## 4.9 FLORA

A flora assessment has been prepared for the Project as part of the Ecological Assessment by Niche Environment and Heritage (2013) and is presented in Appendix E. The flora assessment was prepared in accordance with the DGRs for the Project.

A description of the existing environment relating to flora is provided in Section 4.9.1. Section 4.9.2 describes the potential impacts of the Project, Section 4.9.3 outlines mitigation measures, management and monitoring, and Section 4.9.4 describes the aspects of the Project biodiversity offset strategy relevant to flora.

## 4.9.1 Existing Environment

## Regional and Local Setting

The Project area is in the Bluevale CMA sub-catchment of the Namoi CMA planning region within the Gunnedah Basin. The Project is located within the Brigalow Belt South Bioregion as defined in the *Interim Biogeographic Regionalisation of Australia* (Thackway and Cresswell, 1995; SEWPaC, 2012a).

On a local scale, the Project mining area is positioned to the west of Vickery State Forest. The majority of the Project mining area is comprised of previously cleared agricultural areas and rehabilitated workings from prior mining activities. Rainfed cropping and stock grazing is conducted to the north and south of the Project mining area along with irrigated and rainfed crop production, particularly to the west of the Namoi River (Section 4.3.1). The majority of the private haul road and Kamilaroi Highway overpass area is currently used for cattle grazing, with a small area used for cropping (Section 4.3.1).

## Flora Surveys

The flora surveys of the Project area were carried out by Niche Environment and Heritage (2013) and included vegetation community validation and surveys on the 7 to 9 and 14 to 19 November 2011, plus targeted flora field surveys on the 14 to 19 November 2011. Additional threatened flora population counts and off-site surveys, targeting the Winged Peppercress (*Lepidium monoplocoides*), were conducted on 16 to 20 December 2011 and 13 to 16 January 2012. Targeted threatened flora surveys were informed by recent nearby flora surveys (i.e. RPS Harper Somers O'Sullivan Pty Ltd [RPS] conducted a flora and fauna assessment for the nearby Rocglen Coal Mine in 2010) (RPS, 2010a), literature and database reviews as well as on-site vegetation mapping. Field surveys included random meanders, full floristic plots and Winged Peppercress population estimates. A detailed description of the above survey methods is provided in Appendix E.

## Vegetation Communities

The following vegetation communities have been mapped by Niche Environment and Heritage (2013) as occurring within the Project area and surrounds (Figures 4-19 and 4-20):

## Project Mining Area

- Community 2: White Box White Cypress Pine Shrubby Woodland.
  - 2a: Cypress Regeneration.
  - 2b: Semi-cleared.
  - 2c: Derived Native Pasture.
  - 2f: Mature Cypress Forest.
- Community 3: White Box Grassy Woodland.
- Community 7: Silver-leaved Ironbark White Box White Cypress Pine Woodland.
  - 7b: Semi-cleared.
  - 7c: Derived Native Pasture.
  - 7e: Mature Cypress Woodland.
- Community 19c: Plains Grass Blue Grass Derived Native Pasture.
- Community 20: Poplar Box Grassy Woodland.
  - 20a: Derived Woodland.
  - 20c: Derived Native Pasture.
- Community 21: Weeping Myall Low Shrubland.
- Community 22: Mixed Marsh Sedgeland.
- Community 23: River Red Gum Riverine
  Woodland.

## Private Haul Road and Kamilaroi Highway Overpass

- Community 8: Yellow Box Blakely's Red Gum Grassy Woodland.
- Community 20: Poplar Box Grassy Woodland (refer to Appendix E for mapping).
  - 20a: Derived Woodland.
- Community 23: River Red Gum Riverine Woodland (refer to Appendix E for mapping).







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Vegetation was initially mapped using regional mapping and aerial photography interpretation, then vegetation surveys were conducted to validate mapping at a local scale. These surveys targeted all patches of native vegetation within the Project area and all habitat types were surveyed to maximise the chance of finding populations of any threatened flora species. Vegetation sampling methods included rapid data points, plots and transects.

### **Threatened Ecological Communities**

Three vegetation communities in the Project area (i.e. community 3 – White Box Grassy Woodland; community 21 – Weeping Myall Low Shrubland; and community 8 – Yellow Box–Blakely's Red Gum Grassy Woodland) are considered to be components of two Endangered Ecological Communities (EECs) listed on the NSW *Threatened Species Conservation Act, 1995* (TSC Act) (Figures 4-19 and 4-20):

- Community 21 is a significant component of the Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions (Weeping Myall Woodland) EEC (within the Project mining area).
- Communities 3 and 8 are components of the White Box Yellow Box Blakely's Red Gum Woodland (Box-Gum Woodland) EEC (within the Project mining area and private haul road and Kamilaroi Highway overpass).

One patch of Box-Gum Woodland EEC in the Project mining area is located in a thin strip along South Creek just north of the Shannon Harbour Road (between the Eastern Emplacement and the open cut) and exists in a relatively natural state. The Project layout has been modified to avoid this patch. A second patch of this EEC occurs in the northern central portion of the open cut and is considered to exist in relatively natural open woodland.

The area of Box-Gum Woodland EEC along the private haul road and Kamilaroi Highway overpass corridor has been subject to historical clearing for agriculture and is currently grazed.

Patches of the Weeping Myall Woodland EEC are located in small pockets along Stratford Creek to the south of the Project mining area. This EEC contains degraded groundcover and is most likely re-growth from previous agricultural clearance.

## Regionally Significant Vegetation and Vegetation Corridors

The Project mining area is located adjacent to the Vickery State Forest which, although relatively large (approximately 1,942 ha), has limited connectivity with other remnant vegetation in the region. The nearest large area of vegetation is the Boonalla Coordinated Conservation Area (CCA) Zone 3 State Conservation Area (previously Kelvin State Forest), approximately 3.5 km to the east and mostly separated by farmland. Further away is Leard State Forest, approximately 12 km to the north of the Project mining area.

## Flora Species Composition

A total of 307 flora species were recorded during Project surveys, including 78 introduced species (approximately 25%). A complete list of flora species identified during the Project flora surveys is provided in Appendix E.

## Introduced Flora Species and Noxious Weeds

Of the 78 introduced species recorded, five are listed as declared weeds (all in Category 4) for the Gunnedah LGA under the NSW *Noxious Weeds Act* 1993 (NW Act). These weeds include: Paterson's Curse (*Echium plantagineum*); Blue Heliotrope (*Heliotropium amplexicaule*); African Boxthorn (*Lycium ferocissimum*); Common Prickly Pear (*Opuntia stricta*); and Noogoora Burr (*Xanthium occidentale*).

#### **Threatened Flora Species and Populations**

Targeted surveys were undertaken in the Project area to identify potentially occurring threatened flora species listed under the TSC Act and/or the EPBC Act. One threatened flora species was recorded during the surveys (i.e. Winged Peppercress). The two locations where it was found are shown on Figure 4-21. The Winged Peppercress is listed as endangered under the TSC Act and EPBC Act. No threatened flora populations were recorded in the Project area.







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As described in Section 3.1.4, Whitehaven lodged a Referral under the EPBC Act with SEWPaC in January 2012. In May 2012 the Project was declared to be *not a controlled action if undertaken in a particular manner*. The particular measures required to be implemented relate to the management of the Winged Peppercress, and are specified in the EPBC Act Notification of Referral Decision (EPBC 2012/6263). These measures are described in Section 4.9.3.

## Critical Habitat

No critical habitat occurs within the vicinity of the Project, as designated by the Register of Critical Habitat held by the Commonwealth Minister, Register of Critical Habitat held by the Director-General of OEH, the Register of Critical Habitat held by the Director-General of the DPI (Aquaculture, Conservation and Marine Parks Branch) or identified within the *Narrabri Local Environment Plan 2012* (Narrabri LEP).

## **Conservation Areas**

A number of reserved areas are located in the region, including the Vickery State Forest, Boonalla CCA Zone 3 State Conservation Area, Leard State Forest, Leard CCA Zone 3 State Conservation Area, Horton Falls CCA Zone 1 National Park and Mt Kaputar National Park (Figure 4-22).

## 4.9.2 Potential Impacts

## Native Vegetation/Habitat Clearance

The Project would require the progressive disturbance of approximately 464 ha of scattered remnants of native woodland, semi-cleared woodland and White Cypress re-growth (i.e. vegetation communities 2a, 2b, 2f, 3, 7b, 7e, 20a, 21, 22 and 8) (Table 4-24). It would also involve disturbance to approximately 1,284 ha of grassland areas with occasional re-growth trees (i.e. vegetation communities 2c, 7c, 19c and 20c) (Table 4-24). The remainder of the Project disturbance area consists of previously disturbed rehabilitation areas (405 ha) and other nonvegetation areas (89 ha) such as farm dams, roads, tracks and existing infrastructure.

#### **Threatened Ecological Communities**

Approximately 6 ha of Box-Gum Woodland EEC would be cleared for the Project mining area and private haul road and Kamilaroi Highway overpass (3 ha and 3 ha, respectively) (Table 4-24, Figures 4-19 and 4-21). Approximately 1 ha of the Weeping Myall Woodland EEC would be cleared for the Project (Table 4-24, Figures 4-19 and 4-21).

#### Groundwater Dependent Vegetation

Based on the localised nature of predicted surface water and groundwater impacts (Sections 4.4.2 and 4.5.2), the native vegetation surrounding the Project would not be significantly impacted by changes to the availability of water. This includes groundwater dependant ecosystems associated with the Namoi River (Appendix E).

## **Threatened Flora Species**

A total of 46 Winged Peppercress individuals were recorded within the Project mining area, with a further 420 individuals recorded outside the planned disturbance area in the Canyon Coal Mine site (Appendix E). Targeted surveys in the local area and the Pilliga National Park were also conducted in order to assess the regional distribution of the species.

A large population of Winged Peppercress was identified in the Pilliga National Park with an average density of 353 plants per hectare, with an estimated population size of at least 42,450 plants. When considering all known and potential habitat within the Pilliga National Park the population is estimated to be approximately 165,000 individuals, and up to approximately 276,000 when including potential habitat on adjacent private land to the north of the Pilliga National Park (Appendix E).

Potential impacts on the Winged Peppercress were assessed under the *Threatened species assessment guidelines – The assessment of significance* (DECC, 2007a). The assessment is provided in Appendix E and concludes that the Project is unlikely to significantly impact this species in the locality, subject to Whitehaven implementing the management measures specified in the EPBC Act Notification of Referral Decision (EPBC 2012/6263) (Sections 3.1.4 and 4.9.3).

The Project flora surveys did not record the Finger Panic Grass (*Digitaria porrecta*) within the Project area, however the timing of the survey was not considered to be optimal (Appendix E).

An additional threatened flora species, the Silky Swainson-pea (*Swainsona sericea*), was recorded within the proposed biodiversity offset area, however, this species will not be disturbed by the Project.







	Vegetation Community	EEC (TSC Act)	Area	(ha)	
Project Mining Area					
2a	White Box - White Cypress Pine Shrubby Woodland Cypress Regeneration		188		
2b	White Box - White Cypress Pine Shrubby Woodland Semi-cleared		107	792	
2c	White Box - White Cypress Pine Shrubby Woodland Derived Native Pasture	NOT AN EEC	488		
2f	White Box - White Cypress Pine Shrubby Woodland Mature Cypress Forest		9		
3	White Box Grassy Woodland	Box-Gum Woodland	3	3	
7b	Silver-leaved Ironbark - White Box - White Cypress Pine Woodland Semi-cleared	Not an EEC	80	80	
7c	Silver-leaved Ironbark - White Box - White Cypress Pine Woodland Derived Native Pasture	Not an EEC	165	100	
7e	Silver-leaved Ironbark - White Box - White Cypress Pine Woodland Mature Cypress Woodland	Not an EEC	25	190	
19c	Plains Grass – Blue Grass Derived Native Pasture	Not an EEC	3	3	
20a	Poplar Box Grassy Woodland Derived Woodland		46	074	
20c	Poplar Box Grassy Woodland Derived Native Pasture	Not an EEC	628	674	
21	Weeping Myall Low Shrubland	Weeping Myall Woodland	1	1	
22	Mixed Marsh Sedgeland	Not an EEC	2	2	
Private Haul Road and Kamilaroi Highway Overpass					
8	Yellow Box - Blakely's Red Gum Grassy Woodland	Box-Gum Woodland	3	3	
23	River Red Gum Riverine Woodland	Not an EEC	-	-	
Total			1,7	48	

 Table 4-24

 Clearing of Native Vegetation Required by the Project

Source: After Appendix E.

## Introduced Flora

Vegetation and soil disturbance may increase the potential for weed establishment, especially around the margins of the Project disturbance area. This may also increase the potential for weed incursion into the Vickery State Forest (Appendix E).

## Vegetation and Dust

Studies have shown that excessive dust deposition can adversely affect the health and viability of surrounding vegetation. Dust can affect vegetation by inhibiting physiological processes such as photosynthesis, respiration and transpiration, and allow penetration of phytotoxic gaseous pollutants (Appendix E).

Dust emissions associated with the Project would originate predominantly from activities such as blasting, materials handling and vehicle movements. However, with the implementation of Project air quality control measures described in Section 4.7.3, dust-related impacts on adjoining vegetation would be minimised and not predicted to significantly affect the health of the vegetation.

## Bushfire Risk

High intensity fires can adversely impact flora. The risk of a fire would be reduced through the management measures described in Section 4.3.3. The likelihood that the Project would result in a significant impact on flora through a change in the frequency of fires is therefore considered to be very low (Appendix E).

## **Cumulative Impacts**

The Project and the nearby Rocglen Coal Mine may result in indirect impacts on the flora of the Vickery State Forest. The Rocglen Coal Mine does not have approval to clear within the Vickery State Forest and no clearance of Vickery State Forest is proposed by the Project. However the Project may result in some increased edge effects such as weed incursion, noise and dust. In the long-term the Project is likely to improve the connectivity of the Vickery State Forest through the rehabilitation of the Project mine landforms to provide a linking corridor to the Namoi River (Section 5).





The Ecological Assessment has considered the cumulative impact of native woodland vegetation clearing in the 'locality' of the Project as well as the broader Liverpool Plains sub-region (Appendix E).

The 'locality' has been taken to cover the local area within approximately 10 km of the Project mining area. Niche Environment and Heritage (2013) has estimated that approximately 5,643 ha of native woodland is present within the 'locality'. This includes the Vickery State Forest (1,942 ha), woodland adjacent to Vickery State Forest (381 ha), the Boonalla CCA Zone 3 State Conservation Area (2,300 ha), and woodland adjacent and to the north of Boonalla CCA Zone 3 State Conservation Area (1,020 ha). This is likely to be an under-estimate of woodland in the 'locality' given that it does not consider small patches of vegetation, road reserves or scattered paddock trees. Based on these conservative figures, the Project would remove up to 4.8% of native woodland within the 'locality'.

The assessment of the cumulative impact of the Project in a broader sub-regional context has also been evaluated by Niche Environment and Heritage (2013). This evaluation particularly focused on the cumulative impact of the Project when combined with the approved mining operations in the Leard State Forest precinct (i.e. Tarrawonga, Boggabri and Maules Creek coal mines).

Based on the available vegetation mapping of the Namoi CMA by Ecological (2009), it is estimated that there is approximately 255,000 ha of mapped native woodland and open forest communities in the Liverpool Basin CMA sub-region (Appendix E). The Tarrawonga, Boggabri and Maules Creek coal mines are approved to clear a combined total of 3,359 ha of remnant native woodland (DP&I, 2012), which represents approximately 1.31% of the mapped woodland and open forest communities. The additional native woodland clearance associated with the Project would increase the combined total to 1.48%.

Although the removal of up to 4.8% of the native woodland in the 'locality', and 0.17% increase in the Liverpool Basin CMA sub-region, is not insubstantial, the woodland to be impacted by the Project is mostly heavily disturbed having been exposed to logging/thinning, firewood collection, tracks and grazing.

Compared with the adjacent Vickery State Forest, the vegetation and fauna habitat in the Project mining area is of a poorer quality. Given that threatened species that would be affected by the Project are highly mobile (birds and bats) it is likely that local populations of these species also use Boonalla Conservation Area, and revegetation as part of the compensatory habitat package for the Rocglen Coal Mine is strengthening the link between these areas of remnant vegetation in the locality. Given these factors and conditions, it is considered unlikely that any ecological thresholds would be crossed for affected threatened species populations within the locality such that the Project would lead to a significant loss of these species in the medium to long-term (Appendix E).

The proposed rehabilitation of a large proportion of the Project mining area (i.e. 1,360 ha) to native woodland/forest would increase the overall amount of native vegetation in the locality and sub-region in the medium to long-term. Section 5.4 describes how this rehabilitation would create a native woodland/forest corridor that would connect the existing native vegetation in the Vickery State Forest with the Namoi River.

Elsewhere in the sub-region, the Tarrawonga, Boggabri and Maules Creek coal mines are all required to offset their approved native woodland clearing activities (i.e. 3,359 ha) with substantial biodiversity offset areas, which are shown on Figure 4-21. Prescriptive offset-related approval conditions have been imposed on these projects under the EP&A Act and the EPBC Act, including the requirement to develop and implement the Leard Forest Mining Precinct Regional Biodiversity Strategy.

The Project rehabilitation strategy and biodiversity offset program would be designed to complement the Leard Forest Mining Precinct Regional Biodiversity Strategy.

## 4.9.3 Mitigation Measures, Management and Monitoring

This section provides a description of the measures that have been implemented to minimise potential impacts on flora through refinements to the Project design. It also describes the flora management and monitoring programs that are proposed as part of the Project.





## Refinements to the Mine Design to Minimise Land Clearance

Several refinements to the Project have been made during the preliminary environmental assessment and preparation of this EIS to minimise the overall environmental impacts associated with the proposal. Some of these refinements have reduced or avoided potential impacts on flora. In particular:

- maximising the area of the open cut that is backfilled to minimise the overall mine footprint;
- redesigning the Eastern Emplacement and MIA to avoid a high quality remnant patch of Box-Gum Woodland EEC located along South Creek;
- avoidance and conservation of 418 individuals of the endangered flora species Winged Peppercress to the north-east of the Western Emplacement, adjacent to the Canyon Coal Mine rehabilitation area; and
- the private haul road and Kamilaroi Highway overpass would be constructed to minimise the number of mature trees that would be felled.

#### Proposed Biodiversity Management Plan

Whitehaven would prepare and implement a Biodiversity Management Plan for the Project which would include the following aspects relevant to flora:

- conducting pre-clearance surveys for the Finger Panic Grass (*Digitaria porrecta*);
- riparian restoration/enhancement of Weeping Myall;
- protection of vegetation and soil outside of the Project disturbance areas;
- conservation and re-use of topsoil; and
- weed control.

The Biodiversity Management Plan would also cover the following aspects relevant to fauna:

- adopting land clearing strategies to minimise impacts on fauna;
- salvaging and re-using material from the site for habitat establishment;
- minimisation of removal of hollow trees, logs and stags;
- managing artificial lighting;
- controlling feral animals;
- limiting vehicle speed limits;

- clearing monitoring, two-staged clearing, fauna rescue and relocation of micro-habitat features; and
- monitoring and performance evaluation of fauna micro-habitat management actions.

Measures relevant to flora are discussed in detail below and the measures relevant to fauna are discussed in Section 4.10.3.

Pre-clearance Surveys for Finger Panic Grass

Pre-clearance surveys would be undertaken for the Finger Panic Grass (*Digitaria porrecta*) within the Project area in suitable potential habitat between the months of December and May. The surveys would be undertaken by an appropriately qualified person. If Finger Panic Grass is identified in the Project area during the pre-clearance surveys, the following management measures would be evaluated and applied, where practicable:

- evaluation of whether the occurrence can be avoided (e.g. modifying a stockpile);
- further survey work to evaluation the complete extent of the population;
- collection and propagation of seed/vegetative material for use in revegetation and rehabilitation; and/or
- conservation of Finger Panic Grass in an offset area or funds towards conservation of Finger Panic Grass in NSW.

## Riparian Restoration/Enhancement of Weeping Myall

A program would be developed and implemented as part of the Biodiversity Management Plan to retain and manage the remaining vegetation along a portion of Stratford Creek, including the Weeping Myall EEC (Figure 4-19).

Weeping Myall EEC is located along the main flood channel of Stratford Creek and is characterised by a dominant low over-storey of Weeping Myall (*Acacia pendula*) to 8 m high with an absent mid-storey and shrub layer and a degraded and sparse groundcover. The perimeter of the area to be managed would be fenced with a stock proof fence to facilitate regeneration of the native vegetation. Whitehaven would undertake control of weeds within this area.





## Protecting Vegetation and Soil Outside of Disturbance Areas

Land clearance for the Project would be undertaken progressively. The area cleared at any particular time would generally be no greater than that required to accommodate the mine's needs for the following 12 months. Areas to be cleared would be delineated, restricting clearing to the minimum area necessary to undertake the approved activities.

Vegetation clearance protocols would be used to minimise the impact on flora. Key components of the vegetation clearance protocols would include aspects such as the clear delineation of areas to be cleared of native remnant vegetation, timing and methods to be used, and re-use of cleared vegetation in revegetation programs.

## Conserving and Reusing Topsoil

As described in Section 4.3.3, topsoil would be stripped from disturbance areas following vegetation clearance and stockpiled for use in rehabilitation. Topsoil stockpiles would be temporary structures with topsoil progressively reclaimed and used in rehabilitation. The incorporation of the ground-layer vegetation and low shrubs into the topsoil when it is stripped would be used to assist rehabilitation by increasing the seed bank and organic matter within the stockpiled soil.

#### Weed Control

Weed management measures that would be undertaken as part of the Project would include:

- regular inspections of revegetated areas and other parts of the mining tenements to identify and demarcate areas of noxious and environmental weeds;
- regular liaison with local landholders and relevant government agencies to monitor the spread and management of weeds within the local area;
- mechanical removal and/or the application of approved herbicides in areas identified as being affected by weeds by an appropriately qualified contractor;
- follow-up site inspections to evaluate the effectiveness of weed control programs;
- follow-up weed control in previously treated areas where weed management has been sub-optimal; and
- minimisation of potential seed transport to or from the site through the inspection of vehicles and use of the site's vehicle wash bay.

## Management of the Winged Peppercress Population

Management of the Winged Peppercress population would be conducted in accordance with the EPBC Act Notification of Referral Decision (EPBC 2012/6263) (Section 3.1.4). The Decision stated that the measures listed below must be undertaken to avoid significant impacts on listed threatened species and communities.

- 1) Protection of Winged Peppercress plants. This must include:
  - Fencing and signposting the patch of Winged Peppercress plants located north-west of the Western Emplacement area, incorporating a 20 m buffer around the patch, prior to the commencement of the action, to avoid accidental damage/disturbance.
  - b) Excluding stock from the fenced patch of Winged Peppercress plants.
- Translocating approximately 46 Winged Peppercress plants from within the Western Emplacement area footprint to the fenced protection area to the north-west of the Western Emplacement area. This must include:
  - a) Collection of seed from Winged Peppercress plants within the Western Emplacement area footprint, and subsequent planting of these seeds within the fenced protection area to the north-west of the Western Emplacement area.
  - b) Translocation of individual Winged Peppercress plants by hand from within the Western Emplacement area footprint, to within the fenced protection area to the north-west of the Western Emplacement area. This must be undertaken using appropriate techniques as described in "Guidelines for the translocation of threatened plants in Australia" (Vallee et al. 2004).
- Undertaking a monitoring and maintenance program over the life of the action. This must include:
  - a) Annual monitoring of the protected area.
  - b) Undertaking weed and pest control within the protected area, should monitoring suggest that these are required.
  - c) Repair of the fence if inadequacies are identified.





In addition to the above, Whitehaven would, as part of the Project, sponsor additional surveys for the Winged Peppercress within the Pilliga National Park. This would include using the Pilliga National Park population as a control site so that its characteristics can be compared with the patch to be conserved in the fenced protection area located to the north-west of the Western Emplacement (Figure 4-21).

## Proposed Rehabilitation Management Plan

Whitehaven would prepare and implement a Rehabilitation Management Plan for the Project that would describe the revegetation program for the re-profiled mine landforms. Further information on the content of the Rehabilitation Management Plan is provided in Section 5.

The Project revegetation program would target a combination of native woodland/forest (1,360 ha) and agricultural (780 ha) post-mining land uses. The agricultural land would comprise predominantly native grasses for grazing with some areas of potential cropping.

Revegetation of woodland/forest areas would include planting of species characteristic of the local vegetation communities, including species from the Box - Gum Woodland EEC (e.g. White Box overstorey as well as an appropriate understorey).

The rehabilitation monitoring program for the Project (Section 5) would be designed to track the progress of revegetation (in terms of plant growth, species diversity and fauna usage) and to determine the requirement of intervention measures such as thinning to reduce locked-re-growth, or additional plantings that may be required.

Annual surveys would be undertaken by an appropriately qualified and experienced person to evaluate the success of rehabilitation and identify any additional measures required to achieve rehabilitation success. A detailed monitoring report would be prepared annually that includes a summary of previous monitoring reports, results of that years monitoring and planned remedial works, if required. The monitoring results would be summarised in the Annual Review.

## Other Management Measures Relevant to Flora

Dust mitigation and management measures to be undertaken as part of the Project are described in Section 4.7.3.

## 4.9.4 Offset Strategy

The DGRs state that the EIS must include a comprehensive offset strategy to maintain or improve the terrestrial and aquatic biodiversity values of the region in the medium to long-term.

The biodiversity offset strategy for the Project has been developed in consideration of:

- the DGRs;
- OEH's Principles for the Use of Biodiversity Offsets in NSW (OEH, 2012);
- the Namoi CAP and Namoi CMA Biodiversity Offsets Policy; and
- ecological principles commonly used in the design of reserves for wildlife conservation.

## **Biodiversity Offset**

The biodiversity offset area for the Project is located on freehold land owned by Whitehaven, approximately 35 km to the north-northeast of the Project mining area (Figure 4-22). The proposed biodiversity offset is the eastern half of the former 'Willeroi' property (referred to herein as 'Willeroi East'). The western half of the Willeroi property is to be used as the biodiversity offset area for the Tarrawonga Coal Project (Tarrawonga Coal Pty Ltd [TCPL], 2011).

Willeroi East is connected to Mount Kaputar National Park via offset areas for other projects in the region, and prior to its purchase by Whitehaven was used for agricultural purposes, mainly cattle and sheep grazing.

## Flora and Fauna Values within the Project Biodiversity Offset Area

As for the Project area, the biodiversity offset area is situated in the Namoi CMA Region. There are a number of regional priorities for biodiversity conservation in the Namoi CMA Region, including the buffering of habitat from the potential impacts of climate change (Namoi CMA, 2011a).

The proposed biodiversity offset area is located within an OEH recognised 'high priority area', 'regional key fauna habitat' and climate change linkage as described and mapped in the *Wildlife Corridors for Climate Change – New England Tablelands and Nandewar bioregions – Landscape Selection Process, Connectivity for response to Climate Change* (DECC, 2007b) (Figure 4-23) (Appendix E).







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The main watercourse in the proposed biodiversity offset area is Maules Creek which is a small tributary of the Namoi River. Maules Creek runs along the western boundary of the area, and is fed by a number of drainage lines that occur within the biodiversity offset area and surrounds.

A total of 10 vegetation communities (and their variants) occur in the biodiversity offset area including:

- Community 1: Narrow-leaved Ironbark White Cypress Pine Shrubby Open Forest.
- Community 2: White Box White Cypress Pine Shrubby Woodland.
  - 2a: Cypress Regeneration.
  - 2b: Semi-cleared.
  - 2c: Derived Native Pasture.
  - 2e: Derived Shrubland.
- Community 3: White Box Grassy Woodland.
  - 3c: Derived Native Pasture.
- Community 5: Bracteate Honeymyrtle Low Riparian Forest.
  - 5b: Semi-cleared Regenerating.
  - 5c: Derived Native Pasture.
- Community 8: Yellow Box Blakely's Red Gum Grassy Woodland.
  - 8c: Derived Native Pasture.
- Community 9: River Oak River Red Gum Riparian Forest.
  - 9c: Derived Native Pasture.
- Community 10: Rough-barked Apple Riparian Open Forest.
  - 10a: Regeneration.
- Community 11: Semi-evergreen Vine Thicket.
- Community 12: Trachyte Outcrop Shrubland.
- Community 24: Red Stringybark Shrubby Open Forest.
  - 24b: Semi-Cleared.

Detailed descriptions of each of these communities are provided in Appendix E.

Three communities in the biodiversity offset area are considered to be components of two EEC's. These are (Figure 4-24):

 Communities 3c and 8c – components of Box-Gum Woodland EEC.  Community 11 – component of Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions (Semi-evergreen Vine Thicket) EEC.

Vegetation mapping within the biodiversity offset area is shown on Figures 4-24 and 4-25.

The biodiversity offset area covers approximately 1,671 ha, and comprises approximately 1,396 ha of existing forest/woodland, 248 ha of derived native grasslands and 27 ha of erosion/scald (which would be actively managed and rehabilitated as part of the proposal). The 248 ha of derived native grassland would be restored to a woodland/forest habitat (in the medium to long-term) via active management (e.g. regeneration and revegetation) and is therefore included in the offset calculations.

The 1,284 ha of cleared derived grassland to be impacted by the Project is proposed to be compensated for via rehabilitation of approximately 1,360 ha of the Project final landforms to woodland/forest areas. The proposed biodiversity offset area (Willeroi East) is therefore focussed on offsetting the 464 ha of non-grassland vegetation types.

Table 4-25 provides a summary of the vegetation to be impacted (excluding derived grassland) against that to be conserved and/or revegetated and enhanced as part of the biodiversity offset proposal.

As described in Section 4.9.2, the Project would clear approximately 6 ha of Box-Gum Woodland EEC and 1 ha of Weeping Myall Woodland EEC. Approximately 156 ha of Box-Gum Woodland EEC has been mapped at the biodiversity offset plus 19 ha of Semi-evergreen Vine Thicket EEC (Table 4-26 and Figure 4-25).

Appendix E provides a detailed comparison of the flora located within the Project area and the biodiversity offset.

The Project area supports a range of flora species known from the lower Western Slopes and Plains that are absent from the proposed biodiversity offset, primarily due to the difference in altitude between the two areas. Notwithstanding, Niche Environment and Heritage (2013) consider the vegetation in the biodiversity offset to be an acceptable match for that at the Project (Appendix E).







VICKERY COAL PROJECT FIGURE 4-24 Vegetation Communities -Biodiversity Offset Area

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	Vegetation Community	Project Impact (ha)	Biodiversity Offset Area (ha)
1a	Narrow-leaved Ironbark - White Cypress Pine Shrubby Open Forest	0	418
2	White Box - White Cypress Pine Shrubby Woodland	0	50
2a	White Box - White Cypress Pine Shrubby Woodland Cypress Regeneration	188	121
2b	White Box - White Cypress Pine Shrubby Woodland Semi-cleared	107	567
2c	White Box - White Cypress Pine Shrubby Woodland Derived Native Pasture	0	72
2e	White Box - White Cypress Pine Shrubby Woodland Derived Shrubland	0	22
2f	White Box - White Cypress Pine Shrubby Woodland Mature Cypress Forest	9	0
3	White Box Grassy Woodland	3	0
3c	White Box Grassy Woodland Derived Native Pasture	0	136
5	Bracteate Honeymyrtle Low Riparian Forest	0	36
5b	Bracteate Honeymyrtle Low Riparian Forest Semi-cleared	0	24
5c	Bracteate Honeymyrtle Low Riparian Forest Derived Native Pasture	0	13
7b	Silver-leaved Ironbark - White Box - White Cypress Pine Woodland Semi-cleared	80	0
7c	Silver-leaved Ironbark - White Box - White Cypress Pine Woodland Derived Native Pasture	0	0
7e	Silver-leaved Ironbark - White Box - White Cypress Pine Woodland Mature Cypress Woodland	25	0
8	Yellow Box - Blakely's Red Gum Grassy Woodland	3	0
8c	Yellow Box - Blakely's Red Gum Grassy Woodland Derived Native Pasture	0	20
9	River Oak – River Red Gum Riparian Forest	0	19
9c	River Oak – River Red Gum Riparian Forest Derived Native Pasture	0	7
10	Rough-barked Apple Riparian Open Forest	0	3
10a	Rough-barked Apple Riparian Open Forest Regeneration	0	10
11	Semi-evergreen Vine Thicket	0	19
12	Trachyte Outcrop Shrubland	0	10
19c	Plains Grass – Blue Grass Derived Native Pasture	0	0
20a	Poplar Box Grassy Woodland - Derived Woodland	46	0
20c	Poplar Box Grassy Woodland - Derived Native Pasture	0	0
21	Weeping Myall Low Shrubland	1	0
22	Mixed Marsh Sedgeland	2	0
24b	Red Stringybark Shrubby Open Forest Semi-cleared	0	97
Total		464 <sup>1</sup>	1,644 <sup>2</sup>
Offset	Ratio	:	3.5:1

 Table 4-25

 Vegetation Communities – Project and Biodiversity Offset Area

1

Excludes derived grassland. Excludes scald/erosion. 2





			Area (ha)	
Number	Community Name	EEC (TSC Act)	Project	Biodiversity Offset Area
3	White Box Grassy Woodland		3	0
Зс	White Box Grassy Woodland – Derived Native Pasture		0	136
8	Yellow Box – Blakely's Red Gum Grassy Woodland	Box-Gum Woodland <sup>1</sup>	3	0
8c	Yellow Box – Blakely's Red Gum Grassy Woodland Derived Native Pasture		0	20
21	Weeping Myall Low Shrubland	Weeping Myall Woodland <sup>2</sup>	1	0
11	Semi-evergreen Vine Thicket	Semi-evergreen Vine Thicket <sup>3</sup>	0	19
Total			7	175
Offset Ratio			25:1	

 Table 4-26

 Endangered Ecological Communities – Project and Biodiversity Offset Area

<sup>1</sup> Also listed under the EPBC Act (White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland).

<sup>2</sup> Also listed under the EPBC Act (Weeping Myall Woodlands).

<sup>3</sup> Also listed under the EPBC Act (Semi-evergreen vine thickets of the Brigalow Belt [North and South] and Nandewar Bioregions).

In addition, Niche Environment and Heritage (2013) recorded a range of vertebrate fauna species during surveys of the biodiversity offset area. There were many similarities between the vertebrate species present within the biodiversity offset and the Project area. Vertebrate fauna species in the biodiversity offset are represented by amphibians, reptiles, woodland and forest birds and arboreal and ground dwelling mammals (Appendix E).

Ecological gains from the biodiversity offset would include:

- Similar vegetation communities/fauna habitats, compared to the Project area, would be conserved/enhanced in the biodiversity offset.
- The biodiversity offset is suitably located to benefit flora and fauna populations (biodiversity values) potentially impacted by the Project.
- The biodiversity offset removes a substantial area of native vegetation from the deleterious effects of livestock grazing, thereby allowing it to recover and improve over time.
- The biodiversity offset is located within the same CMA region as the Project area.
- The biodiversity offset is located near the Mount Kaputar National Park and compliments the existing reserve system.
- The biodiversity offset has the capacity to improve (with moderate to high resilience) through removal of threatening process and active management.

- Maules Creek is located within the biodiversity offset providing a diversity of habitats.
- Substantial areas of Box-Gum Woodland EEC (156 ha) and Semi-evergreen Vine Thicket EEC (19 ha) occur in the biodiversity offset.
- The biodiversity offset is positioned adjacent to largely undisturbed natural vegetation. Consequently, it is not isolated in the landscape and its high connectivity would help its long-term viability.

The proposed biodiversity offset is therefore considered to be a suitable offset against the residual flora and fauna impacts associated with the Project, particularly, given the anticipated improvement in the flora and terrestrial and aquatic biodiversity values that could reasonably be expected in the biodiversity offset over the medium to long-term.

## Security of the Biodiversity Offset

Whitehaven intends to reach an agreement with the NSW Government so that the biodiversity offset can be permanently added to the adjoining Mount Kaputar National Park. However, Whitehaven recognises that the formal process of incorporating the area into the National Park may take some time, and as a result an interim conservation arrangement would be made to ensure protection and management of the biodiversity offset (e.g. a voluntary conservation agreement with the NSW Minister for the Environment).





#### Management of the Biodiversity Offset

A biodiversity offset strategy would be prepared by a suitably qualified person(s) to facilitate the management of the biodiversity offset area. The biodiversity offset strategy would be developed within 12 months of Development Consent.

Based on the findings of the detailed flora and fauna survey of the biodiversity offset area, a number of management measures are proposed to enhance its flora and fauna value.

These measures would be detailed in the biodiversity offset strategy and would include:

- promotion of natural regeneration and revegetation;
- habitat enhancement;
- control of weeds;
- pest management; and
- fire management.

Further details of the above management measures are provided in Appendix E.

## Monitoring and Completion Criteria

The biodiversity offset strategy would also include a program to monitor the effectiveness of the management measures and to evaluate performance against specified completion criteria. The monitoring would be undertaken by a suitably qualified person(s), and independent audits would be performed as necessary.

Completion criteria would be developed in consultation with the relevant government agencies to define the required condition of the offset before it could be added to the Mt Kaputar National Park.

Proposed completion criteria for the biodiversity offset area are presented in Table 4-27.

## Offset Principles Reconciliation

Table 4-28 provides a reconciliation of the proposed offset strategy against OEH Offset Principles.

Table 4-27				
Proposed Biodiversity Offset Completion Criteri	ia			

Component	Completion Criteria
Enhancement Areas (i.e. existing woodland/forest)	Areas of existing remnant vegetation within the biodiversity offset area (1,396 ha) have been conserved and enhanced.
Revegetation Areas (i.e. derived native grasslands and cleared lands)	248 ha of revegetated woodland/open woodland habitat area as a self-sustaining ecosystem <sup>1</sup> .

The methodology for determining a self-sustaining ecosystem shall be to the satisfaction of the Director-General.

 Table 4-28

 Reconciliation of the Proposed Offset Strategy against OEH Offset Principles

OEH Offset Principles (OEH, 2012)	Description of How the Proposed Offset Addresses the OEH Offset Principles		
Impacts must be avoided first by using prevention and mitigation measures.	Measures to avoid and mitigate Project impacts on flora and fauna are described in Sections 4.9.3 and 4.10.3, respectively. The proposed offset strategy is proposed to address residual impacts. The Project mine layout has been designed, as far as practicable, to avoid items of high ecological value.		
All regulatory requirements must be met.	Whitehaven is required to meet all statutory requirements. The proposed offset strategy is not proposed to substitute other licence/approval requirements.		
Offsets must never reward ongoing poor performance.	The proposed offset strategy is proposed to address residual impacts associated with the Project-only. Whitehaven has previously secured biodiversity offsets for other mining activities within the Namoi CMA. All current and proposed offset sites are managed for conservation and no other purpose.		
Offsets will complement other government programs.	The proposed offset strategy would complement the current reserve system in NSW by providing long-term security and management of a significant area of vegetation/habitat. The Willeroi East property adjoins Willeroi West, which is the biodiversity offset for the Tarrawonga Coal Project. This adjoins Mount Kaputar National Park and hence, contributes to a significant, continuous area of vegetation.		
	Whitehaven proposes that the biodiversity offset area be transferred to the NSW National Parks and Wildlife Service (NPWS) and managed by the OEH.		





Table 4-28 (Continued)
Reconciliation of the Proposed Offset Strategy against OEH Offset Principles

OEH Offset Principles (OEH, 2012)	Description of How the Proposed Offset Addresses the OEH Offset Principles
Offsets must be underpinned by sound ecological principles.	<ul> <li>The biodiversity offset is underpinned by sound ecological principles such as:</li> <li>consideration of structure, function and compositional elements of biodiversity, including threatened species, through flora and fauna surveys (Appendix E);</li> <li>enhance biodiversity and provide a net benefit to biodiversity conservation at a range of scales through a number of proposed management measures (e.g. revegetation);</li> <li>consideration of the conservation status of ecological communities; and</li> <li>measures to protect the long-term viability and functionality of biodiversity (e.g. enhancing the existing habitat as well as securing and managing the land for conservation purposes).</li> </ul>
Offsets should aim to result in a net improvement in biodiversity over time.	The biodiversity offset would result in the conservation and enhancement of existing remnant vegetation within the biodiversity offset (1,396 ha) and revegetation of grassland areas (248 ha). A number of measures are proposed to manage the area for conservation purposes. An assessment of biodiversity is provided in Appendix E. The offset strategy would commence 12 months after Development Consent, whereas vegetation clearance for the Project would occur progressively over the 30 year mine life. The biodiversity offset strategy would also describe the mechanism for securing the offset
Offects must be enduring they	in perpetuity and funding for its management.
must offset the impact of the	security of the offset in perpetuity.
the impact occurs.	Whitehaven proposes that the biodiversity offset area be transferred to the NPWS and managed by the OEH.
Offsets should be agreed prior to the impact occurring.	The offset strategy is proposed as part of the Project. The implementation of the biodiversity offset is likely to be a condition of Development Consent. The timing of finalizing the security mechanism will be determined in consultation with the OEH and to the satisfaction of the DP&I.
Offsets must be quantifiable – the impacts and benefits must	The area of the biodiversity offset is specified in this section of the EIS. The offset strategy has been prepared based on the following (Appendix E):
be reliably estimated.	<ul> <li>characteristics of the habitat to be cleared and the flora and fauna (including threatened species and communities) likely to be impacted:</li> </ul>
	<ul> <li>characteristics and condition of the vegetation/habitat as well as the species present in the biodiversity offset and current threats requiring management.</li> </ul>
	<ul> <li>proposed management measures to avoid and mitigate impacts from the Project;</li> <li>proposed management measures to enhance the biodiversity of the biodiversity offset; and</li> </ul>
	• the level of security on the biodiversity offset.
	Flora and fauna surveys have been undertaken in both the disturbance area and the biodiversity offset area by Niche Environment and Heritage (Appendix E).
	The offset strategy includes a proposed framework for development and implementation of a management plan, monitoring program, independent auditing and completion criteria.
Offsets must be targeted.	The biodiversity offset was specifically targeted for its ability to demonstrate a like-for-like or better conservation outcome for biodiversity. It includes consideration of
	<ul> <li>the conservation status of ecological communities present within the Project area;</li> </ul>
	• the presence of threatened fauna species or their habitats (Appendix E);
	<ul> <li>long-term viability and connectivity (i.e. the biodiversity offset area is connected to existing offset areas and/or NPWS estates); and</li> </ul>
	<ul> <li>the potential to enhance condition by management actions and the removal of threats (i.e. clearing and grazing).</li> </ul>
Offsets must be located appropriately.	The proposed biodiversity offset area is located within the same CMA region as the Project are (i.e. the Namoi CMA Region) and therefore has the capacity to benefit biodiversity values in the same region as the Project. Vegetation present is considered to be an acceptable match to that disturbed by the Project (Appendix E).
Offsets must be supplementary.	The biodiversity offset area is a previously grazed property and is not currently subject to management or funding for conservation. This property is considered a supplementary offset.
Offsets and their actions must be enforceable through development consent conditions, licence conditions, conservation agreements or a contract	Measures to monitor and independently audit the biodiversity offset are provided. The implementation of the biodiversity offset is likely to be a condition of Development Consent.





## 4.10 FAUNA

A fauna assessment has been prepared for the Project as part of the Ecological Assessment by Niche Environment and Heritage (2013) and is presented in Appendix E. The fauna assessment was prepared in accordance with the DGRs for the Project.

A description of the existing environment relating to fauna is provided in Section 4.10.1. Section 4.10.2 describes the potential impacts of the Project, Section 4.10.3 outlines mitigation measures, management and monitoring, and Section 4.10.4 describes the aspects of the Project biodiversity offset strategy relevant to fauna.

## 4.10.1 Existing Environment

## Regional and Local Setting

The Project area is in the Bluevale CMA sub-region of the Namoi CMA planning region within the Gunnedah Basin. The Project is located within the Brigalow Belt South Bioregion as defined in the *Interim Biogeographic Regionalisation of Australia* (Thackway and Cresswell, 1995; SEWPaC, 2012a).The Project area is also located within the Bassian Zoogeographic Region (Spencer, 1896; Schodde, 1994).

#### Fauna Surveys

Baseline fauna surveys of the western portion of the Project mining area were conducted by Cenwest Environmental Services in March and April 2011. Additional fauna surveys of the remaining portions of the Project mining area and immediate surrounds were carried out by Niche Environment and Heritage in November 2011. A literature and database review was carried out to inform survey methods.

Survey methods used included diurnal bird surveys, call playback for owls and mammals, diurnal herpetological surveys, arboreal Elliot trapping, arboreal and ground hair tubes, camera traps, Anabat detectors, spotlighting and stag watches. A detailed description of the survey methods is provided in Appendix E.

Aquatic ecology surveys were undertaken by Coast Ecology on two ephemeral drainage lines within the Project mining area (i.e. the north-west drainage line and South Creek) in February and March 2012. Methods included database searches, habitat assessment, macroinvertebrate sampling, water quality assessment, fish surveys and amphibian surveys according to the *NSW AUSRIVAS Sampling and Processing Manual* (Turak *et al.*, 2004) (Appendix H of the Ecological Assessment [Appendix E]).

In addition, fauna survey information by RPS (2010a) for the Rocglen Coal Mine was considered as part of the fauna assessment.

## Broad Fauna Habitat Types

The seven broad fauna habitat types identified by Niche Environment and Heritage (2013) as occurring in the Project area (Figure 4-26) are listed below.

- Woodland/Forest mostly in the east of the Project mining area adjacent to Vickery State Forest, contains White Box, Ironbark, Grey Box and White Cypress Pine and shows evidence of disturbance from clearing for agriculture, sheet erosion, over-grazing, logging and farm tracks.
- Native Grassland the dominant habitat type present within the Project mining area, contains derived native grasslands and exotic grasslands.
- Cypress Regeneration located as isolated patches adjacent to Grassy Woodland, dominated by mostly immature White Cypress Pine with limited connectivity and mostly absent structural layers and ground cover.
- Shrubland located outside of the Project mining area, along the Namoi River and associated with Sedgeland.
- Sedgeland located along the Namoi River to the south of the Project mining area.
- Riparian present at the Project mining area and private haul road and Kamilaroi Highway overpass along the Namoi River. This habitat type is characterised by *Eucalyptus camaldulensis* (River Red Gum).
- Disturbed represents previous mining areas, infrastructure and erosion areas.

In addition, a number of agricultural and historic mine dams and ephemeral drainage lines are present within and adjacent to the Project mining area which provide some habitat resources.









The Box-Gum Woodland EEC is a component of the Woodland broad fauna habitat type, and the Weeping Myall Woodland EEC is a component of the Shrubland broad fauna habitat type (Figures 4-21 and 4-25). These listed communities are a comparatively minor component of the fauna habitats in the Project area, but nevertheless provide some habitat resources (e.g. nectar, pollen, invertebrates, and hollows) likely to be used by native fauna, including some threatened species (Appendix E).

## Fauna Species Composition

A total of 187 vertebrate fauna species were recorded during the Project field surveys (i.e. surveys by Cenwest Environmental Services and Niche Environment and Heritage) in the Project area and surrounds, including one fish, 10 frogs, 18 reptiles, 122 birds and 36 mammals (Cenwest Environmental Services, 2011; Niche Environment and Heritage, 2013).

## Exotic Fauna

A total of 12 introduced species were recorded in the Project area and surrounds during the Project surveys. These included nine mammal species: European Cattle, Goat, Pig, Rabbit, Brown Hare, Cat, Red Fox, House Mouse and Domestic Dog. Two introduced bird species were also recorded: Common Mynah and Common Starling. One introduced fish species was recorded during Project aquatic ecology surveys: Eastern Gambusia (Cenwest Environmental Services, 2011; Niche Environment and Heritage, 2013).

## Threatened Fauna under the TSC Act

Figure 4-27 provides the location of threatened species recorded during the Project surveys (i.e. surveys by Cenwest Environmental Services and Niche Environment and Heritage), plus surveys conducted for the Rocglen Coal Mine (RPS, 2010a) and records on the Atlas of NSW Wildlife database (OEH, 2012). No threatened species were recorded along the private haul road and Kamilaroi Highway overpass corridor.

Ten threatened fauna species listed under the TSC Act have been recorded within the Project disturbance area (Figure 4-27). These comprise six birds and four bats (noting that two bat species are possible records and one bat species is probable).

- Blue-billed Duck (Oxyura australis);
- Little Eagle (Hieraaetus morphnoides);
- Speckled Warbler (Pyrrholaemus saggitatus);

- Hooded Robin (south-eastern form) (Melanodryas cucullata cucullata);
- Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*);
- Diamond Firetail (Stagonopleura guttata);
- Yellow-bellied Sheathtail-bat (Saccolaimus flaviventris) (possible);
- Beccari's Freetail-bat (Mormopterus beccarii);
- Eastern Bentwing-bat (*Miniopterus schreibersii* oceansis) (probable); and
- Large-eared Pied Bat (*Chalinolobus dwyeri*) (possible).

An additional nine threatened fauna species listed under the TSC Act have previously been recorded in the Project surrounds (i.e. in Vickery State Forest, along the Namoi River, within a patch of remnant vegetation to the west of the Project, etc.) (Figure 4-27). These species include: Grey Falcon (*Falco hypoleucos*), Little Lorikeet (*Glossopsitta pusilla*), Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*), Turquoise Parrot (*Neophema pulchella*), Varied Sittella (*Daphoenositta chrysoptera*), Gilbert's Whistler (*Pachycephala inornata*), Squirrel Glider (*Petaurus norfolcensis*), Eastern Freetail-bat (*Mormopterus norfolkensis*) and Little Pied Bat (*Chalinolobus picatus*).

All of the above species are listed under the TSC Act as 'Vulnerable', except for the Grey Falcon which is listed as 'Endangered'.

There are also potential habitat resources in the Project area for the following additional 12 threatened fauna species listed under the TSC Act (as 'Vulnerable'): Pale-headed Snake (Hoplocephalus bitorquatus), Square-tailed Kite (Lophoictinia isura), Spotted Harrier (Circus assimilis), Glossy Black-cockatoo (Calyptorhynchus lathami), Superb Parrot (Polytelis swainsonii), Barking Owl (Ninox connivens), Masked Owl (Tyto novaehollandiae), Powerful Owl (Ninox strenua), Painted Honeyeater (Grantiella picta), Spotted-tailed Quoll (Dasyurus maculatus), Koala (Phascolarctos cinereus) and Corben's Long-eared Bat (Nyctophilus corbeni).

Further information on recorded and potential threatened fauna species (including figures showing their local and regional records) is provided in Appendix E.







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## Aquatic Threatened Species under the NSW Fisheries Management Act, 1994

No threatened species listed under the NSW *Fisheries Management Act, 1994* (FM Act) were recorded during Project surveys. One endangered population, Eel-tailed Catfish (*Tandanus tandanus*), was considered to have some potential habitat along the Namoi River, however, based on the potential hydrological impacts (Sections 4.4.2, 4.5.2, 4.9.2 and 4.10.2) the Project is considered unlikely to have a significant impact on this population (Appendix H of the Ecological Assessment [Appendix E]).

## Threatened Ecological Communities under the NSW Fisheries Management Act, 1994

The Aquatic Ecological Community in the Natural Drainage System of the Lowland Catchment of the Darling River, listed as an EEC under the FM Act, is determined to exist within the Namoi River and its tributaries and floodplains downstream of the junction with the Manilla River at Manilla (DPI, 2012d). The site of the proposed Namoi River pump station, and the private haul road and Kamilaroi Highway overpass area is considered to be on the fringes of the extent of this ecological community (i.e. within a floodplain of the Namoi River).

#### Threatened Fauna under the EPBC Act

One fauna species recorded within the Project mining area is listed under the EPBC Act, *viz.* the Large-eared Pied Bat (*Chalinolobus dwyeri*). This species was a possible recording (Figure 4-27) and is listed as 'Vulnerable' under the EPBC Act.

As described in Section 3.1.4, Whitehaven lodged a Referral under the EPBC Act with SEWPaC on 20 January 2012. A Project meeting with SEWPaC was subsequently held on 10 February 2012 to discuss the Project and the Referral under the EPBC Act.

On 17 May 2012 a delegate of the Commonwealth Minister declared the Project was 'not a controlled action if undertaken in a particular manner'. The EPBC Act Notification of Referral Decision (EPBC 2012/6263) stated that several measures relating to the Winged Peppercress must be undertaken to avoid significant impacts on listed threatened species and communities. The decision does not contain any measures relating to fauna.

## 4.10.2 Potential Impacts

## Fauna Habitat Removal and Modification

Animals can use native vegetation for foraging, roosting, movement, shelter and breeding. The Project would require the progressive removal of approximately 1,748 ha of native habitat (Table 4-29).

#### Table 4-29 Broad Fauna Habitat Types Proposed to be Cleared for the Project

Broad Fauna Habitat Type	Area (ha)
Woodland/Forest	273
Native Grassland	1,284
Cypress Regeneration	188
Shrubland	1
Sedgeland	2
Total	1,748

Source: Appendix E

The Project area would be cleared progressively over the 30 year mine life, but would be accompanied by progressive rehabilitation of woodland/forest and grassland. The aim would be to reinstate cleared habitats over the medium to long-term.

## Hollow-bearing Trees, Dead Wood and Dead Trees

Loss of hollow-bearing trees is a key threatening process listed under the TSC Act. A range of hollow-nesting birds, bats and arboreal mammals were recorded within the Project area, including cockatoos, parrots, possums and microbats (Appendix E).

Removal of dead wood and dead trees is also a key threatening process listed under the TSC Act. Dead trees can provide tree hollows for a range of fauna as described above. Dead standing trees (stags) are generally uncommon across the range of habitats present but nevertheless are present in small numbers. Fallen wood can provide habitat resources for fauna (e.g. lizards and nesting birds) (Appendix E).

## Natural Flow Regimes

The Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands is a key threatening process listed under the TSC Act and Degradation of native riparian vegetation along New South Wales watercourses is a similar key threatening process under the FM Act.





The Project is unlikely to adversely change the macroinvertebrate or fish community composition of the local area given the ephemeral nature and highly disturbed condition of the creek systems (Appendix H in Appendix E). Similarly, the Project is unlikely to have a significant impact to the aquatic flora and fauna of the Namoi River system, given the limited potential impacts on groundwater and surface water (Sections 4.4.2 and 4.5.2).

## Groundwater Dependent Fauna

Stygofauna are aquatic subterranean invertebrate animals found in groundwater systems. As described in Section 4.4.1, eight bores in the vicinity of the Project mining area were sampled for stygofauna in August 2012 (Figure 4-7). No stygofauna were recorded in either the Maules Creek Formation of the Upper Namoi Alluvium. Notwithstanding, the Project would involve direct excavation into the Maules Creek Formation groundwater system (Section 4.4.2), and as a result any stygofauna that may inhabit the area of the open cut itself would be lost. However, the Maules Creek Formation is extensive, with the coal measures and intervening strata continuing in all directions and underneath the adjoining Upper Namoi Alluvium (Figure 4-8b). It is therefore likely that the water bearing strata in the Maules Creek Formation provide continuous habitat for stygofauna (i.e. species that may occur within the open cut are also likely to occur outside it). As a result the risk of the Project causing significant impacts to stygofauna contained within the Maules Creek Formation is considered to be low.

The groundwater modelling conducted by Heritage Computing (2013) has concluded that potential drawdowns on the Upper Namoi Alluvium groundwater system would be negligible and no material changes to groundwater quality are likely (Section 4.4.2 and Appendix A). As a result no significant Project-related impacts to stygofauna in this groundwater system are expected to occur.

## **High Frequency Fires**

High frequency fire resulting in the disruption of lifecycle processes in plants and animals and loss of vegetation structure and composition is a key threatening process listed under the TSC Act. High fire frequency is not likely to occur as a result of the Project as Whitehaven would implement strategies to minimize fire risk (Section 4.3.3).

## Introduced Animals

If not controlled, there is a potential for an increase in pressure on native fauna in the Vickery State Forest from introduced species. Additionally, activities associated with the Project may provide increased refuge and scavenging resources (e.g. discarded food scraps) for these species, unless appropriately managed to discourage exotic animals.

## Fauna and Noise, Dust and Artificial Lighting

There is potential for increased disruption to fauna surrounding the mine due to dust, noise and artificial lighting (Appendix H). Measures would be adopted to minimise noise (Section 4.6.3), dust (Section 4.7.3) and artificial lighting (Section 4.12.3).

## Fauna and Vehicular Traffic Movements

Vehicular traffic movements associated with the construction and operation of the Project have the potential to result in the mortality of some fauna species. Vehicular speed limits and induction programs would be used to minimise these potential impacts (Section 4.10.3).

## **Threatened Fauna Species**

A total of 31 threatened fauna species have potential to be affected to some degree by the Project, either due to the loss of known or potential habitat and/or direct loss of individuals (Appendix E). Impact assessments in accordance with *Threatened species assessment guidelines: the assessment of significance* (DECC, 2007a) (Seven Part Test Guidelines) were conducted for threatened species, and are provided in Appendix E.

The Project would result in the removal of known habitat for the following species recorded within the Project area:

- Blue-billed Duck highly mobile species not dependent on the habitat on-site.
- Little Eagle (*Hieraaetus morphnoides*) a species known to occupy eucalypt forest and open woodland, using tall, living trees.
- Speckled Warbler a bird that requires large areas of continuous woodland and open forest habitat with a well developed grassy, part shrub understorey.
- Hooded Robin (south-eastern form) a woodland bird that inhabits woodland, dry forest and semi-cleared farmland.





- Grey-crowned Babbler (eastern subspecies)

   a woodland bird that occupies open woodland, edge habitats and farmlands with isolated trees.
- Diamond Firetail a woodland bird that inhabits grassy eucalypt woodlands, often in riparian areas.
- Yellow-bellied Sheathtail-bat a wide-ranging bat species that forages in most habitats, with or without trees.
- Beccari's Freetail-bat this bat species roosts mainly in tree hollows and occurs in a range of vegetation types including rainforest, forests, woodlands and along watercourses.
- Eastern Bentwing-bat highly mobile species, roosts primarily in caves and hunts in forested areas.
- Large-eared Pied Bat this bat species roosts in various natural and man-made structures including caves and buildings and occurs in dry open forest and woodlands.

None of these species are confined to the Project area and the Project is unlikely to cause a net impact on any threatened fauna species over the medium to long-term, considering:

- the Project area is a highly disturbed system;
- no clearing within Vickery State Forest is proposed;
- clearing would be staged over a 30 year period;
- progressive rehabilitation of the mine landforms would result in re-establishment of woodland/forest; and
- conservation of the Project biodiversity offset area would include regeneration of 248 ha of derived native grassland and conservation of a total of 1,671 ha over the medium to long-term.

Further information on threatened fauna species is provided in Appendix E.

## **Threatened Ecological Communities**

Potential impacts of the Project on the Aquatic Ecological Community in the Natural Drainage System of the Lowland Catchment of the Darling River EEC are limited to impacts associated with:

- the proposed pump station and water supply pipeline on the Namoi River; and
- the proposed private haul road and Kamilaroi Highway overpass.

As described in Section 2.10.6, the pump station would include a submersible pump within the Namoi River. The conceptual design of the Namoi River pump station is shown on Figure 2-15. Design features to minimise impacts of the pump station on aquatic ecology are described in Section 4.10.3. Section 4.5.2 describes the potential impacts of the proposed private haul road and Kamilaroi Highway overpass on the current flooding regime. The scale and nature of the predicted changes in flooding are not expected to have any significant impacts on the *Aquatic Ecological Community in the Natural Drainage System of the Lowland Catchment of the Darling River* EEC.

## **Cumulative Impacts**

The main potential impact to the Project on fauna is considered to be the loss of habitat.

The cumulative impacts of all mining operations and proposals on habitat and fauna without consideration of the proposed mitigation outcomes would likely result in adverse changes to the resident fauna populations, including some threatened fauna species. However, these cumulative impacts are considered to be relatively minor when compared to the past and present disturbance of agricultural practices, particularly, in relation to EECs where natural communities have become threatened due to clearing of productive land and the remaining remnants are mostly small fragmented occurrences on poor soils and in poor condition.

As described in Section 4.9.2 and 5.4, the loss of habitat associated with the Project would be compensated for by the Project biodiversity offset, plus rehabilitation of 1,360 ha of the Project area to native woodland/forest communities.

#### 4.10.3 Mitigation Measures, Management and Monitoring

## Proposed Biodiversity Management Plan

As described in Section 4.9.3, Whitehaven would prepare and implement a Biodiversity Management Plan for the Project that would cover the following aspects relevant to fauna:

- adopting land clearing strategies to minimise impacts on fauna;
- salvaging and re-using material from the site for habitat establishment;
- minimisation of removal of hollow trees, logs and stags;
- managing artificial lighting;





- controlling feral animals;
- limiting vehicle speed limits;
- clearing monitoring, two-staged clearing, fauna rescue and relocation of micro-habitat features; and
- monitoring and performance evaluation of fauna micro-habitat management actions.

The measures relevant to fauna are discussed below.

## Land Clearing Strategies

Clearing of trees and shrubs would, where practicable, be restricted to late summer and autumn in order to avoid the spring when birds are nesting, winter when bats are hibernating and early to mid-summer when bats are bearing young.

Land clearance for the Project would be undertaken progressively over the 30 year mine life, and the area cleared at any particular time would generally be no greater than that required to accommodate the mine's needs for the following 12 months.

Measures that would be used at the Project to minimise potential impacts on fauna during land clearing would be described in the Biodiversity Management Plan, and are summarised below:

- Areas requiring clearing would be delineated and would be restricted to the minimum area necessary to undertake the approved activities.
- Suitable trained or qualified person(s) would be present during the felling of identified hollow bearing trees to provide assistance with the identification, and if necessary, rescue and care of any injured fauna.
- The species, number and condition of fauna identified during clearing activities would be recorded and a summary provided in the Annual Review.

## Salvage of Habitat Features

Habitat features such as tree hollows, logs and stags would be salvaged from the Project disturbance areas where possible. Tree hollows and logs would be selectively chosen for placement in areas where habitat enhancement is required. These features would be fixed to mature trees or placed on the ground. Cleared vegetation from within areas of Project disturbance would be re-used in the mine rehabilitation program. Monitoring and performance measures to evaluate the effectiveness of fauna micro-habitat management actions would be described in the Biodiversity Management Plan.

## Feral Animal Control

Feral animal control measures to be undertaken as part of the Project would include:

- trapping and/or baiting of animal pests; and
- follow-up site monitoring to determine the effectiveness of trapping and/or baiting programs.

Feral animal control measures would be implemented in accordance with the requirements of the Livestock Health and Pest Authorities. A summary of the monitoring results would be reported in the Annual Review.

## Artificial Lighting

Lighting strategies/control measures to minimise potential night-lighting impacts are described in Section 4.12.3.

## Vehicle Speed Limits

An on-site speed limit of 40 kilometres per hour (km/hr) would be applied to Project haul roads and internal roads.

## Proposed Rehabilitation Management Plan

Progressive rehabilitation and revegetation of the Project areas is summarised in Section 4.9.3 and described in detail in Section 5.

## Proposed Management Measures for Potential Aquatic Impacts

The conceptual design of the Namoi River pump station is shown on Figure 2-15. Proposed design features and operating procedures specific to minimising potential impacts on aquatic ecology include:

- starting the pump slowly and then ramping up velocity to reduce the likelihood of fish in the vicinity of the intake being drawn into the pump;
- installing a suitable self-cleaning screen that would reduce the intake of fish eggs and larvae at the pump inlet; and
- regular cleaning of the screen to dislodge trapped organisms.





## Proposed Farm Management Plan

Whitehaven owns and manages several properties around the Project area. Various measures would be adopted to manage the Whitehaven-owned properties to optimise both farming and biodiversity outcomes, including:

- proactive management of stock (cell grazing, low intensity grazing in overgrazed areas);
- selected areas of natural regeneration (e.g. along watercourses or within or adjacent to) existing remnant woodland patches, native plant windbreaks; and
- riparian restoration along semi-permanent creek/drainage lines (South Creek and Stratford Creek).

Components of the Farm Management Plan (Section 4.3.3) that relate to biodiversity outcomes would be prepared by a suitably qualified person(s) within 12 months of Project approval to facilitate the management of Whitehaven-owned properties.

## Other Management Measures Relevant to Fauna

Weed control measures that would be implemented during the life of the Project are described in Section 4.9.3.

## 4.10.4 Offset Strategy

As described in Section 4.9.4, the DGRs state the EIS must contain a comprehensive offset strategy. The Project biodiversity offset strategy is described in Section 4.9.4 and Appendix E. In addition to the discussion in Section 4.9.4, all the main broad fauna habitat types disturbed by the Project are represented in the proposed biodiversity offset area, with the exception of Sedgeland (2 ha) (Table 4-30). In summary, the biodiversity offset has the following values relating to fauna:

- It is located within the same CMA region as the Project area and therefore has the capacity to benefit biodiversity values in the region.
- It is located next to existing or proposed offset areas and Mount Kaputar National Park and therefore complements the existing reserve system.
- The major broad fauna habitat types (Native Grassland and Woodland/Forest) are present in the biodiversity offset area (Table 4-30).
- The biodiversity offset has the capacity to improve (with moderate to high resilience) through continued removal of the threatening processes and active management.
- Ephemeral creeks such as Maules Creek occur within the biodiversity offset area, providing a diversity of habitats.
- Most of the threatened species recorded in the Project area have also been recorded within the biodiversity offset area or immediate surrounds, and those that haven't have potential habitat in the biodiversity offset area (Figures 4-27 and 4-28).

As described in Section 4.9.4, the 1,284 ha of cleared derived grassland to be impacted by the Project is proposed to be compensated for via rehabilitation of approximately 1,360 ha of the Project final landforms to woodland/forest areas. The proposed biodiversity offset area is therefore focussed on offsetting the 464 ha of non-grassland vegetation types.

Table 4-25 provides a summary of the habitats to be impacted (excluding derived grassland) against that to be conserved and/or revegetated and enhanced as part of the biodiversity offset proposal.

Table 4-30 Approximate Areas of Broad Fauna Habitat Types

Broad Fauna Habitat Types	Project Impact (ha)	Biodiversity Offset Area (ha)
Woodland/Forest	273	1,132
Woodland/Forest – Regeneration/Revegetation	-	248
Cypress Regeneration	188	121
Shrubland/Heathland	1	32
Sedgeland	2	0
Vine Thicket	0	19
Riparian	0	92
Total	464 <sup>1</sup>	1,644 <sup>2</sup>

<sup>1</sup> Excludes derived grassland.

<sup>2</sup> Excludes scald/erosion.







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## 4.11 ROAD TRANSPORT

A Road Transport Assessment for the Project was undertaken by GTA Consultants (2012) and is presented in Appendix F.

The assessment was prepared in accordance with the *Guide to Traffic Generating Developments* (NSW Roads and Traffic Authority [RTA], 2002), and where relevant, makes reference to the RTA's (1996) *Road Design Guide* and Austroads standards.

Section 4.11.1 provides a description of the existing road network and traffic volumes. Section 4.11.2 provides an assessment of the potential impacts of the Project to the road network in the vicinity of the Project. Section 4.11.3 provides relevant mitigation, management and monitoring measures for road transport.

## 4.11.1 Existing Environment

## Road Hierarchy and Conditions

## State Roads

Kamilaroi Highway (State Highway 29) runs generally north-south and to the west of the Project and provides a link between the Upper Hunter region and the north-west of NSW. The Kamilaroi Highway provides access to regional centres such as Gunnedah, Boggabri, Narrabri and Bourke.

In the vicinity of the Project, the Kamilaroi Highway has a single travel lane in each direction, with auxiliary turn lanes at some intersections, and a posted speed limit of 100 km/hr. At its intersection with Blue Vale Road separate deceleration and acceleration lanes have been installed to accommodate the slower moving coal trucks on the Whitehaven haul route with minimum disruption to the through traffic.

## Regional Roads

Rangari Road (Main Road 357) runs in an approximately east-west direction and is located to the north of the Project (Figure 4-29) and links between Kamilaroi Highway to the west and Manilla to the east.

Rangari Road typically has a single travel lane in each direction, and a posted speed limit of 80 km/hr. Rangari Road crosses the Namoi River about 1.6 km to the east of its intersection with Kamilaroi Highway. At this bridge, Rangari Road is narrowed to a single lane with a 10 km/hr speed limit, and eastbound traffic is required to give way to westbound traffic. Rangari Road is also known as the 'Boggabri-Manilla Road' or the 'Manilla Road'.

## Local Roads

Hoad Lane provides a connection northwards from Blue Vale Road at the Braymont Road/Shannon Harbour Road intersection, then an east-west connection to Braymont Road (Figure 4-29). A private road access to the Canyon Coal Mine (part of the Whitehaven haul route) intersects with Hoad Lane at a tee intersection (i.e. along the northern boundary of MLA 1).

South of the Canyon Coal Mine access road, Hoad Lane has a sealed surface, with a single travel lane in each direction, and centre road markings along most of its length. A right turn lane is provided in Hoad Lane for vehicles turning into Shannon Harbour Road, and an acceleration lane is provided for vehicles turning left into Hoad Lane/Blue Vale Road from Shannon Harbour Road. To the north of the Canyon Coal Mine access road, and to the east of Braymont Road, Hoad Lane has an unsealed surface.

Blue Vale Road provides a north-south connection from the Kamilaroi Highway to the north-west of Gunnedah to the intersection of Hoad Lane, Shannon Harbour Road and Braymont Road (Figure 4-29). At this intersection, Hoad Lane and Blue Vale Road form the main road, with Shannon Harbour Road and Braymont Road forming staggered tee intersections. Blue Vale Road has a sealed surface with a single travel lane in each direction and centre line marking along much of its length.

Braymont Road provides a link from the township of Boggabri east and south-east to meet with Blue Vale Road some 20 km north of Gunnedah (Figure 4-29). Braymont Road crosses the Namoi River via a bridge to the east of Boggabri. West of the Namoi River, Braymont Road has a sealed surface with a single travel lane in each direction. East of the Namoi River, it has an unsealed surface, and follows a straight east-west alignment for about 6 km, before a 90 degree (°) bend where it intersects with Barbers Lagoon Road at a three way intersection. Braymont Road continues in a north-south direction after this intersection and runs to the west and south of the Project before joining Blue Vale Road at a tee intersection.







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Shannon Harbour Road forms part of the Whitehaven haul route connecting the Rocglen Coal Mine and Blue Vale Road (Figure 4-29). Shannon Harbour Road has a sealed surface with a single travel lane in each direction. Public traffic travelling west along Shannon Harbour Road are required to divert around the Rocglen Coal Mine via an unsealed section of road (Riordan Road) to connect to Wean Road, to the south-east of the Rocglen Coal Mine.

Barbers Lagoon Road is a local road and extends in a north-south direction between Braymont Road in the south and Rangari Road in the north (Figure 4-29). The northernmost 700 m of Barbers Lagoon Road has a sealed surface, with a single travel lane in each direction and a marked centre line on its approach to Rangari Road. The remaining length of Barbers Lagoon Road has an unsealed surface and follows a reasonably straight north-south alignment, with the exception of a dog-leg about 1.2 km north of Braymont Road.

### Whitehaven Haul Route

The Tarrawonga and Rocglen Coal Mines use an approved haul route to the Whitehaven CHPP, along a combination of public and private roads (Figure 4-29). The public roads on the route include Rangari Road, Hoad Lane, Blue Vale Road and the Kamilaroi Highway (Figure 4-29). The Project would use a portion of this existing haul route to transport Project ROM coal between the MIA and the Whitehaven CHPP (Section 2.6.2).

## **Existing Traffic Volumes**

Available traffic flow data from RMS and the Road Transport Assessment for the Tarrawonga Coal Project (Halcrow, 2011) was reviewed and additional traffic counts were conducted for the Project Road Transport Assessment over one week during October – November 2011 (Appendix F). Relevant traffic count locations are shown on Figure 4-29 and the existing daily traffic volumes are summarised in Table 4-31.

		Surveyed Total Traffic (vehicles/day)		
Site <sup>1</sup>	Road and Location	Average Weekday	Saturday	Sunday
1	Barbers Lagoon Road south of Rangari Road <sup>2</sup>	51	37	40
2	Blue Vale Road north-east of Kamilaroi Highway <sup>3</sup>	1,515	997	145
3	Blue Vale Road south of Shannon Harbour Road <sup>4</sup>	480	230	80
4	Braymont Road west of Blue Vale Road <sup>2</sup>	273	118	14
5	Braymont Road at Namoi River Bridge <sup>2, 5</sup>	122	n/a	n/a
6	CHPP Access Road <sup>2</sup>	673	193	10
7	Hoad Lane west of Haul Route <sup>3</sup>	49	32	49
8	Kamilaroi Highway between Blue Vale Road and CHPP <sup>2</sup>	3,188	2,226	1,702
9	Kamilaroi Highway south of Rangari Road <sup>2</sup>	2,028	1,391	1,325
10	Kamilaroi Highway north of Blue Vale Road <sup>2</sup>	2,488	1,946	1,762
11	Rangari Road east of Kamilaroi Highway <sup>2</sup>	369	105	117
12	Rangari Road west of Whitehaven Haul Route <sup>2</sup>	637	344	132
13	Rangari Road east of Whitehaven Haul Route <sup>2</sup>	67	50	37
14	Shannon Harbour Road east of Blue Vale Road <sup>4</sup>	217	74	31
15	Wean Road south of Rangari Road <sup>3</sup>	49	56	29

## Table 4-31 Existing Average Weekday Traffic Volumes

Source: After Appendix F. <sup>1</sup> Refer to Figure 4-29.

<sup>2</sup> Survey 30 November – 6 December 2011.

<sup>3</sup> Survey 27 October – 2 November 2011.

<sup>4</sup> Survey 8 February – 14 February 2011.

<sup>5</sup> Data available for Tuesday to Friday only.





## Roadway Capacity

Austroads (2009) defines a Level of Service as a qualitative measure describing operational conditions within a traffic stream (in terms of speed, travel time, room to manoeuvre, safety and convenience) and their perception by motorists and passengers. Level of Service A provides the best traffic conditions, with no restriction on desired travel speed or overtaking. The existing Level of Service at each of the survey locations in Table 4-31 would be A (Appendix F).

## Road Safety

A review of the RMS road accident data in the vicinity of the Project for the period of 1 October 2005 to 20 September 2010 has been undertaken by Halcrow (2012) as a component of the Baseline Road Transport Assessment. A review of the crash data identified no particular accident pattern or causation factors on local roads (Appendix F).

## School Buses

A number of school buses operate in the vicinity of the Project, however, the majority of these do not operate on the Whitehaven haul route (Appendix F). Whitehaven has implemented a protocol whereby all ROM coal haulage truck drivers maintain positive communication between themselves and the bus drivers via UHF radio.

## Road Maintenance Agreements

Whitehaven has entered into road maintenance agreements with both the Narrabri Shire Council and Gunnedah Shire Council.

The road maintenance agreement with Narrabri Shire Council covers the section of the Whitehaven haul route within the Narrabri LGA, and requires the road and intersections to be maintained in good condition at all times at Whitehaven's cost. Maintenance requirements are determined through joint inspections carried out every four months.

The road maintenance agreement with Gunnedah Shire Council covers the maintenance of roads used by Whitehaven in association with its mines and facilities in the region (e.g. the Whitehaven CHPP, Tarrawonga Coal Mine, Rocglen Coal Mine, and Canyon Coal Mine). Under this agreement, Whitehaven is required to pay 95% of road maintenance costs incurred by Gunnedah Shire Council for Hoad Lane and Blue Vale Road. The maintenance requirements are determined through joint inspections.

## 4.11.2 Potential Impacts

Potential traffic impacts of the Project on traffic generation, roadway capacity and safety are assessed in Appendix F and are summarised below.

## Project Traffic Generation

Traffic generated by the Project would include construction traffic, operational traffic, ROM and domestic coal haulage and gravel haulage. Table 4-32 summarises the estimated total Project traffic generation for Years 1, 7 and 17 (traffic in both directions).

Whitehaven currently holds approvals to transport ROM coal along the Whitehaven haul route at a rate of up to 3.5 Mtpa from the Tarrawonga and Rocglen Coal Mines. This ROM coal haulage can take place between the hours of 7.00 am to 10.00 pm Monday to Friday and 7.00 am to 6.00 pm on Saturdays. If the 3.5 Mtpa is averaged over these approved operating hours it equates to approximately 782 t of ROM coal being transported per haulage hour, or 19 truck deliveries per hour, from the Tarrawonga and Rocglen Coal Mines to the Whitehaven CHPP.

ROM coal transport from the Project to the Whitehaven CHPP via the Whitehaven haul route and the private haul road and Kamilaroi Highway overpass is proposed to be undertaken up to 24 hours per day, seven days per week (Section 2.6.1). If the maximum Project ROM coal production rate of 4.5 Mtpa is averaged over the 24 hour trucking period it would equate to 13 truck deliveries per hour.

Noise modelling of Project ROM coal road transport was conducted by Wilkinson Murray (2012) (Section 4.6.2). No exceedances of the relevant night-time or day RNP road noise assessment criteria were predicted at receivers for all assessed traffic scenarios, inclusive of Project and non-Project related traffic (Appendix C).

## **Cumulative Traffic Increases**

In order to conservatively consider the potential impacts of the Project, an annual baseline growth rate and the expected traffic generation from other mines/projects was adopted by GTA Consultants (2012) in the Road Transport Assessment (Appendix F).





	Existing	Project Traffic Distribution		
Road and Location	(non-Project)	Year 1	Year 7	Year 17
Barbers Lagoon Road south of Rangari Road	51	0	0	0
Blue Vale Road north of Kamilaroi Highway	1,515	219	425	425
Blue Vale Road north of proposed Private Haul Route	1,515	219	1,095	1,095
Blue Vale Road south of Shannon Harbour Road	480	219	1,095	1,095
Braymont Road west of Blue Vale Road	273	201	0	0
Braymont Road at Namoi River Bridge	122	65	111	111
CHPP Access Road south-west of Kamilaroi Highway	673	0	0	0
CHPP Access Road west of Private Haul Road	673	0	670	670
Hoad Lane west of Whitehaven Haul Route	49	65	111	111
Kamilaroi Highway between Blue Vale Road and CHPP	3,188	219	425	425
Kamilaroi Highway south of Rangari Road	2,028	0	0	0
Kamilaroi Highway north of Blue Vale Road	2,488	0	0	0
Private Haul Road and Kamilaroi Highway Overpass	_1	0	670	670
Rangari Road east of Kamilaroi Highway	369	44	120	120
Rangari Road west of Whitehaven Haul Route	637	0	0	0
Rangari Road east of Whitehaven Haul Route	67	44	120	120
Shannon Harbour Road east of Blue Vale Road	217	162	39	39
Wean Road south of Rangari Road	49	23	39	39
Hoad Lane north of Shannon Harbour Road	_2	219	0	0
Temporary Infrastructure Area Access Road	_2	201	0	0
MIA Construction Access off Shannon Harbour Road	_1	150	0	0
MIA Access Road	_1	0	627	627
ROM Coal Haul Truck MIA Access Road	_1	0	738	738
Braymont Road west of Existing Infrastructure Area Access	_2	0	0	0

 Table 4-32

 Average Weekday Daily Existing and Project Traffic Distribution (vehicles/day)

Source: After Appendix F.

<sup>1</sup> Road not currently constructed.

<sup>2</sup> Existing daily traffic volume not available.

Based on an analysis of RTA traffic volume data, a 1% per annum baseline traffic growth rate was applied to the existing traffic volumes provided in Table 4-31 (Appendix F). In addition, the expected traffic movements generated from the Boggabri Coal Mine, Tarrawonga Coal Mine and the Maules Creek Coal Project were estimated.

Table 4-33 presents the predicted traffic flows in Project Years 1, 7 and 17.

It is expected that for all survey locations shown on Figure 4-29 the future Level of Service would remain A, with the predicted traffic volumes shown in Table 4-33.

## Private Haul Road and Kamilaroi Highway Overpass

As described in Section 2.6.3, Whitehaven would construct the private haul road and Kamilaroi Highway overpass between Blue Vale Road and the Whitehaven CHPP. This would allow haulage trucks to travel between Blue Vale Road and the Whitehaven CHPP without the need to travel along, and turn across the Kamilaroi Highway.

The proposed private haul road and Kamilaroi Highway overpass would be constructed prior to the cumulative road haulage of ROM coal along the Whitehaven haul route (from all Whitehaven mines) exceeding the currently approved rate of 3.5 Mtpa, pending grant of the necessary land access requirements and other approvals (e.g. relevant RMS and council approvals).



Road and Location	Existing	Year 1	Year 7	Year 17
Barbers Lagoon Road south of Rangari Road	51	128	64	68
Blue Vale Road north of Kamilaroi Highway	1,515	1,962	1,774	1,878
Blue Vale Road north of proposed Private Haul Route	1,515	1,962	2,444	2,548
Blue Vale Road south of Shannon Harbour Road	480	896	1,317	1,317
Braymont Road west of Blue Vale Road	273	483	298	325
Braymont Road at Namoi River Bridge	122	196	248	260
CHPP Access Road south-west of Kamilaroi Highway	673	684	394	430
CHPP Access Road west of Private Haul Road	673	684	1,064	1,100
Hoad Lane west of Whitehaven Haul Route	49	116	165	170
Kamilaroi Highway between Blue Vale Road and CHPP	3,188	3,687	3,599	3,870
Kamilaroi Highway south of Rangari Road	2,028	2,430	2,540	2,739
Kamilaroi Highway north of Blue Vale Road	2,488	2,749	2,974	3,223
Private Haul Road and Kamilaroi Highway Overpass	0	0	670	670
Rangari Road east of Kamilaroi Highway	369	891	1,017	1,048
Rangari Road west of Whitehaven Haul Route	637	812	969	1,027
Rangari Road east of Whitehaven Haul Route	67	150	183	189
Shannon Harbour Road east of Blue Vale Road	217	386	276	297
Wean Road south of Rangari Road	49	74	93	98
Hoad Lane north of Shannon Harbour Road	480	896	222	222
Temporary Infrastructure Area Access Road	0	201	0	0
MIA Construction Access off Shannon Harbour Road	0	150	0	0
MIA Access Road	0	0	627	627
ROM Coal Haul Truck MIA Access Road	0	0	738	738
Braymont Road west of Existing Infrastructure Area Access	273	282	298	325

Table 4-33 Predicted Year 1, 7 and 17 Cumulative Traffic Volumes

Source: After Appendix F.

Note: Includes surveyed traffic, 1% background growth, Boggabri Coal Mine, Tarrawonga Coal Mine, Maules Creek Coal Project, and Project traffic.

During construction of the infrastructure there is potential for short-term delays to traffic travelling along the Kamilaroi Highway and Blue Vale Road. These delays would be due to a temporary decrease in speed limits to ensure safety to the public and the construction workforce, and due to temporary road closures while the overpass structure is constructed (e.g. during crane lifts).

## Mine Infrastructure Area

Light and delivery vehicles would access the MIA via a new access road (MIA Access Road) connecting the existing Shannon Harbour Road with the Blue Vale Road realignment. Coal haulage trucks would have a dedicated MIA access road constructed off the Blue Vale Road realignment, to the south of Shannon Harbour Road (Figure 2-9). This would remove potential interaction between the coal haulage trucks and light vehicles accessing the MIA.

## Proposed Road Realignments and New Intersections

As described in Section 2.4.1, the Project open cut would require the realignment of sections of Blue Vale Road, Hoad Lane and Shannon Harbour Road, to the east and south of the open cut, to provide for continued public road accessibility around the southern and eastern extents of the Project. A small realignment of the southern section of Braymont Road would be required to allow the open cut to reach its full extent (Figure 2-8).

Two new intersections would be constructed between the MIA Access Road, the coal haulage truck MIA access road and the Blue Vale Road realignment. The intersections would be three way intersections with the Blue Vale Road realignment having right of way. Acceleration and deceleration lanes would be provided for vehicles turning in and out of the MIA.



The new sections of road and intersections would be designed and constructed to the same standard as the existing sealed roads, in accordance with the RTA's *Road Design Guide* (1996) and in consultation with the Gunnedah and Narrabri Shire Councils.

The proposed Blue Vale Road realignment would add an extra 5 km of travel distance for vehicles travelling north-south/south-north along Blue Vale Road. This would add approximately 3 to 4 minutes to typical travel times.

It is anticipated that this increase in travel time would primarily affect local landholders in the general vicinity of the Project travelling between their properties and either Gunnedah or Boggabri, school buses operating along Hoad Lane and Blue Vale Road and the local mining workforce.

Emergency service vehicles (i.e. ambulance, fire service vehicles and police vehicles) are located both in Gunnedah and Boggabri. It is anticipated that emergency service vehicles responding to an incident to the north of the Project would generally travel from Boggabri, while incidents to the south of the Project would generally be responded to by vehicles travelling from Gunnedah. As such, it is considered unlikely that emergency service vehicles would need to travel along the proposed Blue Vale Road diversion to respond to incidents.

In addition the Project would have some mobile emergency service capabilities (e.g. fire fighting and first aid) which could be used to respond to certain incidents in the general vicinity of the Project to assist community emergency services.

## ROM Coal Road Transport Route Intersections with Kamilaroi Highway

The Whitehaven haul route intersects with the Kamilaroi Highway at the Whitehaven CHPP access road and the intersection with Blue Vale Road. The two intersections are each tee intersections, with the Kamilaroi Highway being the road with priority.

The intersections are both constructed to a good standard, with deceleration and acceleration lanes to accommodate the slower moving coal trucks. The construction of the private haul road and Kamilaroi Highway overpass would mean that coal trucks would no longer use these intersections. They would however continue to be used by other traffic entering the Whitehaven CHPP and/or using Blue Vale Road. No upgrades to these intersections are required as a result of the Project.

#### Road Safety Review

The Road Transport Assessment did not identify any particular accident patterns or causation factors on local roads in the vicinity of the Project (Section 4.11.1). The Project traffic would continue to use the same routes covered by the existing maintenance agreement (as well as using the private haul road and Kamilaroi Highway overpass once constructed), which is an appropriate method of ensuring that the roads are maintained to the standard required for safe operation.

GTA Consultants (2012) anticipate that no significant road safety issues would occur as a result of the Project.

## School Buses

Based upon shift times, the Project's morning peak traffic would be between 6.00 am and 7.00 am and afternoon peak traffic would occur between 6.00 pm and 7.00 pm. This is outside of the hours that the school buses operate, and therefore, the potential for conflict between Project traffic and school buses is low (Appendix F).

## Temporary Road Closures Associated with Blasting

During mining operations there would be occasions when blasting would be required within 500 m of Blue Vale Road, Hoad Lane, Braymont Road, and the sections of the realigned Blue Vale Road and Shannon Harbour Road. Approvals would be sought from the Gunnedah Shire Council and Narrabri Shire Council to temporarily close sections of the local roads to allow blasting to occur, typically for periods of approximately 15 minutes.

#### **Oversize Vehicles**

A number of oversize vehicle movements would be generated on an occasional basis during the life of the Project. These would be associated with the transport of mining equipment and infrastructure to and from the Project and would be transported with the relevant permits, licences and escorts as required by the relevant government agencies. The proposed movement for any oversize vehicles would be negotiated with the RMS and relevant local councils on a case-by-case basis.





## Level Crossings

While there would be no increase in the existing approved number of trains transporting product coal from the Whitehaven CHPP, the Project would extend the life of the Whitehaven CHPP (i.e. Development Consent [DA 0079.2002] expires in October 2022]) (Attachment 4).

It is therefore considered that delays and potential safety risks associated with the currently approved rail movements from the Whitehaven CHPP along the Werris Creek Mungindi Railway would continue for the life of the Project.

## 4.11.3 Mitigation Measures, Management and Monitoring

The Project would result in minor impacts on the operation of the surrounding road network. Significantly, the proposed construction of the private haul road and Kamilaroi Highway overpass would remove the need for coal trucks to merge with, and turn across, traffic on the Kamilaroi Highway.

The potential impacts to traffic travelling on the Kamilaroi Highway and Blue Vale Road during the construction of the private haul road and Kamilaroi Highway overpass would be managed through the development of a works authorisation deed and a construction traffic management plan with the RMS. The construction traffic management plan would include management measures to be implemented during the construction phase, including the identification of alternative routes should temporary closure of the Kamilaroi Highway be required.

The Kamilaroi Highway overpass would be constructed by suitably qualified contractors, endorsed by the RMS.

No significant impacts on the performance, capacity, efficiency and safety of the road network are expected to arise as a result of the Project, and no specific traffic monitoring or mitigation measures are considered warranted (Appendix F).

Notwithstanding, Whitehaven would implement the following road transport management measures:

- Temporarily close public roads when blasting is undertaken within 500 m of them (Section 4.11.2).
- All oversized vehicles would have the relevant permits, licences and escorts, as required by the government agencies and the proposed route would be negotiated with the relevant local councils.

- All oversize vehicles loads would be appropriately secured and covered.
- The Blue Vale Road and Braymont Road realignments would be designed and constructed in accordance with the requirements of Gunnedah Shire Council, Narrabri Shire Council and the RTA's (1996) *Road Design Guide*.

As described in Section 4.11.1, Whitehaven currently has road maintenance agreements with the Narrabri Shire Council and the Gunnedah Shire Council. It is anticipated that similar agreements would continue to be maintained over the life of the Project, based on the levels of traffic generated.

## 4.12 VISUAL CHARACTER

A Visual Assessment for the Project was undertaken by Urbis (2012) and is presented in Appendix H.

A description of the existing visual setting of the Project is provided in Section 4.12.1. Section 4.12.2 describes the potential visual impacts of the Project and Section 4.12.3 outlines visual impact mitigation measures, management and monitoring.

## 4.12.1 Existing Environment

The Project area and surrounds comprise a number of distinct land use types and landscape units. These include agricultural areas, the Vickery State Forest, the existing Rocglen, Tarrawonga, Boggabri and Canyon Coal Mines, residential dwellings, ephemeral watercourses and the Namoi River. Land use and key landscape features that contribute to visual character and scenic quality are described below in the context of the regional, sub-regional and local settings.

Topographic features in the vicinity of the Project are described in Section 4.3.1.

## Regional Setting (> 5 km)

The regional setting has attributes of moderate scenic quality due to the presence of the unnamed wooded range 9 km to the east of the Project. The contrast between the vegetation and topography of the ranges and agricultural areas of the valley adds to visual interest.

Several reserved areas (Leard CCA Zone 3 State Conservation Area, Kelvin CCA Zone 2 Aboriginal Area and Mount Kaputar National Park) are located in the regional setting.





The regional setting also has many attributes of low scenic quality due to the generally flat, cleared dryland agricultural areas that dominate the landscape (Appendix H).

## Sub-regional Setting (1 to 5 km)

The sub-regional setting has attributes of low scenic quality due to the presence of flat, cleared dryland agricultural areas, but has attributes of moderate scenic quality due to the presence of Vickery State Forest and the meandering form of the Namoi River with its associated riparian remnant vegetation. The patterning created by the irrigated crops of the Namoi Valley provides some visual interest and results in a moderate scenic quality (Appendix H).

## Local Setting (<1 km)

The local setting has been heavily modified over time with the majority of vegetation, apart from the Vickery State Forest, disturbed by historic agricultural clearing and past mining activities (Section 4.3.1). The overall visual character of the local setting is considered to be of low scenic quality (Appendix H).

To the immediate east of the Project, is the Vickery State Forest which predominantly comprises native woodland and forest vegetation and is of moderate scenic quality.

## 4.12.2 Potential Impacts

The major aspects of the Project considered to have the potential to impact on the visual landscape include (Appendix H):

- modification of topographic features including:
  - development of the open cut;
  - development of the external waste rock emplacements on either side of the open cut;
  - construction of flood and noise control earth bunds;
  - construction of the water diversion drains and storages; and
  - development of the MIA and associated ROM coal handling infrastructure;
- realignment of sections of Blue Vale Road, Shannon Harbour Road, Hoad Lane and Braymont Road to the east and south of the Project;

- construction and use of a private haul road and Kamilaroi Highway overpass between Blue Vale Road and the Whitehaven CHPP; and
- use of lighting during night-time operations.

The external waste rock emplacements would be constructed to a maximum height of 375 m AHD, which would be up to approximately 100 m above the existing ground level.

#### Visual Assessment Methodology

The potential visual impacts of the Project were assessed by Urbis (2012) by evaluating the level of visual modification in the context of the visual sensitivity of relevant surrounding land use areas.

The degree of visual modification of a proposed development can be measured as an expression of the visual interaction, or the level of contrast between the development and the existing visual environment, and is generally considered to decrease with distance (Appendix H).

Visual (viewer) sensitivity is a measure of how critically a change to the existing landscape would be viewed from various use areas, where different activities are considered to have different sensitivity levels (Appendix H). Visual impacts were determined generally in accordance with the matrix presented in Table 4-34.

## Table 4-34 Visual Impact Matrix

			· • · · · · · · · · · · · · · · · · · ·		
		Н	М	L	
ation	Ξ	H	H	М	VL = Very Low
odific	М	Н	М	L	L = Low
Jal Mo	L	М	L	L	M = Moderate
Visu	VL	L	VL	VL	H = High
	\	<i>,</i> Ц			

Viewer Sensitivity

Source: Appendix H.





### Visual Impact Assessment

Visual simulations were prepared for the locations identified in Table 4-35 and shown on Figure 4-30. The simulations were prepared using Project landforms for Years 7 or 17 (depending on the viewpoint) at which stage the waste emplacements would have reached maximum height, representing the greatest potential for visual impact, and progressive rehabilitation would have commenced, but would not be fully established. Visual simulations have also been prepared for Year 26 of the Project when all landforms are, or are close to being fully constructed, and the rehabilitation of the Project waste emplacements would be substantially complete.

Predicted visual impacts at the five visual simulation locations, and a number of other locations within the regional and sub-regional setting are summarised in Table 4-36 and discussed below.

## Dwellings

The high visual sensitivity of the 'Mirrabinda No. 2' dwelling coupled with a moderate level of modification means a high level of visual impact is expected (Table 4-36). However, with progressive and final rehabilitation the level of visual impact would reduce to low (Appendix H).

The moderate visual sensitivity of the 'Bungalow', 'Mirrabinda No. 1' and 'Mirrabinda No. 3' dwellings coupled with a moderate to high visual modification level means a medium to high potential visual impact would be expected (Table 4-36). However, with progressive and final rehabilitation the level of visual impact would reduce to low (Table 4-36). The moderate visual sensitivity of the 'Silkdale' and 'Clinton' dwellings coupled with a moderate visual modification level means a moderate potential visual impact would be expected (Table 4-36). However, with progressive and final rehabilitation the level of visual impact would reduce to low to very low.

The moderate visual sensitivity coupled with the low to moderate visual modification level at the 'Brolga' and 'Coulston (secondary residence)' dwellings means a low to moderate level of visual impact would be expected (Table 4-36). However, with progressive and final rehabilitation the level of visual impact would reduce low to very low (Appendix H).

The low visual sensitivity coupled with the low visual modification level at the 'Coulston (primary residence)' dwelling means a low level of visual impact would be expected (Table 4-36). Once rehabilitation of the waste emplacement has established, the level of visual impact is expected to be very low (Appendix H).

The very low visual sensitivity of the 'Braymont' dwelling coupled with a moderate to high level of modification, would result in a low level of visual impact which would reduce to very low following progressive and final rehabilitation of the Western Emplacement (Appendix H).

There are no privately-owned dwellings within the local setting of the Project (i.e. less than 1 km from the planned mine disturbance areas).

Visual Simulation Location	Potential View of Project Landforms	Figure
Adjacent to the 'Brolga' Dwelling (privately-owned)	View towards Western and Eastern Emplacements.	Figure 4-31
Blue Vale Road, 3.3 km south of the Project	View towards Western and Eastern Emplacements.	Figure 4-32
Braymont Road, 3.9 km north-west of the Project	View towards Western Emplacement.	Figure 4-33
Kamilaroi Highway, 4.2 km west of the Project	View towards Western Emplacement.	Figure 4-34
Kamilaroi Highway, 200 m west of the highway overpass	View east towards Kamilaroi Highway overpass.	Figure 4-35

Table 4-35 Visual Simulation Locations

Source: After Appendix H.







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Year 7 Simulation





Year 26 Simulation

Resource Strategies





Year 7 Simulation





Resource Strategies





Year 17 Simulation



Year 26 Simulation



FIGURE 4-33 Existing View and Visual Simulations -Braymont Road (VP9) WHITEHAVEN COAL







Year 17 Simulation







Resource Strategies WHC-10-03 EIS Sect 4\_004C





Simulation





Viewpoint <sup>1</sup>	Location	Visual Sensitivity	Visual Modification Level	Potential Visual Impact	Impact After Final Rehabilitation
Regional Se	tting (>5km)				
VP1	Wean Road - Bengalala	L	L	L	VL
VP2	Coulston Primary Dwelling	L	L	L	VL
VP3	Blue Vale Road	L	L	L	VL
Sub-Regiona	al Setting (1 – 5 km)				
VP4	Brolga Dwelling	М	L - M	L - M	L - VL
VP5	Coulston Secondary Dwelling	М	L – M	L – M	L - VL
VP6	Blue Vale Road	VL	M – H	VL – L	VL
VP7	Silkdale Dwelling	М	М	М	L - VL
VP8	Braymont Dwelling	М	L - M	L	L - VL
VP9	Braymont Road	VL	M – H	L	VL
VP10	Bungalow Dwelling	М	M – H	M – H	L
VP11	Kamilaroi Highway	L	М	L	VL
VP12	Clinton Dwelling	М	М	М	L - VL
VP13	Mirrabinda No. 1 Dwelling	М	M – H	M – H	L
VP14	Mirrabinda No. 2 Dwelling	Н	М	Н	L
VP15	Mirrabinda No. 3 Dwelling	М	M – H	M – H	L
Local Setting	g (<1 km)				
VP16	Kamilaroi Highway	н	VL	1	N/A

Table 4-36 Summary of Visual Assessment

Source: After Appendix H.

H – High; M – Moderate; L – Low; VL – Very Low.

<sup>1</sup> Refer Figure 4-30.

#### Roads

The potential visual impacts of the Project were assessed from Wean Road adjacent to the 'Bengalala' dwelling, Blue Vale Road, Braymont Road to the north of the Project mining area, Kamilaroi Highway west of the Project mining area and the Kamilaroi Highway looking east towards the proposed Kamilaroi Highway overpass (Table 4-36).

As shown in Table 4-31, traffic levels on Braymont Road and Wean Road are low, on Blue Vale Road are moderate (primarily associated with Whitehaven mining related vehicle movements) and on the Kamilaroi Highway are high.

In the sub-regional setting, Braymont Road and Blue Vale Road are predicted to have a very low visual sensitivity with moderate to high level of modification which results in a very low and very low to low potential visual impact, respectively (Table 4-36). The level of impact would become very low after progressive and final rehabilitation of the waste emplacements (Appendix H). Wean Road and Kamilaroi Highway (to the west of the Project mining area) both have a low visual sensitivity coupled with a low and moderate, respectively, level of modification resulting in a low level of visual impact. This becomes very low following progressive and final rehabilitation of the waste emplacements (Appendix H). Kamilaroi Highway (200 m west of the proposed Kamilaroi Highway overpass) has a high visual sensitivity and a very low modification level for the proposed overpass structure which results in a low visual impact (Table 4-36).

The Blue Vale Road realignment would also have a low visual sensitivity. However the close proximity of the road to the mining landforms would result in prominent visual impacts, particularly at locations where the road is adjacent to the Eastern Emplacement during the early stages of the mine life. Visual impacts along parts of the northern section of the Blue Vale Road realignment would increase during the later stages of the mine life as the open cut progress eastwards, presenting views of the operational areas of the mine to vehicles travelling along the road.





Although Table 4-33 indicates that up to 1,317 vehicles per day would travel along Blue Vale Road in the vicinity of the Project, over 80% of these movements would be Project-related vehicles. As a result, it is anticipated that the usage of Blue Vale Road by non-mining vehicles in this area would be relatively low.

## Night-Lighting

From most locations in the sub-regional and regional setting, direct views to the lighting sources would be obscured from view by vegetation within the landscape and around residences. Significantly, the use of the pro-active noise management system would mean that the mine fleet would not operate on the external batters of the Western Emplacement between 6.00 pm and 7.00 am (Table 4-15).

In addition, the design of the Project is such that the outer edge of the Western Emplacement would be constructed and rehabilitated early in the mine life. This (and the natural topography of the Project mining area) would provide a barrier between the operating fleet in the open cut and the majority of the surrounding residences, which would minimise the potential for direct night-light impacts.

Notwithstanding the above, there is potential for the Project to spill a certain amount of light from vehicles and stationary work lights, and when there is cloud cover at night this may result in some reflection off the cloud base.

In addition, the Project would result in an increased number of vehicles using the Whitehaven haul route at night (primarily due to the proposed 24 hour trucking). Consequently there would be an increase in night lighting impacts associated with vehicle headlights.

The nature and degree of night-lighting for the Project would be similar to the existing night-lighting at the Tarrawonga and Rocglen Coal Mines.

It is considered night lighting produced by the Project would not be visible from Siding Springs Observatory, which is located approximately 115 km to the south-west of the Project.

#### **Cumulative Impacts**

The assessment of cumulative visual impacts has considered the combined effects of the Project with the effects of the existing Rocglen Coal Mine. Due to the elevated and hilly topography of the Vickery State Forest, views of both the Project and the Rocglen Coal Mine landforms would generally be only available from viewpoints to the south and south-east of the Project. As with views of the Project, these viewpoints would only be available from elevated areas and/or areas where no vegetation screening is present (e.g. from paddocks, private roads).

The night-time setting is currently subject to the effects of lighting from the Rocglen Coal Mine. However, the Rocglen Coal Mine is contained to some extent between the rising topography of the Vickery State Forest and the unnamed range to the east.

Cumulative visual impacts as a result of the Project and the Rocglen Coal Mine are considered to be low to moderate and confined to viewpoints to the south of the Project (Appendix H).

## 4.12.3 Mitigation Measures, Management and Monitoring

The mitigation and management measures that would be implemented for the maintenance of visual amenity at the Project are described below.

#### Progressive Rehabilitation

Progressive rehabilitation of the Western Emplacement, Eastern Emplacement and open cut infill areas would be undertaken and would assist in reducing the contrast between the Project landforms and the surrounding environment. The design of the mine waste rock emplacements would assist with the visual shielding of the active open cut operations.

Rehabilitation would be conducted in accordance with the rehabilitation and landscape management strategy presented in Section 5.

## Visual Screening

Visual screening such as the use of vegetation screens consisting of native plants that are compatible with the existing surrounding vegetation would be used to reduce potential visual impacts from local sensitive viewpoints.

In addition, upon receiving a request from an owner of any privately-owned dwelling which has significant direct views of the Project, Whitehaven would implement reasonable and feasible visual mitigation measures (e.g. vegetation screening) in consultation with the owner to minimise the visibility of the Project from the dwelling.





Vegetative screens, and in some cases bunds, would be installed along sections of the Blue Vale Road realignment where views of the active mine operations would be available to road traffic (Figure 4-30). These vegetative screens and bunds would mitigate some of the visual impact along the Blue Vale Road realignment, although it is anticipated that residual visual impacts would be experienced by motorists due to the close proximity to the mining landforms.

Screens would be installed along sections of the Kamilaroi Highway overpass to manage potential truck lighting impacts to neighbouring residences.

## Night-Lighting

Whitehaven would seek to minimise light emissions from the Project by carefully selecting the sites where lights would be placed, and by use of physical barriers and/or operational measures to reduce light spill without compromising operational safety. As described in Table 4-15, no mining activities would be conducted on the western face or on top of the Western Emplacement between 6.00 pm and 7.00 am. As such, it is anticipated that night-lighting impacts to areas west of the Project would be minimal.

Measures that would be employed to mitigate potential impacts from night-lighting would include one or more of the following, where practicable:

- All external lighting associated with the Project would comply with AS 4282:1997 Control of the Obtrusive Effects of Outdoor Lighting.
- Night-lighting would be restricted to the minimum required for operations and safety requirements.
- Directional lighting techniques would be used.
- Light shrouds and reflectors would be used to limit the spill of lighting.
- In consultation with the landholder, trees would be planted at nearby private dwellings to help screen any potential visual impacts.
- In consultation with the landholder, curtains, cladding and/or screens would be provided at nearby private dwellings to help screen any potential night-time lighting impacts, in consultation with the landholder.

As described above, lighting impacts from trucks travelling along the Kamilaroi Highway overpass would be managed by the installation of visual screens.

## 4.13 ABORIGINAL HERITAGE

An Aboriginal Cultural Heritage Assessment was undertaken for the Project by Landskape (2012) and is presented in Appendix I.

The Project Aboriginal Cultural Heritage Assessment has been undertaken in accordance with the following guidelines:

- Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW [now referred to as the OEH], 2010a).
- Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (DECCW, 2010b).
- Draft Guidelines for Aboriginal Cultural Impact Assessment and Community Consultation (DEC, 2005a).
- The Australian International Council on Monuments and Sites (ICOMOS) *Burra Charter* (Australia ICOMOS, 1999).
- Aboriginal Cultural Heritage: Standards and Guidelines Kit (NPWS, 1997).
- Ask First: A Guide to Respecting Indigenous Heritage Places and Values (Australian Heritage Commission, 2002).
- NSW Minerals Industry Due Diligence Code of Practice for the Protection of Aboriginal Objects (NSW Minerals Council, 2010).

A description of Aboriginal heritage (including cultural and archaeological) in the vicinity of the Project is provided in Section 4.13.1. Section 4.13.2 describes the potential impacts of the Project and Section 4.13.3 outlines mitigation measures, management and monitoring.

## 4.13.1 Existing Environment

## Aboriginal History

The Project area is located on lands covered by the Kamilaroi (or Gamilaraay) dialect of the "Darling Tributaries" languages (Wafer and Lissarrague, 2008). Estimates suggest that there were at least 60 Kamilaroi clans in the region (O'Rourke, 1997).





At the time of first contact with European observers, the Kamilaroi were hunter-fisher-gathers and appear to have had a semi-sedentary lifestyle. There are several reports of villages of circular huts with conical roofs made from reeds, grass and boughs, or sometimes of bark, with bark floors. The reports by Allan Cunningham and Major Thomas Mitchell indicate that such villages were associated with substantial permanent water supplies, such as at Barbers Lagoon on the Namoi River (Appendix I).

It is expected that traditional values and activities remained on the Liverpool Plains, practiced by the Kamilaroi people up until the 20<sup>th</sup> century. In the early 20<sup>th</sup> century Aboriginal people in the area were settled on reserves at Baan Baa approximately 30 km north-west from the Project area and Borah Crossing approximately 30 km south-east of the Project area (Appendix I).

The number of Kamilaroi people is reported to have declined over time due to the loss of land, disturbance to the environment and to social networks and the influence of disease.

Post-contact, many Kamilaroi people are reported to have worked in association with pastoral stations and homesteads (O'Rourke, 1997).

#### Natural Resources

Ephemeral water sources were likely available to Aboriginal groups in the drainage lines located within and surrounding the Project area. Variable climatic conditions likely affected the availability of water, and may have influenced the way Aboriginal people moved through the landscape over time (Appendix I).

Exploitation of animal food resources in the past is likely to have included a range of vertebrates, molluscs and crustaceans. Local available plant foods are also likely to have been used. Mature trees found in the area would have been used for their bark in the manufacture of watercraft while nets and fishing line made out of local resources would have been used to catch fish or waterbirds (Appendix I).

Sections 4.9 and 4.10 and Appendix E provide information regarding the ecological attributes of the Project area and surrounds.

#### Previous Archaeological Investigations

A number of Aboriginal heritage surveys and assessments have previously been undertaken in the Project area and surrounds, including:

- Hamm (2005) Aboriginal Cultural Heritage Assessment Report, Boggabri Coal Project.
- Archaeological Surveys and Reports (2005) Archaeological Investigation for Sites of Indigenous Cultural Significance for the Proposed East Boggabri Coal Mine.
- Archaeological Surveys and Reports (2007) Belmont Coal Project via Gunnedah: Aboriginal Heritage Assessment.
- RPS (2010b) Cultural Heritage Survey and Assessment Rocglen Mine Extension.
- Landskape (2010) Tarrawonga Coal Mine Modification Cultural Heritage Assessment.
- Insite Heritage (2010) Aboriginal Cultural Heritage Impact Assessment Report for the Continuation of Boggabri Coal Mine.
- AECOM Australia (2010) Aboriginal Archaeology and Cultural Heritage Impact Assessment for the Maules Creek Coal Project.
- Kayandel Archaeological Services (2011) Tarrawonga Coal Project Aboriginal Cultural Heritage Assessment.

In addition to the above, a number of relevant investigations have been undertaken in the wider region, including Kamminga (1978), Thompson (1981), Haglund (1985), Purcell (2000), Navin Officer Heritage Consultants (2007), Archaeological Surveys and Reports (2007; 2009) (Appendix I).

Searches of the Aboriginal Heritage Information Management System (AHIMS) database were completed for the Project area (20 km by 20 km) and the private haul road and Kamilaroi Highway overpass area (2 km by 2 km). The searches were used to assist with the understanding of the local cultural and archaeological context.

This extensive body of existing information and AHIMS database search assisted with providing a regional context for the assessment and in developing a model of the likely archaeological and cultural significance of the Project area (Appendix I).

#### Cultural Heritage Assessment

#### Assessment Program

The Aboriginal Cultural Heritage Assessment used relevant information from previous assessments and the results of Project field surveys and associated consultation with the Aboriginal community.

Table 4-37 summarises the main stages of the Aboriginal heritage consultation/survey program undertaken as part of the Project.





 Table 4-37

 Summary of the Project Aboriginal Heritage Consultation/Survey Program

Date	Consultation/Survey Conducted
15 September 2011	Letters requesting the names of Aboriginal parties or groups that may have been interested in registering in the consultation process were sent to the Red Chief LALC, Office of the Registrar, NTSCORP, DECCW Dubbo EPRG, the National Native Title Tribunal, Namoi CMA, Gunnedah Shire Council and Narrabri Shire Council to identify Aboriginal parties.
29 September 2011	Public advertisement published in the Namoi Valley Independent inviting interested Aboriginal parties or groups to register.
30 September 2011	Letters seeking registrations of interest were sent to Aboriginal parties or groups identified by the above step and any additional Aboriginal parties previously consulted with for the nearby Tarrawonga and Rocglen Coal Mines.
17 October 2011	Provision of a proposed methodology for undertaking the Aboriginal Cultural Heritage Assessment distributed to registered stakeholders.
31 October 2011	Project information session held for all registered stakeholders.
October/November 2011	Feedback from the registered stakeholders in regard to the proposed methodology received. Consideration given to all comments received on the proposed methodology.
4 November 2011	Record of outcomes from the Project information session provided to all registered stakeholders.
4 November 2011	Invitation to registered stakeholders to attend the Aboriginal cultural heritage survey.
11 November 2011	Record of names of registered stakeholders provided to OEH and the Red Chief LALC, in accordance with DECCW (2010a).
21 November - 16 December 2011, 5-6 March 2012	Aboriginal and cultural heritage survey and inspection conducted over a period of 13 days. Cultural significance of the area and Aboriginal heritage sites discussed with the Aboriginal participants.
16 August 2012	Draft Aboriginal Cultural Heritage Assessment issued to the registered stakeholders for review, including survey results, archaeological and cultural significance assessment (based on feedback received during consultation and fieldwork), potential impacts and proposed management and mitigation measures.
12 September 2012	Meeting held for all registered Aboriginal stakeholders to discuss the Draft Aboriginal Cultural Heritage Assessment.
September 2012	Phone calls, emails and/or letters sent to all registered parties advising of a two week extension to the period for comment. Revised date for comments 28 September 2012.
19 September 2012	Meeting held with local Elders to discuss the Draft Aboriginal Cultural Heritage Assessment and logistics for an Elders site inspection following a request at the 12 September 2012 meeting.
September 2012	Written feedback and advice received from registered stakeholders (including comments on the consultation, survey, assessment and proposed management and mitigation measures).
October 2012	Comments received from registered stakeholders on the draft Aboriginal Cultural Heritage Assessment (in relation to cultural heritage) were considered and/or addressed in the Aboriginal Cultural Heritage Assessment.
1 November 2012	Site inspection undertaken with 11 Senior Elders at the request of the Elders and the registered Aboriginal stakeholders. Sites and locations within the Project area inspected to the satisfaction of the Elders. Discussions undertaken in the field relating to: potential water impacts; potential vibration impacts; maintaining access to public land and the Namoi River; and employment opportunities. Elders requested at the start of the inspection that no information provided by them during the inspection be used or replicated in the EIS.

Source: After Appendix I.

The following Aboriginal stakeholders registered an interest in being consulted in relation to the Aboriginal Cultural Heritage Assessment process:

- Aboriginal Native Title Consultants;
- Aunty Joan Suey;
- Aunty Joyce Dorrington;
- Bigundi Biame Traditional People;
- Bill Mitchell;
- Brian Draper;
- Bullen Bullen Consultants;

- Bullwarra Consultants;
- Cacatua Culture Consultants;
- Cindy Foley;
- Deslee Talbott Consultants;
- Dulcie Robinson;
- Giwiir Consultants;
- Gomeroi Namoi Traditional Group;
- Gomery Culture Consulants;
- Gomilaroi Culture Consultancy;
- Gunida Gunya Aboriginal Corporation;





- Gunjeewong Cultural Heritage Aboriginal Corporation;
- Gunnedah Elders justice Committee;
- Hunter Valley Cultural Consultants;
- James Foley;
- Judith Walters;
- Linda Roser;
- Lorraine Robinson;
- Michael Long;
- Min-Min Aboriginal Corporation;
- Minnga Consultants;
- Muswellbrook Cultural Consultants;
- Ngurrimbaa-Gunidjaa Traditional Owners
- Patricia Gail Reynolds;
- Red Chief LALC;
- Reg Talbott;
- Roger Matthews;
- Ronald Long;
- Sonny Fitzroy;
- T&G Culture Consultants;
- T'N'L Site Trackers;
- Traditional Owner of Gomeroi Country;
- Uncle Henry Roser/Talbott;
- Upper Hunter Heritage Consultants
- Yinnar Cultural Services; and
- Yvonne Rodgers.

## Archaeological Findings

Previous archaeological investigations identified four Aboriginal heritage sites within the Project mining area and surrounds (20-4-0009, 20-4-0065,16-4-0002 and 20-4-0014) and one Aboriginal heritage site in the private haul road and Kamilaroi Highway overpass area (20-4-0037) (Figures 4-36 and 4-37). All of these sites were stone artefact scatters, however, site 20-4-0009 also included axe-grinding grooves.

Surveys undertaken for the Project identified an additional 30 sites in the Project mining area and surrounds and five sites in the private haul road and Kamilaroi Highway overpass area (Figures 4-36 and 4-37). All sites consisted of stone artefact scatters or isolated stone artefacts. Further detailed description of these sites is presented in Appendix I.

## Archaeological and Cultural Heritage Values

The archaeological significance rankings for each of the 35 sites recorded by the Project surveys, and five sites previously recorded and located within the Project area, are provided in Table 4-38. No Aboriginal heritage sites of high archaeological significance were recorded. One site consisting of several axe grinding grooves on the Namoi River (20-4-0009) was classified as having moderate archaeological significance. All of the other sites were classified as having low archaeological significance (Table 4-38) (Appendix I).

No Aboriginal heritage sites within the Project area or immediate surrounds are listed on the NSW State Heritage Inventory or the Australian Heritage Database.

The Aboriginal Cultural Heritage Assessment (including a specific assessment of cultural significance via consultation with the Aboriginal community) was undertaken in accordance with the relevant requirements of the various advisory documents and guidelines, as listed above.

Table 4-37 summarises the main stages of the Aboriginal heritage consultation/survey program undertaken as part of the Project, with further detail provided in Section 4 of Appendix I. The registered Aboriginal parties were asked to contribute their cultural knowledge on the Project area, and the sites within in it, at all stages during the consultation process (i.e. during the initial information session, as part of the review of the proposed methodology, during the field surveys and as part of reviewing the draft Aboriginal Cultural Heritage Assessment including a specific meeting held with all registered stakeholders during the review period).

The registered Aboriginal stakeholders identified the Project area as a place that Aboriginal people would have occupied in the past. Comments received from the registered Aboriginal stakeholders in relation to the cultural significance are detailed in Appendix I. In summary, the Aboriginal stakeholders identified that:

- All sites have some cultural significance as they preserve a record of how and where people lived in the past and stand as a testimony to the continuation of Aboriginal culture and association with the land.
- The Namoi River and adjacent plains are of particular cultural significance to Aboriginal people. Local Aboriginal people previously and still visit the Namoi River for significant social events including meetings, fishing, mussel collecting and family outings.







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 Table 4-38

 Archaeological Significance of Aboriginal Heritage Sites<sup>1</sup>

Archaeological Significance Rating	Aboriginal Heritage Site	Number of Sites
High	-	-
Medium	20-4-0009	1
Low	OS-1, OS-2, OS-3, OS-4, OS-5, OS-6, OS-7, OS-8, OS-9, OS-10, OS-11, OS-12, OS-13, OS-14, OS-15, OS-16, OS-17, OS-18, OS-19, OS-20, IF-1, IF-2, IF-3, IF-4, IF-5, IF-6, IF-7, IF-8, IF-9, IF-10, IF-11, IF-12, IF-13, IF-14, IF-15, 20-4-0065, 16-4-0002, 20-4-0014, 20-4-0037.	39
Source: After Appendix I.		

<sup>1</sup> Includes sites recorded by the Project surveys and sites previously recorded in the Project area.

## 4.13.2 Potential Impacts

## **Potential Direct Impacts**

The Project would result in direct disturbance of 24 known Aboriginal heritage sites and the partial disturbance of eight sites. These sites are located within or partially within the footprint of the proposed open cut, waste emplacements, MIA, and the private haul road and Kamilaroi Highway overpass area and would therefore be subject to direct disturbance by the Project (Figures 4-36 and 4-37).

There would be no direct impacts to the axe grinding grooves at Site 20-4-0009 as a result of the Project.

## Potential Indirect Impacts

Open artefact scatters and isolated artefacts are not considered to be particularly sensitive to potential indirect impacts (e.g. blasting vibration) and the potential indirect impacts on these sites would be limited.

Wilkinson Murray (2012) has undertaken a blasting assessment for the Project and has concluded that blasting impacts to the axe grinding grooves at Site 20-4-0009 would be negligible (Appendix C).

## 4.13.3 Mitigation Measures, Management and Monitoring

The mitigation, management and monitoring measures described below have been developed in consultation with the registered Aboriginal stakeholders and in consideration of the cultural and archaeological significance of the Aboriginal heritage sites to be impacted. The consultation process with the registered Aboriginal stakeholders is described in Appendix I.

A Heritage Management Plan would be developed in consultation with the Aboriginal community and OEH. The Heritage Management Plan would be developed prior to any works which would harm Aboriginal cultural heritage sites in the Project area. A summary of measures expected to be included in the Heritage Management Plan and implemented over the life of the Project are provided below. Further detail is provided in Appendix I.

## Surface Disturbance

The following measures would be used to manage surface disturbance activities:

- Whitehaven would maintain a record of known Aboriginal heritage sites (including on-site plans and in relevant Project documentation).
- Where practicable, known Aboriginal heritage sites would be avoided during Project construction and operation works.
- The location of known Aboriginal heritage sites would be considered during final detailed engineering designs of the road realignments and ancillary infrastructure such as pipelines.
- Where avoidance of known Aboriginal heritage sites is not practicable, site(s) would be subject to baseline recording in consultation with the registered Aboriginal stakeholders prior to disturbance and artefacts would be salvaged for safekeeping in accordance with the stakeholders' wishes.

During development of the Heritage Management Plan, the Aboriginal community would be requested to provide advice on the storage of collected artefacts and the management of artefacts at the completion of Project activities (e.g. artefact replacement onto the post-mining landscape or retained for educational purposes).

#### **General Management Measures**

The following general management measures would be used during the life of the Project:

 A record of known Aboriginal sites, their status and location would be maintained by Whitehaven.





- Ongoing consultation would be undertaken with the Aboriginal community over the life of the Project. Appropriate Aboriginal representation would be facilitated during archaeological fieldwork (e.g. salvage of artefacts prior to disturbance).
- Whitehaven would provide opportunities for Aboriginal community members to access known Aboriginal sites located on Whitehaven-owned land (e.g. for cultural reasons or as part of scheduled field activities). Such access would be subject to Occupational Health and Safety requirements.
- Erosion and sediment control works would be undertaken in accordance with the requirements of the Development Consent and in consideration of Aboriginal cultural heritage sites and management measures.
- Any additional Aboriginal heritage sites which may be identified during the development of the Project would be recorded and registered with the OEH in consultation with Aboriginal stakeholders. Should additional Aboriginal heritage sites be identified, they would be managed in accordance with the measures described in the HMP.

The measures presented above are considered by Landskape (2012) to be best practice in the mining industry. They are effective and reliable, as demonstrated by their continued use and inclusion in management plans and strategies for other similar operations developed in consultation with the Aboriginal community and to the satisfaction of relevant government agencies (Appendix I).

## 4.14 NON-ABORIGINAL HERITAGE

A Non-Aboriginal Heritage Assessment for the Project was undertaken by Dr Michael Pearson of Heritage Management Consultants (2012) and is presented as Appendix J.

The assessment was prepared in consideration of the relevant principles and articles contained in the *Burra Charter* (Australia ICOMOS, 1999) and the *NSW Heritage Manual* (NSW Heritage Office and NSW Department of Urban Affairs and Planning [DUAP], 1996).

A description of existing non-Aboriginal heritage within the Project area and surrounds is provided in Section 4.14.1. Section 4.14.2 describes the potential impacts of the Project, while Section 4.14.3 outlines mitigation measures, management and monitoring.

## 4.14.1 Existing Environment

## Historical Overview

Surveyor-General John Oxley passed through the Gunnedah Basin during his 1818 expedition, however, it was Alan Cunningham during his 1827 expedition to the Darling Downs who discovered the Namoi River. The first European in the local area however, was not an explorer, but the escaped convict George 'the Barber' Clarke, who lived with the Kamilaroi Aboriginal people for five years from 1826.

Clarke based himself at Barbers Lagoon on Wilberoi Reserve (approximately 6 km south-east of Boggabri and 5 km north-west of the Project) and rustled cattle from the squatters further south (Appendix J).

In 1829 the Colonial Government established the 'Limits of Location', bounding nineteen counties within which settlement could be sanctioned and more easily controlled. The promise for better grazing land enticed pastoralists to send their stock beyond the 'Limits of Location' (i.e. to the Boggabri region), which resulted in the squatting boom.

Further discussion on the early European settlement and the pastoral history of relevance to non-Aboriginal items in the vicinity of the Project is provided in Appendix J.

## Heritage Items of Relevance to the Project

Heritage Management Consultants (2012) completed its historical and archival research and review of heritage registers prior to survey of the Project area. No items of state or regional non-Aboriginal heritage significance were identified in the vicinity of the Project (Appendix J).

One item identified approximately 2 km to the west of the Project, (i.e. the Broadwater Homestead Complex [VH12]), was assessed as being of local significance (Figure 4-38).

The Broadwater Homestead Complex consists of several buildings dating to the late 19<sup>th</sup> or early 20<sup>th</sup> century, including a weatherboard cottage, a brick cottage and corrugated iron clad woolshed with a high pitched roof and skillion additions. A number of old tractors and other pieces of farm equipment are located in the paddock surrounding the complex.







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The Broadwater Homestead Complex is of local significance as it contains a number of well-maintained buildings that reflect rural settlement of the local area in the late 19<sup>th</sup> and early 20<sup>th</sup> century. The deteriorating condition of other buildings of the same period elsewhere in the region suggests that the complex is locally important.

Heritage Management Consultants (2012) identified 14 other non-aboriginal heritage items within or near the Project area during the surveys. These items included cottages and sheds, building foundations, dips, surveyors scarred trees and survey marks, and agricultural items (Appendix J).

As described above, none of these items were considered to be of state or regional non-Aboriginal heritage significance, nor were they considered to be of local significance (Appendix J).

## 4.14.2 Potential Impacts

The Broadwater Homestead Complex, would not be directly impacted by the Project and potential impacts from blasting induced vibration are expected to be negligible (Appendix J).

Items within the Project area would be disturbed as a result of the Project.

## 4.14.3 Mitigation Measures, Management and Monitoring

No specific mitigation measures, management or monitoring programs are proposed for the Broadwater Homestead Complex or any other non-Aboriginal heritage items within the Project area.

While of no heritage significance, a number of items (including a horse-drawn dam scoop) identified during the surveys in the Project area, may be of interest to local collectors. Prior to Project disturbance, these objects would be offered to the Boggabri Historical Society and the Gunnedah Museum.

## 4.15 REGIONAL ECONOMY

A Socio-Economic Assessment (including a regional economic impact assessment) was undertaken for the Project by Gillespie Economics (2012b) and is presented in Appendix K.

The regional economic assessment was conducted at two different scales to assess the potential impact of the Project on the region and in NSW. The local region adopted for the Project was the combined Statistical Local Areas (SLA) of Narrabri and Gunnedah.

Regional economic assessment is primarily concerned with the effect of a proposal on an economy in terms of specific indicators, such as gross regional output (business turnover), value-added, income and employment. The regional economic assessment is based on analysis of a 2005 to 2006 input-output table prepared by Gillespie Economics for the regional (i.e. Narrabri and Gunnedah SLAs) and NSW economies.

A summary of the existing regional and NSW economy is provided in Section 4.15.1. The potential impacts of the Project on the regional and NSW economies are described in Section 4.15.2, while mitigation measures are provided in Section 4.15.3.

## 4.15.1 Existing Environment

The gross regional product for the regional economy (i.e. Narrabri and Gunnedah SLAs) is estimated at \$917M, comprising \$468M to households as wages and salaries (including payments to self employed persons and employers) and \$449M in other value-added contributions (Appendix K).

The agriculture sector is of greater relative importance to the regional economy than it is to the NSW economy (Table 4-39), while the services and building sectors are of less relative importance than they are to the NSW economy (Table 4-39). Mining, manufacturing and utilities sectors in the region are of similar relative importance as they are to NSW.





Sector	Total Employment (%)		Contribution to GRP (%)		Contribution to Output (%)	
	Regional	NSW	Regional	NSW	Regional	NSW
Agriculture, Forestry and Fishing	24	3	22	2	21	2
Mining	1	1	4	2	2	2
Manufacturing	8	11	11	11	19	19
Utilities	1	1	2	2	4	3
Building	5	7	4	6	6	9
Services	62	77	53	71	48	65

 
 Table 4-39

 Contributions to Employment, Gross Regional Product and Output by Industry Sector – Regional and NSW Economies (2005 to 2006)

Source: After Appendix K.

Note: Rows may not sum to 100% due to rounding.

In terms of gross regional output and value-added, grains, other agriculture, business services and retail trade are the most significant sectors to the regional economy (Appendix K). Imports and exports are spread across many sectors with major contributors being the grains, other agriculture, food and textile manufacturing, retail trade and business services (Appendix K).

The retail trade sector is the most significant sector in terms of regional employment, while the retail trade and business services sectors are the most significant sectors in terms of income (Appendix K).

## 4.15.2 Potential Impacts

The regional economic impact assessment by Gillespie Economics (2012b) included consideration of the impacts of the Project (including construction) on both the regional (i.e. Narrabri and Gunnedah SLAs) and NSW economies, and also potential impacts at the cessation of the Project (Appendix K).

## Construction

The construction of the Project is predicted to have the following impacts on the regional economy (Appendix K):

- \$21M in annual direct and indirect output;
- \$9M in annual direct and indirect regional value-added;
- \$6M in annual direct and indirect household income; and
- 89 direct and indirect jobs.

In total, the construction of the Project is predicted to have the following impacts on the NSW economy (Appendix K):

- \$39M in annual direct and indirect output;
- \$18M in annual direct and indirect regional value-added;
- \$13M in annual direct and indirect household income; and
- 156 direct and indirect jobs.

## Operation

The operation of the Project is predicted to have the following impacts on the regional economy (Appendix K):

- \$588M in annual direct and indirect regional output or business turnover;
- \$271M in annual direct and indirect regional value-added;
- \$38M in annual household income; and
- 423 direct and indirect jobs.

Businesses that can provide the inputs to the production process required by the Project and/or the products and services required by employees would directly benefit by way of an increase in economic activity. However, because of the inter-linkages between sectors, many indirect businesses would also benefit (Appendix K).





Flow-on impacts from the Project are likely to affect a number of different sectors of the regional economy. The sectors most impacted by output, value-added and income flow-ons are likely to be the other property services sector; wholesale mechanical repairs sector; agricultural, mining and construction machinery, lifting and material handling equipment manufacturing sector; scientific research, technical and computer services sector; wholesale trade sector; and retail trade sector (Appendix K).

The Project would provide direct employment for an average of 193 Whitehaven staff and on-site contractors during operations (with a maximum operational workforce of 250 people). Of these 193 direct jobs, 145 employees are assumed to reside in the region, based on existing distribution of employees (Appendix K).

In total, the operation of the Project is predicted to have the following impacts on the NSW economy (Appendix K):

- \$1,111M in annual direct and indirect output or business turnover;
- \$520M in annual direct and indirect value-added;
- \$196M in annual household income; and
- 2,292 direct and indirect jobs.

The potential impacts of the Project on the NSW economy are expected to be substantially greater than for the regional economy alone, as more Project and household expenditure would be captured, and there is a greater level of inter-sectoral linkages in the larger NSW economy (Appendix K).

## Agricultural Activities and Productivity

As described in Section 4.3.2, Gillespie Economics (2012a) conducted an evaluation of the economic value of lost agricultural production (i.e. opportunity costs) as a result of the Project reducing the area of agricultural land. The Gillespie Economics (2012a) report is included as an attachment to the AIS (Appendix G). The analysis used gross margins developed by the DPI to estimate the foregone gross margin present value of agricultural production from land directly impacted by the Project.

In the Benefit Cost Analysis (BCA) conducted for the Project (Appendix K), the value of foregone agricultural production has been incorporated through the inclusion of the full current land value of affected properties (\$9M). The total residual value of land (i.e. adjoining Whitehaven-owned land plus the 780 ha of re-established agricultural land in the Project area) is estimated to be \$16M, or \$2M present value (at 7% discount rate).

These opportunity costs have been factored into the regional economy and NSW economy impact predictions summarised above. They are considered to be conservative as the difference in the current and residual land value (i.e. \$7M) is greater than the detailed estimate of the present value of the foregone agricultural production calculated using gross margins (Gillespie Economics, 2012a).

## End of Project Life

The establishment and operation of the Project would stimulate demand in the regional and NSW economy leading to increased business turnover in a range of sectors and increased employment opportunities. Cessation of the mining operations would result in a contraction in regional economic activity.

The magnitude of the regional economic impacts of cessation of the Project would depend on a number of interrelated factors, including the movements of workers and their families, alternative development opportunities and economic structure and trends in the regional economy at the time (Appendix K).

New mining resource developments in the region would help broaden the region's economic base and buffer against impacts of the cessation of individual activities (Appendix K). The Gunnedah Basin is a prospective location with a range of coal and coal seam methane resources, with a range of development proposals pending (Appendix K).

## 4.15.3 Mitigation Measures, Management and Monitoring

Whitehaven would develop a Rehabilitation Management Plan for the Project which would include details of the mine closure strategy (Section 5). The plan would be developed in consultation with the Narrabri and Gunnedah Shire Councils, other relevant government agencies and the local community, and would include consideration of amelioration of potential adverse socio-economic effects due to the reduction in employment at Project closure.





## 4.16 EMPLOYMENT, POPULATION AND COMMUNITY INFRASTRUCTURE

Gillespie Economics (2012b) has considered the potential impacts of the Project on existing regional community infrastructure as a result of employment and population change (Appendix K).

For the purposes of the employment, population and community infrastructure assessment, the combined Narrabri and Gunnedah SLAs were considered to be the local region.

The Project contributions to regional employment, population and community infrastructure demand are likely to be modest, as the additional Project workforce would be modest (Section 2.13).

The Project would however potentially occur in the context of other regional employment, population and community infrastructure demands, in particular demands associated with the Boggabri Coal Mine, Tarrawonga Coal Mine and the Maules Creek Coal Project.

Potential estimated cumulative and Project-only employment, population and community infrastructure demands are described in Section 4.16.2. Proposed Project mitigation measures are provided in Section 4.16.3.

## 4.16.1 Existing Environment

Whitehaven plays an active role in local communities through financial contributions to regional events and facilities, and by funding contributions to community programs and groups (Section 3.2.3).

The populations of Narrabri and Gunnedah SLAs declined between 2001 and 2006 by 5.8% and 4.7% respectively, illustrating the trend of depopulation of many inland rural areas in NSW (Appendix K).

A description of the existing population profile, employment, housing, health and education resources in the Narrabri and Gunnedah SLAs is provided in Appendix K.

## 4.16.2 Potential Impacts

As the impacts of Project construction on regional employment and population would be minor, the following discussion focuses on population and community infrastructure effects during the operation of the Project. Further detail on Project construction community infrastructure effects is provided in Appendix K. Based on workforce projections and assumptions detailed in Appendix K, Gillespie Economics (2012b) has estimated the workforce demand, population change and potential impacts on community infrastructure that may arise from the Boggabri Coal Mine, Tarrawonga Coal Mine, Maules Creek Coal Project and the Project as described below.

## Workforce Demand

The workforces of the mining projects would vary over time, and the potential impacts of new workforce demand on the regional population are highly dependent on assumptions regarding the percentage of new employees that would be sourced from within the region.

The operation of the Project would require an average operational workforce of some 193 employees (of which 48 are assumed to be non-local).

The direct non-local workforce demand of the Maules Creek Coal Project is expected to be higher than the Project, comprising some 463 additional construction and operational employees during the construction phase, and 376 additional operational employees thereafter (Appendix K).

The direct non-local workforce demand of Boggabri Coal Mine is expected to be more modest, comprising some 105 additional construction and operational employees during the construction phase, and up to 181 additional operational employees in 2021 (Appendix K).

The direct non-local workforce demand of the Tarrawonga Coal Mine is currently approximately 86 but is planned to increase to 120 once operations increase to 3 Mtpa (TCPL, 2011).

Table 4-40 summarises estimated incremental non-local employment associated with 2021, when the greatest cumulative operational employment demand from the four mines is expected to occur. It is assumed that operations at the Rocglen Coal Mine would have ceased by this date.





# Table 4-40 Direct Incremental Non-Local Workforce Requirements – 2021

Project	Non-local Hires
Maules Creek Coal Project	376
Boggabri Coal Mine	181
Tarrawonga Coal Mine	14
Project	48
Total	619

Source: After Appendix K.

Note: Only includes non-local workforce that are assumed to relocate into the region.

Table 4-40 indicates the Project non-local operational workforce demand (48 people) would comprise approximately 8% of the direct cumulative non-local workforce demand of the four mines.

Operational direct non-local workforce demands also potentially increase the regional population when new workers bring spouses and children with them to the region, which is less common during construction activities.

In addition, during operations indirect employment generation from the four mines would be expected to result in more flow-on jobs in the region, a proportion of which are expected to be filled by non-locals.

These employment and population flow-on effects have been estimated in the Socio-Economic Assessment (Appendix K), and are summarised below.

It is noted that operations at Whitehaven's Rocglen Coal Mine would be required to ramp down to allow the Project to reach full production. Whitehaven anticipates that a large proportion of the employees at the Rocglen Coal Mine would relocate to the Project at such a time. This would decrease the requirement for non-local employees, and subsequently decrease the demand on community infrastructure. It is also noted that the Project would require a significantly smaller construction workforce than the Maules Creek Coal Project. Given construction workforces tend to be largely non-local, the proportion of non-local employees of the entire Project workforce is therefore lower than the non-local proportion of the Maules Creek Coal Project workforce.

In addition, it is anticipated that construction of the Maules Creek Coal Project and the expansions of the Boggabri Coal Mine and Tarrawonga Coal Mine would commence prior to approval of the Project. As such, peak construction workforce demand for the Project is not anticipated to coincide with peak construction periods at the other mining projects in the region. This would reduce the short term demands on the local housing market associated with accommodating construction workforces.

## **Population Effects**

Table 4-41 illustrates Gillespie Economics (2012b) upper level estimates of the total population effects that may arise as a result of the four mines in 2021, based on conservative assumptions regarding indirect employment, availability of local labour and family size.

The Project maximum direct and indirect population change to the region is estimated to be approximately 1,057 people (Appendix K) which is approximately 24.4% of the cumulative total in Table 4-41.

For both Narrabri LGA and Gunnedah LGA, the additional population influx for the Project in isolation would only partially offset historic population decline (Appendix K).

Table 4-41
Estimated Upper Bound Cumulative Regional Population Change – 2021

Location	Direct Population	Indirect Population	Total Population
Narrabri LGA	1,074	1,401	2,477
Narrabri	831	1,038	1,868
Boggabri	244	365	608
Gunnedah LGA	686	1,009	1,695
Other – not specified	70	83	153
Region Total	1,830	2,493	4,325

Source: After Appendix K.

Note: Totals may have minor discrepancies due to rounding.





## **Community Infrastructure Effects**

#### Housing

There is considerable short-term and rental accommodation in Narrabri and Gunnedah (Appendix K). However, considering the construction workforce associated with the Project plus the other mines in the region, there is potential that cumulative construction related demand would impact on the availability of short-term accommodation for tourism (Appendix K).

Cumulative direct and indirect demand for operational housing is likely to be significant. Up to an additional 423 accommodation units (e.g. houses, units, hotel rooms) would be required in the region as a result of the Project at maximum operational employment levels (Appendix K).

Where housing supply is insufficient to meet demand, even temporarily, this may manifest itself in increased property prices and higher rent prices. While this may be seen as beneficial for property owners, it can adversely affect existing tenants, particularly those on lower incomes who can be priced out of the market (Appendix K).

A new mining accommodation camp was approved for development in Boggabri in October 2012. The accommodation camp is anticipated to provide accommodation for approximately 850 people once fully developed. Whitehaven would investigate the opportunity to secure accommodation for Project construction and operational workforce at this facility.

Because of higher relative wages in the mining sector, the demand for rental accommodation and to purchase is likely to be at the higher end of the market, where supply is more limited (Appendix K).

#### Education and Training

Cumulative potential developments in the region would contribute to greater demand for education in both the public and private sectors.

Provision of education services is primarily the responsibility of the public sector, although there is an increasing role for the private sector, with planning and development driven by population changes (Appendix K).

It is recognised that there may be a lag between population growth and the provision of additional education services resulting in temporary education access issues. In other regions where mining has resulted in rapid population growth, it has been suggested that increasing child aged population has ultimately had positive education benefits such as more teachers, reduced class sizes and broader curriculum (Appendix K).

The direct and indirect increase in demand for educational facilities for the Project in isolation is generally considerably less than the decline in demand for education places between 2001 and 2006 (Appendix K).

## Health

The estimated cumulative changes in population levels (Table 4-41) would substantially increase demand for health services and facilities.

Provision of health services is primarily the responsibility of the public sector, although some aspects of these services are also provided by the non-government sector.

It is recognised that there may be a lag between population growth and the provision of additional health services resulting in temporary health care access issues, but ultimately increased populations result in the provision of more health facilities for the community (Appendix K).

There is also the potential to indirectly positively impact on public health through the provision of employment opportunities and the reduction in unemployment (Appendix K).

There is potential for the Project in isolation to increase the demand for public health services and facilities in the region (Appendix K). However, the Project contribution to this demand would be in line with its relative contribution to predicted cumulative population growth.

#### **Community Services and Recreation Facilities**

The maximum direct and indirect increase in population from the Project in isolation is small. No additional investment in community services and recreation facilities infrastructure would therefore be anticipated as a result of the Project in isolation (Appendix K).

However, from a cumulative impact perspective there may be considerable increase in demand for community services and recreation facilities that would require detailed planning by local and State Government agencies (Appendix K).





## Social/General Community

The demand for mining labour can result in skilled labour being bid away from other professions (e.g. domestic trade services) which can result in shortages of these services in the region. It is anticipated that the cumulative impact of the Project plus the other mines in the region may contribute to local skills shortages (Appendix K).

A changing sense of place for existing residents may also be caused by cumulative influxes in populations associated with mining projects, as towns move away from their historical focus on servicing agricultural and forestry enterprises, to an increased focus on servicing mining activities (Appendix K).

The high wages in the mining sector relative to other sectors can also potentially result in social divisions between those involved in the mining sector and those who are not (Appendix K).

Both these effects can be heightened during construction of projects, when there are high numbers of unattached construction workforces, who may only partially integrate into the community (Appendix K).

## End of Mine Life

Potential socio-economic impacts associated with the end of Project life are described in Section 4.15.2.

## 4.16.3 Mitigation Measures, Management and Monitoring

As described in Section 4.16.2, some population growth would occur as a result of the Project employment and associated flow on effects.

Appendix K indicates only negligible impacts on community infrastructure demand would arise as a result of the Project in isolation. However, cumulative impacts with the Boggabri Coal Mine, Tarrawonga Coal Mine and Maules Creek Coal Project would be more significant. There are also other potentially significant Projects being considered in the region that may further increase community infrastructure demand (e.g. the Watermark and Caroona projects) (Attachment 4).

Whitehaven would work in partnership with the Narrabri and Gunnedah Shire Councils and the local community so that the benefits of the projected economic growth in the region are maximised and impacts minimised. In this respect, a range of general and specific social impact mitigation and management measures are proposed and would include:

- Continuation of the current donations policy which supports education, health and community causes.
- Employ local residents preferentially (where they have the required skills and experience and demonstrate a cultural fit with the organisation), as the employment of local residents reduces potential population effects.
- Purchase local non-labour inputs to production preferentially where local producers can be cost and quality competitive.
- Include a code of conduct for construction workers with regard to behaviour in the contractor induction program.

Impacts as a result of the increased housing demand are being offset by Whitehaven through the purchase of property in Narrabri where six houses are currently being constructed for employees. Whitehaven also has an agreement with a Gunnedah developer to lease newly constructed dwellings for employees, with the option for the employees to purchase the dwellings. This will encourage employees to settle in the local area.

Whitehaven intends to continue to grow its housing strategy to provide more accommodation options for its current and future employees.

It is expected that as with other recent coal mining projects in NSW, planning agreements in accordance with Division 6 of Part 4 of the EP&A Act would be required with each Council by the Development Consent for the Project. The planning agreements would be negotiated between Whitehaven, the DP&I, Narrabri Shire Council and Gunnedah Shire Council.

## 4.17 HAZARD AND RISK

A PHA was conducted to evaluate the potential hazards associated with the Project. It was conducted by a multi-disciplinary team, including technical advisors from Whitehaven in accordance with the general principles of risk evaluation and assessment outlined in the DP&I *Multi-Level Risk Assessment* (DP&I, 2011).

The PHA also addressed the requirements of *State Environmental Planning Policy No. 33 (Hazardous and Offensive Development)* and was conducted in general accordance with *Hazardous Industry Planning Advisory Paper No. 6: Hazard Analysis* (DoP, 2011).





Potential incidents and hazards identified for the Project are described in Section 4.17.1. Proposed preventative and control measures to address potential hazards are discussed in Section 4.17.2.

## 4.17.1 Hazard Identification and Risk Assessment

Potentially hazardous materials handled at the Project include hydrocarbons (petrol, diesel, oils, greases, degreasers and kerosene), explosives and chemicals (Appendix N).

In accordance with DP&I (2011), the PHA specifically covered the potential risks from fixed installations. As such, the main focus of the assessment was the on-site storage of the potentially hazardous materials (Appendix N).

The following generic classes of incident associated with on-site storage were identified:

- leaks/spills;
- fire;
- explosion; and
- theft.

Following identification of the potential hazards associated with the Project, a qualitative assessment of the risks to the public, property and the environment associated with the Project was undertaken (Appendix N).

An assessment of the combination of the consequence and probability rankings concluded that the overall risk rankings for the identified hazards would be low, and therefore tolerable (Appendix N).

## 4.17.2 Hazard Prevention and Mitigation Measures

A number of hazard control and mitigation measures would be described in management plans for the Project. Relevant management plans are anticipated to include:

- Blast Management Plan.
- Bushfire Management Plan.
- Site Water Management Plan.
- Waste Management Plan.
- Pollution Incident Response Management Plan.

In addition, the following hazard treatment measures would be adopted for the Project (Appendix N):

- Maintenance Ongoing and timely maintenance of all mobile and fixed plant and equipment in accordance with the recommended maintenance schedule, and consistent with the maintenance schemes required by legislation.
- Staff Training Operators and drivers would be trained and (where appropriate) licensed for their positions. Only those personnel licensed to undertake skilled and potentially hazardous work would be permitted to do so.
- Engineering Structures Mining and civil engineering structures would be constructed in accordance with applicable codes, guidelines and Australian Standards. Where applicable, Whitehaven would obtain the necessary licences and permits for engineering structures.
- Contractor Management All contractors employed by Whitehaven would be required to operate in accordance with the relevant Australian Standards and NSW legislation.
- Water Management As reported in Appendix B, water management structures would be constructed to separate runoff from undisturbed areas and disturbed areas.
- Coal Stockpile Management Coal stockpiles would be managed to reduce the potential for spontaneous combustion.
- Storage Facilities Storage and usage procedures for potentially hazardous materials (i.e. fuels and lubricants) would be developed in accordance with Australian Standards and relevant legislation.
- Emergency Response Emergency response procedures manuals and systems would continue to be implemented.



