soils associated with the Project (Rail) include impacts to agricultural land and an increased risk of erosion in areas of construction and operation. The presence of problematic soils may also pose risks for successful rehabilitation. A Soil Survey Methodology will be developed for the Project (Rail) to better define and refine the presence of good quality agricultural land and strategic cropping land, the location of major soil types, the presence of aggressive soils, and appropriate topsoil stripping depths. An Erosion and Sediment Control Plan in accordance with the Best Practice Erosion and Sediment Control (IECA, 2008) guidelines will subsequently be developed.

A desktop land contamination study identified the potential impacts of contaminated land in the study area. The study did not identify any lots registered on the Contaminated Land Register (CLR). One lot is registered on the Environmental Management Register. It is intended that neither phase of the Project (Rail) will lead to land contamination requiring registration in the CLR. Any potential impacts can be managed effectively by implementing appropriate mitigation measures.

The extent of the land through which the Project (Rail) traverses is classified as production from relatively natural environments and is used predominantly for cattle grazing and fattening. The Project (Rail) traverses 16 leasehold lots and 10 freehold lots. It has been identified that the construction and operation of the Project (Rail) has potential to result in direct permanent changes to the land use in the Project Area. Potential impacts include:

- Fragmentation and intrusion of agricultural land
- Changes to overland water flow
- Clearing of remnant vegetation
- Reduction of water quality in waterways and water storages
- Increased traffic and damage of road infrastructure
- Disruption of stock movement through the stock route network
- Temporary raising or realignment of power lines
- Interference with water pipelines
- Restriction of access to mineral resources



Measures are devised to mitigate any potential impacts. Further mitigation will occur through the drafting of management plans. The Project (Rail) alignment has been the subject of multiple iterations based on feedback from landholders and other key stakeholders. Adani will continue to work with landowners, key stakeholders and state and local governments to minimise potential impacts on land use.

E.11.3 Nature Conservation

The Project (Rail) passes through a predominantly cleared and fragmented landscape, of which 1,502 ha is non-remnant vegetation and 366 ha is remnant vegetation. Within the remnant vegetation, a range of vegetation communities and habitat types exist including 18 regional ecosystems (REs) and two EPBC Act listed TECs.

One TEC is present within the rail corridor and associated infrastructure and temporary construction camp footprints based on the identified presence of its constituent REs. The Brigalow TEC to be cleared comprised a total area of 37.4 ha. The occurrence of the TEC throughout the construction footprint, Study Area and wider landscape is mapped.

No threatened flora species listed under the EPBC Act or the NC Act were recorded within the Study Area for the Project (Rail) during field surveys. Eight terrestrial fauna habitat types are defined across the Study Area, containing broadly similar habitat values in terms of structure, but providing varying value for wildlife based on their specific forage and shelter resources. Open cleared land was the most common and widespread fauna habitat type within the Study Area, typically providing a low diversity of suitable resources for fauna compared to the higher ecological value of remnant vegetation, which typically occurred in association with watercourses and creek lines.

Squatter pigeon (southern) was the only threatened bird listed under the EPBC Act recorded. The squatter pigeon (southern) is likely to be locally common within the Study Area, and the broader region, where suitable habitat is present. A further three EPBC Act listed threatened fauna are likely to occur at the Study Area, potential habitat for these species within the Study Area was identified and mapped.

Two common EPBC Act listed migratory bird species were recorded at the Study Area. In addition, two EPBC Act listed migratory bird species not recorded during field studies are considered likely to occur. However, habitats at the Study Area are not considered likely to support important assemblages of migratory species.

Aquatic habitats throughout the Study Area are categorised into five broad waterbody types that vary in size and geomorphology. No conservation significant aquatic species were recorded within these habitats, nor are any considered likely to occur.

In relation to EPBC listed fauna species, the Project (Rail) Study Area is not considered to support an important population or habitat critical to survival, therefore, it is not considered to constitute a 'significant impact' to any of these species.

Potential impacts to the identified terrestrial and aquatic ecological values throughout the construction and operation phases of the Project are summarised into the following categories;

- Clearing of vegetation
- Disturbances of watercourses and changes to surface water flows



- Increased anthropogenic activity leading to disturbance
- Introduction of weeds and feral pest species
- Barrier to movement

Clearing for the construction footprint will result in the loss of approximately 366 ha of remnant vegetation. Of this, 37.4 ha of the EPBC Act listed Brigalow TEC will potentially be lost.

To address these impacts mitigation measures are outlined, including avoidance of ecologically sensitive areas, the preparation of Management Plans, the design of fauna-friendly culverts and fish passageways to facilitate fauna and fish passage, on-going monitoring and offsetting to address loss of fauna habitat and vegetation where impacts cannot be adequately avoided or mitigated.

In consideration of the extensive areas of existing disturbance within the proposed rail corridor, the relatively localised nature of impacts associated with civil works, the management of these impacts through an integrated suite of actions, and with the provision of offsets, the overall impacts of the Project can be significantly reduced.

E.11.4 Water Resources

The Project (Rail) traverses the western most extremity of the Fitzroy River catchment (at its eastern extent) and across the broad, flat Suttor and Belyando River sub-catchments of the Burdekin River to its western extent at the Project (Mine).

The hydrological regime is characterised by a prolonged dry autumn, winter and spring with little or no flow and summers where large tropical rain systems and cyclones flood local creeks and rivers for weeks at a time across wide floodplains. Highly dispersive cracking clay soils in gilgai landscape absorb large amounts of rain before discharging highly turbid, sediment-charged runoff to the rivers and creeks. Ecologically, the waterways are described as slightly to moderately disturbed due to the loss of much riparian vegetation as a result of the surrounding land use.

Twelve major waterways and 76 minor waterways and overland flow paths are traversed by the Project (Rail). The major waterway crossings will comprise either a bridge or culvert or a combination of both depending on the predicted depth of the water. Crossings of the smaller waterways will also consist of either a bridge or culvert or a combination of both but will predominantly be culvert only.

Identified environmental values for the affected waterways include:

- Aquatic ecosystems
- Stock watering and farm use
- Other values (floodplain)

The main construction phase surface water effects on these values relate to the potential disturbance of watercourses for the crossings, which manifest as:

- Change and / or interruption to flows, particularly a rise in flood levels upstream of the railway (afflux)
- Degradation of water quality
- Barriers to movement of aquatic fauna



The main surface water environmental effects of the railway during the operating (permanent) phase on the environmental values derive from long term changes to surface water flows and include:

- Increased depth and extent of flooding
- Possibly longer inundation periods
- Possibly altered drainage patterns
- Scouring and geomorphological changes

Conceptual flood modelling presents results for three bridge length scenarios as a preliminary step based on concept level design. Individual crossing structures will require further modelling as detailed design for the Project (Rail) progresses to determine exact afflux impacts and limits can be determined.

Groundwater resources are likely to be most vulnerable to impact in the vicinity of major creeks/rivers and other areas characterised by relatively shallow depths to groundwater. Temporary construction dewatering may be required in such areas and both direct and indirect contamination and other impacts are more likely due to the lack of any significant saturated zone between the ground surface and water table.

Construction of new infrastructure such as culverts, cuttings, embankments and bridge structures has the potential to result in short-term, localised impacts on shallow groundwater, such as increases or decreases in groundwater levels. Such areas are likely to be limited to crossing points of the Belyando River and the Mistake, Logan and Diamond creeks. In general, no significant impacts on groundwater resources and groundwater quality are expected given:

- No long-term lowering of groundwater levels due to construction dewatering activities is anticipated.
- The majority of the Project (Rail) area does not contain well developed or extensive alluvial aquifers. Groundwater in the area is therefore not considered threatened or vulnerable as a resource.
- Outside of the main river corridors groundwater and surface water connectivity is thought to be limited.

Similarly, no significant long term impacts on groundwater resources and groundwater quality are anticipated during operation of the rail line given that:

- Only a small number of shallow cuttings are included in the preliminary rail design and hence no significant permanent lowering of groundwater levels due to drainage of cutting areas is anticipated.
- River crossing points will be designed such that compaction of alluvial sediments and upstream ponding of surface water flow is minimised.

E.11.5 Air Quality

The most important air pollutant associated with the Project (Rail), i.e. both diesel locomotive exhausts and fugitive coal dust released from loaded wagons, is particulate matter, which primarily consists of fugitive releases during the transportation of coal when no mitigation measures are applied. Particulate matter concentrations at sensitive receptors identified in areas surrounding the



rail line have been assessed as TSP, PM_{10} , $PM_{2.5}$ and deposited dust against the air quality objectives set out for the Project (Rail).

The assessment of impacts to humans found that the predicted change in air quality at sensitive receptor locations, the closest of which along the rail corridor is situated 1.6 km from the rail line, is negligible. For particulate matter, the ground-level concentration of PM_{10} is predicted to diminish rapidly with distance from the rail line and is predicted to meet the objective of 50 µg/m³ at the nearest sensitive receptors and moreover be compliant with the objective at approximately 200 m from the track centreline.

The assessment also found that the most important air pollutant emitted from the locomotives exhaust is NO_2 . However, the highest predicted incremental 1-hour average ground-level concentration of NO_2 at any Project (Rail) fence line, the closest of which is 40 m away to south side of the western railway section, is 58 per cent of the Air EPP objective of 250 µg/m³. Assuming that the background level of NO_2 is negligible due to the lack of emission sources in the region, the combined impacts are expected to be well below the Air EPP criteria.

While the air quality impact assessment found that air quality objectives would be met within close proximity of the rail line, measures to minimise particulate emissions from the construction and operation of the Project (Rail) have been identified and practicable measures to minimise dust emissions are incorporated into the Environmental Management Plan for the Project (Rail).

E.11.6 Greenhouse Gas Emissions

The Project (Rail) construction and operation will result in the generation of GHG emissions. The GHG emissions generated during the construction of the Project (Rail) will result from emissions generated during vegetation removal, wastewater treatment, transport, manufacturing and construction of building materials and energy usage. These GHG emissions will be relatively low, produced over a short time period and are therefore unlikely to contribute significantly to Queensland's overall GHG emissions.

The GHG emissions generated during the operation of the Project (Rail) will primarily arise from diesel usage.

The total Scope 1 emissions over the life of the Project (Rail) are estimated to be approximately 57,647 t/CO₂-e for:

- Construction at 311 kt/CO₂-e
- Operation at 57,335 kt/CO2-e

Management and mitigation of any potential impacts on the surrounding environment will be implemented through a hierarchy of avoidance, mitigation and offsets throughout the life of the Project (Rail). Through efficient and appropriate management of the Project (Rail) construction and operations, emissions can be reduced. Recognising opportunities to make significant energy consuming equipment more efficient, including the application of technical efficiencies in plant and equipment as and once available, would provide improved efficiency.



E.11.7 Noise and Vibration

With regard to potential noise and vibration impacts associated with the Project (Rail), construction activities such as impact piling are predicted to generate the highest sound pressure levels at distance. However, given the separation distance between, and temporary nature of, construction work and the nearest sensitive receptors it is unlikely that any adverse noise impacts will occur during construction works. Mitigation measures to minimise construction noise will be employed

Vibration levels produced by rail corridor construction activities are predicted to be well below the most stringent structural damage criteria of 3 mm/s at all identified receptors.

Given the distance to the nearest sensitive receptors, noise and vibration impacts from blasting are unlikely to occur under the majority of scenarios, under worst-case conditions it has been predicted that a marginal exceedance of the airblast overpressure criteria may occur at the nearest sensitive receptor when blasting is conducted at the closest point of the Project (Rail) to the receptor. Blasting mitigation measures have been recommended to assist in reducing the magnitude of the noise and vibration levels as well as the perception of vibration at sensitive locations. It is recommended that blast monitoring be considered to assess compliance and confirm the predictions and all residential receptors be informed when blasting is to be undertaken.

The assessment indicates that rail noise levels from the proposed corridor are expected to meet the 65 dB(A) $L_{Aeq,24hrs}$ and 87 dB(A) L_{max} noise targets at all identified sensitive receptors. Similarly, operational vibration targets will be readily met at all identified receptors.

E.11.8 Waste

Waste will be generated during the construction, operation and decommissioning phases of the Project (Rail). The waste management hierarchy for the Project (Rail) follows a framework for prioritising waste management practices to achieve the best environmental outcomes possible. This waste management hierarchy follows a strategy of:

- Avoid unnecessary resource consumption
- Reduce waste generation and disposal
- Re-use waste resources without further manufacturing
- Recycle waste resources to make the same or different products
- Recover waste resources, including the recovery of energy
- > Treat waste before disposal, including reducing the hazardous nature of waste
- Dispose of waste only if there is no viable alternative

The characterisation of waste streams for the Project (Rail) is based on its concept design during the construction and operational phases, and is generally defined as either construction or demolition waste, or commercial and industrial waste under the *Waste Reduction and Recycling Act 2011*. Similar waste material will be generated during both phases, however, in different quantities. After the application of the management measures proposed for the Project (Rail), it is unlikely that the waste generated during the construction and operational phases of the Project (Rail) will have a significant residual impact.



E.11.9 Transport

During the construction phase the worst case construction period was identified to generate approximately 50,910 vehicle trips per month (or 1,697 daily trips). This includes on road and off-road trips. The analysis of the road network during this period indicates that the expected increase in traffic associated with the construction of the Project (Rail) can be adequately accommodated and does not impact the operating performance of the road network. It is also recognised that this impact is short term and occurs within a two year construction period.

The delivery of materials and equipment are spread over the two year construction period and will be managed in order to minimise impact on the local community. Special consideration will be given to traffic levels on the eastern end of Peak Downs Highway during peak periods. Construction of level crossings and grade separated crossings will be planned and managed to minimise delays and will ensure that adequate warning is available to motorists.

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. Traffic management will address key safety and logistical issues that may arise from the construction of the Project (Rail).

A number of mitigating measures have been identified to ensure that transport and traffic impacts associated with the construction and operation of the Project (Rail) are minimised. These measures will be incorporated into traffic management plans for the Project (Rail). An important mitigation measure relating to construction traffic impacts is the implementation of a community information and awareness program. This program will be initiated prior to construction commencing and continue throughout the entire construction period to ensure that local residents are fully aware of construction activities, with particular regard to construction traffic issues. The awareness program will identify communication protocols for community feedback on issues relating to construction vehicle driver behaviour and construction-related matters.

E.11.10 Hazard and Risk

The hazard and risk assessment identified a total of 40 hazards which resulted in nine high risks, 23 medium risks and eight low risks in the absence of management and mitigation. After mitigation measures have been implemented, the residual risks arising comprise two high risks, seven medium and 31 low risks: Preventative and responsive measures have been identified.

Based on the studies conducted, it can be concluded that there are no hazards during normal operations which have offsite impacts from the proposed rail line, maintenance yard and other associated infrastructure. The proposed controls identified and outlined in this assessment adequately safeguard against risks associated with the Project (Rail).

There are potential risks to health and safety of the workforce and community from the Project (Rail). The implementation of workplace health and safety procedures and the mitigation measures identified will minimise the potential risks to acceptable levels.

E.12 Conclusion and Recommendations

The outcomes of specialist studies, community consultation and stakeholder engagement, along with regulatory requirements, codes and guidelines all form the framework which has determined Project



commitments made by Adani. These commitments range from broad social, economic cultural and economic commitments, through to measures required to protect environmental values specific to the Project site. They include further investigations, field work and monitoring required at various stages of the Project life. These documented commitments are a part of an ongoing strategy to meet EIS obligations.

The Draft Environmental Management Plans present a range of management and mitigation measures to be implemented during construction and operation of the Mine and Rail. Based on the findings of the EIS and assuming implementation of the Draft EMPs and Draft Offsets Strategy (see Volume 1 Section 9) it is considered that the Project can be undertaken without unacceptable social, environmental or cultural impacts. The Project also presents a range of opportunities and positive impacts to regional and State economies.

