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7 Terrestrial Ecology

This Chapter describes the existing environment for terrestrial ecology that may be affected by the revised Project and the measures required for the mitigation of these potential impacts. The revised Project requires mine development in areas adjacent to Lagoon Creek and the development of infrastructure as described in **Chapter 3**.

7.1 Purpose of the Terrestrial Ecology Assessment

The tasks and objectives of the terrestrial ecology assessment were as follows:

- describe the terrestrial flora and fauna species present or likely to be present, in the areas affected by the revised Project;
- describe any species of endangered, vulnerable and near-threatened (EVNT) terrestrial species;
- describe any threatened species or Threatened Ecological Communities (TECs) listed under the Commonwealth EPBC Act;
- describe any areas of vegetation and regional ecosystems listed under State legislation;
- describe any exotic and pest terrestrial organisms;
- describe the habitat requirements and the sensitivity of terrestrial species to changes arising from the revised Project;
- describe terrestrial habitat of the revised Project area;
- discuss the potential impacts of the revised Project on the terrestrial species and ecosystems and describe proposed mitigation actions; and
- outline strategies to avoid, minimise, mitigate and offset potential impacts of the revised Project on terrestrail flora and fauna values.

7.2 Legislation

Relevant Commonwealth and Queensland policies and legislation applicable to the management of ecological and biodiversity values for the revised Project are summarised below. In addition, a full list of legislation relevant to the revised Project is located in **Chapter 1** and further examined within the revised Project's Regulatory Approvals Plan located in **Appendix C**.

7.2.1 Commonwealth Legislation

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The EPBC Act prescribes the Commonwealth's role in environmental assessment, biodiversity conservation and the management of protected areas. Under the environmental provisions of the EPBC Act, actions that are likely to have a significant impact on a Matter of National Environmental Significance (NES) are identified as "controlled actions" and cannot be undertaken without approval under the EPBC Act.



On 23 April 2007, a referral was made to the then Australian Government Minister forEnvironment and Water Resources (the Federal Environment Minister) under the EPBC Act, for a project which, amongst other things, sought an expansion of the existing coal mine into new areas and an increase in production to 10 Mtpa (the Project).

On 24 April 2007 an application was made under the *State Development and Public Works Organisation Act 1971* (SDPWO Act) to the Coordinator-General to declare the project to be a "significant project", now known as a "coordinated project", with the assumption that the Project met the criteria set down in the SDPWO Act. On 18 May 2007, the Project was declared to be a "significant project" for which an Environmental Impact Statement (EIS) was required.

On 24 May 2007, the Federal Environment Minister, determined that the Project was a controlled action due to the likelihood of significant impacts on listed threatened species and communities (sections 18 and 18A), and that the action would be assessed by an EIS undertaken through the bilateral assessment process (referral number EPBC 2007/3423).

On 25 May 2007 a Mining Lease application (MLA) 50232 was lodged together with an amendment to the Environmental Authority to include the Project.

The Final Terms of Reference (ToR) were published on 24 October 2007 and in November 2009, NAC submitted an EIS for the Project. The EIS for the Project was released for public consultation between 14 November 2009 and 3 February 2010. However, in response to feedback from both the public and government, before the EIS was assessed by the Coordinator-General, NAC sought to revise the Project.

The revised Project includes:

- a reduction in the active area to be mined within MLA 50232, from 5,069 hectares to 3,163 ha.
 The Revised Project proposes mining in three pits (down from four), namely Manning Vale West, Manning Vale East and Willeroo mining pits.
- a reduction in Product coal from 10 Mtpa to 7.5 Mtpa;
- the establishment of a buffer zone around Acland; and
- a commitment to not divert Lagoon Creek.

Two variations to referral EPBC 2007/3423 were lodged, one during late 2008 and one in November 2012, with the latter variation lodged to reflect the revised Project summarised above, and detailed in Chapter 3. The Federal Environment Minister accepted these project variations respectively on 11 December 2008 and on 9 November 2012.

On 14 November 2012 the State government confirmed that, due to modifications to the original project, including reductions to its scope, the EIS process would restart at the draft terms of reference (ToR) for EIS stage. New ToR for the revised Project, were released by the Coordinator-General on 22 March 2013.

A stand alone MNES report has been preapred for the revised Project in Appendix H.



Independent Expert Scientific Committee

On 13 March 2013, an amendment to the EPBC Act (the Water Trigger) was introduced into Federal Parliament to enable water resources to become a matter of national environmental significance in relation to coal seam gas and large coal mining development. The Water Trigger amendment was passed in June 2013 and is now in force, providing the Minister with the power to consider and impose conditions directly relating to impacts on a water resource itself.

The final Terms of Reference (ToR) for the revised Project were issued March 2013, prior to the Water Trigger EPBC Act amendment. The revised Project's ToR includes the requirement to provide a stand-alone document on the revised Project's potential impacts on water resources. This stand-alone document has been prepared having regard to the Independent Expert Scientific Committee Information Guidelines for Proposals Relating to the Development of Coal Seal Gas and Large Coal Mines where there is a Significant Impact on Water Resources. The information contained within this document is largely drawn from the revised Project's EIS, with additional information to meet the IESC's Information Guidelines as required. The IESC report is in **Appendix H**.

7.2.2 State Legislation

The Queensland legislation that is relevant to terrestrial ecology aspects of the revised Project are the:

- Nature Conservation Act 1992;
- Land Protection (Stock and Pest Route Management) Act 2002;
- Vegetation Management Act 1999; and
- Environmental Protection Act 1994

Nature Conservation Act 1992

The NC Act provides for the conservation and management of Queensland's native animal and plants. The NC Act prohibits the taking or destruction, without authorisation, of certain listed flora and fauna species.

The *Nature Conservation (Wildlife) Regulation 2006* (NCWR) lists the plants and animals considered presumed extinct, endangered, vulnerable, rare, common, international and prohibited. It states the declared management intent and the principles to be observed in any taking of or destruction for each group.

The *Nature Conservation (Koala) Conservation Plan 2006* (the 'Koala Plan') provides for the conservation of Koala (*Phascolarctos cinereus*) in Queensland and includes provisions for the assessment and management of Koalas during the development approval processes and implementation of projects. Differentiated levels of provisions apply to the three different Koala areas that have been delineated across Queensland. The revised Project is situated in Koala District C. Koala District C is the described in Schedule 1, Section 3 of the Koala Plan' which comprises 77 local government authorities where Koalas are found. Although there is evidence of decline in this district, Koalas are classified as 'least concern' wildlife under the NC Act in this area due to a generally lower perceived threat to their survival (EPA & QPWS 2006).



Land Protection (Stock and Pest Route Management) Act 2002

The Land Protection (Stock and Pest Route Management) Act 2002 and the Land Protection (Pest and Stock Route Management) Regulation 2003 provides for pest management in Queensland.

Vegetation Management Act 1999

The Vegetation Management Act regulates the clearing of mapped remnant vegetation, known as Regional Ecosystems (REs) on freehold and leasehold land in Queensland. For the purposes of assessing significant projects, the VM Act is supported by the Regional Vegetation Management Code for Southeast Queensland Bioregion (RVMC) and Policy for Vegetation Offsets (the Offset Policy). A mining activity or a petroleum activity as defined under the *Environmental Protection Act 1994* is exempt from assessment under this Code on all land tenures through Schedule 8 of the *Sustainable Planning Act 2009* (RVMC 2006).

Environmental Protection Act 1994 (EP Act)

The objective of the EP Act is to protect Queensland's environment by promoting ecologically sustainable development. The *Environmental Protection Regulation 2008* provides a mechanism to enforce the EP Act and allows for an assessment of the risk that an ERA poses to environmentally sensitive areas (ESAs) in proximity to the revised Project.

7.3 Revised Project Context

The revised Project site is located within southeast Queensland's Darling Downs region 14 km north-northwest of Oakey, 35 km northwest of Toowoomba and 177 km west of Brisbane, Queensland's capital city. Toowoomba is the closest regional centre to the revised Project and is one of Australia's largest provincial cities with a population of 90,000.

The Darling Downs is located within the Condamine River catchment at the headwaters of the Murray-Darling Basin and is characterised by fertile soils and a long history of agricultural development. In recent times the Darling Downs, like many agricultural regions, has experienced significant change in land use activities driven by a combination of new policy initiatives, technological developments, changing commodity markets, and broader demographic and cultural shifts.

The revised Project site is located within the Lagoon Creek catchment. Lagoon Creek is the main local watercourse and is an ephemeral creek which forms a tributary of Oakey Creek, within the greater Condamine River catchment. Lagoon Creek flows roughly across the middle of the revised Project site in a northeast to southwest direction. The elevation of the surrounding area ranges from 390 m above sea level at Lagoon Creek up to 525 m above sea level on a local basaltic ridge. The revised Project site average is 420 m above sea level.

Vegetation communities and habitat of the revised Project site and surrounding area have been heavily cleared. Vegetation and habitat is now found within road reserves, hills and ridgelines and along watercourses such as Lagoon Creek.





7.4 Existing environment

This section describes the revised Project site in terms of terrestrial ecology, based on desktop assessment and a program of field surveys conducted over the past 13 years.

Table 7-1 provides a number of photographs of the revised Project area. The location of these photographs is shown in **Figure 7-2**. These photographs illustrate the condition of the revised Project area and vegetation within impact areas and potential offset sites. These photographs were taken in June and August 2013.

A detailed list of the surveys, relevant survey guidelines that were used, the purpose of the survey, timing, hours of survey effort and findings are shown in **Appendix G.5.2**. **Figure 7-3** and **Figure 7-4** illustrate the location of survey sites, survey transects and the type of survey technique, to demonstrate the breadth of survey location and habitats in which surveys have been conducted.

7.4.1 Land Use

Land use within the Study area has included a combination of grazing and modified pastures on small farms, cash and forage cropping, with small areas of urban settlement. Much of the revised Project site has long been cleared of its original vegetation, due to agricultural production, although localised areas of vegetation remain along Lagoon Creek, relic alluvial plains and upland low hills. The revised Project site has been subject to long periods of continued dry years and unreliable rainfall since the early 1990's.

Aerial photography of the revised Project site shows that large areas of vegetation and habitat have been cleared and replaced with pasture and cropping. Contour banks have been built across much of the arable land of the revised Project site. Contour banks have been built to manage runoff across the cleared landscape, in an effort to avoid erosion of farmland. Paddocks that have had contour banks built are used for cropping and in some instances grazing. The presence of contour banks demonstrates that native vegetation and habitat have been cleared to accommodate farming.

Vegetation has been cleared from the majority of the Project site for agricultural purposes. Vegetation remains in small, scattered fragments along Lagoon Creek, isolated patches to the south of Acland, along a low ridgeline west of the Jondaryan – Muldu Road and in the south western corner of the revised Project area, near the rail loop. Very thin patches of vegetation are found along roadsides and fencelines across the revised Project site. A similar pattern of vegetation distribution is seen in the general Acland area, with extensive areas of grazing and dryland cropping.



Location	Description	Photo
Number		
1	Looking north from potential offset paddock near Muldu. (Photo August 2013)	
2	Looking east towards the homestead within the lot of the potential offset site. (Photo August 2013)	
3	Looking south-west from the potential offset paddock. Note the high infestation of weeds particularly Mayne's Pest. (Photo August 2013)	

Table 7-1 Photographs of the revised Project area



Location Number	Description	Photo
4	Mapped 11.8.5 with a severe tree pear infestation. (Photo August 2013).	
5	Looking east to paddock with grazing pressures and tree pear infestation. (Photo August 2013).	
6	Looking south from a potential offset site across grazing paddocks (Photo August 2013).	



Location Number	Description	Photo
7	Area of 11.8.5 vegetation (Photo August 2013).	
8	Looking towards the end of the 11.8.11. Photo looking north. (Photo August 2013)	
9	Looking east towards vegetation occurring on the ridge lines. (Photo August 2013)	



Location Number	Description	Photo
10	Photo looking north along the vegetation adjacent to the Haul Road. This vegetation is a continuation of the 11.8.5 patch to the south. (Photo August 2013).	
11	Photo looking north-east showing non- remnant vegetation. (Photo August 2013).	
12	Photo looking south through the shrubby 11.8.5. (Photo August 2013).	



Location Number	Description	Photo
13	Power line easement that dissects the 11.8.5 – Eucalyptus orgadophila patch located to the east of the Haul Road. This easement runs through the section that is north of the road that divides the 11.8.5 patch. (Photo June 2013)	
14	North paddock of 11.8.5 (Photo August 2013).	
14a	South paddock of 11.8.5 (Photo August 2013).	



Location Number	Description	Photo
15	Photo looking east through 11.8.5 located in the southern paddock. (Photo August 2013).	
16	Adjacent paddock looking west across to a weed infested paddock. (Photo August 2013).	
17	11.8.11 grassland (Photo August 2013).	



Location Number	Description	Photo
18	Photo in 11.8.5 looking south this patch in on the west of the haul road. (Photo June 2013).	
19	This photo is the view looking north from the road. The small patch of 11.8.5 can be seen in the background. Possible 11.3.21 paddock. (Photo June 2013).	
20	Shrub thicket located on the far western section of the revised Project area. Site is just outside disturbance footprint. (Photo August 2013)	



Location Number	Description	Photo
21	Photo looking west across previously cleared field now with high levels of regrowth vegetation and scattered trees. (Photo June 2013).	
22	Looking west across mapped grassland, photo showing regrowth vegetation. (Photo August 2013)	
23	Belah patch looking south. (Photo August 2013)	



Location Number	Description	Photo
23a	Evidence of lopped Poplar Box located with Belah patch. (Photo August 2013)	
24	This photo is looking west along the road. Seen in this photo is the dense and tall road verge vegetation consisting of large Poplar Box. (Photo June 2013).	
25	Belah and Brigalow to the south of the road (Photo June 2013) photo looking east.	



Location Number	Description	Photo
26	Looking north towards Gum-topped Box dominated woodland. Area noted of having high Koala activity. (Photo August 2013)	
27	Looking across the northern edge towards the west of the 11.3.2 patch. Noted weeds Box Thorn and Prickly Pear with high levels of low shrubs. (Photo August 2013).	
28	Looking south through the 11.3.2 patch (Photo August 2013).	



Location Number	Description	Photo
29	Looking south from the southern boundary of the 11.3.2 patch showing regrowth vegetation including weeping myall. (Photo August 2013).	
30	Photo looking east showing recent cultivation activities. (Photo August 2013).	
31	Stock dam located just north of Lagoon Creek. Lots of waterbird activity. (Photo August 2013).	



Location Number	Description	Photo
32	Looking east across the 11.3.21 mapped grassland. (Photo August 2013).	
33	Looking west across the mapped 11.3.21 grassland noting shrub growth in the background. (Photo August 2013).	
34	Photo looking south to adjacent paddock from mapped grassland. Paddock was once cultivated now has high levels of weed infestation. (photo August 2013)	



Location Number	Description	Photo
35	Looking north through the stock route with 11.3.17 mapped either side. (Photo August 2013).	
36	Water hole along Lagoon Creek (Photo August 2013).	
37	Looking west across the mapped 11.3.21 grassland toward the vegetated stock route. (Photo August 2013).	



Location Number	Description	Photo
38	Photo looking east across stock route to show grazed paddock and cultivation in adjacent paddocks. (Photo August 2013).	
39	Photo looking south along the stock route mapped as 11.3.2. (Photo August 2013).	
40	Photo looking south showing the cultivation in adjacent paddock to the mapped grassland. (Photo August 2013).	



Location Number	Description	Photo
41	Photo looking south through 11.3.1 with evidence of a drill pad in the foreground. (Photo August 2013).	
42	Looking west across a site mapped as grassland. This photo shows the density of Acacia shrub grow in a previous cleared paddock. (Photo June 2013).	
43	Looking west this photo shows the high cover of shrubs in a paddock that has been previously cleared. (Photo August 2013).	



Location Number	Description	Photo
44	Looking south along the western boundary of the 11.3.1 RE showing wild infestation of cultivated species (Photo August 2013).	
45	Looking south across the 11.3.1 patch (Photo August 2013).	
46	Photo looking south along Greenwood School Road (Photo June 2013).	



Location	Description	Photo
Number		
47	Photo looking west from the Piggery shows the adjacent land currently being cultivated. (Photo August 2013).	
48	Photo looking south through the 11.3.1 patch. Note the Piggery observed in the background and the depression to the right is runoff from the piggery (Photo June 2013).	
49	Photo looking north across the rail alignment towards stand of vegetation on adjacent property. (Photo August 2013).	



Location Number	Description	Photo
50	Photo looking north towards remnant vegetation located within the same paddock as the potential grassland offset. (Photo August 2013).	
51	Photo looking east across potential grassland offset site located near proposed rail alignment. (Photo August 2013).	
52	Photo looking west across the cattle yards to the paddock that is currently grazed on the other side of the rail alignment to the potential offset. (photo August 2013).	



Location Number	Description	Photo
53	Photo looking south towards adjacent paddock in fore ground the remnant of vegetation before clearing and in the background heavily cleared land with cultivation. (Photo August 2013)	
54	Photo looking north in potential offset paddock. The background shows a tree line associated with a depression in the landscape. (Photo June 2013).	
55	Looking south from potential offset paddock showing adjacent land use of cultivation. (Photo August 2013).	



Location Number	Description	Photo
56	Paddock monoculture of exotic creeping bluegrass (Photo June 2013)	
57	Photo looking east across the southern section of the paddock that shows high infestations of Balloon Cotton Bush and Bull Thistle. (Photo June 2013).	
58	Photo looking east across potential grassland offset site paddock (Photo August 2013)	



Location Number	Description	Photo
59	Photo looking west across the potential grassland offset site. (Photo August 2013)	
60	Showing potential grassland offset site is actually a wetland area with gilgais. Photo looking south. (Photo August 2013)	
61	Exotic grass in wetland (Photo June 2013)	



Location Number	Description	Photo
62	North paddock of the potential grassland offset area Oakey-Cooyar Rd. Photo looking north-east toward road (Photo August 2013)	
63	Looking east this photo shows a paddock that has been recently ploughed. (Photo June 2013).	
64	Looking north in the centre of the potential grassland offset site along Oakey-Cooyar Rd. (Photo August 2013)	



Location Number	Description	Photo
65	Looking south from potential grassland offset site along Oakey-Cooyar Rd to adjacent paddock. (Photo August 2013)	





7.4.2 Methodology

The ecology surveys and field work were completed by ecologists employed and engaged by SKM. The local indigenous community was not involved in the surveys.

Vegetation community surveys

Field surveys were completed to map vegetation communities of the revised Project area and to confirm the regional ecosystems found on the revised Project site. These surveys used the "Methodology for survey and mapping of regional ecosystems and vegetation communities in Queensland" (Neldner 2005 and Neldner 2012).

Further surveys were completed to assess the condition of regional ecosystems. Information on the condition of the regional ecosystems has been used to develop the Biodiversity Offset Strategy for the revised Project. The assessment of the condition of vegetation used the method described in "BioCondition: a terrestrial vegetation condition assessment tool for biodiversity in Queensland field assessment manual" (Eyre 2008 and Eyre 2011).

Data sheets for the BioCondition assessment and vegetation surveys are included in **Appendix G.5.3** and **Appendix G.5.4**, respectively.

Terrestrial flora surveys

Flora and vegetation surveys were completed on six occasions between 2005 and 2013. These surveys were either conducted in association with fauna surveys or were specific surveys to confirm vegetation condition. The survey sites were located in areas of habitat suited to the listed species, including along Lagoon Creek and in areas of vegetation within and adjacent to the revised Project site. Table 7-2 lists the flora and vegetation surveys that have been completed for the Study area and the purpose of the survey.

Opportunistic flora surveys were undertaken during the October and November 2013 bird, reptile and mammal surveys.

Survey date	Purpose
August 2005	General flora and vegetation survey – record species and vegetation communities
February 2007	Vegetation condition assessment of bluegrass Threatened Ecological Community
February-March 2007	General flora and vegetation survey
February 2011	Vegetation condition assessment of vegetation communities in impact area and offset sites
June 2013	Vegetation condition assessment of vegetation communities in impact area and offset sites
August 2013	Confirmation of regional ecosystems, threatened species survey

Table 7-2 Flora and vegetation surveys



August 2005 flora survey

Vegetation types for the Stage 2 EIS were identified during field inspections conducted in 2005. In each of the habitat types, flora and fauna were investigated. Plant collections were made and fauna sampling was performed using a combination of systematic and opportunistic survey methods over a number of days and nights.

February 2007 - Blue Grass Communities within the Stage 2 EIS Project site

In response to information requested by the DEWHA, the nature and extent of the bluegrass (*Dichanthium* spp.) dominant grasslands ecological community in the Stage 2 EIS Project site was assessed in February 2007. The survey used the following methods:

- Visual inspection of the mapped remnant area.
- Erection of a 100 m survey transect in accordance with the then Environmental Protection Agency survey methodology for assessing biocondition using:
 - a 100 m line-intercept transect;
 - 50 m x 10 m plot in which weed cover, native plant richness and fallen woody material were recorded;
 - five quadrats, 1 m x 1 m, to determine percentage cover of grasses, herbs, forbs and shrubs; and
 - an assessment of the likelihood of the mapped remnant area returning to "good native condition".

February-March 2007 flora survey

Detailed flora field surveys were completed of an area that included the revised Project area from 26 February 2007 to 2 March 2007 and within the private haul road route on 20 November 2008. The private haul road route is in proximity to the revised Project's proposed rail spur. The survey concentrated primarily on areas with remnant tree cover, native grasslands and roadside easements.

Surveys involved numerous traverses on foot to observe all vegetation types present within the Project site. The purpose of the surveys was to identify the floristics, structure and condition of each patch of vegetation and the type and distribution of plant communities present. Vegetation plots and transects were established in individual patches of vegetation to sample species diversity and structure.

Identification of plant communities was undertaken including an assessment of the presence of threatened REs and ecological communities as listed under the VM Act and the EPBC Act respectively. Site data for each quadrat and transect was recorded in a standardised format to record information regarding species presence, species richness and vegetation community assemblages.

The methodology was generally consistent with that put forward in the publication "Methodology for Survey and Mapping of Vegetation and Regional Ecosystems in Queensland (Neldner et al 2005). A GPS was used to record locations of specific floristic data and to assist in mapping. The overall condition of the site vegetation was recorded, including the extent of modification and weed invasion.



A preliminary list of target endangered, vulnerable and near threatened (EVNT) flora taxa was generated through database searches. Potential subject species are listed in **Appendix G.5.5**, from the Protected Matters Search Report and Wildnet database searches. Targeted searches were completed for threatened flora species listed under the NC Act and the EPBC Act. Cropper (1993) suggests that a general traverse is a suitable method for detecting the presence of rare species during flora surveys. As a result, several traverses were undertaken as part of the field surveys within areas of suitable habitat.

Searches for threatened species recorded in the Acland area (i.e. Austral Cornflower, Belson's panic, lobed bluegrass and finger panic grass) were undertaken within areas of known and suitable habitat, such as roadside easements and less disturbed woodlands and native grasslands. Locations of any threatened species located within the revised Project site were recorded using a GPS and the approximate number of individuals present was recorded for each location.

February 2011 bluegrass dominant grassland assessments

Surveys to assess the condition of the EPBC listed threatened ecological community, bluegrass dominant grassland were completed in February 2011. These surveys were undertaken to determine the ecological condition of the grassland patches, following above average rain over the preceding summer months. Information on species, density and condition of the bluegrass dominant grassland was collected.

This survey was carried out in accordance with Eyre et al (2005) used the Species density, species present, presence of weeds, percent bare ground and overall vegetation community condition was collected. Transects were established for the recording of this information, with plots of 0.1 ha (20 m by 50 m).

June 2013 biocondition survey

This survey was completed to assess the condition of vegetation communities affected by the revised Project and potential offset sites. The biocondition information was collected to devise the offset strategy for the revised Project that will meet both Queensland and Commonwealth requirements for biodiversity offsets.

Data was collected in accordance with Eyre et al (2011), which describes the methods to assess the condition of vegetation in Queensland. Data collected included number of large trees, recruitment of canopy species, canopy height, canopy cover, shrub cover, species richness, non-native species cover, native perennial grass cover and litter cover.

Condition of vegetation to be cleared and the condition of vegetation at proposed offset sites was collected, to enable a comparison to be made of the vegetation to be lost and quality of the areas to be used for offsets.

August 2013 biocondition and vegetation community verification survey

Further bio condition assessments were undertaken of both the impact areas and the offset areas, to capture the variation in vegetation quality across the revised Project area and offset locations. The assessment was completed in accordance with Eyre et al (2011).



The regional ecosystems of the revised Project area were verified, using Neldner (2012). Surveys were also conducted for threatened listed species thought to occur in the revised Project area.

The location of flora survey sites and transects completed within and adjacent to the revised Project site since 2005 are presented in **Figure 7-3**.

Terrestrial fauna surveys

Fauna surveys were completed on four occasions between 2005 and 2013. These surveys were either conducted in association with vegetation surveys or were species-specific surveys. The survey sites were located in areas of habitat suited to the listed species, including along Lagoon Creek and in areas of suitable vegetation. Trapping and monitoring techniques used for mammals, reptiles and amphibians included harp traps, pits fall traps Elliott traps, Anabat detectors and camera traps. Spotlighting was used for arboreal mammals. Birds were surveyed using standardised time based counts conducted in the morning. Call playback for a range of owl species was also used, along with spotlighting. Table 7-3 lists the surveys, the fauna groups that were surveyed, and the survey techniques that were used.

	Survey					Fauna Group						
Survey technique	2005	February - March 2007	Reptiles – February 2007	August 2013	October/November 2013 (Bird, reptile and mammal survey)	Birds	Amphibians	Frogs	Reptiles	Bats	Arboreal mammal	Ground dwelling mammals
Elliott traps	х	х			х				х			х
Pitfall traps		х	х						х			х
Anabat detectors	х	х		х	х					х		
Bird surveys	х	х		х	х	х						
Ground searches	х	х	х		х		х	х	х			х
Spotlighting	х	х	х		x		х	х	х	х	х	х
Call playback		х				х						
Incidental observations	x	х			x	х	x	x	х		x	х
Scats, tracks		х			x				х		х	х
Camera traps				х	х	х						х

Table 7-3 Fauna surveys, groups and techniques


2005 Fauna survey

A targeted field survey concentrating on species of conservation significance was completed for the New Acland Stage 2 EIS in 2005 (Stage 2 EIS). The methodology was formulated based on the results of a literature review and gap analysis, review of relevant databases and agency consultation.

Fauna survey techniques included Elliott trapping, ANABAT II ultrasonic bat call recording, spotlighting, habitat searches, dip nets for aquatic life, and bird surveys at dusk and dawn. Opportunistic surveys for fauna were also completed. **Table 7-4** lists the survey effort associated with the 2005 fauna survey.

2005 fauna survey	
Survey technique	Survey description
Trapping	Small mammal trapping was carried out using Elliott traps placed approximately 10 m apart and baited with a mixture of rolled oats, peanut butter, honey and a little vanilla essence. Traps were set for a minimum period of 2 consecutive nights, and checked early each morning. The Elliott trapping accounted for a total of 375 trap nights. Pitfall traps were not used because of the difficulty finding suitable sites due to rock, grazing or thick weed vegetation. The survey sites for this survey were located within the existing mine footprint and in the area of the Manning Vale West pit, where ground condition did not allow for the use pitfall traps.
Spotlighting	Spotlighting observations were conducted from a vehicle for roadside vegetation and on foot in the larger remnants for 4 hours per night to detect arboreal mammals, bats, nocturnal birds, reptiles and frogs using a 100 watt spotlight.
Bird Observation	Birds were observed at dawn and dusk at each site and identified visually or from calls heard. Other bird observations in the study area were made throughout the day as other activities were carried out.
Anabat	An Anabat II bat detector system was used to record the ultrasonic calls of insect eating bats for later computer analysis and identification of the species present at the Project site.
Opportunistic surveys	Searches were conducted for animals under bark, logs, rocks and leaf litter. Opportunistic observations were made of birds and other animals at all times of the day while in the area.

Table 7-4 2005 Fauna survey

February-March 2007 Fauna survey

Detailed fauna field surveys were completed within the Project site between 26 February 2007 and 2 March 2007. A combination of sampling techniques were used, including diurnal and nocturnal census and opportunistic observations. Survey methods included Elliott and pit fall trapping, ultrasonic call recording of microchiropteran bats, spotlighting, frog and reptile searches, nocturnal owl call broadcast and diurnal bird census.

Aerial photographs, vegetation mapping and topographic maps were used to stratify habitat types and identify the sampling sites. At least one sampling site was surveyed per habitat type with greater effort in the larger, dominant habitats, such as the poplar box woodland. Grassland, young regrowth and



aquatic habitats provided incidental data to complement the observations from the larger areas of habitat within the Project site. Details of survey techniques, effort and localities are provided below.

Fauna surveys were conducted under Scientific Purposes Permit Number WISP04231607, Scientific User Registration No. 274 and Animal Care and Ethics Approval number AEC-CA2007/01/167. **Table 7-5** lists the survey effort associated with the February – March 2007 fauna survey.

February – March 2007 survey			
Survey technique	Survey description		
Trapping	Live-trapping of small to medium sized mammals was conducted at four trap sites targeting the larger fragments of forest and woodland, as these were expected to yield the majority of the mammal assemblage. A standardised quadrat arrangement, 100 m x 50 m, was used at each site delineated by 25 Elliott traps placed 10 m apart along the perimeter. The Elliott traps comprised 20 type A (33 cm x 10 cm x 9 cm) and 5 type B (15 cm x 16 cm x 45 cm) aluminium folding traps. All Elliott traps were baited with peanut butter, rolled oats and honey. Traps were placed in or under cover at every opportunity. Traps were opened for a three-night period of approximately 96 hours. Traps were checked in the morning and any captured animals were measured, weighed and released. The total trapping effort equated to 300 trap nights. Live-trapping of small ground-dwelling mammals was supplemented by the use of pitfall traps. A total of 20 pit traps, comprising 600 mm x 30 mm steel pipe, were established at three sites. The pits were opened for three consecutive nights and checked each morning. Drift fences consisted of 300 mm high polyurethane damp course. The total pit trapping effort equated to 60 trap nights.		
	Targeted searches of up to two hours duration were conducted in grassland habitats to target the Grassland Earless Dragon.		
	Live-trapping of herpetofauna was conducted using pitfall traps positioned in low-lying areas and heavy cracking clays near Lagoon Creek to target the presence of the Grey Snake (<i>Hemiaspis damelii</i>), Grassland Earless Dragon and the Five-clawed Worm Skink. A total of 20 pit traps, comprising 600 mm x 300 mm steel pipe, were established at three sites. The pits were opened for three consecutive nights and checked each morning. Drift fences consisted of 300 mm high polyurethane damp course. The total pit trapping effort equated to 60 trap nights. Pit traps sites were selected to sample grassland and woodland habitat with an open understorey. Pitfall traps were located along Lagoon Creek, where ground conditions allowed for the digging of holes of the installation of the traps.		

Table 7-5 February - March 2007 Fauna survey



February – March 200	February – March 2007 survey			
Survey technique	Survey description			
Spotlighting	Spotlighting and dusk census for arboreal mammals was conducted at each of the seven sites, in addition to other forest fragments. Spotlighting was conducted by foot and vehicle, and comprised a general traverse across the Project site using Lightforce 50W hand-held spotlights powered by 12V batteries. Two observers conducted the survey for a minimum period of two hours per night over four nights resulting in a total survey effort by spotlight of 16 hours. All fauna heard or observed were recorded to species level. Observations of fauna were aided by the use of binoculars. Notes were taken on the location and relative abundance of observed fauna. Spotlighting was conducted briefly between calls and then following completion of the call playback series. Quiet listening for dusk calls of each owl species was also undertaken whilst conducting other field activities such as spotlight searches. Both nocturnal and diurnal herpetological surveys were conducted at each sample site. The nocturnal herpetofauna was observed during spotlighting surveys and included the survey of the margins of wet areas and farm dams for active frogs and reptiles. Nocturnal surveys for frogs were conducted using spotlights and head torches to survey along drainage lines, around wet low-lying lands and dams. Spotlighting activities.			
Ground searches	The diurnal component of the reptile surveys consisted of hand searches for active and resting individuals under rocks, logs, bark, leaves and timber and artificial debris when encountered. Specific reptile census was conducted for one hour at each trap site and opportunistic observations were also recorded during other survey activities.			
Bird observation	Standardised time-based bird counts of 30 minute duration were conducted at each trap site during the live trapping program. Census were conducted during morning periods and centred on the trapping quadrat. All bird species heard or observed were quantified. Birds were also recorded opportunistically during all other site visits and field surveys activities. Binoculars were carried in the field at all times to assist in identification.			
Call playback	Call playback of the Barking Owl (<i>Ninox connivens</i>), Masked Owl (<i>Tyto novaehollandiae</i>) and Barn Owl (<i>Tyto alba</i>) was conducted during spotlighting surveys at all sample sites. Pre-recorded owl calls were broadcast via a portable CD player and megaphone for a period of five minutes each, followed by a five minute listening period.			
Anabat	Three stationary ultrasonic bat call detectors (Anabat II, Titley Electronics) were used with a storage ZCAIM unit to record bat calls at four sites: Anabat 1-4. Calls were recorded continuously between 1800 and 0500 hours on each occasion for three nights. Calls were identified to genus or species level where possible using the computer frequency analysis software, Analook v.4.0.			
Opportunistic surveys	Searches were conducted for animals under bark, logs, rocks and leaf litter. Opportunistic observations were made of birds and other animals at all times of the day while in the area.			



2007 Reptile Survey

A targeted reptile survey (for Dunmall's Snake (*Furnia dunmalli*), Five-clawed Worm Skink (*Anomalophus mackayi*) and the Grassland Earless Dragon (*Tympanocryptis pinguicolla*)) across the Stage 2 EIS Project site was completed in February 2007 to satisfy approval conditions imposed under EPBC Act by the Commonwealth Department of Environment, Water, Heritage and the Arts. Table 7-6 lists the survey effort associated with the 2007 reptile survey.

Reptile 2007 survey	Reptile 2007 survey			
Survey technique	Survey description			
Trapping	Three pitfall lines, comprising five buckets linked by drift fencing in suitable habitat, were established. Traps were open for four consecutive nights, for a total of 60 bucket nights.			
Spotlighting	Two hours of road and track based survey was completed on each of four survey nights in an effort to detect snakes for a total of eight hours of search effort.			
Ground searches	Ten systematic herpetofauna survey sites were established. A total of one hour of diurnal survey effort and one hour of nocturnal survey effort was expended at each site. Survey effort consisted of rolling logs and rocks, stripping loose bark from trees, spotlighting and point observations (observer remaining stationary and observing cracking clay pans with binoculars). A total of 20 hours of intensive searching was completed at systematic survey sites. Twelve active search plots to target the Grassland Earless Dragon were established. Commencing at a central point, the area within a 50 m radius was thoroughly searched for reptiles for a period of half an hour. A total of six hours of search effort was achieved.			

Table 7-6 2007 Reptile survey

The 9 to 14 February 2007 survey was undertaken to satisfy an EPBC approval condition for the Stage 2 project. The condition required the person taking the action to undertake an additional fauna survey of the Stage 2 project area to specifically target the presence of the listed endangered Grassland Earless Dragon and the listed vulnerable Long-legged Worm skink and the listed vulnerable Dunmall's snake. The 9 to 14 February 2007 survey was located in the Stage 2 mining lease, to the east of Acland and north of Lagoon Creek.

The fauna survey that was undertaken between 26 February and 2 March 2007 was to inform the Stage 3 EIS. This survey included trapping and survey sites along Lagoon Creek, in vegetation within the Manning Vale West Pit and in an area to the south of the revised Project area. The surveys for the Grassland Earless Dragon, the Long-legged Worm skink and the Dunmall's snake were located in areas of grassland and open woodland habitat (Brigalow and poplar box). The survey techniques used in both these surveys involved the use of pitfall traps, nocturnal and diurnal searches, active searching that involved hand searches of rocks, logs, bark, leaves, timber and artificial debris in an effort to locate the species.



Koala survey – March 2013

A specific survey for the Koala was undertaken for the revised Project area in March 2013. The Koala is known to range within the vicinity of the revised Project area. This survey was completed to collect specific information relating to the Koala's presence and habitat across the revised Project site.

The survey was informed by a review of vegetation mapping and aerial photography, to determine areas to be surveyed. A five day field survey was undertaken in March 2013, to assess the quality of habitat and to search for Koalas and included both direct observation and presence of scats and / or scratches on trees. The Spot Assessment Technique (SAT) was used to determine Koala activity and use of habitat. The SAT method was completed in accordance with Philips and Callaghan (2011) and involved the following steps:

- locate and uniquely mark with flagging tape a centre tree and then the 29 nearest Koala food trees to the centre tree; and
- undertake a search for Koala faecal pellets beneath each of the 30 marked trees based on a cursory inspection of the undisturbed ground surface, within a distance of one metre around the base of each tree, followed (if no faecal pellets are initially detected) by a two minute inspection involving disturbance of the leaf litter and ground cover within the prescribed search area. The search is concluded once a single faecal pellet has been detected or when the maximum two minute search time has expired, whichever happens first. Where the location of faecal pellets falls within overlapping search areas due to two or more trees growing in close proximity to each other, both should be scored for pellet(s).

2013 Fauna survey

In August 2013, a scoping fauna survey was completed, to provide information to develop the survey plan for the more detailed reptile survey completed in November 2013. **Table 7-7** lists the survey effort associated with the 2013 fauna survey.

August 2013 survey			
Survey technique	Survey description		
Anabat	One Anabat was setup for four nights and did detect bats within the area. The purpose of this survey was to provide an understanding of areas for future detailed fauna survey scheduled for November 2013.		
Camera traps	Four camera traps were set out for four nights (16 trap nights). The locations of the camera traps were to determine appropriate sites for future detailed fauna survey scheduled for November 2013. Camera traps were baited with raw chicken frames and peanut butter and were located in areas that were determined from desktop and brief site assessment to possibly have the greatest fauna usage within the area.		

Table 7-7 2013 fauna survey



2013 Bird survey

A targeted bird survey for Australian Painted Snipe, Black-breasted Button Quail, Red Goshawk and Regent Honeyeater was undertaken to within the revised Project area. The desk top analysis concentrated on ecology, habitat requirements and previous records of occurrence for each species. The desktop analysis relied on drawing information from the following existing sources:

- Aerial photography (Google 2013);
- Regional Ecosystem Mapping (Queensland Herbarium v6.1);
- Species Profile and Threats database SPRAT (DotE 2013);
- EPBC database search tool (DotE 2013); and
- Wildlife Online (DEHP 2013).

This information was applied to the revised Project area to determine the most appropriate locations for the targeted bird survey. **Figure 7-5** shows the location of the survey sites used during the targeted bird survey. Based on the habitat requirements of the target species, the vegetation (RE) present and the known condition of the vegetation; the survey effort for each patch of vegetation was established. Those patches of vegetation that were more likely to be best suited to one or more of the target species were allocated a greater survey effort. These sites were visited on consecutive days in line with the requirements for temporal variation during survey, particularly for Australian Painted Snipe, Black-breasted Button Quail and Regent Honeyeater (which require surveys over 3 - 5 days). Marginal sites were visited only once, as were areas where searches for Red Goshawk nests were undertaken. Some vegetation communities in the study area contain habitat that is not considered suitable for the targeted species (e.g. grassland communities), and therefore, were not part of the survey.

Surveys were conducted over seven days from 28 October to 3 November 2013. During this time the weather was fine and sunny $(20 - 33^{\circ}C)$, with one afternoon storm on 30 October 2013 (3 mm rain) and some windy periods on several afternoons. The conditions on site were noted to be dry and there had been an extended dry season prior to the site visit. Some trees were in bud with open flowers present in the canopy of the Poplar Box communities (<10% of the canopy). Water was not flowing in Lagoon Creek, but many of the dams were holding water.

At each site a habitat assessment and bird survey was conducted by two experienced ecologists familiar with the revised Project area. The habitat assessment involved taking representative photographs and recording the following details about each survey site:

- Location;
- vegetation communities (RE);
- dominant flora species in each stratum;
- geology and landscape;
- presence of weeds;
- condition of understorey;
- presence of major disturbances (i.e. fire, storm, grazing or land clearing);



- presence of habitat trees (i.e. trees with nests or hollows) and fallen logs;
- abundance of potential food resources (flowers);
- presence of water bodies / wetlands;
- presence of leaf litter; and
- presence of rocky outcrops or logs.

Bird survey techniques were varied depending on the target species and were consistent with the DotE generic survey guidelines for birds (DEWHA, 2010) and specific survey guidelines for each of the four species being surveyed (DotE, 2013) Bird watching (by two ecologists with binoculars) was used in searches for Regent Honeyeater, Red Goshawk and Australian Painted Snipe. Flushing of understorey was used for Australian Painted Snipe and Black-breasted Button Quail. Active searches and stationery observations were conducted during dusk traverses of Lagoon Creek for Australian Painted Snipe. Searches for raptor nests were conducted for Red Goshawk. Timing of surveys varied from early morning (within 2 hours of dawn), late morning (>2 hours post dawn), early afternoon (within 3 hours of noon), late afternoon (> 3 hours past noon) and dusk (up to 1 hour past dusk). General observations were made at each site to ascertain some representation of the diversity of birds and the dominant bird species in the study area.

Suitable habitat, DotE recommended survey effort and the survey effort expended per target species is detailed in **Table 7-8**. This table shows that the survey effort has satisfied the requirements outlined in the gap analysis performed by DotE on ecological surveys conducted for the revised Project. The DotE survey guidelines were used to devise the survey program, for these species. NAC also liaised with DotE on the specific details of the surveys to be undertaken and agreed on the effort required to meet the Department's needs. In these discussions, DotE identified the species that required further survey effort. This advice is the basis for the inclusion of these species listed in **Table 7-8**.



Table 7-8 Suitable habitat, sites and survey effort per target species

Species	Habitat requirements (DoE 2013)	Appropriate habitat within the study area	Requirements as per Guideline (DEWHA 2010)	Requirements as per Gap Analysis	Survey Effort during November 2013
Australian Painted Snipe	Mainly in shallow, often temporary freshwater wetlands or saltmarshes, generally with good cover of grasses, low scrub, lignum, open timber or samphire.	Creek line (on and offline pools) and dams on floodplain. Sites: Lagoon Creek and adjacent dams.	Area searches / transects through suitable wetlands; detection by sighting and flushing. Targeted observations at dawn and dusk of suitable foraging areas. Effort: Targeted stationary observations (10 hours over 5 days). Land-based searches or line transects (10 hours over 3 days).	Previous surveys were undertaken in drought conditions and did not include line transects and flushing. 10 hours of line transects or land-based searches (including flushing) over 3 days, undertaken in suitable conditions.	12 hrs over 3 days traversing waterway & flushing patches of appropriate habitat. At the time of survey, water was not flowing in Lagoon Creek but associated dams (online and offline) held water. This indicates appropriate conditions.
Black- breasted Button Quail	The species is restricted to rainforests and forests, mostly in areas with rainfall of 770-1200 mm per annum. It prefers drier, low, closed forests, particularly semi-evergreen vine thicket, low microphyll vine forest, araucarian microphyll vine forest and araucarian notophyll vine forest. There are also reports from dry forest described as bottle tree scrub (brigalow, belah and <i>Brachychiton sp.</i>) with a shrub	RE 11.8.3 & 11.3.1, 11.3.17, 11.9.5, 11.9.10 (marginal). Sites: 7, 8, 10, 17, 19, 21, 22, 23, 25, 26 (NB. site 17 and 19 included in waterway traverse).	Area searches of suitable habitat with detection of flushing birds or hearing of foraging. Search for platelets. Effort: Land-based searches (15 hours over 3 days).	Previous surveys did not include flushing for the species and did not consider shrubby brigalow/belah forest as habitat. 15 hours of line transects or land-based searches in potential habitat over 3 days.	Best sites (7 & 8) - 60 mins by 2 ecologists on 3 days (6hrs). Marginal sites - 30-60 mins by 2 ecologists over 5 days (10 hrs). Total 16 hrs. Surveys conducted during breeding season.



Species	Habitat requirements (DoE 2013)	Appropriate habitat within the study area	Requirements as per Guideline (DEWHA 2010)	Requirements as per Gap Analysis	Survey Effort during November 2013
	understorey.				
Red Goshawk	Coastal and sub-coastal tall, open forest and woodland, tropical savanna traversed by rivers lined with timber and along the edges of rainforest. Nests are located above 20m in trees >30m high. Further inland these nest sites are restricted to alongside major river banks.	RE 11.8.5, 11.3.2, 11.3.17 (marginal), tall trees on waterway, clumps of tall trees in paddock. Sites: 1-6, 9, 11-14, 17, 19, 24, 28, 29 & waterway (NB. site 17 and 19 included in waterway traverse).	Search for characteristic nests, including ground searches along river banks in areas with tallest trees. Effort: Area searches (80 hours over 10 days).	Previous surveys did not include searches for nests. Area searches to be conducted in suitable habitat until 80 hours is reached, all trees have been searched or a nest is located (whichever comes first).	All areas of suitable RE habitat searched (39.5 hrs), plus 20 hrs searching other REs, plus 12 hours traversing waterway & floodplain, plus 3 hours searching other clumps of trees. Total 74.5 hrs (all suitable habitat searched). Surveys conducted during time when young will be fledging so nests will be present.
Regent Honeyeater	Mostly occurs in box-ironbark associations. Prefers the wettest, most fertile sites within these associations such as along creek flats, broad river valleys and foothills.	RE 11.8.5, 11.3.2, 11.3.17 (marginal), areas of flowering <i>Eucalyptus sp.</i> Sites: 1-6, 9, 11-14, 17, 19, 24, 28, 29 & waterway (NB. site 17 and 19 included in waterway traverse).	Area searches in suitable habitat, preferably in the morning. Detection by call or sighting. Targeted searches of woodland with heavily flowering trees, especially near water. Effort: Area searches (20 hours over 10 days), targeted searches (20 hours over 5 days).	Previous surveys did not involve targeted survey of flowering nectar resources and occurred in unfavourable conditions. Targeted searches (20 hours over 5 days) in patches of flowering <i>Eucalyptus sp.</i>	Best sites (9, 11, 12, 24, 28) - 30 - 45 mins by 2 ecologists on 5 days (28 hrs). Marginal sites - 30 - 60 mins by 2 ecologists (11.5 hours). Plus 2 hours by 2 ecologists in wooded section of waterway (4 hours). Total 43.5 hrs. Surveys were conducted during peak breeding season. Some trees were heavily budding and approximately 10% of the canopy contained open flowers. Detectability highest in early morning.



2013 Reptile and Mammals Survey

A five day fauna survey was conducted by four ecologists from 11- to 15 November 2013. This survey was completed to survey for reptiles and mammals that were considered to possibly occur within the revised Project area and to complement the findings from earlier ecology surveys undertaken for the revised Project.

The desktop review involved the collation and review of existing information relevant to the Project area. Information was sourced from the following:

- New Acland Stage 2 EIS Nature Conservation chapter, 2005;
- New Acland Stage 2 Targeted Flora and Fauna Surveys, 2007;
- New Acland Stage 3 EIS Terrestrial Ecology Report and Matters of Environment al Significance Report, 2007;
- New Acland Stage 3 Expansion Project Ecological Assessment of the Natural Grassland on Basalt and Fine Textured Alluvial Plains. Natural Grassland Ecological Assessment;
- New Acland Coal Mine Stage 3 Natural Grassland Re-assessment to Inform Offset Strategy;
- New Acland Stage 3 Koala and flora survey;
- Regional Ecosystem Mapping (Queensland Herbarium v6.1);
- Species Profile and Threats database SPRAT (DotE 2013);
- EPBC database search tool (DotE 2013); and
- Wildlife Online (DEHP 2013).

This survey was targeted on:

- Five-clawed Worm-Skink;
- Yakka Skink;
- Northern Quoll;
- Long-nosed Potoroo;
- Large-eared Pied-bat; and
- South-eastern Long-eared Bat.

The fauna survey included five trapping sites and 11 observational sites in line with relevant DotE fauna survey guidelines (DEWHA, 2010a, SEWPaC, 2011, SEWPaC 2011a). These survey sites were representative of the habitat types across the revised Project area. A targeted trapping program was implemented at the trapping sites. The locations of the survey sites are illustrated in **Figure 7-5**. **Table 7-9** describes the habitat found at each survey site and the fauna species targeted.

During the survey period, mornings and evenings were mild with moderately warm daytime temperatures. Thunderstorms occurred every evening. Weather information was recorde at the nearby Oakey Aerodrome. Temperatures ranged between 13°C and 32°C. A total of 16.6 mm of rain was recorded during the survey period. Winds were slight in the mornings and became blustery in the afternoons, associated with storms.



Terrestrial fauna surveys were conducted under the following permits:

- Animals Ethics Approval: CA 2012/11/643 expiry 31/12/2015; and
- Scientific Purposed Permit: WISP10848512 expiry 28/02/2017.

Site number	Site type*	Description	RE	Targeted EPBC fauna species
1	Trapping	Brigalow (<i>Acacia harpophylla</i>) and Belah (<i>Casuarina cristata</i>) open forest with limited hollows on cracking clay soils.	11.3.1	 Five-clawed Worm-skink Large-eared Pied-bat Long-nosed Potoroo Northern Quoll South-eastern Long-eared Bat Yakka Skink
2	Trapping	Semi-evergreen vine thicket vegetation with logs, litter and rocky substrate.	11.8.3	 Large-eared Pied-bat Long-nosed Potoroo Northern Quoll South-eastern Long-eared Bat
3	Trapping	Poplar Box (<i>Eucalyptus populnea</i>) and Weeping Myall (<i>Acacia</i> <i>pendula</i>) woodland with limited hollows and a mid-sparse shrub layer on cracking clay soils.	11.3.2	 Five-clawed Worm-skink Large-eared Pied-bat Long-nosed Potoroo Northern Quoll South-eastern Long-eared Bat Yakka Skink
4	Trapping	Mountain Coolabah (<i>E. orgadophila</i>) grassy open- woodland with Prickly Pear (<i>Opuntia</i> sp.) on red clay soils.	11.8.5	 Five-clawed Worm-skink Large-eared Pied-bat Long-nosed Potoroo Northern Quoll South-eastern Long-eared Bat Yakka Skink
5	Trapping	Mountain Coolabah (<i>E. orgadophila</i>) grassy open- woodland with Prickly Pear (<i>Opuntia</i> sp.) on red clay soils.	11.8.5	 Five-clawed Worm-skink Large-eared Pied-bat Long-nosed Potoroo Northern Quoll South-eastern Long-eared Bat Yakka Skink
6	Observational	Mountain Coolabah (<i>E. orgadophila</i>) grassy open- woodland with Prickly Pear (<i>Opuntia</i> sp.) on red clay soils.	11.8.5	 Five-clawed Worm-skink Large-eared Pied-bat Long-nosed Potoroo Northern Quoll South-eastern Long-eared Bat Yakka Skink

Table 7-9 Survey trapping sites



Site number	Site type*	Description	RE	Targeted EPBC fauna species
7	Observational	Natural Queensland Bluegrass (<i>Dichanthium sericeum</i>) grassland with cracking clay soils.	11.3.21	Five-clawed Worm-skinkYakka Skink
8	Observational	Brigalow and Belah open forest with limited hollows on cracking clay soils.	11.9.5	 Five-clawed Worm-skink Large-eared Pied-bat Long-nosed Potoroo Northern Quoll South-eastern Long-eared Bat Yakka Skink
9	Observational	Brigalow and Poplar Box woodland with limited hollows and a mid-shrub layer on clay soils	11.9.10	 Five-clawed Worm-skink Large-eared Pied-bat Long-nosed Potoroo Northern Quoll South-eastern Long-eared Bat Yakka Skink
10	Observational	Brigalow and Belah open forest with limited hollows on cracking clay soils.	11.3.1	 Five-clawed Worm-skink Large-eared Pied-bat Long-nosed Potoroo Northern Quoll South-eastern Long-eared Bat Yakka Skink
11	Observational	Brigalow and Belah open forest with limited hollows on cracking clay soils.		As above
12	Observational	Natural Queensland Bluegrass grassland with cracking clay soils.	11.3.21	Five-clawed Worm-skinkYakka Skink
13	Observational	Mountain Coolabah grassy open- woodland with Prickly Pear on cracking clay soils.	11.8.5	 Five-clawed Worm-skink Large-eared Pied-bat Long-nosed Potoroo Northern Quoll South-eastern Long-eared Bat Yakka Skink
Rail Ioop	Observational	Grazing paddock largely cleared of vegetation with cattle present. Clay soils have been heavily compacted by livestock.	11.3.21/1 1.3.2	Five-clawed Worm-skinkYakka Skink
Dam	Anabat site	Farm dam surrounded by sparse trees with heavy cattle pugging.	Non- remnant	Large-eared Pied-batSouth-eastern Long-eared Bat



Site number	Site type*	Description	RE	Targeted EPBC fauna species
Lagoon Creek	Observational (and one camera trap)	Ephemeral creek with sparse Brigalow patches along the riparian zone. Lagoon Creek was dry at the time of survey.	Small patches of 11.3.1, 11.3.2, 11.3.17 and 11.3.21	 Five-clawed Worm-skink Large-eared Pied-bat Long-nosed Potoroo Northern Quoll South-eastern Long-eared Bat Yakka Skink

* Site type-; Trapping- site with traps, Observational- opportunistic site targeting species preferred habitat types

The survey techniques that were used included Elliot trapping, cage trapping, camera trapping, hair funnels, harp traps, bat call detection (Anabat) and spotlight searches. The survey techniques employed during the survey are provided in **Table 7-10**. A summary of the survey techniques employed for each targeted fauna species is provided in **Table 7-11**. A summary of the survey techniques techniques employed at each fauna site is provided in **Table 7-12**.

Survey technique	Description	Total survey effort
Active search	Diurnal searches for Five-clawed Worm-skink and Yakka Skink were conducted at 15 sites. A minimum survey effort of two person hours was conducted at each site. See Table 7-12 for a breakdown of active search effort per site.	16 hours
Habitat search	Opportunistic	
Tracks/scats/pellets	Opportunistic searches were conducted throughout the survey for tracks, scats and pallets of predator and target species. Predator scats were collected for analysis for hairs and bone fragments by Barbara Triggs.	Opportunistic
Bat detector - passive	Four nights of passive Anabat recording (using zero-crossings Anabat interface module) was conducted at a farm dam surrounded by vegetation that provided potential habitat for microchiropteran bats.	3 nights
Bat detector - active	Active Anabat recording (using zero-crossings Anabat interface module) was conducted at selected sites that provided potential habitat for microchiropteran bats.	6 hours
Harp trap	Four collapsible harp traps were deployed for four nights at sites that provided potential habitat for microchiropteran bats.	16 trap nights (four harp traps for four nights)

Table 7-10 Fauna survey techniques



Survey technique	Description	Total survey effort
Camera trap	Thirty-nine baited, infra-red, motion triggered camera traps were deployed across five sites for four nights to identify Long-nosed Potoroo and Northern Quoll. Traps were baited with either a peanut butter, oat and walnut oil mixture (sites 2 and 9), targeting Long- nosed Potoroo or sardines and chicken frames (sites 4, 5, 13 and Lagoon Creek), targeting Northern Quoll. See Table 7-12 for a breakdown of cameras per site.	156 trap nights (39 camera traps for four nights)
Hair funnel	Ten and 20 hair funnels were set approximately 10 m apart along transects at sites 2 and 9, respectively. Each hair funnel was baited with a peanut butter, oat and walnut oil mixture and left on site for four nights. All hair samples obtained were sent to Barbara Triggs for identification. See Table 7-12 for a breakdown of hair funnels per site.	120 trap nights (30 hair funnels for four nights)
Elliott trap	Twenty large Elliott traps (Elliott B) were used in an attempt to capture Long-nosed Potoroo, Northern Quoll and Yakka Skink across sites 4 and 5. Traps were placed in a single transect line, at intervals of approximately 5-10 m. Traps were left open for four consecutive nights and checked early each morning within two hours of sunrise. Traps were baited with a mixture of peanut butter, oat and walnut oil, and chicken necks. See Table 7-12 for a breakdown of Elliot traps per site.	80 trap nights (20 Elliot traps for four nights)
Cage trap	Forty wire cage traps were used in an attempt to capture Long- nosed Potoroo, Northern Quoll and Yakka Skink across sites 2, 5, 4, 9 and 13. Traps were placed in a single transect line, at intervals of approximately 5-10 m. Traps were left open for four consecutive nights and checked early each morning within two hours of sunrise. Traps were baited with a mixture of peanut butter, oat and walnut oil, and chicken necks. See Table 7-12 for a breakdown of cage traps per site.	160 trap nights (40 cage traps for four nights)
Spotlighting	Spotlight searches for Long-nosed Potoroo and Northern Quoll were conducted at eight sites. The activity involved foot based searches using head torches and spotlights in areas of potential habitat for the target species. See Table 7-12 for a breakdown of spotlight hours per site.	14 hours



Species	Active search	Habitat searches	Tracks / scats / pellets	Bat detector (Passive)	Bat detector (Active)	Harp traps	Camera traps	Hair funnels	Elliott Traps	Cage traps	Spotlighting	TOTAL
Reptile												
Five-clawed Worm-skink	16 hours											16 hours active search
Yakka Skink	16 hours		None detected						80 trap nights		14 hours	16 hours active search, 80 trap nights, 14 hours spotlighting
Mammal												
Northern Quoll		Opportunistic	None detected				156 trap nights		80 trap nights	160 trap nights	14 hours	396 trap nights, 14 hours spotlighting
Long-nosed Potoroo		Opportunistic	None detected				156 trap nights	120 trap nights		160 trap nights	14 hours	436 trap nights, 14 hours spotlighting
Large-eared Pied-bat				16 hours	6 hours	16 trap nights						16 trap nights, 6 hours passive bat detection, 6 hours active bat detection
South-eastern Long-eared Bat						16 trap nights						16 trap nights

Table 7-11 Survey effort for target species



Fauna Survey Site	Active search (person hours)	Habitat search	Tracks/ scats/ pellets	Bat detector - passive	Bat detector - active (hours)	Harp trap	Camera trap (no. cameras)	Hair funnel (no. funnels)	Elliott trap (no. traps)	Cage trap (no. traps)	Spot- lighting (person hours)
1	2		х								
2		Х	Х				5	10		5	3
3			Х								
4		Х	Х			Х	10		10	10	2
5		Х	Х				9		10	10	2
6	2		Х								
7	2		Х								
8	2		Х			Х					1
9		Х	Х			Х	9	20		10	1
10	2		Х								
11			Х								
12	2		Х								
13		Х	Х				5			5	1
Rail loop			Х		2						2
Dam			Х	Х							
Lagoon Creek	4		х		4	Х	1				2

Table 7-12 Survey techniques employed at each fauna survey site







7.4.3 Survey adequacy

Over a period of 13 years, NAC has undertaken a wide range of flora and fauna surveys of the revised Project site and other areas included in the New Acland Coal Mine tenements. These surveys have been described in **Section 7.4.2** and the survey effort undertaken for these surveys is detailed in **Appendix G.5.2**.

Survey guidelines are available for fauna species (birds, mammals, reptiles and fish). Guidelines for flora species and ecological communities have not been published. In the absence of specific EPBC related guidelines for ecological communities, reference has been made to the listing advice for the threatened ecological communities likely to be located within the revised Project site. For flora species, standard vegetation survey methods were used, such as those published by the Queensland Department of Environment and Heritage Protection.

In summary, the survey guidelines have been satisfied for all of the species and threatened ecological communities that are expected to be found in the revised Project area.

Three species of mammal were not surveyed, as the habitat for these species is not present in the area of the revised Project. These species were the brush-tailed rock wallaby, long nosed potoroo and the northern quoll. These species' habitat includes areas of thick heath or wet sclerophyll forest for the long nosed potoroo, and broken and rocky country for the long nosed potoroo and the northern quoll. Records from the Queensland Museum and the Department of Environment and Heritage Protection do not include records of these species from the Acland area.

The EPBC survey guidelines and other recognised survey methods have been used for the conduct of the ecology surveys for the revised Project and other surveys associated with the New Acland Coal Mine. The highly disturbed condition and fragmented distribution of vegetation and habitat of the revised Project site, and the general Acland area, has resulted in a greatly modified landscape with very little habitat. While this is the case, the surveys have located some species and communities listed under the EPBC Act. These species and communities have been consistently observed during the surveys that have been completed, and on this basis, the survey effort and approach satisfies the guidelines.

7.5 Results

The Wildnet database and EPBC Protected Matters Search Tool identities the species listed in **Table 7-13** as possibly occurring on the revised Project site. **Table 7-13** describes the preferred habitat for these species and whether the species have been located on the revised Project site

The list includes:

- nine birds;
- six mammals;
- six reptiles; and
- thirteen plants.



Scientific	NC Act Status	EPBC Act	Preferred Habitat	Presence in revised
Name/Common		Status		Project area
Name				
Birds				
<i>Erythrotriorchis</i> <i>radiates</i> - Red Goshawk	-	Endangered	Occurs over woodland and forested areas in tropical and warm temperate Australia. They prefer mosaic landscapes with a large population of prey (birds) and permanent water. Preferred habit is open forest to allow for fast attacks and manoeuvring in flight.	Not present – habitat throughout the revised Project is highly disturbed and there is a lack of permanent water bodies and with very little area of forest or woodland. Species or nests have not been located following surveys consistent with DotE survey guidelines.
Geophaps scripta scripta - Squatter Pigeon	Vulnerable	Vulnerable	This species prefers open forests to sparse, open woodlands. The species forages in well drained, gravelly, sandy and loamy soils that support open forest to woodland communities.	Not present – while grasslands with surrounding woodlands observed in the vicinity of the revised Project, the species has not been recorded during the surveys completed over past 13 years. Species has not been located following surveys consistent with DotE survey guidelines.
<i>Lathamus discolor</i> - Swift Parrot	Endangered	Endangered	In Queensland it is known to occur in ironbark, red gum and yellow box woodlands, and forests on which they feed on nectar in flowers.	Not present – species is known to have high level of site fidelity, and as no previous records of the species are known from the revised Project area, it is reasonable to conclude that this species is not present.

Table 7-13 Species possibly found in the vicinity of the revised Project site



Scientific Name/Common Name	NC Act Status	EPBC Act Status	Preferred Habitat	Presence in revised Project area
Neochmia ruficauda ruficauda - Star Finch (eastern)	Endangered	Endangered	Occurs in grassland and grassy woodland near permanent water. Population believed to be between Bowen, Winton and Wowan – north of the revised Project site.	Not present - revised Project site is outside the range of the Star Finch.
Ninox strenua	Vulnerable	-	Occurs along the Great dividing Range and adjacent inland slopes. Prefers tall, wet eucalypt forests.	Not present, lack of tall, wet forests in the vicinity of the revised Project area.
Poephila cincta cincta - Black- throated Finch (southern)	Endangered	Endangered	Prefers grassy open woodlands and forests dominated by Eucalyptus, Corymbia and Melaleuca. Usually associated with riparian vegetation.	Not present – revised Project area is in the "may occur" part ofd the species modelled distribution, however the revised Project area does not encompass habitat that is likely to be inhabited by the species.
Rostratula australis - Australian Painted Snipe	Vulnerable	Vulnerable	Favours shallow fresh waterbodies inundated or waterlogged grasslands. Sites usually include rank emergent tussocks of grass sedges and rushes	Not present – areas of poor quality vegetation along Lagoon Creek. Species has not been located following surveys consistent with DotE survey guidelines.
<i>Turnix</i> <i>melanogaster -</i> Black-breasted Button-quail	Vulnerable	Vulnerable	Prefers vine thickets and rainforests that are periodically water-stressed.	Not present – very small area of isolated semi- evergreen vine thicket located on eastern edge of in the revised Project site. Species has not been located following surveys consistent with DotE survey guidelines.



Scientific Name/Common Name	NC Act Status	EPBC Act Status	Preferred Habitat	Presence in revised Project area
<i>Xanthomyza phrygia</i> - Regent Honeyeater	-	Endangered	They use the moister fertile sites in dry box-ironbark woodland and forests such as creekflats and river valleys.	Not present – preferred habitat not present on Project site. Species has not been located following surveys consistent with DotE survey guidelines.
Mammals				
Chalinolobus dwyeri - Large- eared Pied Bat	Vulnerable	Vulnerable	Has been recorded in sandstone gorges in tall eucalypt forests, dry sclerophyll woodlands and forests and rainforests and wet sclerophyll forests. They prefer a combination of sandstone cliffs to provide roosting habitat that are adjacent to higher fertility areas such as box gum woodlands and river/rainforest corridors that can be used for foraging. The species also favours habitat with a canopy.	Not present –This species is highly dependent on sandstone caves for roosting, which do not occur in the revised Project area. Hollow roosting sites available in the revised Project area are only provide opportunistic habitat if the species was flying over the area.
Dasyurus hallucatus - Northern Quoll	-	Endangered	Habitat includes rocky areas in eucalypt forest/woodlands, rainforest, beach scrubs. Eucalypt forests and woodland communities usually have a high level of structural diversity. Typically habitat includes some form of high relief rocky area, surrounded by vegetation for uses as dens.	Not present – The Northern Quoll has only been recorded as far south as the Sunshine Coast, approximately 150 km to the north-east of the Project area (DSEWPaC, 2011a). Additionally, the revised Project area is highly fragmented and moderately suitable patches of denning habitat are disconnected from fauna movement corridors and subject to predation by predatory pests.



Scientific Name/Common Name	NC Act Status	EPBC Act Status	Preferred Habitat	Presence in revised Project area
<i>Nyctophilus</i> <i>corbeni</i> - South- eastern Long- eared Bat	-	Vulnerable	Occurs in larger remnants with a well-developed understorey. Throughout inland Queensland, the habitat for this species is dominated by various eucalypt and bloodwood species and various types of tree mallee with it being most abundant in vegetation with a distinct canopy and a dense cluttered shrub layer.	Not present – The Project area lacks suitable habitat for this species. There are no patches of vegetation with a distinct canopy and a dense cluttered shrub layer in the Project area.
Petrogale penicillata - Brush-tailed Rock-wallaby	Vulnerable	Vulnerable	Prefers rock faces with large tumbled boulders, ledges and caves. Known to occur in a variety of the vegetation types such as dense rainforest wet sclerophyll forest vine thicket and dry sclerophyll forest.	Not present - no large tumbled boulders, ledges or caves located within the project site. Vegetation communities are highly fragmented and of low structural diversity.
Potorous tridactylus tridactylus - Long-nosed Potoroo (SE Mainland	Vulnerable	Vulnerable	Prefers dense understorey vegetation such as coastal heathlands and sclerophyll forests, with dense ground cover. Also prefers sandy soils where it is able to dig for food resources (fungi).	Not present – The Project area lacks suitable habitat for this species. There are no patches of vegetation with dense undergrowth in the Project area. The Project area supports high numbers of the predatory pests Foxes (<i>Vulpes vulpes</i>) and Feral Cats (<i>Felis catus</i>) which prey on this species and have contributed to its decline.



Scientific Name/Common Name	NC Act Status	EPBC Act Status	Preferred Habitat	Presence in revised Project area
Pteropus poliocephalus - Grey-headed Flying-fox	-	Vulnerable	This species feeds in a variety of habitats including rainforests, forests and woodlands communities, urban areas and gardens and orchards. It roosts in trees located neat water such as lakes rivers and the coast.	Known – has been recorded in the vicinity of the revised Project area. (Black Flying-fox were recorded foraging and sheltering within the revised Project area.)
Reptiles				
Anomalopus mackayi - Five- clawed Worm- skink	Endangered	Vulnerable	This species occurs in woodland and grasslands, including bluegrass grasslands, poplar box and brigalow communities. In modified areas, the species has been found sheltering under sheet metal, timber and hay bales.	Not present – bluegrass, poplar box and brigalow communities are found within the revised Project site. The species has not been recorded during the surveys completed over past 13 years.
<i>Delma torquata</i> - Collared Delma	Vulnerable	Vulnerable	This species is found in poplar box, lemon-scented gum and ironbark forests on stony soils and rocky ridges in southern Queensland. These communities usually have an understorey of grasses and lantana that produce thick leaf litter. The species seeks the protection of fallen timber and stones.	Not present – potentially suitable habitat in poplar box and brigalow communities. Eucalypt communities along rocky ridge lines have been recorded during surveys and these areas provide possible habitat. The species has not been recorded during the surveys completed over past 13 years.
<i>Egernia rugosa -</i> Yakka Skink	Vulnerable	Vulnerable	The Yakka Skink is known to occur in brigalow communities, as well as poplar box woodlands. The species has been found in cavities around buried rocks stumps and logs, it also seeks refuge in hollow logs and to burrow tunnels. In cleared areas, the species is known to find shelter under log piles,	Not present – no burrow systems or latrine sites have been identified. The species has not been recorded during the surveys completed over past 13 years.



Scientific Name/Common	NC Act Status	EPBC Act Status	Preferred Habitat	Presence in revised Proiect area
Name				
			erosion gullies and rabbit warrens.	
<i>Furina dunmalli</i> - Dunmall's Snake	Vulnerable	Vulnerable	This species is very rare and secretive. There are few records of its occurrence. It has been recorded at sites in brigalow, cypress pine and sheoak communities, on black alluvial cracking soils. The species has been found sheltering under fallen timber and ground litter, it could make use of cracks in clay soils.	Not present – habitat occurring in brigalow communities. The species has not been recorded during the surveys completed over past 13 years.
Paradelma orientalis - Brigalow Scaly- foot	Vulnerable	Vulnerable	This species has been recorded in a variety of open woodland communities and soils types. Specific habitat preferred by the species, relevant to the project site includes brigalow/belah open forest and mountain coolibah open woodland. Its preferred micro habitat includes sandstone slabs, logs, fallen bark, leaf litter and grass tussocks. The species is known to be able to persist in areas that have been cleared and disturbed.	Not present – preferred habitat of brigalow/belah open forest and mountain coolibah open woodland recorded within the revised Project site. The species has not been recorded during the surveys completed over past 13 years.
<i>Tympanocryptis pinguicolla -</i> Grassland Earless Dragon	-	Endangered	Occurs in naturally treeless native tussock grassland on black or brown clay loams. It prefers ungrazed or lightly grazed paddocks with a slight slope dominated by wallaby grasses, spear grasses, tussocks grasses and kangaroo grasses. They are known to shelter under rocks and sometimes in	Not present –grasslands present within the revised Project area. The species has not been recorded during the surveys completed over past 13 years.



Scientific Name/Common Name	NC Act Status	EPBC Act Status	Preferred Habitat	Presence in revised Project area
			insect holes. The species has been collected from Brookstead, Pittsworth and Toowoomba	
Plants				
<i>Bothriochloa biloba</i> - Lobed Blue-grass	-	Vulnerable	This species is from the Darling Downs and northern NSW. It grows in in cleared eucalypt forests and relict grassland often dominated by other grasses such as Queensland Blue-grass. It prefers heavy textured soils – black and brown clays.	Known
<i>Cadellia pentastylis -</i> Ooline	Vulnerable	Vulnerable	Occurs in dry rainforest, semi-evergreen vine thickets and dry sclerophyll communities.	Unlikely – preferred habitat is not present or in a very degraded condition within the revised Project site.
<i>Clematis fawcettii -</i> Stream Clematis	Vulnerable	Vulnerable	Occurs on loamy soils growing in the gaps of canopies in dry rainforests near streams and semi- evergreen vine thicket, usually near watercourses.	Not present – the only semi-evergreen vine thicket doesn't occur near a stream
Dichanthium queenslandicum - King Blue- grass	Vulnerable	Vulnerable	Occurs in black cracking clay in tussock grasslands mainly in association with other species of blue grass.	Possible – in blue grass grasslands throughout the revised Project site.
<i>Digitaria porrecta</i> - Finger Panic Grass	Near threatened	Endangered	Occurs in grassland on basaltic plains and in undulating woodlands and open forests. Usually occurs on dark and fine textured soils with some degree of seasonal cracking. It persists in disturbed locations. It is found in vegetation communities dominated by mountain coolibah and poplar box.	Known



Scientific Name/Common Name	NC Act Status	EPBC Act Status	Preferred Habitat	Presence in revised Project area
<i>Haloragis exalata subsp. velutina</i> - Tall Velvet Sea- berry	Vulnerable	Vulnerable	This species occurs in rainforest and rainforest margins, including dry rainforests. It is often found in damp areas near watercourses.	Not present – no suitable habitat within the revised Project site. Nearest record is from the Bunya Mountains.
<i>Homopholis belsonii -</i> Belson's Panic	Endangered	Vulnerable	Found in poor soils in dry woodlands of belah, poplar box and sometimes brigalow. It typically prefers light to moderate shade.	Known
<i>Lepidium</i> <i>peregrinum</i> - Wandering Pepper-cress	-	Endangered	This species was thought to be extinct until recently rediscovered in near Clifton in northern NSW. Was found in open riparian forest growing in sandy alluvium.	Not present – no suitable sandy soils observed within the revised Project area.
<i>Picris evae -</i> Hawkweed	Vulnerable	Vulnerable	Occurs in Eucalypt open woodlands with grassy understory composed of Dichanthium species. The species has be found growing along roadsides and in cultivated areas, on black, dark grey or red- brown soils and clay loam soils.	Not present – in grassland and brigalow communities.
<i>Rhaponticum australe</i> - Austral Cornflower	Vulnerable	Vulnerable	Occurs in eucalypt open forest with grassy understorey on roadsides and in road reserves.	Known, has been found adjacent to the rail spur alignment.
Sarcochilus weinthalii - Blotched Sarcochilus	Endangered	Vulnerable	Found growing in trees of rainforests and dry scrubs.	Not present – no suitable habitat recorded within the revised Project area.
<i>Streblus pendulinus -</i> Siah's Backbone	-	Endangered	This species grows mainly along watercourses in well- developed rainforest, gallery forest or drier rainforests.	Not present - no suitable habitat recorded within the revised Project area.



Scientific Name/Common Name	NC Act Status	EPBC Act Status	Preferred Habitat	Presence in revised Project area
<i>Thesium australe -</i> Austral Toadflax	Vulnerable	Vulnerable	Occurs in grasslands and grassy woodlands. Commonly associated with kangaroo grass.	Not present – grassland and grassy woodland habitat occurs within the revised Project area.

7.5.1 Observed Regional Ecosystems

Ten regional ecosystems were found in the revised Project site and are listed in **Table 7-14**. The distribution of these regional ecosystems is mapped in **Figure 7-6**. The location and extent of each community, a general description of species and structure, and an assessment of the conservation values of the community at a national, State and regional level are discussed below.

Regional Ecosystem Code	VM Act Status	Description
11.3.1	Endangered	Acacia harpophylla and/or Casuarina cristata open forest on alluvial plains
11.3.2	Of concern	Eucalyptus populnea woodland on alluvial plains
11.3.17	Of concern	Eucalyptus populnea woodland with Acacia harpophylla and/or Casuarina cristata on alluvial plains
11.3.21	Endangered	<i>Dichanthium sericeum</i> and/or <i>Astrebla</i> spp. grassland on alluvial plains. Cracking clay soils
11.8.11	Of concern	Dichanthium sericeum grassland on Cainozoic igneous rocks
11.8.3	Of concern	Semi-evergreen vine thicket on Cainozoic igneous rocks. Steep hillsides
11.8.5; 11.8.5a	Least concern	Eucalyptus orgadophila open woodland on Cainozoic igneous rocks
11.9.5	Endangered	Acacia harpophylla and/or Casuarina cristata open forest on fine-grained sedimentary rocks
11.9.10	Of concern	Acacia harpophylla, Eucalyptus populnea open forest on Cainozoic fine- grained sedimentary rocks
11.9.13	Of concern	<i>Eucalyptus moluccana</i> or <i>Eucalyptus microcarpa</i> open forest on fine grained sedimentary rocks

Table 7-14 Regional ecosystems of the revised Project site

Vegetation mapping was completed within and adjacent to the Mine in February and March 2007, when the region had been experiencing prolonged drought conditions. A map of regional ecosystems was prepared based on observations made at the time of field surveys. The vegetation mapping showed areas of bluegrass communities in several locations of the site. These were along Lagoon Creek, in the Manning Vale West pit area, along the Acland-Sabine Road and the Oakey-Cooyar Road.



Vegetation surveys and revised mapping was undertaken in August 2013, to confirm the vegetation communities and distribution within the revised Project area and the proposed mine footprint. This survey used the Queensland Herbarium regional ecosystem mapping methodology (Neldner 2012).

The vegetation mapping completed in 2013, has confirmed the presence of those regional ecosystems listed in **Table 7-14** within the disturbance area of the revised Project. The vegetation survey also identified that the areas mapped as regional ecosystems have changed, with an increase in the area of Brigalow and a reduction in the area of bluegrass dominant grassland.

The bluegrass communities identified in the 2007 vegetation mapping were found along Lagoon Creek in three patches and also in two blocks in the Manning Vale West pit area. The location of the bluegrass communities across the revised Project area coincides with areas mapped in the preclearing vegetation mapping as brigalow and poplar box communities. Specifically, these communities are mapped as 11.3.17 (*Eucalyptus populnea* woodland with *Acacia harpophylla* and/or *Casuarina cristata* on alluvial plains), 11.9.5 (*Acacia harpophylla* and/or *Casuarina cristata* on alluvial plains), 11.9.10 (*Acacia harpophylla*, *Eucalyptus populnea* open forest on fine-grained sedimentary rocks) and 11.9.10 (*Acacia harpophylla*, *Eucalyptus populnea* open forest on fine-grained sedimentary rocks). Some areas that were mapped as bluegrass communities now have woody vegetation regrowth occurring throughout the community. The woody regrowth includes *Acacia falcata*, *Acacia salicina*, *Acacia harpophylla*, *Eremophila mitchellii* and *Eucalyptus populnea*. The density of the regrowth of woody species in areas mapped as bluegrass communities is shown in Photo 29, Photo 32 and Photo 33 in **Table 7-1**. The regrowth has a height of two metres and is of a density that is dominating the site, providing shade to the understorey grasses. In its current state, this vegetation is non-remnant vegetation.

These areas lack the diversity of herb and forb species, with *Dichanthium sericeum* being the dominant species, to the exclusion of other grasses, herbs and forbs.

The present condition and structure of the regrowth vegetation in areas that were mapped as bluegrass communities is consistent with a woodland community that has been extensively cleared, where pasture has been established in place of the woodland, and where grazing has occurred regularly over a period of years. The woody regrowth of the revised Project area is even aged and of a consistent height. A vegetation community with such a structure is usual where the grazing pressure has been removed and has not returned for several years, allowing the woody regrowth to become established, with the potential to replace the created pasture.

The change in grazing use of areas that are regenerating has resulted in a change to the vegetation community, with the community moving from a grassland community to regenerating brigalow and poplar box woodland.

Vegetation mapping completed in August 2013 also revised the extent and location of the brigalow communities. The area that has been mapped as a Brigalow community, was shown as regional ecosystem 11.9.10 - *Acacia harpophylla*, *Eucalyptus populnea* open forest on fine-grained sedimentary rocks. This community is present within the disturbance area of the revised Project, however it is interspersed with another brigalow community – 11.9.5 - *Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks. The 11.9.5 community is an artefact community, which has resulted from the clearing of the overstorey *Eucalyptus populnea* from



the 11.9.10 community, leaving a community of *Acacia harpophylla* and *Casuarina cristata*. The removal of the *Eucalyptus populnea* has changed the community from 11.9.10 to 11.9.5.

A small area of regional ecosystem 11.9.13 - *Eucalyptus moluccana* or *E. microcarpa* open forest on fine grained sedimentary rocks has been located in the Manning Vale West pit area. The size of this patch is 3.6 ha.

Reassessment of the semi-evergreen vine thicket community on the eastern boundary of the pit has determined that this community does not extend into the mining lease and is restricted to the eastern side of the Oakey-Cooyar Road. An additional area of the semi-evergreen vine thicket community was confirmed, outside the disturbance footprint of the revised Project, to the west of the Manning Vale West pit area.

7.5.2 Threatened Flora Species

Three species of grasses listed as threatened under the NC Act and the EPBC Act have been recorded within the revised Project site, as displayed in **Figure 7-6**. These species are:

- Bothriochloa biloba Lobed bluegrass;
- Digitaria porrecta Finger panic grass; and
- Homopholis belsonii Belson's panic.

Table 7-15 lists the flora species that have been confirmed within the revised Project footprint that are listed under the NC Act and the EPBC Act.

Listed species	NC Status	EPBC status	Description
Bothriochloa biloba - Lobed bluegrass	-	Vulnerable	One isolated occurrence in eastern part of the revised Project area, near Acland-Silverleigh Road, in the Manning Vale East Pit area.
<i>Digitaria porrecta</i> - Finger panic grass	Near threatened	Endangered	One isolated patch in the western part of the revised Project area, in the Manning Vale West Pit area
Homopholis belsonii - Belson's panic	Endangered	Vulnerable	Twelve patches found in the bluegrass dominated grassland community found in the Manning Vale West Pit and the Willeroo Pit areas, to the south of Lagoon Creek. This species has been found in the shelter of trees in the brigalow and poplar box vegetation communities.

Table 7-15 Listed plant species within the Project site

The vegetation surveys that were completed in August 2013, confirmed the presence of *H. belsonii* within the Manning Vale West pit area. This species was found growing in the brigalow and belah communities. The extent of *H. belsonii* is consistent with previous surveys.



Further occurrences of flora species listed under either the NC Act or EPBC Act were not found during the August 2013 vegetation survey.

7.5.3 Threatened Fauna Species

Grey-headed Flying fox

The Grey-headed flying fox has been recorded in the vicinity of and at the revised Project area. This is the only EPBC Act listed threatened fauna species recorded within or adjacent to the revised Project site.

The Grey-headed Flying-fox has been recorded within the revised Project site. Individuals of the species have not been observed in recent surveys and evidence of roosting sites has also not been observed. It is likely that the woodland and forest patches on site provide foraging habitat for this wide-ranging nomadic species. The species feeds on the nectar and fruits of a diverse range of native and exotic plant species and may range over considerably large areas in search of seasonally available food resources.

Koala

From the fauna surveys completed over the past six years, the Koala has been recorded within the revised Project disturbance area and the general Acland area. The Koala has been seen in poplar box woodland along Lagoon Creek. Evidence of the Koala has also been recorded in poplar box communities west of the revised Project, specifically in the Manning Vale West pit. Surveys completed in March 2013 found evidence of Koalas, in the form of scats and scratches in poplar box communities.

EPBC Birds

A total of 21 survey sites and 8km of Lagoon Creek were surveyed for the target bird species (Australian Painted Snipe, Black-breasted Button Quail, Red Goshawk and Regent Honeyeater). The target species were not located (nor were any nests belonging to the target species). All areas of potential habitat in the revised Project area are inadequate or sub-optimal for the target species due to the high levels of disturbance or a lack of essential resources. This is despite the surveys being conducted in areas of habitat that are the 'best on offer'.

The condition of the native vegetation communities and Lagoon Creek on the revised Project area varies from good to very poor, with the majority of the areas being considered to be in poor condition. The small and isolated nature of the vegetation communities has meant that the majority suffer from extensive weed invasion, significant disturbance to the understorey (through grazing) and pest invasion (particularly foxes, pigs and cats).

There were five habitat types identified within the revised Project area that possibly provide habitat for the targeted bird species. These habitats are described in detail in **Table 7-16**. The bird survey sites are shown in **Figure 7-5**.



Table 7-16 Bird habitat description

Habitat and Description	Habitat features	Description	
Mountain coolibah (<i>Eucalyptus orgadophila</i>) woodland (RE11.8.5)		This habitat type makes up > 30% of the vegetation on the study area. The condition is poor to good. Most occurrences are on a hilltop. The canopy is generally 16-18m high with 10 - 20% cover and the dominant species is <i>Eucalyptus</i> <i>orgadophila</i> with some <i>Corymbia erythrophloia</i> . The trees are remnant with little to	
	Features:	no recruitment.	
	Occasional to common hollow and fallen logs Common to abundant litter and grass No to low (<10% canopy) flower abundance Occasional stones (20-60cm) Disturbance: Grazing Selective logging Heavy weed infestation Sites: 2, 3, 4, 5, 6, 29 Target species: Red Goshawk, Regent Honeyeater	The shrub layer is heavily modified and often includes <i>Opuntia tomentosa</i> * as a dominant species, with the exception of Sites 2 and 29 where <i>Geijera parviflora</i> is dominant. The ground layer is grassy and often grazed.	
Semi-evergreen vine thicket (RE11.8.3)	Features: Occasional hollows and fallen logs Occasional to common decorticating bark Common fine litter Occasional to common grass	This habitat type makes up <0.1% of the vegetation on the study area. The condition is poor. It is on a hilltop. The canopy is generally 10-12m high with 5 - 10% cover and the dominant species is <i>Casuarina cristata</i> . Other softwood scrub species exist in T2, including: <i>Exocarpos</i> <i>latifolius, Flindersia sp.,</i> <i>Capparis sp.</i> The shrub layer is heavily modified and often includes <i>Lycium ferrocissimum</i> * as a dominant species, with <i>Carissa ovata</i> . These shrubs	
	Disturbance:	formed sporadic dense clumps.	
	Grazing Selective logging	The ground layer is bare with some areas of sparse grassy	



Habitat and Description	Habitat features	Description
	Moderate weed infestation	cover.
	Pests (i.e. fox & pig)	
	Sites: 7	
	Target species: Black-breasted Button Quail	
Brigalow / belah open forest with or without poplar box emergents (RE11.9.5, 11.9.10, 11.3.1, 11.3.17)	Features: Rare to occasional hollows and fallen logs Common decorticating bark Abundant litter and occasional grass No flower abundance Patchy understorey Disturbance: Selective logging Moderate weed infestation Evidence of pests (i.e. pigs) Sites: 8, 10, 21, 22, 23, 25, 26 Target species: Black-breasted Button Quail	This habitat type makes up <20% of the vegetation on the study area. The condition is poor to fair. The vegetation is often in a low-lying area. The canopy is generally 10-12m high with 30% cover and the dominant species is <i>Casuarina cristata</i> or <i>Acacia</i> <i>harpophylla</i> . Sometimes there is emergent <i>E. populnea</i> . The shrub layer is heavily modified and often includes dense regrowth <i>A.</i> <i>harpophylla</i> . The ground layer is bare with sparse grassy cover.
Poplar box woodland to open forest with or without vine forest understorey (RE11.3.2, 11.9.7)	Features: Occasional to common hollows and fallen logs Abundant litter and grass Low flower abundance (<10 % canopy cover)	This habitat type makes up <10% of the vegetation on the study area. The condition is good to poor. It is on alluvial plains or mid-rises. The canopy is generally 10-12m high with 10 - 20% cover and the dominant species is <i>E. populnea</i> . Sometimes <i>Acacia pendula</i> is dominant as a T2 layer. The shrub layer is varied from vine forest understorey (dominated by <i>Carissa ovata</i>) like at site 9, to <i>Acacia sp.</i> (<i>A. harpophylla, A. pendula</i>) and <i>Geijera parviflora</i> to open



Habitat and Description	Habitat features	Description
	Disturbance: Selective logging Grazing Moderate weed infestation Evidence of pests (i.e. pigs) Sites: 9, 11, 12, 13, 14, 24, 28 Target species: Regent Honeyeater, Red Goshawk, Black-breasted Button Quail (where vine forest understorey – Site 9)	grassy areas. The ground layer is sparse to dense grass (depending on the density of the shrub layer).
Lagoon Creek riparian zone	Features: Occasional remnant trees with hollows and stags Dams, occasionally with fringing vegetation Disturbance: Cleared Heavily grazed and eroded in places Pests evident (i.e. pigs and foxes) Sites: 17-19 Target species: Australian Painted Snipe, Pagnet Heapyroater, Ped Coshawk	The creek runs across the middle of the study area from north-east to south-west. It is in poor to very poor condition. The creek ranges from shallow overland flow paths connected by dams to deeply eroded channels and pools. The condition of the riparian vegetation varies from completely cleared (particularly in the southern extents) to scattered patches of brigalow (RE11.3.1, 11.3.17), natural grasslands (RE11.3.21) and poplar box woodland (RE11.3.2).

In response to the poor quality of habitat within the revised Project area, only those native bird species that are particularly resilient to disturbance and are regularly successful in grazed areas and on habitat edges have been noted as being present and/or abundant. The following provides a summary of habitat requirements, description of available habitat and findings of the survey for each target species.

Australian Painted Snipe

The species has been recorded in wetlands in all states of Australia, but its main distribution is along the east coast of Australia. There is estimated to be up to 5,000 individuals. There is one record of the species within 10km of the study area, at Jondaryn, however the date of the record is not supplied. Other nearby (within 50km) sightings are from Dalby (1965) and Lake Broadwater (2001) (ALA 2013).



The Australian Painted Snipe was not located during the targeted survey, which focused on areas within and adjacent to Lagoon Creek. Lagoon Creek has been modified to a point where it is no longer suitable for the species. The creek is ephemeral and would have naturally contained areas of temporary wetlands suitable for the species, but grazing activity and the construction of dams along the creek have changed the local hydrology such that local flooding is reduced (and the formation of temporary wetlands is precluded) and water quality in dams is generally poor. Only some of the smaller dams retain native fringing rushes (*Juncus usitatus*), but cattle access is evident. In addition, there is a high population of foxes around the revised Project area and evidence of fox activity along Lagoon Creek.

Black-breasted Button Quail

The species is endemic to eastern Australia, primarily south-eastern Queensland and north-eastern New South Wales. There is estimated to be up to 5,000 individuals and 14 sub-populations in Queensland. The nearest records of the species are about 40km north of the study area, at Yarraman State Forest and around Crow's Nest, however, these records are from 2009 (ALA 2013). The study area is just outside the 'expert distribution' for the species (ALA 2013).

The Black-breasted button quail was not located during the targeted survey, which focused on areas of SEVT and brigalow within the revised Project area. It is likely that the available habitat has been reduced too far and modified to a point where it is no longer suitable for the species. The areas of brigalow available to the species did not contain the dense understorey required for cover. There is only one small (<2 ha) patch of SEVT remaining on the study area and it is isolated and heavily degraded by grazing and weed invasion (particularly African Boxthorn *Lycium ferocissimum*). There is an absence of a thick leaf litter layer in all available habitats in the study area, which is essential for the species for feeding and nesting. It is noteworthy to add that the average annual rainfall for the area is 620mm (BoM 2013), which is less than specified for the species.

Red Goshawk

The species is endemic to eastern Australia. It is very sparsely dispersed across approximately 15% of coastal and sub-coastal Australia, from western Kimberley Division (north of 19°S) to north-eastern NSW (north of 33°), and occasionally on continental islands. There is estimated to be up to 660 individuals. There are records of the species are about 10-15km east of the study area, around Crow's Nest, however, these records are from 1952 and 1978 (ALA 2013).

The Red Goshawk (nor its nest) were not located during the targeted survey, which focused on wooded areas and Lagoon Creek. The species prefers extensively wooded areas and it is likely that the study site does not provide enough remnant vegetation. The diversity and density of medium sized birds (which form its prey) was noted to be low on the study area, which could also contribute to the lack of suitable resources for Red Goshawk.

Regent Honeyeater

The species is endemic to eastern Australia. However, most sightings originate from New South Wales and Victoria. In Queensland, the Regent Honeyeater has been recorded from 15 sites. There is estimated to be up to 400 individuals. There are records of the species are about 30 km south-west of the revised Project area, around Ravensbourne National Park (1901 and 1936), about 35 km north-west in Dalby (2000 and 2001) and 40 km north in Bunya Mountains (2012) (ALA 2013).



The Regent Honeyeater was not located during the targeted survey, which focused on wooded areas particularly box forest on flood plains and street trees in Acland. The species prefers box-ironbark woodland/open forest and there are no ironbark species naturally occurring on the study area. The ironbark specimens that do occur are Mugga Ironbark that has been introduced to the revised Project area and planted as street trees around the town centre of Acland. The species is not often recorded in Queensland and existing records in the region are distant and over 45 years old, therefore it is not likely that the species would utilise the heavily fragmented vegetation or the few street trees available in the study area.

EPBC Reptiles and Mammals

The habitat within the revised Project area is significantly altered from its original state with the vast majority of the area having been cleared. Remaining habitat is restricted to small, isolated patches of remnant vegetation that is subject to weed and pest invasion and on-going cattle grazing. The revised Project area, consisting primarily of grazing paddocks, has produced a heavily disturbed landscape. The remaining remnant vegetation is heavily fragmented, isolated and provides limited habitat to native fauna. The habitat of the revised Project area relevant to the reptiles and mammals that were the target of this survey can be attributed to six habitat types, as described in **Table 7-17**. The bird survey sites are shown in **Figure 7-5**. Photographs of habitat of the revised Project area are provided in **Photograph 7-1** to **Photograph 7-6**.


Habitat type	Key habitat features	Site(s)	Corresponding REs	Potential target species
Brigalow / Belah woodland (Photograph 7-1)	Limited branch-sized hollows with a mid-sparse shrub layer provide habitat for arboreal fauna, bats and birds. Logs, litter, rocks and cracking clay soils provide habitat for reptiles and macropods.	1, 8, 9, 10 and 11	11.3.1 11.9.5 11.9.10	 Five-clawed Worm- skink Large-eared Pied-bat Long-nosed Potoroo Northern Quoll South-eastern Long- eared Bat Yakka Skink
Cleared land (Photograph 7-2)	Little habitat for the species of fauna targeted in this report. Cracking clay soils may provide habitat for reptiles though long term cattle grazing has resulted in soil compaction and minimal cracks are present.	Rail loop	Non-remnant	 Five-clawed Worm- skink Yakka Skink
Mountain Coolabah woodland (Photograph 7-3)	Abundant branch- and trunk-sized hollows with a mid-sparse shrub layer provide habitat for arboreal and terrestrial fauna, bats and birds. Logs, litter, rocks and cracking clay soils provide habitat for reptiles and macropods.	4, 5, 6 and 13	11.8.5	 Five-clawed Worm- skink Large-eared Pied-bat Long-nosed Potoroo Northern Quoll South-eastern Long- eared Bat Yakka Skink
Natural grasslands (Photograph 7-4)	Tussocks, fallen logs and cracking clay soils provide habitat for reptiles and macropods.	7 and 12	11.3.21	Five-clawed Worm- skinkYakka Skink
Poplar Box / Weeping Myall woodland (Photograph 7-5)	Limited branch-sized hollows with a mid-sparse shrub layer provide habitat for arboreal fauna, bats and birds. Logs, litter, rocks and cracking clay soils provide habitat for reptiles and macropods.	3	11.3.2	 Five-clawed Worm- skink Large-eared Pied-bat Long-nosed Potoroo Northern Quoll South-eastern Long- eared Bat Yakka Skink
Semi-evergreen vine thicket (Photograph 7-6)	Trees with a mid-sparse shrub layer provide habitat for bats and birds. Logs, litter, rocks and cracking clay soils provide habitat for reptiles and macropods.	2	11.8.3	 Large-eared Pied-bat Long-nosed Potoroo Northern Quoll South-eastern Long- eared Bat

Table 7-17 Fauna habitat description





Photograph 7-1 Brigalow / Belah woodland



Photograph 7-2 Cleared land





Photograph 7-3 Mountain Coolabah woodland



Photograph 7-4 Natural grasslands





Photograph 7-5 Poplar Box / Weeping Myall woodland



Photograph 7-6 Semi-evergreen vine thicket





7.6 Fauna diversity

None of the fauna species targeted in reptile and mammal survey were identified in the revised Project area. In total, 43 fauna species were observed comprising eight reptiles, 17 birds (one exotic species) and 18 mammals (including eight exotic species). These species are listed in **Appendix G.5.1**.

Overall, the habitat in the study area for the fauna species targeted in this report, and other native species generally, is of poor quality. The site has previously undergone significant clearing for cultivation and grazing and is heavily disturbed and mostly comprised of cleared land and access tracks. The small patches of remnant vegetation that remain are generally associated with Lagoon Creek and farm houses. As a result, these small patches are highly fragmented, isolated and subject to edge effects. Consistent with a landscape in this condition, the area is heavily invaded by introduced pest species such as the Feral Cat (*Felis catus*) and Wild Dog (*Canis familiaris*), Indian Mynas (*Acridotheres tristis*), Red Fox (*Vulpes vulpes*) and European Rabbits (*Oryctolagus cuniculus*), and weeds including Velvet Tree Pear (*Opuntia tomentosa*) and Rhodes Grass (*Chloris gayana*).





7.7 Assessment of Impacts

This section assesses the impact of the revised Project on terrestrial ecology (significant flora and fauna) that have been identified from the ecological surveys.

7.7.1 Clearing of vegetation

The revised Project will result in the clearing of 142.9 ha of nine regional ecosystems and 64.7 ha of three threatened ecological communities, as listed in **Table 7-18**. Figure 7-7 shows the impact of the revised Project footprint in relation to the distribution of significant remnant vegetation communities and flora species.

Table 7-18 Area of threatened ecological communities and regional ecosystems to be cleared

Threatened Ecological Community	EPBC status	Area cleared (ha)
Brigalow (<i>Acacia harpophylla</i>) dominated and co-dominated community	Endangered	24.6
Bluegrass dominant grasslands of the Brigalow Belt Bioregions (North and South)	Endangered	40.1
Total area of TECs		64.7
Regional Ecosystem	VM Status	Area cleared (ha)
Acacia harpophylla and/or Casuarina cristata open forest on alluvial plains (RE 11.3.1)	Endangered	12.0
Eucalyptus populnea woodland on alluvial plains (RE11.3.2)	Of concern	4.5
<i>Eucalyptus populnea</i> woodland with <i>Acacia harpophylla</i> and/or Casuarina cristata on alluvial plains (RE11.3.17)	Of concern	5.8
<i>Dichanthium sericeum</i> and/or <i>Astrebla</i> spp. grassland on alluvial plains. Cracking clay soils (RE 11.3.21)	Endangered	35.9
<i>Dichanthium sericeum</i> grassland on Cainozoic igneous rocks (RE 11.8.11)	Of concern	4.1
<i>Eucalyptus orgadophila</i> open woodland on Cainozoic igneous rocks (RE 11.8.5 and 11.8.5a)	Least concern	60.3
Acacia harpophylla and/or Casuarina cristata open forest on fine- grained sedimentary rocks (RE11.9.5)	Endangered	12.6
Acacia harpophylla, Eucalyptus populnea open forest on Cainozoic fine-grained sedimentary rocks (RE11.9.10)	Of concern	4.1
<i>Eucalyptus moluccana</i> or <i>E. microcarpa</i> open forest on fine grained sedimentary rocks (RE 11.9.13)	Of concern	3.6
Total area of regional ecosystems		142.9





Brigalow community

An area of 28.7 ha of Brigalow woodland is to be cleared for the revised Project. The regional ecosystems that comprise the Brigalow community are 11.3.1, 11.9.5 and 11.9.10. The Brigalow TEC includes only regional ecosystems 11.3.1 and 11.9.5. The Brigalow to be cleared is located within the Manning Vale East and Willeroo pit areas, north and south of Lagoon Creek, on the eastern side of the revised Project area and within the Manning Vale West pit area. There will not be any Brigalow cleared for the construction of mine infrastructure.

The Brigalow communities comprise isolated clumps of Brigalow within the disturbance footprint of the revised Project.

The impact of the revised Project on the Brigalow community is assessed to be a low impact, due to the small area that is to be cleared. The design and proposed placement of the rail spur and loop has proactively avoided an area of Brigalow community in the south-western corner of the revised Project area. The placement of the rail spur and loop will avoid clearing 4.33 ha of Brigalow community. Several small patches of the Brigalow community are located on the banks of Lagoon Creek. These small areas of the community will not be impacted as Lagoon Creek will not be diverted as part of the revised Project is 2.71 ha. A 100 metre wide corridor will be retained and actively regenerated along the length of Lagoon Creek, as it runs between the Manning Vale East and Willeroo pits.

The impact of the revised Project on areas of Brigalow is as a result of the placement of the mine pits, which is a consequence of the location of the coal resource. The impact on the Brigalow community is an unavoidable outcome of the revised Project. The area of impact has been limited to the smallest possible area.

Poplar box woodland

An area of 10.3 ha of poplar box woodland, comprising regional ecosystems 11.3.2 and 11.3.17, will be impacted by the revised Project. The poplar box woodlands are found in the Manning Vale West pit area and also adjacent to Lagoon Creek.

Areas of the woodland will be unaffected by the revised Project. These areas are located outside the disturbance footprint in the vicinity of Lagoon Creek and to the west of the proposed rail spur.

Bluegrass community

An area of 40 ha of the bluegrass community will be cleared as a result of the revised Project. The majority of the community to be cleared is located within the Manning Vale West Pit area, on the western side of the revised Project area. Other areas of the community that will be cleared are parts of two patches on the southern side of Lagoon Creek, between Acland-Silverleigh Road and Acland-Sabine Road, within the Willeroo pit.

The impact of the revised Project on the bluegrass community is assessed to be a low impact, due to the small area that is to be cleared, at 40 ha and the low quality of the community within the disturbance footprint. The bluegrass dominant grassland community within the Willeroo pit is of low quality, illustrated by the low diversity of grassland species, dominance of *Dichanthium sericeum* and



the moderate level of weed infestation. The quality of the community in the Manning Vale West pit is of higher quality, with a greater diversity of grassland species.

The revised Project will result in the clearing of 35.89 ha of the community adjacent to Lagoon Creek. An area of 7.15 ha of the community is outside the disturbance footprint of the revised Project, located either between the mine pit and Lagoon Creek or to the west of the Willeroo pit.

Within the Manning Vale West pit, an area of 4.21 ha of the bluegrass dominant grassland community will be impacted by the revised Project. This patch of the community is fully within the Manning Vale West pit boundary and the impact cannot be avoided.

As with the Brigalow community, the impact of the revised Project on the bluegrass dominant grassland is as a result of the placement of the mine pits, which is a consequence of the location of the coal resource.

Mountain coolabah woodland

Several patches of mountain coolabah woodland are found within the disturbance footprint of the revised Project. The mountain coolabah woodland is present as regional ecosystem 11.8.5 and 11.8.5a. These areas of woodland are within the Manning Vale West pit area, and cover an area of 60.3 ha. This community is a Least Concern Regional Ecosystem.

Five areas of mountain coolabah woodland fall outside the disturbance footprint of the revised Project and will not be affected by the development of the revised Project. These remnants are located to the north west and north of the Manning Vale West pit, within the Mine.

Gum-topped box forest

A small area of gum-topped box woodland is located in the Manning Vale West pit. This regional ecosystem is 11.9.13 and is 3.6 ha in size.

7.7.2 Flora species

Three flora species that are listed under either the NC Act or the EPBC Act have been recorded from the revised Project site and are within the disturbance footprint. The impact of the revised Project on these species is described below.

There are four other flora species that may occur within the disturbance footprint of the revised Project. An assessment of the impact of the revised Project on these species is also described below.

Bothriochloa biloba - Lobed bluegrass

The revised Project will result in the clearing of one patch of *Bothriochloa biloba*. This is located on Acland-Silverleigh Road in the road reserve and will fall within the Manning Vale East Pit. Habitat for the Lobed bluegrass will remain within and around the revised Project site following the construction of the revised Project, in the form of eucalypt woodland and grasslands.

Digitaria porrecta - Finger panic grass

The revised Project will result in the clearing of one patch of *Digitaria porrecta*. This is located in the western part of the revised Project area and will fall within the Manning Vale West Pit. It is possible



the species is also found in other areas of the revised Project area, in suitable habitat. Preferred habitat of mountain coolibah and poplar box communities are to be retained in the revised Project area, and not affected by the revised Project footprint. These communities are present across the Acland region and will continue to support the Finger panic grass.

Homopholis belsonii - Belson's panic

The revised Project will result in the clearing of 12 patches of *Homopholis belsonii*. These patches of *H. belsonii* are associated with the bluegrass dominated grassland community and are found in the Manning Vale West Pit and the Willeroo Pit, to the south of Lagoon Creek. *H. belsonii* is associated with brigalow threatened ecologic al community and the mountain coolibah woodlands.

Habitat for Belson's panic will remain unaffected by the revised Project. The poplar box, belah and Brigalow woodlands unaffected by the revised Project are located in remnant areas. These areas of remnant include along roadsides, in vegetation adjacent to the disturbance area and remnants within the mining lease. Therefore, the impact of the revised Project on this is species is low.

Dichanthium queenslandicum - King Blue-grass

King blue grass is known to occur on black clay soils in grassland communities. This habitat is found within the revised Project footprint and it is possible that the species could be affected, although the species has not been recorded within the revised Project area. Areas of suitable habitat will remain outside the revised Project disturbance area and, as a result the impact of the revised Project on this is species is low.

Picris evae - Hawkweed

Hawkweed may possibly be found in the eucalypt woodlands across the revised Project site. It is possible the species will be affected by the revised Project. While areas occupied by this species may be affected by the revised Project, there will be habitat retained outside the revised Project footprint. Vegetation suitable for hawkweed will be retained in grassland areas along Lagoon Creek, scattered areas of brigalow and grassland to the south of the Willeroo pit and to the east and west of the Manning Vale West pit. Therefore, the impact of the project on this is species is low.

Rhaponticum australe - Austral Cornflower

This species is known to occur in the vicinity of the revised Project area and has been located adjacent to the proposed rail spur alignment. The known location of the species is outside the disturbance footprint of the revised Project. Despite no occurrences to-date, there is a marginal possibility that this species may occur in areas of eucalypt woodland that are to be cleared for the revised Project. Therefore, the impact of the revised Project on this is species is low.

Thesium australe - Austral Toadflax

Austral toadflax is known from grassland communities and it is possible that this species could be affected by the revised Project, due to the clearing of grasslands. However, there will be areas of grassland retained within the revised Project area, where the species can continue to occur. Therefore, the impact of the revised Project on this is species is low.



7.7.3 Fauna species

Two listed species are known from the revised Project area, these are the Koala and Grey-headed Flying fox.

Phascolarctos cinereus - Koala

The Koala has been confirmed at the revised Project site and has been seen along Lagoon Creek. Habitat and evidence of Koalas have been located in the vegetation within the Manning Vale West pit disturbance area and Lagoon Creek. The revised Project will result in the clearing of 10.3 ha of habitat used by the Koala. This area of habitat is isolated from other areas of Koala habitat in the western part of the revised Project area. However, it appears that Koalas move across the revised Project area and makes use of areas of isolated and fragmented habitat.

To the south of the Manning Vale West pit, near to the rail loop and to the south west of Acland, there are areas of poplar box woodland that have value as Koala habitat

Koala habitat along Lagoon Creek will be retained, although small areas of the poplar box communities outside of the conservation zone will fall within the disturbance footprint. Habitat will continue to be available to the species along Lagoon Creek and the unhindered movement of Koalas will continue once the revised Project is constructed and operated.

Pteropus poliocephalus - Grey-headed Flying-fox

The revised Project will result in the temporary reduction in foraging habitat as a result of the clearing of vegetation for the revised Project. There is the potential for an impact to the local foraging behaviour of members of the local flying-fox population. The Grey-headed Flying-fox has been recorded as single individuals foraging in the revised Project site. There are no camps located within the area. Areas of habitat and vegetation suitable for use by the Grey-headed Flying fox for feeding will continue to be available to the species, with the development of the revised Project. Consequently, while areas suitable for foraging will be removed for the revised Project, areas of suitable habitat will be retained, especially along Lagoon Creek and outside the mine pits. As there are not any camps within the revised Project site, the impact on the species is considered to be low, as the Grey-headed Flying-fox uses habitat and resources from the general Acland area. Retention of habitat outside the disturbance footprint will continue to be available to the species.

7.8 Infrastructure impacts

The power network will be relocated along roads and disturbed areas of the revised Project area. The new power lines will be constructed on poles, as is standard for 33kV electricity distribution networks. The underground 33kV network is located in a disturbed area of the existing mine, as shown in **Figure 3-26** and a 300m section to provide power to the rail loop.

The placement of power poles will specifically avoid areas of threatened ecological communities and listed species, as there is flexibility on the location of the poles. Lay down areas and related facilities required for the construction of the relocated power lines will also be located to avoid matters of national environmental significance.



The revised Project will require the relocation of telecommunication facilities. These facilities will be relocated by Telstra, in association with NAC. A telecommunications hut and telephone cables will need to be removed from the revised Project site. Impacts associated with the relocation of the telecommunication infrastructure will be managed by Telstra as part of their relocation of these facilities.

7.8.1 Indirect impacts

Dust generation from mining, blasting, conveyor systems and wind blown coal dust from stockpiles, has the potential to cause an impact to matters of vegetation communities and species near the mine.

The main sources of dust from the revised Project are vegetation clearing, blasting and excavation, general haulage around the site, the coal handling and preparation plant, mine pits, rail transport and overburden dumps. Some of these dust sources are confined to particular areas such as the excavation pits and stockpiles where as other sources of dust such as vehicle movement will occur throughout the mine and along roads.

With the prevailing easterly winds, dust will be blown to the west of the revised Project area. The landscape to the west is primarily cleared farming and grazing land. Detailed surveys of the revised Project site and the surrounding area show that there are no terrestrial ecology values or areas considered having high ecological value located within the predicted prevailing dust path.

Consequently, the revised Project will not cause an impact to communities or species from project generated dust as there are no matters within the predicted dust plume.

Dust generation from mining, blasting, conveyor systems and wind-blown coal dust from stockpiles has the potential to cause an impact to matters of NES.

The main sources of dust from the revised Project are vegetation clearing, blasting and excavation, general haulage around the site, the coal handling and preparation plant, mine pits, rail transport and overburden piles. Some of these dust sources are confined to particular areas such as the excavation pits and stockpiles where as other sources of dust such as vehicle movement will occur throughout the mine and along roads.

With the prevailing easterly winds, dust will generally be blown to the west of the revised Project area. The landscape to the west is primarily cleared farming and grazing land. Detailed surveys of the revised Project site and the surrounding area show that there are no matters of NES or areas considered as having high ecological value located within the predicted dust path.

Consequently, the revised Project will not cause an impact to matters of NES from project generated dust as there are no matters within the predicted predominant dust plume.

7.8.2 Dust

Most dust from coal mines is associated with windblown dust from overburden movements, wind erosion and wheel generated dust.



A dust deposition rate of 1,000 mg/m²/day is predicted to result in measurable reductions in crop growth during overcast weather, but the effect may be more difficult to detect in sunny weather (Doley, 2003). Model calculations on a cotton crop suggest that dust deposition rates of 500 mg/m²/day are unlikely to have a detectable effect on vegetative growth (Doley, 2003). The predicted dust deposition rates from the revised Project are not likely to have a significant impact on vegetation communities or species.

As described in Section 9.4.4 of the EIS, air dispersion modelling completed for the revised Project for the years 2019, 2023 and 2029 show that daily dust deposition rates at residential receptors close to the mining lease boundary, at the maximum, are at 22% of the level identified by Doley (2003) as having an impact of crops. The dust deposition modelling shows the highest predicted level of dust deposition to be 218 mg/m²/day. This level of dust deposition is predicted to occur in 2029.

Section 9.5.1 of the EIS details the measures to be undertaken to minimise dust emissions from the revised Project. NAC proposes to implement a dust forecasting system to provide daily predictions of upcoming meteorological conditions and potential risk of air quality impacts from mining operations from the revised Project. Predictions from the dust forecasting system will allow operators to identify locations and times of potentially increased risk of dust generation and to facilitate appropriate planning to minimise or avoid potential impacts. An adaptive air quality management plan has been prepared for the revised Project.

The adaptive management measures will include the suspension or modification of operations in response to the following triggers:

- potential dust risk predictions from the dust forecasting system;
- warning or exceedance alarms from the strategic real time air quality monitoring system; and
- observation(s) of significant dust generation during visual monitoring of mining activities.

In summary, the adaptive management measures include:

- increase watering rate applied to haul roads in the Manning Vale West Pit, Manning Vale East Pit and Willeroo Pit;
- suspension of overburden/interburden blasting if meteorological conditions are unfavourable;
- suspension or modification of dozer operations on overburden dumps; and
- suspension or modification of all or selected overburden and/or coal handling activities (including excavation, loading, dumping and hauling).

Additionally, NAC will undertake veneering and profiling of the loaded coal to minimise dust emissions during the transport of coal from the Train Loadout Facility.

These measures will limit the impact of dust deposition on vegetation communities and species adjacent to the Manning Vale West Pit, Train Loadout Facility and Rail Spur.



7.8.3 Habitat Fragmentation

The revised Project will result in the clearing of native vegetation and habitat. As previously described, vegetation and habitat across the revised Project site is already highly fragmented, disconnected from adjacent areas of habitat and scattered cleared farming country.

Fragmentation of vegetation and habitat will occur in patches to the west and east of the Manning Vale Pit and to habitat along Lagoon Creek.

While the revised Project will lead to clearing of 142 ha of remnant vegetation, there will be 281 ha of native vegetation and habitat unaffected by the revised Project. Vegetation along Lagoon Creek will be retained and continue to provide habitat connectivity. Lagoon Creek's riparian vegetation will be protected by a conservation zone, 50 metres either side of the creek channel. The conservation zone possesses a dedicated management plan, the Conservation Zone Management Plan (Appendix J.6), which is designed to protect and enhance the condition of the riparian vegetation.

Remnants of vegetation and habitat will be retained adjacent to the rail loop, along Acland-Sabine Road, in the north-western corner of the revised Project area and in the southern-eastern corner of revised Project area. These remnants will not be cleared by the revised Project and as a result, will not be further fragmented. **Figure 7-6** shows those areas of vegetation and habitat that will remain unaffected by fragmentation arising from the revised Project.

7.9 Mitigation Measures

NAC proposes a number of mitigation measures to manage the impact of the revised Project on terrestrial ecology values. These mitigation measures are included in the EM Plan, which is provided in **Appendix J.19**. The measures are specifically described in a number of specific management plans and the delivery of biodiversity offsets.

7.9.1 Biodiversity Offset Strategy (BOS)

The Biodiversity Offset Strategy has been prepared in accordance with the EPBC Act Environmental Offsets Policy 2012 and with reference to the Queensland Biodiversity Offset Policy, the State Policy for Vegetation Management and the Policy for Vegetation Management Offsets. The BOS addresses the offset needs for both TECs and listed species, as well as for regional ecosystems and State protected species.

The Biodiversity Offset Policy has been used to inform the BOS though reference to specific requirements for mining projects.

NAC has prepared a Biodiversity Offset Strategy to describe how the loss of the TECs, regional ecosystems and listed species, as a consequence of the revised Project, will be offset. The BOS includes:

- a description of the TEC, regional ecosystems and listed species to be cleared, the area and location within the revised Project area;
- the location of the offset sites, both on land owned by NAC and others;



- the assessment of the condition of the TEC regional ecosystems to be cleared and the quality of the offset site;
- management commitments to improve the quality of the offset site; and
- monitoring and reporting plans to submission to DotE.

The EPBC Offset calculator has been used to compare impact and proposed offset sites for the bluegrass dominant grasslands. The bluegrass offsets are intended to be located on land owned by NAC and which is adjacent to the revised Project site.

The brigalow offsets have not been assessed with the Offset calculator. This will be completed once there is confirmation from the third party landholder that there is agreement to enter into discussions on the establishment of an offset on their property.

The BOS is found in Appendix I.

Brigalow Offset

The total Brigalow impact of the revised Project on brigalow is 28.7 ha, which includes both Queensland and Commonwealth listed communities, comprised of RE 11.3.1, RE 11.9.5 and 11.9.10.

The revised Project will result in the clearing of 24.6 ha of Brigalow TEC, based on the impact of regional ecosystems 11.3.1 and 11.9.5. Endangered Brigalow community, under Queensland legislation includes regional ecosystems 11.3.1, 11.9.5 and 11.5.10 and covers an area of 28.7 ha.

NAC is currently investigating several options with regard to suitable Brigalow offset areas within the Bioregion. The Brigalow offset for Queensland and Commonwealth impacts will be collocated to improve the ecological benefit of the offset and to improve the management effectiveness of the offset.

It is expected that the Brigalow offset will be approximately 100 ha.

Natural grasslands Offset

The bluegrass community consists of RE 11.3.21 and 11.8.11. Of this, the entire 40.1 ha is listed by Queensland and Commonwealth legislation. The proposed bluegrass offset of 247 ha has been identified on the NHG's property and this should satisfy the Queensland and Commonwealth offset policies. Based on the EPBC offset calculator, the area of this is offset is in the order of 90 ha. The three listed grass species that may be impacted by the revised Project have been identified as occurring within the proposed offset area, and so will be collocated within the natural grasslands offset area.

Poplar box and Gum-topped box Offset

NAC is investigating options for the establishment of an offset for poplar box and gum-topped box in the Bioregion. Initial information has identified that an appropriate area is available to offset the clearing of 13.9 ha of these communities. Investigations are continuing and discussions are planned with third party landholders on whose property the offset may be located.

Securing offsets for these communities will also provide an offset for the loss of Koala habitat.



Fauna listed under Nature Conservation Act

Habitat for the Koala, a special least concern species under the Nature Conservation Act, will be cleared for the revised Project. This habitat is poplar box woodland and an area of 10.3 ha is to be cleared, in the Manning Vale West pit and along Lagoon Creek.

An offset for the Koala will be satisfied with the creation of an offset for the poplar box woodland (11.3.2) – an of concern regional ecosystem.

Plants listed under Nature Conservation Act

Two species of plant listed under the Nature Conservation Act will be affected by the revised Project. These species are *Digitaria porrecta* and *Homopholis belsonii*.

These species will be translocated and re-established within areas of bluegrass dominant grassland offset, to be located to the south of the revised Project on land owned by NAC.

The two listed threatened species affected by the project (*Digitaria porrecta* - Finger panic grass; and *Homopholis belsonii* - Belson's panic) will be offset within the offsets provided for the natural grassland communities.

Within the revised Project area, these two species are regularly observed and are available in areas of the natural grassland and in other areas of the revised Project area. There is the possibility that these species could also be located in the Brigalow offset areas, however, this will not be known until these Brigalow offsets are inspected and assessed.

The Queensland Biodiversity Offset Policy has been used to develop the structure and content of the BOS, in relation species listed under the *NC Act 1992*.

7.9.2 Management Plans

Bluegrass Offset Management Plan (BOMP)

NAC has prepared a BOMP that outlines the methodology for establishing and managing a *Dichanthium sericeum* dominated grassland community that will be used for the biodiversity offset that addresses the clearing of the EPBC TEC. Key aspects of the BOMP include the revegetation and management goals/objectives, trial location and area details, planned revegetation techniques (e.g. species selection, seeding methods and rates, timing, etc.), rehabilitation acceptance criteria, a monitoring and reporting regime, a maintenance regime for weeds and poor establishment and a comprehensive long term management regime.

The biodiversity offset will be located on land owned and controlled by the Acland Pastoral Company (a subsidiary of the NHG).

The BOMP is found in **Appendix J.8**.

Conservation Zone Management Plan (CZMP)

For the Mine and revised Project, NAC has committed to a conservation zone over Bottle Tree Hill and 50 metres either side of Lagoon Creek, to protect and enhance ecologically significant areas of remnant vegetation not to be mined, and to promote the restoration of the Lagoon Creek riparian



zone. NAC has produced a CZMP to manage these ecologically significant areas within the Mine and revised Project areas. The main components of the CZMP includes the revegetation and management goals/objectives, planned revegetation techniques (e.g. species selection, planting methods and rates, timing, etc.), rehabilitation acceptance criteria, a monitoring and reporting regime, a maintenance regime for weeds and poor establishment, and a comprehensive long term management regime.

The CZMP is found in **Appendix J.6**.

Threatened Species Translocation Plan (TSTP)

A TSTP has been developed for the threatened flora species impacted by the revised Project. The TSTP aims ensure no net loss of individuals from the local population and will include:

- a discussion of known ecology and reproductive biology of the target species;
- a methodology for relocating the target species;
- a set of performance indicators to demonstrate successful relocation of the target species;
- a review of propagation potential for the target species;
- a methodology for the propagation of the target species;
- identification of suitable receiving sites for the propagated and/or relocated individuals of the target species; and
- a regime for long term monitoring and management of translocation sites.

The TSTP is found in **Appendix J.7**.

Construction Phase Management

Areas to be cleared will have boundaries clearly marked by tape, pegs or other means. The demarcated boundaries will conform within the limits of design drawings and will comply with the Mine's existing clearance procedures. Particular attention will be paid to defining the boundaries of clearing where threatened ecological communities, under Federal legislation, and endangered regional ecosystems, under State legislation, are present.

All vegetation clearance will be restricted to that necessary for the safe operation of mining activities. A plan for dealing with fauna during clearing and construction will be prepared to outline protocols for dealing with injured wildlife and other necessary actions relating to fauna. This plan will be prepared by the construction contractor, to be implemented during the construction of the revised Project. Contractors to construct telecommunications and electricity networks will also prepare construction management plans that will describe their commitments to managing fauna during construction.

All remnant vegetation that does not require clearing will be protected from further disturbance to enhance its potential for natural regeneration.



Pest and Weed Management Plan (PWMP)

A PWMP has been prepared for the Project, and details:

- management methods for declared weeds within the revised Project site in accordance with local management practice and / or agency guidelines, in particular for *Lycium ferocissimum* (African Boxthorn) and *Opuntia stricta* (Prickly Pear);
- management methods for weeds of concern within the revised Project site in accordance with the local management strategies and / or agency guidelines, in particular for *Xanthium pungens* and *Xanthium spinosum* (Noogoora and Bathurst burrs, respectively);
- monitoring of treated areas to assess the success of declared weed management;
- monitoring of revised Project site to identify any new infestations of weeds;
- information on identifying declared weeds; and
- use of wash-down facilities for earthmoving equipment entering or leaving the revised Project site.

The PWMP is found in **Appendix J.9**.

Pest and Domestic Animal Management

NAC will continue to take reasonable steps to keep the Project site free of Class 1 and Class 2 declared animal pests, in accordance with the requirements of the LP Act. Management of animal pests will also be consistent with any pest management plans set by the Toowoomba Regional Council. NAC undertakes periodic consultation with Toowoomba Regional Council and Agforce to keep up to date with pest management issues.

To protect native fauna within the revised Project site, Project employees, contractors or visitors will not be allowed to bring domestic animals, such as cats and dogs, onto the Project site.

7.10 Conclusion

The revised Project is located in area that has had a long history of agricultural use, which has resulted in the clearing of large areas of vegetation and habitat. Consequently, vegetation and habitat is fragmented and present in isolated parches across the Acland area.

The revised Project will result in the clearing of 142.9 ha of remnant vegetation within the planned disturbance footprint. Nine regional ecosystems will be affected by vegetation clearance activities proposed for the revised Project. Under the VM Act, three regional ecosystems are listed as Endangered, five regional ecosystems are listed as Of Concern and one regional ecosystem as Least Concern.

There are two threatened ecological communities, under the EPBC Act, to be impacted by the revised Project, covering an area of 64.7 ha – a *Dichanthium sericeum* dominant grassland community (40.1 ha) and an *Acacia harpophylla* dominant and co-dominant community (24.6 ha).

Two Queensland and three Commonwealth listed plant species are known to occur within the disturbance footprint of the revised Project area - *Digitaria porrecta* (Qld and Cth), *Homopholis belsonii*



(Qld and Cth) and *Bothriochloa biloba* (Cth), respectively. A further three species of listed plants possess a low probability of being affected by the revised Project.

The Koala has been identified in the vicinity of the revised Project area and some of the Koala habitat within the revised Project area will be cleared. The Grey-headed flying fox has been observed in the revised Project area. A further three birds, two mammals and six reptiles may inhabit the revised Project area, although survey efforts since 2005 have not recorded sightings of these species within the revised Project area.

While there will be clearing of vegetation and habitat for the revised Project, there will be areas left unaffected by the revised Project footprint. These areas will continue to be used by wildlife and be able to provide resources for species found in the revised Project area.

Those impacts that are not able to be avoided are to be managed with the implementation of an offset strategy and a number of specific management plans, to address matters such as species translocation, offset management and management of the Lagoon Creek corridor.

7.11 Summary of Mitigation Measures and Commitments

Project Activity	Mitigation measures
Removal of riparian vegetation at waterway crossings.	Minimise areas of vegetation to be cleared by selecting crossing locations which require minimal clearing of established vegetation. Implementing the management measures described in the FLURP and the Conservation Zone Management Plan. Monitor riparian vegetation on banks to review and refine riparian management and rehabilitation strategies.
Earthworks and construction within the channel and banks for watercourse crossing	Minimise width of the rail and road crossing and locate workspace areas away from creek banks, so as to reduce the disturbance to riparian vegetation, bank and channel affected by construction. Restrict construction within and around the creek channel to the dry periods and rehabilitate areas of disturbed channel bed and banks. Design and construct temporary barriers in waterways to minimise disturbance to environmental flows. Monitor the effectiveness of waterway crossing rehabilitation.
Follow up reptile surveys	Surveys of habitat suitable for small mammals, Brigalow reptiles, bats and birds will be conducted in October and November 2013.
Rail loop and spur	The location of the rail loop and spur will avoid areas of brigalow and poplar box woodland in the south-western corner of the mining lease.
Lagoon Creek vegetation and habitat retention	Vegetation and habitat will be retained along the length of Lagoon Creek. Fauna movement will be able to continue unaffected by the revised Project. Areas of regional ecosystems and threatened ecological communities will be retained along Lagoon Cree, between the Willeroo and Manning Vale East pits.

Table 7-19 Summary of Mitigation Measures and Commitments



Project Activity	Mitigation measures
Biodiversity Offsets	The Biodiversity Offset Strategy will be implemented, to secure offsets for Brigalow and Bluegrass Dominant Grassland TECs, <i>Bothriochloa biloba</i> , <i>Digitaria porrecta</i> , <i>Homopholis belsonii</i> and poplar box woodland, mountain coolabah forest and gum-topped box woodland.
Bluegrass offset management	The Bluegrass Offset Management Plan will be implemented to manage the areas of bluegrass offset to be established on land owned by NAC
Lagoon Creek management	The Conservation Zone Management Plan will be implemented to manage the Lagoon Creek riparian zone, to rehabilitate vegetation and habitat along the length of Lagoon Creek.
Threatened species translocation	The Threatened Species Translocation Management Plan will be implemented to relocate threatened species affected by the revised Project. The Plan describes the sites where the species will be relocated to, how the translocation will be completed and monitoring of the implementation of the Plan.
Vegetation clearance	The Construction Phase Management Plan will be implemented to avoid impacts to areas of vegetation and habitat that are to be retained within the revised Project area. Vegetation that falls outside the revised Project disturbance footprint will not be cleared or impacted.
Pest and weed management	The Pest and Weed Management Plan and the Pest and Domestic Animal Management Plan will be implemented to oversee the management of weeds and pest animals at the revised Project site.