WAMBO COAL PTY LIMITED

SOUTH BATES EXTENSION UNDERGROUND MINE

ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 REFERRAL OF PROPOSED ACTION

November 2016

Peabody ENERGY

Referral of proposed action

Proposed action title:

SOUTH BATES EXTENSION UNDERGROUND MINE

1 Summary of proposed action

1.1 **Short description**

The South Bates Extension Underground Mine (the Action) is a proposed extension of underground coal mining operations in the Whybrow Seam at the Wambo Coal Mine and related minor surface infrastructure and activities. The Action is located approximately 20 kilometres (km) west of Singleton, near the village of Warkworth, New South Wales (NSW) (Figure 1).

The Wambo Coal Mine is owned and operated by Wambo Coal Pty Limited (WCPL), a subsidiary of Peabody Energy Australia Pty Limited (Peabody). The Wambo Coal Mine was determined to be a Controlled Action in 2003 (EPBC 2003/1138) and was subsequently approved in November 2004 (Figure 2).

1.2 **Latitude and longitude**

Table 1
Location of the Action

Location Point	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
1	-32	33	01	150	56	17
2	-32	33	57	150	57	32
3	-32	34	51	150	56	37
4	-32	33	54	150	55	21

Location points are presented on Figure 3.

1.3 **Locality and property description**

The Action is 20 km west of Singleton, near the village of Warkworth, NSW (Figure 1). The Action area is located within Coal Lease (CL) 397, Mining Lease (ML) 1572 and ML 1594, which are mining tenements under the NSW *Mining Act, 1992* and Authorisation (A) 444, which is an exploration tenement under the NSW *Mining Act, 1992*.

Land use in the vicinity of the Action is characterised by a combination of coal mining operations, agricultural land use and land reserved for conservation. Lands owned by WCPL that are not subject to mining operations are being utilised for the agistment of stock or part of WCPL's Remnant Woodland Enhancement Program (RWEP).

The Action is generally within land owned by WCPL.

1.4 **Size of the development footprint or work area (hectares)**

The extent of the underground mining related to the Action (indirect disturbance) is shown on Figure 3 and is approximately 505 hectares (ha).

The extent of surface disturbance related to the Action would be up to approximately 2 ha of derived grassland.

1.5 **Street address of the site**

Wambo Coal Mine via Jerrys Plains Road, Warkworth NSW 2330.

1.6 **Lot description**

The Action would involve underground mining within the area shown on Figure 3 and associated minor surface infrastructure and activities. Relevant lot and deposited plan numbers for parcels of land within the area of the Action are provided in Attachment C.

All freehold land within the Action area is owned by WCPL (Figure 4).

1.7 **Local Government Area and Council contact (if known)**

The Action is within the Singleton Local Government Area (Figure 1). The Action is not subject to a local government planning approval, however, a modification of the Wambo Coal Mine Development Consent (DA 305-7-2003) would require approval by the NSW Minister for Planning (or delegate).

Section 2.4 of this referral provides further details about the relevance of the NSW planning system to the Wambo Coal Mine.

1.8 **Time frame**

The Action would be an extension of underground coal mining operations at the Wambo Coal Mine and related minor surface infrastructure and activities that are necessary to support the extension of underground mining.

It is anticipated that mining associated with the Action would commence as soon as practicable after all necessary consents, approvals and licences for the Action have been obtained. Longwall mining related to the Action would be undertaken between approximately 2018 and 2022.

1.9	**Alternatives to proposed action**		No
		✓	Yes, please also complete section 2.2
1.10	**Alternative time frames, locations or activities**	✓	No
			Yes, you must also complete Section 2.3. For each alternative, location, time frame, or activity identified, you must also complete details in Sections 1.2-1.9, 2.4-2.7 and 3 and 5 (where relevant).
1.11	**Commonwealth, State or Territory assessment**		No
		✓	Yes, please also complete section 2.5
1.12	**Component of larger action**	✓	No
			Yes, please also complete section 2.7

1.13	**Related actions/proposals**		No
		✓	Yes, provide details: The Action is separate from, but related to, the approved Wambo Coal Mine (EPBC 2003/1138) and the proposed South Wambo Underground Mine Extension (EPBC 2016/7636). The United and Wambo Open Cut Coal Mine Project (EPBC 2015/7600) is proposed adjacent to the Action area, and has been determined a Controlled Action under the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act). The locations of the other proposed actions (EPBC 2016/7636 and EPBC 2015/7600) are shown on Figure 5. Further discussion of the relationship of the Action to the approved Wambo Coal Mine is provided in Section 2.1. Further discussion on the other proposed actions is provided in Section 2.7 and 3.3 (m).
1.14	**Australian Government funding**	✓	No
			Yes, please also complete section 2.8
1.15	**Great Barrier Reef Marine Park**	✓	No
			Yes, please also complete section 3.1 (h), 3.2 (e)

2 Detailed description of proposed action

2.1 Description of proposed action

Background

Wambo Development Project

The Wambo Development Project was determined to be a Controlled Action in 2003 (EPBC 2003/1138) and subsequently approved in November 2004 (the approved Controlled Action). The Wambo Development Project included the continued development of open cut and underground mining operations at the Wambo Coal Mine and the development and operation of rail and train loading infrastructure.

The main activities associated with the development of the approved Controlled Action included:

- construction and operation of a rail spur (including a rail underpass beneath the Golden Highway and realignment of the intersection between Wallaby Scrub Road and the Golden Highway), rail loop, coal reclaim area, product coal conveyor and train load-out bin to enable the transport of product coal by rail to market;
- continued development of open cut mining operations (including limited auger mining beyond open cut mining limits) within existing WCPL mining and coal leases and into new mining lease application areas;
- an extension to the existing Wollemi Underground Mine Box Cut (within the limits of the Project open cut mining area) to provide direct access for three underground longwall panels in the Whybrow Seam;
- extension of drifts from the Wollemi Underground Mine to facilitate longwall mining of the Wambo Seam;
- construction of a portal and drift access adjacent to the Coal Handling and Preparation Plant (CHPP) to facilitate longwall mining of the Arrowfield and Bowfield Seams;
- upgrade of the existing CHPP to facilitate increased coal production;
- development of a water control system including a water control structure across North Wambo Creek at the north-western limit of the open cut operation and a channel to allow the passage of flows to the lower reaches of North Wambo Creek around the open cut development;
- de-gazettal and physical closure of Pinegrove Road and development of new access and internal haul roads; and
- relocation of the administration area, site offices, existing explosives magazine and construction of additional hydrocarbon storage facilities.

The general arrangement of the approved Controlled Action (EPBC 2003/1138) is shown on Figure 2.

The Wambo Development Project was approved under the NSW planning system in February 2004. The Wambo Coal Mine Development Consent (DA 305-7-2003) has been modified 13 times under the NSW planning system (Modifications).

None of the approved Modifications have significantly extended the overall physical extent of the Wambo Coal Mine, nor did they extend the overall life of the complex beyond 2025.

For each of the above Modifications, WCPL determined that no referral under the EPBC Act was required (i.e. no significant impacts on matters of national environmental significance were expected to occur as a result of each Modification and/or the Modification was consistent with the approved Controlled Action). This current approved development, and the continued operations associated with this development, does not form part of the proposed Action.

The Action

The Action is a proposed extension of underground coal mining operations in the Whybrow Seam at the Wambo Coal Mine and related minor surface infrastructure and activities that are necessary to support the extension of underground mining. The Action area is located within CL 397, ML 1572 and ML 1594, which are mining tenements under the NSW *Mining Act, 1992* and A 444, which is an exploration tenement under the NSW *Mining Act, 1992*.

The Action underground mining area is shown on Figure 3.

The Action would include the following components at the Wambo Coal Mine:

- longwall mining from the Whybrow Seam within the underground mining area shown on Figure 3; and
- development of surface infrastructure associated with gas management to support underground mining activities within the underground mining area excluding any surface disturbance works within the surface development area approved under EPBC 2003/1138.

The Action would use existing infrastructure associated with previously approved mining activities at the Wambo Coal Mine including the existing CHPP, Wambo Coal Terminal, access roads, administration block, bathhouse, workshops, water storages and associated infrastructure. However, the Action does not include any of this existing or approved infrastructure. The Action also does not include augmentations to existing infrastructure or new infrastructure within the surface development area approved under EPBC 2003/1138 (e.g. ventilation infrastructure).

The Action which is the subject of this referral under the EPBC Act, does not include aspects of the operations at the Wambo Coal Mine (including any approved land disturbance activities within the Action area) that would remain consistent with:

- actions currently approved through the Development Consent DA 305-7-2003 (including Modifications) issued under the NSW planning system; and/or
- actions that form part of the approved Controlled Action under the EPBC Act (EPBC 2003/1138); and
- actions that form part of the proposed South Wambo Underground Mine Extension Controlled Action (EPBC 2016/7636).

The Wambo Coal Mine operations which are not the subject of this referral include (but are not limited to):

- approved open cut mining operations at the Wambo Coal Mine;
- approved underground mining operations in the Wambo Seam and Whybrow Seam at the Wambo Coal Mine;
- approved and proposed underground mining of the Arrowfield Seam and Woodlands Hill Seam;
- approved operation of the rail spur, rail loop, coal reclaim area, product coal conveyor and train load-out bin to enable the transport of product coal by rail to market;
- approved operation of the CHPP and associated infrastructure and coal stockpile areas within the approved surface development area;
- approved operation of the administration area, workshops, site offices, explosives magazine and hydrocarbon storage facilities;
- approved construction and operation of a portal and drift access adjacent to the CHPP to facilitate access to the Arrowfield Seam and Woodlands Hill Seam;
- approved operation and maintenance of the North Wambo Creek Diversion; and
- ongoing exploration activities at the Wambo Coal Mine.

Underground Mining Operations

The Action would involve longwall mining within the underground mining area on Figure 3.

Longwall mining involves the extraction of rectangular panels of coal defined by underground roadways constructed around each longwall. The longwall mining machine travels back and forth across the width of the coal face progressively removing coal in slices from the panel. Once each slice of coal is removed from the longwall face, the hydraulic roof supports are moved forward, allowing the roof and a section of the overlying strata to fall behind the longwall machine (referred to as forming the 'goaf').

Extraction of coal by longwall mining methods results in the vertical and horizontal movement of the land surface. The land surface movements are referred to as subsidence effects. The type and magnitude of subsidence effects are dependent on a range of variables which include the mine geometry and topography, the depth of mining, the number of seams mined, the coal recovery from each seam, the nature of overlying strata and other geological factors. The subsidence impacts pertinent to the Action include non-conventional movements and systematic subsidence movements.

As part of the Action, underground mining activities would be undertaken 24 hours per day, seven days per week.

Over the life of the Action, the mining layout may vary to account for factors that include: localised geological features; mine economics; coal market demand; detailed mine design considerations; and adaptive management. The mining layout would remain within the underground mining area (shown on Figure 3) and would be documented in the relevant Mining Operations Plan and Extraction Plans.

Longwalls for the Action would be offset from the base of the escarpment associated with the Wollemi National Park by a distance equivalent to a 26.5 degree angle of draw from the edge of the longwall. This would limit vertical subsidence from the Action underground mining area such that there would be negligible subsidence impacts on Wollemi National Park.

Surface infrastructure and activities associated with underground mining activities are discussed below.

Surface Infrastructure

Gas management infrastructure may be required to support the Action for mine safety reasons (i.e. to maintain gas composition in the underground mine at safe levels). One or two gas drainage boreholes may be developed for each gateroad either side of the longwalls in the underground mining area.

Gas drainage boreholes would be developed using a conventional drill rig. Access to gas management infrastructure for maintenance and monitoring would be via temporary access tracks.

The specific locations of gas management infrastructure would be defined as a component of future detailed mine planning and engineering studies during the Action. This is due to variable gas quantities and the range of topography, vegetation cover and access constraints to be considered.

Surface disturbance for gas management infrastructure would be restricted to grassland areas that are not threatened ecological communities under the EPBC Act.

Gas management infrastructure locations would also avoid threatened flora species.

Surface disturbance associated with gas management infrastructure would be temporary and isolated in nature. The surface disturbance would occur progressively during mining for the Action and would be rehabilitated progressively as the gas management infrastructure is no longer required.

Gas management infrastructure associated with the Action would require a total combined disturbance of up to approximately 2 ha of derived grassland.

Employment

The Wambo Coal Mine workforce currently consists of approximately 670 employees and contractors. The Action would allow for the continued employment of underground and support personnel.

2.2 Feasible alternatives to taking the proposed action

Alternatives to the proposed location, mining methods and scale of the Action have been considered by WCPL in the development of the project description and design for the Action as described in Section 2.1. An overview of the alternatives already considered by WCPL is provided below:

- **Action Location** – the additional underground mining areas were identified by the presence of coal seams able to be economically mined in the vicinity of the Wambo Coal Mine within mining and exploration tenements held by WCPL and able to achieve WCPL's existing subsidence impact performance measures for significant natural and built features.
- **Surface Facilities** – the Action would use existing surface facilities at the Wambo Coal Mine with augmentations to existing infrastructure or new infrastructure within the surface development area approved under EPBC 2003/1138. Minor disturbance associated with gas management infrastructure may be required to support the Action for mine safety reasons.
- **Mining Method** – the depth, seam thickness and dip of the coal seam associated with the Action (Whybrow Seam) is more amendable to underground mining methods than open cut mining methods. Longwall mining was selected over other mining methods due to its superior productivity and suitability to extract the resource.
- **Scale** – the Action would recover approximately an additional 18 million tonnes of run-of-mine coal from the Whybrow Seam. The extent of underground mining associated with the Action is limited by geological features to the south-east, the open cut to the north and Wollemi National Park to the west.

2.3 Alternative locations, time frames or activities that form part of the referred action

Alternatives that have been considered for the Action are discussed in Section 2.2.

2.4 Context, including any relevant planning framework and state/local government requirements

NSW Environmental Planning and Assessment Act, 1979

The NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act) and the NSW *Environmental Planning and Assessment Regulation, 2000* set the framework for planning and environmental assessment in NSW.

The Wambo Coal Mine operates under a Development Consent (DA 305-7-2003) issued and modified under the NSW EP&A Act.

WCPL plans to apply to modify its Development Consent (DA 305-7-2003) under section 75W of the EP&A Act for the South Bates Extension Underground Mine Modification (referred to as MOD 17), which incorporates the Action. WCPL has been in consultation with the NSW Department of Planning and Environment (DP&E) in relation to this Modification (DA 305-7-2003 MOD 17).

Section 75W falls under the former Part 3A of the EP&A Act, and continues to apply to modifications to the Development Consent (DA 305-7-2003), notwithstanding its repeal, through the transitional provisions in Schedule 6A of the EP&A Act.

The assessment process for the proposed MOD 17 would fall under clause 2(a)(iv) of Schedule 1 (Classes of actions to which clause 4.1 applies) of the *Bilateral agreement made under section 45 of the Environment Protection and Biodiversity Conservation Act 1999 (Cth) relating to environmental assessment* between the Commonwealth of Australia and the State of NSW (February 2015) ('the Bilateral Assessment Agreement').

WCPL intends to lodge a formal application for MOD 17 under section 75W of the EP&A Act. In the event the Action is determined to be a Controlled Action, MOD 17 could be assessed by the DP&E in accordance with the Bilateral Assessment Agreement.

Other Leases, Licence and Approvals

Relevant leases, licences or approvals required under other NSW legislation would also be varied and/or obtained for the Action as required.

Under the NSW *Mining Act, 1992*, environmental protection and rehabilitation are regulated by conditions included in all mining leases, including requirements for the regular submission of a Mining Operations Plan, submission of Annual Environmental Management Reports and submission of Extraction Plans to reduce and manage potential impacts of subsidence.

2.5 Environmental impact assessments under Commonwealth, State or Territory legislation

An Environmental Assessment will be prepared to support the application to modify the Development Consent (DA 305-7-2003) pursuant to section 75W of the EP&A Act.

Mr Oliver Holm (Executive Director, Resource Assessments and Compliance) is the relevant contact officer at the NSW DP&E.

2.6 Public consultation (including with Indigenous stakeholders)

WCPL conducts regular consultation with government agencies, community members and other interested parties regarding the Wambo Coal Mine and the proposed South Bates Extension Underground Mine Modification (incorporating the Action).

Consultation undertaken to date in relation to the proposed South Bates Extension Underground Mine Modification (incorporating the Action) has included:

- Ongoing consultation with the DP&E regarding the South Bates Extension Underground Mine Modification (incorporating the Action) from October 2016 to present.
- Ongoing consultation with the Wambo Coal Mine Community Consultative Committee.
- Ongoing consultation with other local landholders and Indigenous groups.
- Ongoing consultation with industry groups and private enterprise within the region.
- Ongoing consultation with surrounding mining and resource companies.

Further consultation in relation to the proposed South Bates Extension Underground Mine Modification (incorporating the Action) will be undertaken during the preparation of the Environmental Assessment, and would involve the use of a variety of consultation mechanisms that in summary include current and future actions such as:

- public availability of key documents (e.g. the Environmental Assessment);
- provision of information on the Wambo Coal Mine website (http://www.peabodyenergy.com/content/404/australia-mining/new-south-wales/wambo-mine);
- meetings with the general community including Indigenous stakeholders;
- meetings with relevant government agencies; and
- community newsletters.

The consultation would include, but not necessarily be limited to, the following government agencies and authorities in addition to the Commonwealth Department of the Environment and Energy [DEE]:

- NSW DP&E;
- NSW Office of Environment and Heritage (OEH);
- NSW Environment Protection Authority;
- NSW Department of Primary Industries (DPI) (including DPI Water); and
- Singleton Shire Council.

Consultation with Indigenous stakeholders is being conducted in accordance with the requirements of the NSW OEH policy *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW Department of Environment, Climate Change and Water [DECCW], 2010).

Indigenous stakeholders have been identified through correspondence with local authorities, government agencies and community organisations in accordance with Section 4.1.2 of the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW, 2010).

Written notification of the South Bates Extension Underground Mine Modification (incorporating the Action) was provided to identified Indigenous stakeholders. These stakeholders were invited to register an interest in the process of consultation for the South Bates Extension Underground Mine Modification (incorporating the Action). A notice was also placed in the Singleton Argus on 24 August 2016 seeking registrations of interest from any additional interested Indigenous stakeholders.

In addition to Indigenous stakeholders having the opportunity to register their interest as detailed above, all Indigenous stakeholders involved in previous consultation activities and the management of Aboriginal heritage at the Wambo Coal Mine are included in the list of stakeholders consulted for the South Bates Extension Underground Mine Modification (incorporating the Action).

The following Indigenous stakeholders have registered their interest in being involved in the consultation process, or have been involved in previous consultation activities at the Wambo Coal Mine (in alphabetical order):

- Aboriginal Native Title Consultants.
- A1 Indigenous Services.
- AGA Services.
- Bawurra Consultants.
- Breeza Plains Cultural Heritage Consultants.
- Buudang.
- Cacatua Culture Consultants.
- Carrawonga Consultants.
- Culturally Aware.
- Deslee Talbott Consultants.
- DFTV Enterprises.
- DRM Cultural Management.
- EMT Cultural & Heritage.
- Galamaay Consultant.
- Gidawaa Walang Cultural Heritage Consultancy.
- Giwiir Consultants.
- HECMO Consultants.
- Heilamon Cultural Consultants.
- HTO Environmental Management Services.
- Hunter Valley Aboriginal Corporation.
- Hunter Valley Cultural Consultants.
- Hunter Valley Cultural Surveying.
- Hunter Valley Environment Land & Mining Services.
- Hunter Valley Natural & Cultural Resource Management.
- I & E Aboriginal Culture and Heritage.
- Janbant Mugrebea.
- Jeffery Matthews.
- Jill Green.
- JLC Cultural Services.
- Kauwul (Wonn1).
- Kawul Cultural Services.
- Kayaway Eco Cultural & Heritage Services.
- KL.KG Saunders Trading Services.

- L.J. Cultural Management.
- Lorraine Towney.
- Lower Hunter Aboriginal Incorporated.
- Lower Hunter Wonnarua Cultural Services.
- Maree /TA Wallangan Cultural Services.
- Minnga Consultants.
- Moreeites.
- Muswellbrook Cultural Consultants.
- Myland Cultural Heritage Group.
- Ngarramang-Kuri Aboriginal Culture & Heritage Group.
- Plains Clans of the Wonnarua People's Registered Native Title Claimants.
- Roger Noel Matthews.
- Ronald Fenwick.
- Roslyn Sampson.
- Scott Smith.
- Smith Dhagaans Cultural Group.
- T & G Culture Consultants.
- Tocomwall Pty Ltd.
- Ungooroo Aboriginal Corporation.
- Ungooroo Cultural & Community Services.
- Upper Hunter Heritage Consultants.
- Upper Hunter Wonnarua Council.
- Valley Culture.
- Waabi Gabinya Cultural Consultancy.
- Wanaruah Custodians Aboriginal Corporation.
- Wanaruah Local Aboriginal Land Council.
- Warragil Cultural Services.
- Wattaka Wonnarua Cultural Consultancy Services.
- Widescope Indigenous Group.
- Wonnarua Culture Heritage.
- Wonnarua Nation Aboriginal Corporation.
- Wonnarua Traditional Custodians.
- Wonnarua Traditional Owners.
- Wurrumay Consultants.
- Yinaar Cultural Services.

All Indigenous stakeholders were provided with a Proposed Methodology (i.e. draft assessment methodology) for the Aboriginal Cultural Heritage Assessment for their review and comment. Representatives from Indigenous stakeholder groups are also participating in the field surveys for the area associated with the Action. Field surveys are being undertaken in the Action area and surrounds over two weeks in November 2016.

The next steps in the consultation programme include the Indigenous stakeholders being provided with the opportunity to review and provide comment on the draft Aboriginal Cultural Heritage Assessment (including the provision of any comments regarding the cultural significance of any Aboriginal object(s) and/or place(s) in the Action area), and the facilitation of a meeting and site inspection with Indigenous stakeholders.

2.7 A staged development or component of a larger action

The Action is not a component of a larger action.

The Action is related to the existing Wambo Coal Mine as described below.

2.8 Related actions

The Action is an extension to underground coal mining operations at the approved Wambo Coal Mine. Other approved and proposed actions in the vicinity of the Action are discussed below.

Wambo Development Project (EPBC 2003/1138)

The Wambo Coal Mine incorporating development and operation of an open cut and underground mine, associated activities including construction and operation of a CHPP, raw and product coal handling facilities and rail and train loading infrastructure over a mine life of some 21 years was determined to be a Controlled Action in 2003 (EPBC 2003/1138) and was subsequently approved in November 2004.

For each of the subsequent Modifications that have been approved through the NSW planning system and form part of the approved Wambo Coal Mine, WCPL determined that no referral under the EPBC Act was required (i.e. no significant impacts on matters of national environmental significance were expected to occur as a result of each Modification and/or the Modification was consistent with the approved Controlled Action).

The Action that is the subject of this referral under the EPBC Act relates to an extension of underground coal mining operations in the Whybrow Seam at the Wambo Coal Mine and related minor surface infrastructure and activities that have not previously been approved under the NSW planning system.

South Wambo Underground Mine Extension (EPBC 2016/7636)

The South Wambo Underground Mine Extension was determined to be a Controlled Action in January 2016 (EPBC 2016/7636). Approval of this Action is pending completion of the bilateral assessment process with the NSW Government.

The South Wambo Underground Mine Extension is a proposed extension of underground coal mining operations specifically associated with the South Wambo Underground Mine at the Wambo Coal Mine and related surface infrastructure and activities.

The location of the components of the South Wambo Underground Mine Extension (EPBC 2016/7636) are shown on Figure 5.

The Action is located in a different area and coal seam to South Wambo Underground Mine Extension and does not form a component of this Action. The two proposed Actions would operate independently.

United and Wambo Open Cut Coal Mine Project (EPBC 2015/7600)

The United and Wambo Open Cut Coal Mine Project is proposed adjacent to the Action area, and has been determined a Controlled Action under the EPBC Act (EPBC 2015/7600). Approval of this Action is pending completion of the bilateral assessment process with the NSW Government.

The designated proponent for Controlled Action (EPBC 2015/7600) is United Collieries Pty Ltd. The Controlled Action for the United and Wambo Open Cut Coal Mine Project includes open cut mining operations in two areas (the proposed United Open Cut and modified operations generally within the approved Wambo open cut mining area) and associated activities.

The location of the components of the United and Wambo Open Cut Coal Mine Project (EPBC 2015/7600) are shown on Figure 5.

The Action is located in a different area, uses different mining methods and would be undertaken by a different designated proponent. The Action does not form a component of the United and Wambo Open Cut Coal Mine Project and the two proposed Actions would operate independently.

3 Description of environment & likely impacts

3.1 Matters of national environmental significance

3.1 (a) World Heritage Properties

Description

No World Heritage Properties are situated within the Action area. The closest World Heritage Property is the Greater Blue Mountains Area.

The Greater Blue Mountains Area consists of 10,000 square kilometres (km^2) of mostly forested landscape on a sandstone plateau extending 60 to 180 km inland from central Sydney, NSW (Figure 6). Wollemi National Park covers an area of approximately 5,017 km^2 and is one of eight areas listed as part of the Greater Blue Mountains Area.

Wollemi National Park, which is part of the Greater Blue Mountains Area, is located approximately 100 metres (m) from the Action area at its closest point (Figures 4 and 6). An escarpment and cliffs associated with Wollemi National Park are located adjacent to, but generally outside the Wollemi National Park boundary.

The values of the Greater Blue Mountains Area which meet the World Heritage criteria are:

(ix) to be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals;

(x) to contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation.

Nature and extent of likely impact

The Action is unlikely to have any direct or indirect impact on the Greater Blue Mountains Area.

The NSW Development Consent (DA 305-7-2003) for the Wambo Coal Mine includes subsidence impact performance measures which are required to be met (Section 4). These subsidence impact performance measures require negligible subsidence impacts and negligible environmental consequence on Wollemi National Park. These subsidence impact performance measures would apply to the Action.

To achieve the subsidence impact performance measure, all longwalls at the Wambo Coal Mine are offset from the base of the escarpment associated with the Wollemi National Park by a distance equivalent to a 26.5 degree angle of draw from the edge of the longwall. This limits vertical subsidence from the additional underground mining areas to less than 20 mm. Vertical movements of these magnitudes are in the order of those which naturally occur due to wetting and drying of surface soils (i.e. the movements could be considered negligible as they are small in comparison to normal processes). As such, it is considered very unlikely that the Wollemi National Park would be adversely impacted by the Action.

Secondary effects, including the Action's contribution to global greenhouse gas emissions, would be relatively small.

Given the above, the Action would not cause one or more of the World Heritage values to be lost, one or more of the World Heritage values to be degraded or damaged, or one or more of the World Heritage values to be notably altered, modified, obscured or diminished. Accordingly, the Action would not have a significant impact on the World Heritage values of the Greater Blue Mountains Area.

3.1 (b) National Heritage Places

Description

No National Heritage Places are situated in the Action area. The closest National Heritage Place is the Greater Blue Mountains Area. Wollemi National Park, which is part of the Greater Blue Mountains Area, is located adjacent to the Action area (as described in Section 3.1(a) above).

Nature and extent of likely impact

As described above, the Action is unlikely to have any direct or indirect impact on the Greater Blue Mountains Area.

The mine layout for the additional underground mining areas has been designed to achieve negligible subsidence impacts and negligible environmental consequences on Wollemi National Park (Section 4).

Secondary effects, including the Action's contribution to global greenhouse gas emissions, would be relatively small.

Given the above, the Action would not have a significant impact on the National Heritage values of the Greater Blue Mountains Area given the Action would not cause one or more of the National Heritage values to be lost, one or more of the National Heritage values to be degraded or damaged, or one or more of the National Heritage values to be notably altered, modified, obscured or diminished. Accordingly, the Action would not have a significant impact on the National Heritage values of the Greater Blue Mountains Area.

3.1 (c) Wetlands of International Importance (declared Ramsar wetlands)

Description

No Ramsar wetlands are situated in the Action area. The closest Ramsar wetland to the Action is the Hunter Estuary Wetlands, which is situated approximately 70 km to the south-east of the Action. The Hunter Estuary Wetlands is comprised of two components, the Kooragang and the Hunter Wetlands Centre Australia and the combined area is approximately 2,968 ha (DEE, 2016a).

Nature and extent of likely impact

The Hunter Estuary Wetlands are situated approximately 70 km to the south-east (i.e. downstream) of the Action, and it is unlikely that the Hunter Estuary Wetlands would be affected by any potential direct or indirect effect of the Action. Secondary effects, such as the Action's contribution to global greenhouse gas emissions, would be relatively small.

The Action would not have a significant impact on the ecological character of the Hunter Estuary Wetlands Ramsar site as it would:

- not result in areas of the wetland being destroyed or substantially modified;
- not result in a substantial and measurable change in the hydrological regime of the wetland;
- not result in the habitat or lifecycle of native species, including invertebrate fauna and fish species, dependent upon the wetland being seriously affected;
- not result in a substantial and measurable change in the water quality of the wetland; and
- not result in an invasive species that is harmful to the ecological character of the wetland being established (or an existing invasive species being spread) in the wetland.

3.1 (d) Listed threatened species and ecological communities

The following subsections consider threatened flora species, threatened fauna species and threatened ecological species in this order.

Description

Threatened Flora Species

A flora assessment was conducted by Orchid Research (2003) for the Wambo Development Project in 2003. A number of flora studies have been undertaken within the Wambo Coal Mine area and surrounds since 2003, including routine monitoring commissioned by WCPL.

FloraSearch conducted specific and targeted flora surveys across the Action area in spring of 2016. The surveys incorporated three methods of sampling: quadrat sampling; spot sampling; and random meanders. This included targeted surveys for all threatened flora species which may occur within the Action area Table 2).

These flora surveys supplemented the previous surveys completed over the Action area and contributed to the current knowledge of the presence of threatened species within the Action area. In addition, consolidated vegetation mapping was prepared across the Action area and surrounds.

A list of threatened flora species under the EPBC Act that have the potential to occur in the Action area was generated from database searches (i.e. EPBC Protected Matters Search Tool and the BioNet website) of the Action area (Table 2) (DEE, 2016b; OEH, 2016a). Threatened flora species database records potentially relevant to the Action are presented on Figure 7.

Table 2
Potential Threatened Flora Species

Species	Conservation Status[1]	Source of Record		Distribution/Habitat Requirements in Relation to the Action	Likelihood of Occurrence within Action Area and Immediate Surrounds	Recorded in Action Area[4]
		EPBC Protected Matters Search[2]	BioNet[3]			
Cryptostylis hunteriana (Leafless Tongue-orchid)	V	•	-	The Action is not within the known distribution of this species (OEH, 2016b) and there are no known records within 20 km of the Action area. There is no potential habitat for this species in the Action area.	Nil	No
Cynanchum elegans (White-flowered Wax Plant)	E	-	•	Mainly in rainforest, but also occasionally in woodland (OEH, 2016b). The nearest records are deep within Wollemi National Park to the south-west of the Action area, where it is likely to occur in sandstone gully rainforest.	Low	No
Eucalyptus glaucina (Slaty Red Gum)	V	-	•	There are several records of this species in the vicinity of the Action area. This species occurs on deep, fertile soils in river valleys (OEH, 2016b).	Low	No
Euphrasia arguta	CE	•	-	The Action is not within the known or predicted distribution of this species (OEH, 2016b) and there are no known records within 20 km of the Action area.	Nil	No
Grevillea parviflora subsp. *parviflora* (Small-flower Grevillea)	V	-	-	The species has been recorded in the vicinity of the Action area by previous surveys for the Wambo Coal Mine (FloraSearch, 2015). Relevant habitat for this species is restricted in the Action area.	Low	No

Table 2 (Continued)
Potential Threatened Flora Species

Species	Conservation Status[1]	Source of Record		Distribution/Habitat Requirements in Relation to the Action	Likelihood of Occurrence within Action Area and Immediate Surrounds	Recorded in Action Area[4]
Homoranthus darwinioides	V	•	-	The Action is not within the known or predicted distribution of this species (OEH, 2016b) and there are no known records within 20 km of the Action area.	Nil	No
Olearia cordata	V	•	•	The Action area is located at the northern edge of the known distribution of this species (OEH, 2016b). This species grows in dry open sclerophyll forest and open shrubland, on sandstone ridges (OEH, 2016b). Sandstone ridges and the habitats they support are absent from the Action area.	Nil	No
Pelargonium sp. Striatellum (G.W. Carr 10345) (Omeo Stork's-bill)	E	•	-	The Action is not within the known or predicted distribution of this species (OEH, 2016b) and there are no known records within 20 km of the Action area. There is no potential habitat for this species in the Action area.	Nil	No
Pomaderris brunnea (Rufous Pomaderris)	V	•	-	The Action is not within the known or predicted distribution of this species (OEH, 2016b) and there are no known records within 20 km of the Action area. The species occurs on active alluvium (OEH, 2016b).	Low	No
Pterostylis gibbosa (Illawarra Greenhood)	E	•	-	There are no known records of this species within 20 km of the Action area, with the closest record for this species over 20 km away at Milbrodale (OEH, 2016b). In the Hunter region, it grows in open woodland dominated by Narrow-leaved Ironbark *E. crebra*, Forest Red Gum and Black Cypress Pine *Callitris endlicheri* (OEH, 2016b).	Low	No
Thesium australe (Austral Toadflax)	V	•	-	This species has a disjunct distribution on the NSW tablelands; there are many records for the northern and southern tablelands, but none for the central tablelands or Hunter Valley (OEH, 2016b). The species is highly unlikely to occur on the Action area.	Nil	No
Wollemia nobilis (Wollemi Pine)	E	•	-	This species is restricted to a few small occurrences in the west of Wollemi National Park in deep sandstone gorges (OEH, 2016b). The Action area is not within the known distribution of this species and does not contain suitable habitat.	Nil	No

1 Conservation status under the EPBC Act (current as of 11 October 2016).

CE – Critically Endangered.

E – Endangered.

V – Vulnerable.

2 DEE (2016b).

3 OEH (2016a). Note this database includes records from the Atlas of NSW Wildlife, Royal Botanical Gardens and Domain Trust, Forests NSW and the Australian Museum.

4 Recorded by FloraSearch (in prep.).

As detailed in Table 2, plant species listed under the EPBC Act have been considered for their potential to occur within the Action area or surrounds. The habitat requirements of each of the flora species listed in Table 2 were reviewed using species profiles provided on the OEH and DEE websites, and other material referenced in Table 2. This information was compared with the habitats identified within the Action area by detailed contemporary surveys, and an assessment was made of the likelihood of suitable habitat for each species being present. Threatened species whose habitats do not occur within the Action area are considered to have a nil likelihood of occurrence (Table 2).

The habitat filtering identified five EPBC Act listed flora species that are considered to have a likelihood of occurring within the Action area (Table 2), including the *Cynanchum elegans* (White-flowered Wax Plant), *Eucalyptus glaucina* (Slaty Red Gum), *Grevillea parviflora* subsp. *parviflora* (Small-flower Grevillea), *Pomaderris brunnea* (Rufous Pomaderris) and *Pterostylis gibbosa* (Illawarra Greenhood). These five species (along with all the other species) were specifically targeted during the field surveys conducted in the Action area, and none of these species were recorded in the Action area by FloraSearch.

Threatened Fauna Species

A significant number of fauna studies have been undertaken previously within the Wambo Coal Mine area and surrounds.

Notwithstanding, Eco Logical Australia (Eco Logical) conducted specific and targeted fauna surveys across the Action area in spring of 2016. These fauna surveys supplemented the previous surveys completed over the Action area and contributed to the current knowledge of the presence of threatened species within the Action area. The fauna surveys undertaken included a variety of techniques and methods, including:

- Amphibian surveys (including call playback for the Green and Golden Bell Frog).
- Reptile surveys (passive and active surveys).
- Diurnal and nocturnal bird surveys.
- Terrestrial and arboreal mammal trapping.
- Remote camera surveys (including targeted surveys for the Spotted-tailed Quoll).
- Microchiropteran bat surveys.
- Spotlight surveys.
- Habitat surveys and mapping, including riparian habitat assessment.
- Recording of opportunistic fauna sightings.

The above survey effort equated to 164 trap/camera nights for carnivorous mammals, 472 trap/camera nights for small/medium sized terrestrial mammals and 164 trap/camera nights for arboreal mammals.

A list of threatened fauna species under the EPBC Act that have the potential to occur in the Action area was generated from database searches (i.e. EPBC Protected Matters Search Tool and the BioNet website) of the Action area (Table 3) (DEE, 2016b; OEH, 2016a). Threatened fauna species database records potentially relevant to the Action are presented on Figure 8.

No threatened fauna species listed under the EPBC Act were recorded within the Action area by Eco Logical (in prep.) as part of the spring 2016 surveys. The Large-eared Pied Bat has been previously recorded in the Action area.

Table 3
Potential Threatened Fauna Species

Species	Conservation Status[1]	Source of Record		Distribution/Habitat Requirements in Relation to the Action	Likelihood of Occurrence within Action Area and Immediate Surrounds	Recorded in Action Area[4]
		EPBC Protected Matters Search[2]	BioNet[3]			
Amphibians						
Litoria aurea (Green and Golden Bell Frog)	V	•	-	This species has not been recorded during the field survey or during previous assessments undertaken for WCPL approvals and/or ongoing monitoring. The closest record of this species is approximately 11 km north-northeast of the Action area. Potential habitat for this species is located within the Action area in the form of farm dams containing *Typha* spp.	Potential	No
Litoria booroolongensis (Booroolong Frog)	E	•	-	This species has not been recorded during the field survey or during previous assessments undertaken for WCPL approvals and/or ongoing monitoring. The closest record of this species is over 50 km north-east of the Action area. There is minimal potential habitat for this species within the Action area.	Unlikely	No
Reptiles						
Hoplocephalus bungaroides (Broad-headed Snake)	V	•	-	This species has not been recorded during the field survey or during previous assessments undertaken for WCPL approvals and/or ongoing monitoring. The closest record of this species is approximately 56 km south-west of the Action area. Limited potential habitat for this species exists in the form of exposed sandstone outcrops within and adjacent to the Action area.	Unlikely	No
Birds						
Anthochaera phrygia (Regent Honeyeater)	CE	•	•	This species has not been recorded during the field survey or during previous assessments undertaken for WCPL approvals and/or ongoing monitoring. The closest records of this species are approximately 6 km east of the Action area and date from 1987 and 1991. Potential habitat for this species exists within the Action area in the form of potential foraging habitat with winter flowering eucalypt species. The Action is not located in the vicinity of a known breeding area (Department of the Environment [DotE], 2016).	Potential	No

Table 3 (Continued)
Potential Threatened Fauna Species

Species	Conservation Status[1]	Source of Record		Distribution/Habitat Requirements in Relation to the Action	Likelihood of Occurrence within Action Area and Immediate Surrounds	Recorded in Action Area[4]
		EPBC Protected Matters Search[2]	BioNet[3]			
Birds (Cont.)						
Botaurus poiciloptilus (Australasian Bittern)	E	•	-	This species has not been recorded during the field survey or during previous assessments undertaken for WCPL approvals and/or ongoing monitoring. The closest record of this species is approximately 40 km south-east of the Action area. Minimal potential habitat for this species is located within the Action area.	Unlikely	No
Calidris ferruginea (Curlew Sandpiper)	CE, M	•	-	This species has not been recorded during the field survey or during previous assessments undertaken for WCPL approvals and/or ongoing monitoring. The closest record of this species is more than 70 km south-east of the Action area. Littoral and estuarine habitats favoured by this species are absent from the Action area.	Unlikely	No
Grantiella picta (Painted Honeyeater)	V	•	-	This species was not been recorded during the field surveys for the Action. This species has previously been recorded at the Wambo Coal Mine. Potential habitat for this species exists within the Action area in the form of potential foraging and nesting habitat.	Potential	No
Lathamus discolour (Swift Parrot)	CE	•	•	This species has not been recorded during the field survey or during previous assessments undertaken for WCPL approvals and/or ongoing monitoring. The closest record of this species is approximately 7 km east of the Action area. Potential habitat for this species exists within the proposed Action area in the form of potential foraging habitat with winter flowering eucalypt species.	Potential	No
Numenius madagascariensis (Eastern Curlew)	CE, M	•	-	This species has not been recorded during the field survey or during previous assessments undertaken for WCPL approvals and/or ongoing monitoring. The closest record of this species is more than 70 km south-east of the Action area. Intertidal mudflats and sandflats favoured by this species are absent from the Action area.	Unlikely	No

Table 3 (Continued)
Potential Threatened Fauna Species

Species	Conservation Status[1]	Source of Record		Distribution/Habitat Requirements in Relation to the Action	Likelihood of Occurrence within Action Area and Immediate Surrounds	Recorded in Action Area[4]
		EPBC Protected Matters Search[2]	BioNet[3]			
Birds (Cont.)						
Rostratula australis (Australian Painted Snipe)	E	•	-	This species has not been recorded during the field survey or during previous assessments undertaken for WCPL approvals and/or ongoing monitoring. The closest record of this species is approximately 60 km south-east of the Action area. No potential habitat for this species is located within the Action area.	Nil	No
Mammals						
Dasyurus maculatus maculatus (Spotted-tailed Quoll [SE mainland population])	E	•	•	This species has not been recorded during the field survey or during previous assessments undertaken for WCPL approvals and/or ongoing monitoring. This species has been recorded by surveys at the adjacent United Mine. Potential habitat for this species exists within the Action area in the form of roosting (tree hollows), nesting and foraging (woodland) habitats.	Likely	No
Petauroides volans (Greater Glider)	V	•	•	This species has not been recorded during the field survey or during previous assessments undertaken for WCPL approvals and/or ongoing monitoring. The closest record of this species is approximately 5 km south of the Action area in the Wollemi National Park. Potential habitat for this species in the form of foraging, nesting and shelter habitats (woodlands containing *Eucalyptus* spp.).	Likely	No
Phascolarctos cinereus (Koala)	V	•	•	This species has not been recorded during the field survey or during previous assessments undertaken for WCPL approvals and/or ongoing monitoring. This species has been recorded by surveys at the adjacent United Mine. Potential habitat for the Koala exists within the Action area in the form of feed trees (White Box and Forest Red Gum).	Potential	No
Pseudomys novaehollandiae (New Holland Mouse)	V	•	•	This species has not been recorded during the field survey or during previous assessments undertaken for WCPL approvals and/or ongoing monitoring. The closest record of this species is approximately 2 km north-east of the Action area and dates from 1981. This is limited potential habitat for this species (shrubby woodland on sands) within the Action area in the form of nesting and foraging.	Unlikely	No

Table 3 (Continued)
Potential Threatened Fauna Species

Species	Conservation Status[1]	Source of Record		Distribution/Habitat Requirements in Relation to the Action	Likelihood of Occurrence within Action Area and Immediate Surrounds	Recorded in Action Area[4]
		EPBC Protected Matters Search[2]	BioNet[3]			
Mammals (Cont.)						
Petrogale penicillata (Brush-tailed Rock-wallaby)	V	-	•	This species was not recorded during the field surveys for the Action, however has been previously recorded in the surrounds during ongoing monitoring conducted by WCPL. Potential habitat (rocky escarpments) is located in the vicinity of the Action area.	Likely	No
Chalinolobus dwyeri (Large-eared Pied Bat)	V	•	•	This species has previously been recorded at the Wambo Coal Mine and surrounds. Potential roosting habitat for this species exists adjacent to the Action area in the form of exposed sandstone outcrops and caves/clifflines. Potential foraging habitat exists in the form as open woodland.	Known	Yes - Previous Surveys
Nyctophilus corbeni (South-eastern Long-eared Bat)	V	•	-	This species has not been recorded during the field survey or during previous assessments undertaken for WCPL approvals and/or ongoing monitoring. The closest record of this species is approximately 13 km west of the Action area. Potential habitat for this species exists within the Action area in the form of potential foraging and roosting habitat (hollow-bearing trees).	Unlikely	No
Pteropus poliocephalus (Grey-headed Flying-fox)	V	•	•	This species has not been recorded during the field survey or during previous assessments undertaken for WCPL approvals and/or ongoing monitoring. This species has been recorded by surveys at the adjacent United Mine. Potential habitat for this species exists within the Action area in the form of foraging habitat, with no roost sites occurring within the Action area.	Potential	No

1 Conservation status under the EPBC Act (current as of 11 October 2016).
CE – Critically Endangered.
E – Endangered.
V – Vulnerable.
M – Migratory.

2 DEE (2016b).

3 OEH (2016a). Note this database include records from the Atlas of NSW Wildlife, Royal Botanical Gardens and Domain Trust, Forests NSW and the Australian Museum.

4 Recorded by Eco Logical (in prep.).

Threatened Ecological Communities

A list of threatened ecological communities under the EPBC Act that were considered to have the potential to occur in the Action area was generated from a database search (i.e. EPBC Protected Matters Search Tool) of the Action area (Table 4) (DEE, 2016b; OEH, 2016a).

Table 4
Potential Threatened Ecological Communities

Community Name	Conservation Status[1]	Source of Record		Distribution/Habitat Requirements in Relation to the Action	Likelihood of Occurrence within Action Area and Immediate Surrounds	Mapped in Action Area[4]
		EPBC Protected Matters Search[2]	BioNet[3]			
Central Hunter Valley Eucalypt Forest and Woodland	CE	•	•	The Action is within the known distribution of this community (DEE, 2016c). The community is associated with soils derived from Permian sedimentary rocks found on the valley floors, lower hillslopes and low ridges (OEH, 2016b). This community has been mapped in the Action area.	Known	Yes
Hunter Valley Weeping Myall (Acacia pendula) Woodland	CE	•	•	The Action is within the known distribution of this community (DEE, 2016c). This community occurs on heavy Permian clay soils (OEH, 2016b). There are known occurrences in the vicinity of the Action area.	High	No
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	CE	•	•	The Action is within the known distribution of this community (DEE, 2016c). This community occurs on the footslopes of the Narrabeen Group sandstone escarpments of the upper Hunter Valley. This community is not considered to have potential to occur on the Action area (OEH, 2016b).	Nil	No

1 Conservation status under the EPBC Act (current as of 11 October 2016).
CE – Critically Endangered.

2 DEE (2016b).

3 OEH (2016a).

4 Recorded by FloraSearch (in prep.).

As indicated in Table 4, the *Central Hunter Valley Eucalypt Forest and Woodland* Critically Endangered Ecological Community (CEEC) is the only threatened ecological community present within the Action area. The area of *Central Hunter Valley Eucalypt Forest and Woodland* CEEC mapped in the Action area is shown on Figure 9.

Nature and extent of likely impact

This section assesses the potential impacts on threatened species or threatened ecological communities under the EPBC Act, and identifies the nature and extent of any likely impacts.

Gas management infrastructure associated with the Action would require a total combined disturbance of up to approximately 2 ha of derived grassland (Community 8 on Figure 10). There would be no clearing in woodland communities or within the *Central Hunter Valley Eucalypt Forest and Woodland* CEEC. Threatened flora species, if present, would also be avoided.

The vegetation types identified within the Action underground mining area include (Figure 10):

- Forest Red Gum – Rough-barked Apple – River Sheoak Forest (Community 2).
- Narrow-leaved Ironbark Shrub-Grass Woodland (Community 3).
- *Melaleuca decora* Low Forest (Community 4).
- Slaty-Box Shrubby Woodland (Communities 5 and 5a).
- Coastal Myall Shrubland (Community 6).
- Escarpment Shrubland (Community 7).
- Derived Grassland (Community 8).

The potential impacts of the Action in regards to subsidence are being considered by Mine Subsidence Engineering Consultants (MSEC).

The following bullet points provide a summary of the potential impacts of the Action associated with mining induced subsidence:

- Subsidence modelling for the proposed longwall layout indicates that generally surface cracking and deformations would be typically limited to 30 to 40 mm, with some cracking around 150 mm or greater (MSEC, in prep.).
- The magnitude of expected surface cracking is considered too small to influence the hydrological processes in these areas and is unlikely to have any biologically significant effect on the soil moisture regime that sustains the existing vegetation. Cracking of soils in similar terrain at the Wambo Coal Mine has produced no observable changes to vegetation condition or the health of individual plants (FloraSearch, 2016). In addition, no scientific evidence of significant surface effects on vegetation from minor soil cracking induced by subsidence is known from underground mining anywhere in Australia (FloraSearch, 2016).
- Subsidence may affect the ephemeral drainage lines in the Action area, through changes in stream alignment and grade, potential increased erosion risk or increased ponding. With the implementation of proposed remediation measures and given the limited habitat value of these drainage lines, availability of water in streams would not be impacted to an extent that would significantly affect the availability of habitat resources for threatened fauna species. Topographical depressions that may lead to additional ponding are generally restricted to existing drainage lines and the flatter grassland areas (rather than woodland areas).
- The extensive escarpment associated with the Wollemi National Park and other cliffs to the south-west and west of the Action are unlikely to be adversely impacted by the Action. There is approximately 15 m of cliffline within the Action area predicted to be disturbed by subsidence, compared to subsidence habitat available in the immediate vicinity (Figure 8). There would be negligible impacts on potential shelter, retreat or roosting sites for threatened fauna species associated with cliffs, in consideration of the area of potential subsidence disturbance compared to the extensive habitat available (see mapped clifflines on Figure 8).

Threatened Flora Species

Table 5 evaluates the nature and extent of likely impacts on each individual threatened flora species identified in Table 2 and discussed in the above sections.

Table 5
Potential Impacts on Flora Species and their Habitats

Scientific Name	Common Name	Nature and Extent of Likely Impacts
Cryptostylis hunteriana	Leafless Tongue-orchid	The Action is not likely to impact this species given the absence of records and lack of suitable habitat within the Action area.
Cynanchum elegans	White-flowered Wax Plant	This species has a low likelihood of occurrence within the Action area, and targeted searches failed to identify this species. It is therefore considered the Action is not likely to impact this species given the absence of records and the nature and extent of proposed disturbance.
Eucalyptus glaucina	Slaty Red Gum	This species has a low likelihood of occurrence within the Action area. Slaty Red Gum (*Eucalyptus glaucina*) is a large conspicuous species that would have been detected in the Action area by the surveys if it was present. On this basis, the Action is not likely to impact this species given the absence of records within the Action area and the nature and extent of proposed disturbance.
Euphrasia arguta	-	The Action is not likely to impact this species given the absence of records in proximity to the Action area.
Grevillea parviflora subsp. *parviflora*	Small-flower Grevillea	This species has a low likelihood of occurrence within the Action area, and targeted searches failed to identify this species. It is therefore considered the Action is not likely to impact this species given the absence of records and the nature and extent of proposed disturbance.
Homoranthus darwinioides	-	The Action is not likely to impact this species given the absence of records and lack of suitable habitat within the Action area.
Olearia cordata	-	The Action is not likely to impact this species given the absence of records and lack of suitable habitat within the Action area.
Pelargonium sp. Striatellum (G.W. Carr 10345)	Omeo Stork's-bill	The Action is not likely to impact this species given the absence of records and lack of suitable habitat within the Action area.
Pomaderris brunnea	Rufous Pomaderris	This species had a low likelihood of occurrence within the Action area, and targeted searches failed to identify this species. It is therefore considered the Action is not likely to impact this species given the absence of records, the location of the Action area relative to the known distribution of the species and the nature and extent of proposed disturbance.
Pterostylis gibbosa	Illawarra Greenhood	This species has a low likelihood of occurrence within the Action area, and targeted searches failed to identify this species. It is therefore considered the Action is not likely to impact this species given the absence of records and the nature and extent of proposed disturbance.
Thesium australe	Austral Toadflax	The Action is not likely to impact this species given the absence of records in proximity to the Action area.
Wollemia nobilis	Wollemi Pine	The Action is not likely to impact this species given the absence of records and lack of suitable habitat within the Action area.

The Action is not likely to have a significant impact on any threatened flora species listed under the EPBC Act (Table 5) in accordance with the *Matters of National Significance: Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act, 1999* (Significant Impact Guidelines) (DotE, 2013a) as it is unlikely that the Action would:

- lead to a long-term decrease in the size of a population;
- reduce the area of occupancy of the species;
- fragment an existing population into two or more populations;
- adversely affect habitat critical to the survival of a species;
- disrupt the breeding cycle of a population;
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- result in invasive species that are harmful to the species becoming established in the species' habitat;
- introduce disease that may cause the species to decline; or
- interfere with the recovery of the species.

This is because:

- Only limited direct surface disturbance is proposed as part of the Action (approximately 2 ha of derived grassland) and would avoid threatened flora species.
- No threatened flora species have been recorded during the recent flora surveys within the Action area. In particular, the *Cynanchum elegans* (White-flowered Wax Plant), *Eucalyptus glaucina* (Slaty Red Gum), *Pomaderris brunnea* (Rufous Pomaderris) *Grevillea parviflora* subsp. *parviflora* (Small-flower Grevillea) and *Pterostylis gibbosa* (Illawarra Greenhood) were not identified despite targeted searches.
- Cracking of soils as a result of subsidence in similar terrain at the Wambo Coal Mine has produced no observable changes to vegetation condition or the health of individual plants (FloraSearch, 2016).
- Land undisturbed by the proposed surface infrastructure provides a higher quality habitat (i.e. the Action would only directly disturb derived grassland and there are significant areas of conserved vegetation in the vicinity of the Action).
- The Action is unlikely to disrupt the lifecycle of the species provided in Table 5 given the absence of records from the Action area.

Threatened Fauna Species

Table 6 evaluates the nature and extent of likely impacts on each individual threatened fauna species identified in Table 3 and discussed in the above sections.

Table 6
Potential Impacts on Fauna Species and their Habitats

Scientific Name	Common Name	Nature and Extent of Likely Impacts
Amphibians		
Litoria aurea	Green and Golden Bell Frog	Despite suitable habitat being present in the vicinity of the Action area, the Action is not likely to significantly impact this species given the absence of records within and surrounding the Action area and the nature and extent of proposed disturbance.
Litoria booroolongensis	Booroolong Frog	The Action is not likely to significantly impact this species given the absence of records within and surrounding the Action area, the lack of suitable habitat present and the nature and extent of proposed disturbance.
Reptiles		
Hoplocephalus bungaroides	Broad-headed Snake	Despite suitable habitat being present in the vicinity of the Action area, the Action is not likely to significantly impact this species given the absence of records within and surrounding the Action area, and the nature and extent of proposed disturbance. Potential subsidence impacts on cliffline habitat would be limited compared to the extensive areas of cliff habitat surrounding the Action area.
Birds		
Anthochaera phrygia	Regent Honeyeater	Despite suitable habitat being present within the Action area, the Action is not likely to significantly impact this species given the absence of recent records within and surrounding the Action area, and the nature and extent of proposed disturbance (i.e. no direct disturbance of woodland habitat).
Botaurus poiciloptilus	Australasian Bittern	The Action is not likely to significantly impact this species given the absence of records within and surrounding the Action area, the lack of suitable habitat present and the nature and extent of proposed disturbance.
Calidris ferruginea	Curlew Sandpiper	The Action is not likely to significantly impact this species given the absence of records within and surrounding the Action area, the lack of suitable habitat present and the nature and extent of proposed disturbance.
Grantiella picta	Painted Honeyeater	The Action is not likely to significant impact this species as its nesting and foraging resources are not limited to the Action area, would not be materially reduced by the Action and would not be fragmented by the Action in consideration of the nature and extent of proposed disturbance (i.e. no direct disturbance of woodland habitat).
Lathamus discolour	Swift Parrot	Despite suitable habitat being present within the Action area, the Action is not likely to significantly impact this species given the absence of recent records within and surrounding the Action area, and the nature and extent of proposed disturbance (i.e. no direct disturbance of woodland habitat).

Table 6 (Continued)
Potential Impacts on Fauna Species and their Habitats

Scientific Name	Common Name	Nature and Extent of Likely Impacts
Birds (Cont.)		
Numenius madagascariensis	Eastern Curlew	The Action is not likely to significantly impact this species given the absence of records within and surrounding the Action area, the lack of suitable habitat present and the nature and extent of proposed disturbance.
Rostratula australis	Australian Painted Snipe	The Action is not likely to significantly impact this species given the absence of records within and surrounding the Action area, the lack of suitable habitat present and the nature and extent of proposed disturbance.
Mammals		
Dasyurus maculatus maculatus	Spotted-tailed Quoll (SE mainland population)	The Action is not likely to significant impact this species as its roosting, nesting and foraging resources are not limited to the Action area, would not be directly disturbed by the Action and would not be fragmented by the Action in consideration of the nature and extent of proposed disturbance (i.e. no direct disturbance of woodland habitat).
Petauroides volans	Greater Glider	The Action is not likely to significant impact this species as its foraging, nesting and shelter resources are not limited to the Action area, would not be directly disturbed by the Action and would not be fragmented by the Action in consideration of the nature and extent of proposed disturbance (i.e. no direct disturbance of woodland habitat).
Phascolarctos cinereus	Koala	The Action is not likely to significant impact this species as its foraging resources are not limited to the Action area, would not be directly disturbed by the Action and would not be fragmented by the Action in consideration of the nature and extent of proposed disturbance (i.e. no direct disturbance of woodland habitat).
Pseudomys novaehollandiae	New Holland Mouse	The Action is not likely to significant impact this species as there are no recent records of the species, its nesting and foraging resources are not limited to the Action area, would not be directly disturbed by the Action and would not be fragmented by the Action in consideration of the nature and extent of proposed disturbance (i.e. no direct disturbance of woodland habitat).
Petrogale penicillata	Brush-tailed Rock-wallaby	The Action is not likely to significantly impact this species given any impacts on potential shelter sites associated with cliffs would be negligible compared to the habitat available. In addition, this species' foraging resources are not limited to the Action area, would not be materially reduced by the Action and would not be fragmented by the Action in consideration of the nature and extent of proposed disturbance (i.e. no direct disturbance of woodland habitat).
Chalinolobus dwyeri	Large-eared Pied Bat	The Action is not likely to significantly impact this species given any impacts on potential roosting sites associated with cliffs would be negligible compared to the habitat available. In addition, this species' foraging resources are not limited to the Action area, would not be materially reduced by the Action and would not be fragmented by the Action in consideration of the nature and extent of proposed disturbance (i.e. no direct disturbance of woodland habitat).
Nyctophilus corbeni	South-eastern Long-eared Bat	Despite suitable habitat being present within the Action area, the Action is not likely to significantly impact this species given the absence of records within and surrounding the Action area, and the nature and extent of proposed disturbance (i.e. no direct disturbance of hollow-bearing trees).
Pteropus poliocephalus	Grey-headed Flying-fox	The Action is not likely to significant impact this species as its foraging resources are not limited to the Action area, would not be directly disturbed by the Action and would not be fragmented by the Action in consideration of the nature and extent of proposed disturbance.

The Action is not likely to have a significant impact on any threatened fauna species listed under the EPBC Act (Table 6) as it is unlikely that the Action would:

- lead to a long-term decrease in the size of a population;
- reduce the area of occupancy of the species;
- fragment an existing population into two or more populations;
- adversely affect habitat critical to the survival of a species;
- disrupt the breeding cycle of a population;
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

- result in invasive species that are harmful to the species becoming established in the species' habitat;
- introduce disease that may cause the species to decline; or
- interfere with the recovery of the species.

This is because:

- Surface infrastructure for the Action involves the direct disturbance of approximately 2 ha of derived grassland and no disturbance of woodland habitat.
- There are significant areas of conserved vegetation in the vicinity of the Action.
- The Action would not materially increase fragmentation of any habitat as it does not involve direct disturbance of remnant vegetation.
- Cracking of soils as a result of subsidence in similar terrain at the Wambo Coal Mine has produced no observable changes to vegetation condition (FloraSearch, 2016), and therefore subsidence is unlikely to affect foraging habitat or nesting and roosting habitat in hollow-bearing trees.
- There would be negligible subsidence impacts on potential shelter, retreat or roosting sites for threatened fauna species associated with cliffs, in consideration of the area of potential subsidence disturbance (approximately 15 m of cliffline) compared to the extensive habitat available in the immediate vicinity (Figure 8).
- With the implementation of proposed remediation measures and given the limited habitat value of drainage lines in the Action area, availability of water in streams would not be impacted to an extent that would significantly affect the availability of habitat resources for fauna species.

Threatened Ecological Communities

The *Hunter Valley Weeping Myall (Acacia pendula) Woodland* CEEC was not identified in the Action area despite targeted searches. Therefore it is unlikely the Action would have a significant impact on the *Hunter Valley Weeping Myall (Acacia pendula) Woodland* CEEC.

The *Central Hunter Valley Eucalypt Forest and Woodland* CEEC was mapped within the Action area and surrounds as vegetation Communities 3 and 5, and grassland within 30 m from the edge of the tree canopy/saplings. There would be no direct disturbance of *Central Hunter Valley Eucalypt Forest and Woodland* CEEC by the Action.

Cracking of soils as a result of subsidence in similar terrain at the Wambo Coal Mine has produced no observable changes to vegetation condition or the health of individual plants (FloraSearch, 2016).

The Action is unlikely to have a significant impact on *Central Hunter Valley Eucalypt Forest and Woodland* CEEC because:

- The Action would not reduce the extent of the community as no direct disturbance is proposed.
- The Action would not increase fragmentation of the community as it does not involve linear development through *Central Hunter Valley Eucalypt Forest and Woodland* CEEC.
- The Action would not adversely affect habitat critical to the survival of the community.
- The Action would not modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for the community's survival.
- The Action would not cause a substantial change in the species composition of an occurrence of the community.
- The Action would not cause a substantial reduction in the quality or integrity of an occurrence of the community.
- The Action would not interfere with the recovery of the community.

3.1 (e) Listed migratory species

Description

Migratory species are those animals that migrate to Australia and its external territories, or pass through or over Australian waters during their annual migrations (DEE, 2016d).

Table 7 provides a list of migratory fauna species listed under the EPBC Act that have the potential to occur in the Action area. This list was generated from an EPBC Protected Matters Search Tool search of the Action area (DEE, 2016b). An assessment of the likelihood of occurrence of each of these species is provided in Table 7. For many species in Table 7, the Action area lacks the extent or presence of habitat needed to support them other than to allow for occasional appearances as nomads, vagrants or individuals with 'passing through' status. At any one time, appearances of these species within the Action area would represent a very small sample of their wider populations.

Table 7
Potential Migratory Species

Species	Distribution/Habitat Requirements in Relation to the Action	Likelihood of Occurrence within Action Area
Apus pacificus (Fork-tailed Swift)	Habitat for this species within the Action area is non-breeding habitat only (DotE, 2015). It is found across a range of habitats, from inland open plains to wooded areas, where it is exclusively aerial (DotE, 2015).	Potential
Hirundapus caudacutus (White-throated Needletail)	Habitat for this species within the Action area is non-breeding habitat only (DotE, 2015). It is found across a range of habitats, more often over wooded areas, where it is almost exclusively aerial (DotE, 2015).	Potential
Monarcha melanopsis (Black-faced Monarch)	This species is widespread in the east, occurring along coasts and east slopes and tablelands of Great Divide (DotE, 2015). It is a wet forest specialist, found mainly in rainforest and wet sclerophyll forest, especially in sheltered gullies and slopes with a dense understorey of ferns and/or shrubs (DotE, 2015).	Potential
Motacilla flava (Yellow Wagtail)	Habitat for this species within the Action area is non-breeding habitat only (DotE, 2015). Habitat requirements for this species are highly variable, but typically include open grassy flats near water (DotE, 2015).	Unlikely
Myiagra cyanoleuca (Satin Flycatcher)	In NSW, this species is widespread on and east of the Great Dividing Range (DotE, 2015). This species is found in Eucalypt forest and woodlands, at high elevations when breeding (DotE, 2015). There is minimal potential habitat for this species in the Action area (Eco Logical, in prep.).	Unlikely
Rhipidura rufifrons (Rufous Fantail)	In NSW this species is widespread on and east of the Great Dividing Range, sometimes recorded further west (DotE, 2015). Important habitat includes moist, dense habitats, including mangroves, rainforest, riparian forests and thickets, and wet eucalypt forests with a dense understorey (DotE, 2015).	Potential
Calidris ferruginea (Curlew Sandpiper)	Littoral and estuarine habitats favoured by this species are absent from the Action area. The closest record of this species is more than 70 km south-east of the Action area (OEH 2016a).	Unlikely
Gallinago hardwickii (Latham's Snipe)	Latham's Snipe is a non-breeding visitor to south-eastern Australia (DEE, 2016c). In Australia, Latham's Snipe occurs in permanent and ephemeral wetlands up to 2,000 m above sea level (DEE, 2016c).	Unlikely
Numenius madagascariensis (Eastern Curlew)	Intertidal mudflats and sandflats favoured by this species are absent from the Action area. The closest record of this species is more than 70 km south-east of the Action area.	Unlikely
Pandion haliaetus (Osprey)	There is no important habitat for this species within the Action area (DotE, 2015). The Action is located at the edge of the known distribution of this species (OEH, 2016b) and there is no potential habitat for this species in the Action area (Eco Logical, in prep.).	Nil

Nature and extent of likely impact

The Action is not likely to have a significant impact on migratory species listed under the EPBC Act as it is unlikely that the Action would:

- substantially modify, destroy or isolate an area of important habitat for a migratory species;
- result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or
- seriously disrupt the lifecycle of an ecologically significant proportion of the population of a migratory species.

This is because:

- None of these species are considered to be at the limit of their known migratory ranges.
- Each of these species is highly mobile and foraging and territorial ranges far exceed the Action area.
- Each of these species is highly mobile and the Action area is not considered to contain limiting foraging or breeding habitat for these species.
- The Action area does not constitute an area of important habitat for any of these species.
- The Action would not involve the direct disturbance of woodland.
- The proposed action is unlikely to disrupt the lifecycle of any of these species.

3.1 (f) Commonwealth marine area
Description

There are no Commonwealth Marine Areas located in the vicinity of the Action. The Commonwealth Marine Area generally stretches from 3 to 200 nautical miles from the Australian coast (DEE, 2016e). As the Action is not located within a Commonwealth Marine Area, the Action is unlikely to impact marine species within a Commonwealth Marine Area.

Nature and extent of likely impact

The Action is unlikely to impact on a Commonwealth Marine Area, and accordingly, is unlikely to have a significant impact on any Commonwealth Marine Area. Secondary effects, including the Action's contribution to global greenhouse gas emissions, would be relatively small.

3.1 (g) Commonwealth land
Description

The Action will not take place on Commonwealth land.

A search of the EPBC Act database using the Protected Matters Search Tool indicates there are two areas of Commonwealth Land within a 20 km radius centred on the Action, which are operated by the Australian Telecommunications Commission and Telstra Corporation Limited.

Nature and extent of likely impact

The Action will not take place on Commonwealth land. The Action is unlikely to impact on Commonwealth land, and accordingly, is unlikely to have a significant impact on any Commonwealth land. Secondary effects, including the Action's contribution to global greenhouse gas emissions, would be relatively small.

3.1 (h) The Great Barrier Reef Marine Park

Description

The Action is not within the Great Barrier Reef Marine Park, or the catchment area of the Great Barrier Reef Marine Park.

Nature and extent of likely impact

The Action will not impact the Great Barrier Reef Marine Park, and accordingly, will not have a significant impact on the Great Barrier Reef Marine Park. Secondary effects, including the Action's contribution to global greenhouse gas emissions, would be relatively small.

3.1 (i) A water resource, in relation to coal seam gas development or large coal mining development

Description

A description of the existing environment in relation to the hydrological characteristics, quality and value of the water resources is provided below.

The NSW DPI Water has developed two groundwater source categories to define the value of groundwater resources as part of the NSW *Aquifer Interference Policy* (NSW Government, 2012):

- highly productive groundwater (total dissolved solids [TDS] of less than 1,500 milligrams per litre [mg/L] and contains water supply works that can yield water at a rate greater than 5 litres per second); and
- less productive groundwater (groundwater that does not meet the highly productive definition).

The terms 'highly productive' and 'less productive' are referred to throughout this section.

Hydrology of the Water Resources

The Action area is situated within the Hunter Coalfield subdivision of the Sydney Basin, which forms the southern part of the Sydney-Gunnedah-Bowen Basin.

The stratigraphy in the area surrounding the Action comprises the Triassic Narrabeen Group, Permian coal measures and more recent Quaternary deposits associated with major drainage pathways (HydroSimulations, in prep.) (Figures 11a and 11b). The Action area is situated within the Late Permian age coal measures of the Singleton Supergroup, which comprise mainly coal, shale, sandstone, siltstone, mudstone and conglomerate.

The target coal seam for the Action (Whybrow Seam) lies within the Jerrys Plains Subgroup of the Wittingham Coal Measures that form part of the Singleton Supergroup.

Groundwater Resources

The hydrogeological regime of the Wambo Coal Mine area and surrounds comprises two main systems (HydroSimulations, 2016):

- Quaternary alluvial aquifer system of channel fill deposits associated with Wollombi Brook, North Wambo Creek, Wambo Creek and Stony Creek.
- Underlying Permian strata consisting of:
  - hydrogeologically 'tight' and hence very low yielding to essentially dry sandstone and lesser siltstone; and
  - low to moderately permeable coal seams, which are the prime water-bearing strata within the Permian measures.

Prior to the commencement of mining operations in the region, the potentiometric surface within the Permian aquifers of the Wambo Coal Mine area most probably reflected the topography, with elevated water levels/pressures in areas distant from the major drainages and reduced levels in areas adjacent to the alluvial lands (HydroSimulations, 2016). Historical and ongoing open cut and underground mining within and surrounding the Action area has created a regional zone of depressurisation within the Permian coal measures (HydroSimulations, 2016).

The alluvium within the Hunter Valley region and more locally is associated with fluvial depositional sequences.

The alluvium associated with North Wambo Creek above the Action area has been affected by open cut mining activities, including the removal of alluvium by open cut mining directly downstream of the Action area (as shown on Figure 11a). A significant portion of alluvium associated with North Wambo Creek (over a distance of approximately 4 km) has been removed by open cut mining activities. These activities have occurred as part of the approved Controlled Action (EPBC 2003/1138). Drawdown in the alluvium within the Action area to date has been approximately 3 m (HydroSimulations, 2015).

Highly productive alluvium associated with the Wollombi Brook is located more than 4 km from the Action area and is no longer directly connected to alluvium in the Action area (Figure 11b).

Surface Water Resources

The Action is located within the Wollombi Brook catchment within the broader Hunter River catchment (Figure 1).

Wollombi Brook drains an area of approximately 1,950 km^2 and joins the Hunter River some 5 km north-east of the Wambo Coal Mine. The Wollombi Brook sub-catchment is bound by the Myall Range to the south-east, Doyles Range to the west, the Hunter Range to the south-west and Broken Back Range to the north-east (Hunter Catchment Management Trust, 2002).

The Action area is within the catchment area of:

- North Wambo Creek; and
- the water management system of the approved Wambo Coal Mine open cut and infrastructure areas.

A section of North Wambo Creek has been diverted to avoid the Wambo open cut and this water control system was approved as part of the approved Controlled Action (EPBC 2003/1138). The North Wambo Creek Diversion is located within and downstream of the Action area.

North Wambo Creek and its tributaries in the Action area are generally considered ephemeral.

Analysis by Advisian (2016) indicates flows in excess of 1 megalitre per day can be expected on approximately 34 days per year in North Wambo Creek (9% of days).

Relevant Water Sharing Plans

The NSW State Government has implemented a number of water sharing plans (i.e. state water resource plans) for rivers and groundwater systems under the NSW *Water Management Act, 2000*, that are applicable to the Action.

The regulatory instruments and applicable water sources and water management zones relevant to the Action are summarised in Table 8. For the groundwater resources, the relevant aquifer and level of productivity based on the categories in NSW Government (2012) is also presented.

Table 8
Relevant State Water Resource Plans and Water Sources

Regulatory Instrument	Water Source	Relevant Aquifer	Productivity[1]
Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009	Lower Wollombi Brook	Alluvial aquifers associated with Wollombi Brook outside the Action area	Highly Productive
		Alluvial aquifers associated with North Wambo Creek	Less Productive
Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016	Sydney Basin-North Coast Groundwater Source	Permian 'porous rock' aquifer	Less Productive
Water Sharing Plan for the Hunter Regulated River Water Source 2003	Zone 1B (Hunter River from Goulburn River Junction to Glennies Creek Junction) Zone 2A (Hunter River from Glennies Creek Junction to Wollombi Brook Junction)	N/A (Regulated River Water Source)	N/A (Regulated River Water Source)

[1] As designated by the NSW DPI Water.

Water Quality of the Water Resources

Groundwater Resources

An extensive groundwater monitoring network in the vicinity of the Action is maintained for the approved Wambo Coal Mine in accordance with a Groundwater Monitoring Program approved by the NSW DP&E (Figure 12).

Groundwater in the alluvium is recharged from multiple sources with varying qualities.

The salinity of groundwater recently sampled from areas surrounding the Action is variable. Although bores GW16 and GW17 are only 250 m apart (Figure 12), and both are alongside North Wambo Creek, their salinities are quite different. The groundwater at GW16 has always been less than 1,000 microSiemens per centimetre (µS/cm) while the groundwater at GW17 is typically about 5,000 µS/cm (HydroSimulations, 2015).

Higher salinities are reported from the surficial groundwater (colluvium and weathered Permian) within the area surrounding the Action.

Surface Water Resources

An extensive surface water monitoring network in the vicinity of the Action is maintained for the approved Wambo Coal Mine in accordance with a Surface Water Monitoring Program approved by the NSW DP&E (Figure 12).

North Wambo Creek within the Action area is highly ephemeral, which has limited the number of water quality samples taken as part of the monitoring program. The available data indicates that the surface water quality of North Wambo Creek within the Action area can be characterised as being:

- near neutral to slightly alkaline (pH ranging from 7.3 to 8.7); and
- electrical conductivity values ranging from 256 to 563 µS/cm (WCPL, 2015).

Value of the Water Resources

As detailed in Section 5.2.1 of the *Significant impact guidelines 1.3: Coal seam gas and large coal mining developments—impacts on water resources* (Significant Impact Guidelines – Water Resources) (DotE, 2013b), the value of a water resource is determined by its utility for third party uses, including environmental and other public benefit outcomes (e.g. use by other industries, recreation and tourism uses or the maintenance of ecosystem function).

Groundwater Resources

The alluvium within the Action area has been disconnected from the regional alluvial system with the removal of alluvium downstream by the approved open cut mining operations (Figures 11a and 11b).

The Permian groundwater sources are generally low yielding and brackish to saline, and are therefore considered to have low potential for use.

The Action area is within land owned by WCPL and there are no bores within the Action area that are used for irrigation, domestic or stock use.

Culturally Significant Sites

The relevant water sharing plans do not identify any culturally significant sites in the vicinity of the Action.

Groundwater Dependent Ecosystems

The closest 'high priority' groundwater dependent ecosystem (GDE) identified by the NSW Government is Parnell Spring. Parnell Spring likely flows from the Triassic age Narrabeen Group and is located approximately 11 km south-southwest of the Action area. The Wambo Coal Mine has resulted in negligible drawdown in Triassic age material.

Potential GDEs in the Action area and surrounds have been identified through a review of the relevant water sharing plans, the regional mapping of GDEs in the Bureau of Meteorology *Atlas of Groundwater Dependent Ecosystems* (2016) and the vegetation mapping conducted by FloraSearch (in prep.) (Figure 10). The Bureau of Meteorology (2016) has not mapped any identified GDEs or vegetation with high potential to be a GDE in the Action area.

There is not considered to be any vegetation in the Action area that solely relies on water from groundwater aquifers. The vegetation along the upper reaches of North Wambo Creek (Forest Red Gum - Rough-barked Apple - River Sheoak Forest – Figure 10) may have some reliance on perched groundwater associated with creek sediments.

Surface Water Resources

North Wambo Creek and its tributaries in the Action area are generally considered ephemeral and have been subject to disturbance from past agricultural and mining activities. The watercourses that would be affected by subsidence from the Action are located on land owned by WCPL and are not utilised for water supply.

The contribution of the North Wambo Creek catchment within and upstream of the Action area is approximately 1% of the total catchment of Wollombi Brook.

Nature and extent of likely impact

The potential impacts of the Action in regards to the hydrology and water quality of water resources are considered below. This assessment builds upon a number of hydrological and hydrogeological studies conducted for the Wambo Coal Mine and the significant record of environmental monitoring at the Wambo Coal Mine (Figure 12).

Potential Impacts on Water Levels in Permian Aquifers

Historical and ongoing open cut and underground mining within and surrounding the Action area has created a regional zone of depressurisation within the Permian coal measures (HydroSimulations, 2016).

The target coal seam (Whybrow Seam) has been mined by the adjacent open cut operations to the north and the current mining in the South Bates Underground Mine to the east. It is anticipated that dewatering of the Whybrow Seam during longwall mining for the Action (over a period of approximately 5 years) would not have a significant impact on water levels in the Permian coal measures from a regional perspective.

Potential Impacts on Water Levels in Alluvial Aquifers

The alluvium within the Action area is disconnected from the regional alluvial system as a result of approved open cut mining operations that have occurred to date (Figures 11a and 11b). Highly productive alluvium associated with the Wollombi Brook is located more than 4 km from the Action area and no longer directly connected to alluvium in the Action area (Figure 11b).

The Action is expected to have negligible impact on the regional alluvial system.

Alluvium within the Action area has been affected by open cut mining activities, with approximately 3 m of drawdown in the alluvium within the Action area to date (HydroSimulations, 2015).

Observations of previous underground mining beneath alluvium at the Wambo Coal Mine have shown a temporary decline in groundwater levels during the passage of the longwall with recovery during higher rainfall conditions.

Subsidence Impacts on Ephemeral Watercourses

Subsidence impacts on ephemeral watercourses may include increased ponding as a result of differential subsidence, increased erosion as a result of increased bed gradients and/or cracking of the channel bed as a result of tensile strains.

WCPL would implement monitoring and remediation measures to mitigate the potential subsidence impacts on these watercourses. Following the implementation of remediation measures during and following mining, there would be negligible diversion of surface water flows and negligible impact on downstream water quality.

There would be no surface water users affected by these subsidence impacts. The ephemeral nature of these watercourses limits the aquatic or terrestrial fauna habitat resources associated with these areas.

Licensing and Water Entitlements

Under the *Water Management Act, 2000*, all water taken by aquifer interference activities is required to be accounted for within the extraction limits set by any relevant water sharing plans (i.e. state water resource plans). Therefore, licensing under the *Water Management Act, 2000* is required to account for any loss of water as a result of the Action from the coal seams and adjacent hardrock and alluvial aquifers.

WCPL would hold/acquire any necessary licences and approvals for the predicted water take associated with the Action, prior to the commencement of the Action, in accordance with (but not limited to) the following:

- *Water Management Act, 2000*, including:
  - *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009.*
  - *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016.*
  - *Water Sharing Plan for the Hunter Regulated River Water Source 2003.*
- NSW *Access Licence Dealings Principles Order 2004*.

Following completion of the Action, WCPL would surrender any licence entitlements required to account for post-closure water takes in perpetuity.

Potential Impacts on Existing Water Users

As described above, the Action area is within land owned by WCPL. The groundwater and surface water within the Action area are not used for irrigation, domestic and/or stock water supply.

In addition, WCPL would hold/acquire any necessary licences and approvals for the predicted water take associated with the Action.

No material impacts on water users are anticipated as a result of the Action.

Potential Impacts on Culturally Significant Sites

As described above, there are no culturally significant sites listed in the relevant water sharing plans. Therefore, there are no potential impacts on culturally significant sites anticipated as a result of the Action.

Potential Impacts on Groundwater Dependent Ecosystems

As described above, there is not considered to be any vegetation in the Action area that solely relies on water from groundwater aquifers. The vegetation along the upper reaches of North Wambo Creek may have some reliance on perched groundwater associated with creek sediments.

Riparian vegetation has been previously undermined elsewhere on North Wambo Creek by the Wambo Coal Mine. Annual monitoring of these areas for several years following completion of mining shows that riparian vegetation remains in generally good condition (Eco Logical, 2015).

Summary of Impacts on Hydrology

Based on the above, there would be no significant additional impact on the hydrological characteristics of the Permian aquifers or alluvial aquifers, or surface water flows as a result of the Action in isolation. Any potential changes in water quantity, integrity of hydrological or hydrogeological connections or changes in the area or extent of the water resources as a result of the Action would not be significant from a regional perspective.

Water Quality of the Water Resources

Regional water quality objectives relevant to the Action area include the following:

- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand [ANZECC & ARMCANZ], 2000); and
- The National Water Quality Management Strategy (DotE, 2014).

Impacts Associated with Underground Mining and Associated Activities

Surface disturbance for the Action is minor and temporary, and appropriate erosion and sediment controls would be installed. It is therefore considered unlikely that there would be significant impacts on the surface water sources as a result of surface runoff from the Action and the relevant local water quality objectives would not be materially affected.

There are no simulated risks of reduced beneficial uses of the alluvium as a result of underground mining activities associated with the Action (HydroSimulations, in prep.).

There is not expected to be a migration of groundwater away from the additional underground mining areas in the Permian aquifers either during mining or following completion of mining activities. On this basis, the Wambo Coal Mine would not lower the beneficial use category of the groundwater within the Permian aquifers.

Licensed Water Discharges

The site water management strategy for the Wambo Coal Mine is based on the containment and re-use of mine water and on the control of sediment that may be potentially carried with runoff from disturbed areas such as the waste rock emplacements. Groundwater inflows associated with the Action would be managed as part of the Wambo Coal Mine's integrated water management system.

The Wambo Coal Mine releases water to the Wollombi Brook in accordance with its Environment Protection Licence (EPL) 529, which operates under the arrangements of the Hunter River Salinity Trading Scheme (a state water quality management plan). These arrangements require flow in Wollombi Brook to exceed 500 megalitres per day (measured at the Bulga gauging station) for water releases to occur.

As any water releases would comply with the rules of the Hunter River Salinity Trading Scheme, which accounts for other third party uses, water releases associated with the Action are considered unlikely to have a significant impact on the water quality of Wollombi Brook or the Hunter River.

Summary of Impacts on Water Quality

The Action is not expected to result in the lowering of beneficial use categories in any of the relevant aquifers or any surface watercourses, and would not result in a significant change to the water quality of the receiving environment. Therefore it is anticipated that the Action would not materially compromise relevant local or regional water quality objectives.

The Action would not result in any significant changes in the ability to achieve relevant local or regional water quality objectives (i.e. water quality targets of the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* [ANZECC & ARMCANZ, 2000] or the National Water Quality Management Strategy [DotE, 2014]).

There would be no significant worsening of the local quality of water and/or high quality water releases into systems adapted solely to lower quality water as a result of the Action, as controlled water releases from the Wambo Coal Mine would continue in accordance with the Hunter River Salinity Trading Scheme.

Therefore, it is considered unlikely that there would be a significant impact on the water quality of local or regional watercourses, alluvial aquifers or the Permian aquifers.

Cumulative Impacts

A range of open cut and underground mine operations has been conducted at the Wambo Coal Mine since mining operations commenced in 1969.

Historically there has been, and there continues to be, a substantial amount of coal mining in the area surrounding the Wambo Coal Mine. This is carried out by a number of companies with development occurring across several coal seams. Coal has been extracted by means of both underground and open cut mining methods. Coal mines adjacent to the Wambo Coal Mine include (Figure 5):

- Hunter Valley Operations, to the north and east;
- Mt Thorley-Warkworth Complex, to the east; and
- United Collieries (in care and maintenance), to the north and east.

Historical and ongoing open cut and underground mining within and surrounding the Action area has created a regional zone of depressurisation within the Permian coal measures (HydroSimulations, 2016). All neighbouring mines have been included in groundwater model simulations (HydroSimulations, 2016). It is expected that the impacts on water levels due to the Action would not be significant from a regional perspective and in the context of impacts as a result of previous developments.

Summary

As described above, there is unlikely to be a significant impact on water resources as a result of the Action in isolation based on the following:

- Dewatering of the Whybrow Seam during longwall mining for the Action (over a period of approximately 5 years) would not have a significant impact on water levels in the Permian coal measures from a regional perspective due to the regional zone of depressurisation within the Permian coal measures created by historical and ongoing open cut and underground mining.
- There is expected to be negligible impact on the regional alluvial system as a result of the Action as highly productive alluvium associated with the Wollombi Brook is located more than 4 km from the Action area and no longer directly connected to alluvium in the Action area.
- Following remediation during and following mining of any subsidence impacts on ephemeral watercourses, there would be negligible diversion of surface water flows and negligible impact on downstream water quality.
- The Action would not lower the beneficial use category of the groundwater within the Permian aquifers and there are no simulated risks of reduced beneficial uses of the alluvium as a result of underground mining activities associated with the Action.
- Controlled water releases from the Wambo Coal Mine would continue in accordance with the Hunter River Salinity Trading Scheme (a state water quality management plan) that accounts for other third party uses.
- There would be no significant worsening of the local quality of water and/or high quality water releases into systems adapted solely to lower quality water as a result of the Action.
- No material impacts on water users (surface water or groundwater) are anticipated as a result of the Action.

3.2 Nuclear actions, actions taken by the Commonwealth (or Commonwealth agency), actions taken in a Commonwealth marine area, actions taken on Commonwealth land, or actions taken in the Great Barrier Reef Marine Park

3.2 (a)	**Is the proposed action a nuclear action?**	✓	No
			Yes (provide details below)
	If yes, nature & extent of likely impact on the whole environment		

3.2 (b)	**Is the proposed action to be taken by the Commonwealth or a Commonwealth agency?**	✓	No
			Yes (provide details below)
	If yes, nature & extent of likely impact on the whole environment		

3.2 (c)	**Is the proposed action to be taken in a Commonwealth marine area?**	✓	No
			Yes (provide details below)
	If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(f))		

3.2 (d)	**Is the proposed action to be taken on Commonwealth land?**	✓	No
			Yes (provide details below)
	If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(g))		

3.2 (e)	**Is the proposed action to be taken in the Great Barrier Reef Marine Park?**	✓	No
			Yes (provide details below)
	If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(h))		

3.3 Description of the project area and affected area for the proposed action

3.3 (a) Flora and fauna

Threatened flora and fauna species that are known to occur or could possibly occur within the Action area and surrounds are described in Section 3.1(d). A description of the regional and local setting of the Action is provided below.

Regional Setting

The Action area lies in the north of the Sydney Basin Bioregion as defined originally by Thackway and Cresswell (1995) and in the south-west corner of the North Coast Botanical Division (Anderson, 1968; Harden, 2002). The Action area is close to the southern boundary of the Brigalow Belt South Bioregion (Thackway and Cresswell, 1995) and just outside the eastern boundary of the Central Western Slopes Botanical Division (Anderson, 1968; Harden, 2002).

Flora

As detailed in Section 3.1(d), a number of flora surveys in the Action area have been undertaken, including by Orchid Research (2003) and FloraSearch (in prep.).

Vegetation types within the Action area as a result of these surveys are shown on Figure 10.

The most alienated part of the Action area is the flat valley floor and gentle lower slopes in the North Wambo Creek valley, which have been almost completely cleared of their original native tree and shrub cover. The lowlands of the North Wambo Creek valley would have formerly supported tall forests dominated by Forest Red Gum.

The vegetated flatter valley floor parts of the central part of the Action area support open ironbark woodlands dominated by Narrow-leaved Ironbark (*Eucalyptus crebra*). Broad moist lower gullies within these woodlands support a more or less dense mid-storey dominated by the honeymyrtle, *Melaleuca decora*. Above the ironbark woodlands, the steeper stony ridges and footslopes running north-east from the Narrabeen Sandstone escarpment carry tall open woodland dominated by Slaty Box (*Eucalyptus dawsonii*). Fingers of Slaty Box woodland extend into the ironbark dominated areas on low ridges.

Very steep, north and north-east facing slopes below the escarpments north and south of Stony Creek support shrublands dominated by Coastal Myall (*Acacia binervia*).

The condition of vegetation in the Action area is discussed further in Section 3.3(g).

Fauna

A number of fauna habitat types would be present within the Action area, comprising mostly of shrubby woodlands dominated by gum and ironbark species on lower footslopes and flats. Historical logging has reduced the density of hollow-bearing trees in lower relief areas. Remaining hollow-bearing trees and decorticating bark forms habitat for arboreal mammals, hollow-roosting bats and reptile species.

A large proportion of the Action area contains mixed native/exotic derived grassland, which have been historically cleared for predominantly agricultural purposes. These areas generally have low habitat values for fauna, despite providing broader foraging areas for birds of prey and some microbat species.

Exposed rock faces contain caves, crevices and sinkholes that provide habitat for cave roosting (subterranean) microbats, as well as reptiles and other mammal species. Small agricultural dams and ephemeral drainage lines present within and adjacent to the Action area also provide habitat resources.

A number of introduced pest species are either known or expected to occur in the Action area and surrounds, including (DEE, 2016b):

- Rock Pigeon (*Columba livia*);
- Spotted Turtle-Dove (*Streptopelia chinensis*);
- Common Blackbird (*Turdus merula*);
- Common Starling (*Sturnus vulgaris*);
- Common Myna (*Acridotheres tristis*);
- Skylark (*Alauda arvensis*);
- House Sparrow (*Passer domesticus*);
- Nutmeg Mannikin (*Lonchura punctulata*);
- European Goldfinch (*Carduelis carduelis*);
- Cane Toad (*Rhinella marina*);
- House Mouse (*Mus musculus*);
- Black Rat (*Rattus rattus*);
- Domestic Dog (*Canis familiaris*);
- Red Fox (*Vulpes vulpes*);
- Cat (*Felis catus*);
- Brown Hare (*Lepus capensis*);
- Rabbit (*Orctolagus cuniculus*); and
- Domestic Cattle (*Bos Taurus*).

3.3 (b) Hydrology, including water flows

The Action is located within the Wollombi Brook catchment within the broader Hunter River catchment.

Wollombi Brook drains an area of approximately 1,950 km^2 and joins the Hunter River some 5 km north-east of the Wambo Coal Mine. The Wollombi Brook sub-catchment is bound by the Myall Range to the south-east, Doyles Range to the west, the Hunter Range to the south-west and Broken Back Range to the north-east (Hunter Catchment Management Trust, 2002).

North Wambo Creek, an ephemeral watercourse, is located within the Action area.

Water resources in proximity to the Action are considered in detail in Section 3.1(i).

3.3 (c) Soil and Vegetation characteristics

The Action area is situated within the Hunter Coalfield subdivision of the Sydney Basin, which forms the southern part of the Sydney-Gunnedah-Bowen Basin. The coal bearing rocks of the Sydney Basin are Permian in age (i.e. approximately 225 to 270 million years old) and are typically associated with low-lying gentle topography (WCPL, 2003).

The Action area is situated within the Late Permian age coal measures of the Singleton Supergroup, which comprise mainly coal, shale, sandstone, siltstone, mudstone and conglomerate. South and west of the Action area is an escarpment of Triassic Narrabeen Group sandstone overlying the Permian sediments (Figures 11a and 11b).

Soil landscapes in the Action area and surrounds have been mapped by the former NSW Department of Land and Water Conservation as described in the *Soil Landscapes of the Singleton 1:250,000 Sheet* (Kovac and Lawrie, 1991).

Underground mining area 1 has already been disturbed as a result of existing open cut mining operations at the Wambo Coal Mine.

Lees Pinch Shallow Soils and Bulga Soloths soil landscape units were mapped within the Action area by Kovac and Lawrie (1991) as part of their regional mapping. Soils along North Wambo Creek have been considered by Soil Management Designs (2016) to form part of the Wollombi Alluvial Soils described by Kovac and Lawrie (1991).

The Lees Pinch Shallow Soils soil landscape occurs at the base of the Narrabeen Group slopes in the southern and western portions of the Action area. This soil landscape is typically associated with rolling hills to steep mountains (Kovac and Lawrie, 1991). This soil landscape unit is comprised mainly of shallow Siliceous Sands with shallow loams, and is dominated by a number of shrub woodland communities (Kovac and Lawrie, 1991).

The Bulga Soloths soil landscape is typically associated with smooth slopes (up to 10%) forming undulating rises (Kovac and Lawrie, 1991). This soil landscape is comprised mainly of Yellow Soloths on upper to midslopes, and occasionally Yellow and Brown Solodic Soils and Brown Earths on lower slopes (Kovac and Lawrie, 1991). Much of this soil landscape has been cleared for grazing (Kovac and Lawrie, 1991).

The Wollombi Alluvial Soils soil landscape is associated with the valley flats of Wollombi Brook catchment (Kovac and Lawrie, 1991). Native vegetation associated with this soil landscape includes forest oak and river oak, with some areas cleared for grazing on unimproved pastures (Kovac and Lawrie, 1991).

The vegetation types identified in the Action area include (Figure 10):

- Forest Red Gum – Rough-barked Apple – River Sheoak Forest (Community 2).
- Narrow-leaved Ironbark Shrub-Grass Woodland (Community 3).
- *Melaleuca decora* Low Forest (Community 4).
- Slaty-Box Shrubby Woodland (Communities 5 and 5a).
- Coastal Myall Shrubland (Community 6).
- Escarpment Shrubland (Community 7).
- Derived Grassland (Community 8).

3.3 (d) Outstanding natural features

Wollemi National Park is located approximately 100 m from the Action area at its closest point (Figures 4 and 6). Wollemi National Park and its associated escarpment are discussed in Sections 3.1(a). Longwalls at the Wambo Coal Mine would be offset from the base of the escarpment associated with the Wollemi National Park so that there is negligible subsidence impact (Section 4).

3.3 (e) Remnant native vegetation

Refer to Sections 3.1(d), 3.3(a) and 3.3(c) above and Figure 10.

3.3 (f) Gradient (or depth range if action is to be taken in a marine area)

The Wambo Coal Mine is located in the Upper Hunter Valley region where landforms are characterised by gently sloping floodplains associated with the Hunter River and the undulating foothills, ridges and escarpments of the Mount Royal Range and Great Dividing Range.

The Action area has elevations ranging from 100 m Australian Height Datum (AHD) in the north-east to 285 m AHD in the south-west.

3.3 (g) Current state of the environment

The Action area encompasses varied geology, soils and topography that have strongly influenced past land use and, consequently, the condition of the native vegetation (FloraSearch, in prep.).

Historic disturbance factors on the Action area have included:

- clearing of native vegetation (generally on areas of gentler topography and better soil types);
- logging;
- grazing by livestock and introduced feral herbivores such as rabbits;

- construction of tracks and fire trails;
- wildfires (the most recent being in 1994); and
- open cut mining activities and the construction of the North Wambo Creek diversion.

In the Action area, the condition of the vegetation varies from poor to good (FloraSearch, in prep.).

The most alienated part of the Action area is the flat valley floor and gentle lower slopes in the North Wambo Creek valley, which have been almost completely cleared of their original native tree and shrub cover. This cleared land has been used mainly for grazing in recent decades.

Adjacent to the valley area is steeper partially cleared land on the footslopes of the Triassic age Narrabeen Group sandstone. These areas have been semi-cleared and logged historically and have been used mainly for grazing. The tree cover is predominantly regeneration approximately 30 or more years old with occasional scattered old growth trees. These wooded areas tend to occupy poorer soils, and are dominated by native species in all canopy layers. These sites are considered to have retained most of their ecological resilience with a high capacity for regeneration, and are assessed to be in good condition (FloraSearch, in prep.).

3.3 (h) Commonwealth Heritage Places or other places recognised as having heritage values

As described in Section 3.1(b), no National Heritage Places are situated within the Action area. The closest National Heritage Place is the Greater Blue Mountains Area. Wollemi National Park, which is part of the Greater Blue Mountains Area, is located to the south-east of the Action area.

There are no Commonwealth Heritage Places within 20 km of the Action area. The closest Commonwealth Heritage Place is the Murinbin House Group, which is located approximately 28 km to the south-east of the Action area. The Murinbin House Group is a considerable distance from the area of any potential direct or indirect impacts of the Action.

3.3 (i) Indigenous heritage values

Aboriginal cultural heritage assessments conducted to date indicate that the Action area was likely used for foraging and access to the lower lying areas to the east. In the broader area, surveys have identified artefact scatters, isolated finds and scarred trees.

An Aboriginal Cultural Heritage Assessment would be prepared for the South Bates Extension Underground Mine Modification (incorporating the Action), as a component of the Environmental Assessment. The assessment would include the development of surface disturbance protocols, including salvage or demarcation of sites where applicable.

There are no indigenous land use agreements, Aboriginal land claims or joint management arrangements existing over the Action area. The Action area is within the boundary of the Plains Clans of the Wonnarua People registered Native Title claim. The Action area is also within the boundary of the Wonnarua Traditional Custodians Claim #3 Native Title application area.

3.3 (j) Other important or unique values of the environment

As detailed in Section 3.1(a), the Wollemi National Park is located in the vicinity, but outside, of the Action area.

3.3 (k) Tenure of the action area (e.g. freehold, leasehold)

Relevant lot and deposited plan numbers for parcels of land within the Action area and surrounds are provided in Attachment C as discussed in Section 1.6.

The majority of the Action area is owned by WCPL as shown on Figure 4.

3.3 (l) Existing uses of area of proposed action

Underground and open cut mining activities have been occurring in vicinity of the Action area since 1969 and 1974, respectively.

The Action is within the existing mining and exploration tenements of the Wambo Coal Mine.

The operational mines in the vicinity of the Action area include:

- Hunter Valley Operations, to the north and east;
- Mt Thorley-Warkworth Complex, to the east; and
- United Collieries (in care and maintenance), to the north and east.

3.3 (m) Any proposed uses of area of proposed action

Approved and proposed actions in the vicinity of the Action are discussed in Section 2.8.

Existing land uses would continue to occur above the additional underground mining areas during and following mining.

4 Environmental outcomes

The following environmental outcomes, relevant to matters of national environmental significance, would be achieved as a result of the proposed Action:

- No impacts to the World Heritage values of a declared World Heritage property.
- No impacts to the National Heritage values of a National Heritage Place.
- No impacts to the ecological character of a declared Ramsar wetland.
- No significant impacts to listed threatened species or ecological communities or their habitat.
- No significant impacts to listed migratory species.
- No impacts to the environment in a Commonwealth marine area.
- No impacts to the environment on Commonwealth land.
- No impacts to the Great Barrier Reef Marine Park.
- No significant impacts to a water resource, in relation to coal seam gas development and large coal mining development.
- Protection of the environment from nuclear actions.

For relevant matters of national environmental significance, the above would be achieved through compliance with the subsidence impact performance measures in the Development Consent DA 305-7-2003 issued under the NSW planning system, which include the following relevant to matters of national environmental significance:

Wollombi Brook	Negligible impact. Controlled release of excess site water only in accordance with EPL requirements.
Wollemi National Park	Negligible subsidence impacts. Negligible environmental consequences.
Other threatened species, populations or communities	Minor cracking and ponding of the land surface or other impact. Negligible environmental consequences.

5 Measures to avoid or reduce impacts

Environmental monitoring and management at the Wambo Coal Mine is covered by a range of management plans and monitoring programmes overseen by statutory planning provisions, which manage and minimise the impacts of the Wambo Coal Mine on the surrounding environment and community.

Approved management plans/monitoring programmes at the Wambo Coal Mine include:

- Environmental Management Strategy.
- Environmental Monitoring Program.
- Flora and Fauna Management Plan (or Biodiversity Management Plan).
- Site Water Management Plan incorporating the:
  - Groundwater Monitoring Program.
  - Surface Water Monitoring Program.
  - Erosion and Sediment Control Plan.
  - Surface and Groundwater Response Plan.
  - North Wambo Creek Diversion Plan.
- Bushfire Management Plan.
- Blast Management Plan.
- Noise Management Plan.
- Air Quality and Greenhouse Gas Management Plan.
- North Wambo Underground Mine Extraction Plan Longwalls 8 to 10A.
- South Bates Underground Mine Extraction Plan Longwalls 11 to 13.
- Life of Mine Rejects Emplacement Strategy.
- Mine Management Plan: Underground Mining in the Vicinity of Wambo Homestead Complex.

WCPL maintains an extensive monitoring programme whereby data is collected, analysed and maintained for reporting, future examination and assessment.

The performance of the environmental management strategy and its associated plans, programs and strategies are reported annually in the Annual Environmental Management Report, in accordance with Development Consent DA 305-7-2003.

Mine Design Objectives

As outlined in Section 2.1, WCPL's mine layout would achieve the following mine design objectives that have been developed to meet the subsidence impact performance measures for the Wambo Coal Mine (Section 4).

Longwalls at the Wambo Coal Mine would be offset from the base of the escarpment associated with the Wollemi National Park by a distance equivalent to a 26.5 degree angle of draw from the edge of the longwall. This would limit vertical subsidence from the additional underground mining areas to less than 20 mm (i.e. negligible subsidence impacts) at Wollemi National Park.

Flora and Fauna Management

WCPL operates under a Flora and Fauna Management Plan (or Biodiversity Management Plan) prepared in accordance with the conditions of the Controlled Action approval (EPBC 2003/1138) and the conditions of the Development Consent DA 305-7-2003 issued under the NSW planning system.

The Flora and Fauna Management Plan includes the following mitigation strategies to minimise the potential impact from approved mining activities at the Wambo Coal Mine on flora and fauna:

- implementation of a Vegetation Clearance Protocol to delineate areas of remnant vegetation to be cleared and promote progressive clearing and the salvage and reuse of material;
- implementation of a Threatened Species Management Protocol including pre-clearance surveys, threat abatement measures, capture and release and the reuse and provision of habitat resources;
- implementation of a rehabilitation program, including progressive rehabilitation, in conjunction with the Wambo Coal Mine Mining Operations Plan;
- implementation of the RWEP; and
- flora and fauna monitoring, regular review, implementation of an adaptive management approach and reporting.

WCPL also implements programs to control weeds and feral animals on its lands.

WCPL implements a Bushfire Management Plan prepared in consultation with the NSW Rural Fire Service to manage bushfire hazards and to minimise the danger of bushfire spread.

The Flora and Fauna Management Plan (or Biodiversity Management Plan) (and any subsequent approved revisions) would continue to apply at the Wambo Coal Mine incorporating the Action.

Site Water Management Plan

The site water management strategy for Wambo Coal Mine is based on the containment and re-use of mine water and on the control of sediment that may be potentially carried with runoff from disturbed areas such as the waste rock emplacements. The Wambo Coal Mine water management system controls waters generated from development and operational areas while diverting upstream water around such areas.

Water releases from the Wambo Coal Mine (including incorporating the Action) would continue to occur in accordance with WCPL's EPL 529, which operates under arrangements of the Hunter River Salinity Trading Scheme.

The Site Water Management Plan comprises a Groundwater Monitoring Program, Surface Water Monitoring Program, Erosion and Sediment Control Plan, Surface and Groundwater Response Plan and North Wambo Creek Diversion Plan.

These plans approved under the NSW planning system include measures to avoid, mitigate, manage, monitor and remediate potential impacts on surface water and groundwater resources.

The Site Water Management Plan would continue to apply at the Wambo Coal Mine incorporating the Action.

Management of Mine Subsidence

In accordance with the conditions of the Development Consent DA 305-7-2003 issued under the NSW planning system, an Extraction Plan would be prepared prior to the commencement of longwall extraction (also called secondary workings) for all longwalls associated with the Action to:

- demonstrate that the subsidence impact performance measures (Section 4) can be achieved; and
- develop detailed mitigation measures and monitoring to manage the potential impacts and/or environmental consequences on natural and built features.

Siting of Gas Management Infrastructure

The specific locations of gas management infrastructure would be defined as a component of future detailed mine planning and engineering studies during the Action.

Surface disturbance for gas management infrastructure would be restricted to grassland areas that are not threatened ecological communities under the EPBC Act.

Additional surveys of potential gas management infrastructure locations would be conducted. If present, any threatened flora species would be avoided.

Surface disturbance associated with gas management infrastructure would be temporary and isolated in nature. The surface disturbance would occur progressively during mining for the Action and would be rehabilitated progressively as the gas management infrastructure is no longer required.

6 Conclusion on the likelihood of significant impacts

6.1 Do you THINK your proposed action is a controlled action?

✓	No, complete section 5.2
	Yes, complete section 5.3

6.2 Proposed action IS NOT a controlled action.

On the basis of the reasons provided in Section 3, the Action is not considered to be a controlled action as it is not likely to have a significant impact on:

- the World Heritage values of a declared World Heritage property;
- the National Heritage values of a National Heritage Place;
- the ecological character of a declared Ramsar wetland;
- a listed threatened species, threatened ecological community, or their habitat;
- a listed migratory species;
- the hydrology or water quality of water resources (in consideration of the value of the resources);
- the environment in a Commonwealth marine area;
- the environment on Commonwealth land; or
- the Great Barrier Reef Marine Park.

6.3 Proposed action IS a controlled action

	Matters likely to be significantly impacted
	World Heritage values (sections 12 and 15A)
	National Heritage places (sections 15B and 15C)
	Wetlands of international importance (sections 16 and 17B)
	Listed threatened species and communities (sections 18 and 18A)
	Listed migratory species (sections 20 and 20A)
	Protection of the environment from nuclear actions (sections 21 and 22A)
	Commonwealth marine environment (sections 23 and 24A)
	Great Barrier Reef Marine Park (sections 24B and 24C)
	A water resource, in relation to coal seam gas development and large coal mining development (sections 24D and 24E)
	Protection of the environment from actions involving Commonwealth land (sections 26 and 27A)
	Protection of the environment from Commonwealth actions (section 28)
	Commonwealth Heritage places overseas (sections 27B and 27C)

7 Environmental record of the person proposing to take the action

		Yes	No
7.1	**Does the party taking the action have a satisfactory record of responsible environmental management?** **Provide details** WCPL has a strong record of compliance with its environmental obligations for its underground mining operations under Development Consent DA 305-7-2003 (as modified). WCPL has established and is committed to continuing open and constructive dialogue with the local community and stakeholders regarding environmental management as part of their operations. Annual Environmental Management Reports are available on the Wambo Coal Mine website (http://www.peabodyenergy.com/content/422/australia-mining/new-south-wales/wambo-mine/approvals-plans-and-reports-wambo-mine). The environmental monitoring program results over recent years have shown that WCPL's management of underground operations at the Wambo Coal Mine provides effective management of potential impacts from the mine's operations and achieves compliance with the subsidence impact performance measures in the Development Consent (DA 305-7-2003).	✓	
7.2	**Provide details of any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against:** **(a) the person proposing to take the action, or** **(b) if a permit has been applied for in relation to the action - the person making the application.** **If yes, provide details** On 1 August 2014, WCPL was convicted in the Singleton Local Court for an offensive odour offence under section 129(1) of the NSW *Protection of the Environment Operations Act, 1997* for a blast fume incident associated with the open cut mining operations which occurred on 24 July 2012. WCPL was ordered to pay a fine of $13,000 and the NSW Environment Protection Authority's costs in the amount of $24,000. WCPL also pleaded guilty to an offensive odour offence under section 129(1) of the *Protection of the Environment Operations Act, 1997* for a blast fume incident associated with the open cut mining operations which occurred on 14 May 2014. The proceedings in respect of this offence were brought by the NSW Environment Protection Authority in the Land and Environment Court of NSW. A sentencing hearing was held on 17 December 2015, and the Court delivered its judgement on 26 September 2016. WCPL was ordered to pay a fine of $60,000. No approval under environmental protection legislation has been revoked or suspended in the 5 years immediately prior to this application being made.	✓	

7.3	**If the person taking the action is a corporation, please provide details of the corporation's environmental policy and planning framework and if and how the framework applies to the action.** The Action would be undertaken in accordance with the Wambo Coal Mine environmental management system (refer Section 5) and Peabody's values as articulated in its Mission Statement: • **Safety:** We commit to safety and health as a way of life. • **Customer Focus:** We provide customers with quality products and excellent service. • **Leadership:** We have the courage to lead, and do so through inspiration, innovation, collaboration and execution. • **People:** We offer an inclusive work environment and engage, recognize and develop employees. • **Excellence:** We are accountable for our own success. We operate cost-competitive mines by applying continuous improvement and technology-driven solutions. • **Integrity:** We act in an honest and ethical manner. • **Sustainability:** We take responsibility for the environment, benefit our communities and restore the land for generations that follow.		
7.4	**Has the party taking the action previously referred an action under the EPBC Act, or been responsible for undertaking an action referred under the EPBC Act?** **Provide name of proposal and EPBC reference number (if known)** The Wambo Development Project was determined to be a Controlled Action in 2003 (EPBC 2003/1138) and subsequently approved in November 2004. The Wambo Development Project included the continued development of open cut and underground mining operations at the Wambo Coal Mine and the development and operation of rail and train loading infrastructure. The South Wambo Underground Mine Extension was determined to be a Controlled Action in January 2016 (EPBC 2016/7636). Approval of this Action is pending completion of the bilateral assessment process with the NSW Government. The South Wambo Underground Mine Extension is a proposed extension of underground coal mining operations specifically associated with the South Wambo Underground Mine at the Wambo Coal Mine and related surface infrastructure and activities.	✓	

8 Information sources and attachments

(For the information provided above)

8.1 References

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8.2 Reliability and date of information

The information presented in Section 3 was sourced from publicly available data and numerous past surveys and assessments undertaken for the Wambo Coal Mine and current surveys/assessments in preparation for the Action. Information in this referral was compiled using assessments current as at 2016, and included:

- Wambo Development Project Environmental Impact Statement (WCPL, 2003) – various terrestrial flora, terrestrial fauna and aquatic ecology assessments;
- North Wambo Underground Mine Modification (WCPL, 2012) – various terrestrial flora, terrestrial fauna, Aboriginal cultural heritage and groundwater assessments;
- North Wambo Underground Mine Longwall 10A Modification (WCPL, 2014) – various terrestrial flora, terrestrial fauna, Aboriginal cultural heritage, surface water and groundwater assessments;
- South Bates (Wambo Seam) Underground Mine Modification (WCPL, 2015) – various terrestrial flora, terrestrial fauna, Aboriginal cultural heritage and groundwater assessments;
- South Wambo Underground Mine Modification (WCPL, 2016) – various terrestrial flora, terrestrial fauna, Aboriginal cultural heritage, groundwater and surface water assessments;
- Wambo Coal Mine Environmental Management System and associated management plans;
- WCPL project team (project information);
- Review and input from FloraSearch and Eco Logical Australia (*baseline flora and fauna surveys and impact assessments* – in prep.);
- Review and input from HydroSimulations (*groundwater assessment* – in prep.);
- South East Archaeology (in prep.) (*cultural heritage impact assessment*); and
- BioNet (OEH, 2016a) and the EPBC Act Protected Matters Search Tool (DEE, 2016b) (database searches within and surrounding the Action area).

Minimal uncertainty regarding the information used in Section 3 is expected given:

- the number of site-based surveys and assessments conducted in the vicinity of the Action;
- the period of operational experience at the Wambo Coal Mine;
- the comprehensive nature of the studies;
- the consultation process conducted with key stakeholders to date; and
- the mitigation measures proposed for the Action.

8.3 Attachments

		✓ attached	Title of attachment(s)
You must attach	figures, maps or aerial photographs showing the locality of the proposed action (section 1)	✓	Figure 1 Regional Location. Figure 2 Wambo Coal Mine Approved by EPBC 2003/1138. Figure 3 Proposed Action. Figure 4 Land Tenure. Figure 5 Other Proposed Actions.
	GIS file delineating the boundary of the referral area (section 1)		
	figures, maps or aerial photographs showing the location of the proposed action in respect to any matters of national environmental significance or important features of the environments (section 3)	✓	Figure 3 Proposed Action. Figure 4 Land Tenure. Figure 6 Greater Blue Mountains Area. Figure 7 Threatened Flora Records. Figure 8 Threatened and Migratory Fauna Records. Figure 9 Threatened Ecological Communities listed under the EPBC Act. Figure 10 Vegetation Communities. Figure 11a Regional Geology Mapping in the Action Area. Figure 11b Regional Geology Mapping in the Wambo Coal Mine Area. Figure 12 Locations of Surface Water and Groundwater Monitoring Sites.
If relevant, attach	copies of any state or local government approvals and consent conditions (section 2.5)		N/A
	copies of any completed assessments to meet state or local government approvals and outcomes of public consultations, if available (section 2.6)		N/A
	copies of any flora and fauna investigations and surveys (section 3)		N/A
	technical reports relevant to the assessment of impacts on protected matters that support the arguments and conclusions in the referral (section 3) conclusions in the referral (section 3 and 4)		N/A
	report(s) on any public consultations undertaken, including with Indigenous stakeholders (section 3)		N/A

9 Contacts, signatures and declarations

Proposed action title: SOUTH BATES EXTENSION UNDERGROUND MINE

9.1 Person proposing to take action

Name and Title: Mr Micheal Alexander

Organisation: Wambo Coal Pty Limited

Trust deed: □ attached; OR

☑ not applicable

ACN / ABN: 13000668057

Postal address: Wambo Coal Pty Limited, PMB 1, Singleton NSW 2330

Telephone: (02) 6570 2200

Email: malexander@peabodyenergy.com

COMPLETE THIS SECTION ONLY IF YOU QUALIFY FOR EXEMPTION FROM THE FEE(S) THAT WOULD OTHERWISE BE PAYABLE

I qualify for exemption from fees under section 520(4C)(e)(v) of the EPBC Act because I am:

□ an individual; OR

□ a small business entity – aggregated turnover is less than $2million for the previous income year (as prescribed within section 328-110 (other than subsection 328-119 (4)) of the *Income Tax Assessment Act 1997*); OR

□ a small business entity – aggregated turnover for the current financial year is likely to be less than $2million (note that aggregated turnover for one of the previous two income years must also be less than $2million) (as prescribed within section 328-110 (other than subsection 328-119 (4)) of the *Income Tax Assessment Act 1997*) (Cth)).

☑ not applicable.

If you are small business entity you must provide the Date/Income Year that you became a small business entity:

COMPLETE THIS SECTION ONLY IF YOU WOULD LIKE TO APPLY FOR A WAIVER

I would like to apply for a waiver of full or partial fees under regulation 5.21A of the EPBC Regulations. Under regulation 5.21A(5), you must include information about the applicant (if not you) the grounds on which the waiver is sought and the reasons why it should be made:

☑ not applicable.

Declaration:

I declare that to the best of my knowledge the information I have given on, or attached to this form is complete, current and correct.
I understand that giving false or misleading information is a serious offence.
I declare that I am not taking the action on behalf of or for the benefit of any other person or entity.

Signature: **Date**: 16/11/2016

9.2 Designated proponent

Name of proposed proponent: Wambo Coal Pty Limited

ACN / ABN:

Postal address:

Telephone:

Email:

Declaration by the proposed proponent: I ....., the proposed proponent, consent to the proposed designation of myself as the proponent for the purposes of the action described in this referral.

Signature : **Date**:

Declaration by the person proposing to take the action: I ....., the person proposing to take the action, consent to the proposed designation of..... as proponent for the purposes of the action described in this referral.

Signature : **Date**:

9.3 Person preparing the referral information (if different from section 9.1)

Name:

Title:

Organisation:

ACN / ABN:

Postal address:

Telephone:

Email:

Declaration: I declare that to the best of my knowledge the information I have given on, or attached to this form is complete, current and correct.
I understand that giving false or misleading information is a serious offence.

Signature: **Date**:

REFERRAL CHECKLIST

HAVE YOU:

- ☑ Completed all required sections of the referral form?
- ☑ Included accurate coordinates (to allow the location of the proposed action to be mapped)?
- ☑ Provided a map showing the location and approximate boundaries of the project area for the proposed action?
- ☑ Provided a map/plan showing the location of the action in relation to any matters of NES?
- ☑ Provided a digital file (preferably ArcGIS shapefile, refer to guidelines at Attachment A) delineating the boundaries of the referral area?
- ☑ Provided complete contact details and signed the form?
- ☑ Provided copies of any documents referenced in the referral form?
- ☑ Ensured that all attachments are less than three megabytes (3mb)?
- ☑ Sent the referral to the Department (electronic and hard copy preferred)

Figures

Refer to Files Provided Separately

Attachment A

Geographic Information System (GIS) data supply guidelines

If the area is less than 5 hectares, provide the location as a point layer. If the area greater than 5 hectares, please provide as a polygon layer. If the proposed action is linear (eg. a road or pipeline) please provide a polyline layer.

GIS data needs to be provided to the Department in the following manner:

- Point, Line or Polygon data types: ESRI file geodatabase feature class (preferred) or as an ESRI shapefile (.shp) zipped and attached with appropriate title
- Raster data types: Raw satellite imagery should be supplied in the vendor specific format.
- Projection as GDA94 coordinate system.

Processed products should be provided as follows:

- For data, uncompressed or lossless compressed formats is required - GeoTIFF or Imagine IMG is the first preference, then JPEG2000 lossless and other simple binary+header formats (ERS, ENVI or BIL).
- For natural/false/pseudo colour RGB imagery:
    - If the imagery is already mosaiced and is ready for display then lossy compression is suitable (JPEG2000 lossy/ECW/MrSID). Prefer 10% compression, up to 20% is acceptable.
    - If the imagery requires any sort of processing prior to display (i.e. mosaicing/colour balancing/etc) then an uncompressed or lossless compressed format is required.

Metadata or 'information about data' will be produced for all spatial data and will be compliant with ANZLIC Metadata Profile. (http://www.anzlic.org.au/policies_guidelines#guidelines).

The Department's preferred method is using ANZMet Lite, however the Department's Service Provider may use any compliant system to generate metadata.

Privacy and Confidentiality Notice

The Department is required under section 74(3) of the *Environment Protection and Biodiversity Conservation Act 1999* (**EPBC Act**) to publish the information (including personal information of the author and/or third parties) provided in this referral on the internet. The information published may include your personal information.

Information including your personal information included in this referral will be used for the purposes of administering the EPBC Act. The information may be provided to various Commonwealth, State and Territory agencies for the purposes of administering the Act or other Commonwealth, State or Territory legislation. For example, if the proposed action (or a component of it) is to be taken in the GBRMP, the Minister is required to provide a copy of your referral to GBRMPA (see section 73A, EPBC Act). For information about how the GBRMPA may use your information, see http://www.gbrmpa.gov.au/privacy/privacy_notice_for_permits.

The Department will collect, use, store and disclose the personal information contained in this referral in a manner consistent with its obligations under the *Privacy Act 1988* and the Department's privacy policy.

The Department's privacy policy contains details about how respondents may access and make corrections to personal information that the Department holds about the respondent, how respondents may make a complaint about a breach of an Australian Privacy Principle, and how the Department will deal with that complaint.

A copy of the Department's privacy policy is available at: http://environment.gov.au/privacy-policy.

The Department is not obliged to publish information that the Minister is satisfied in commercial-in-confidence. If you believe that this referral contains information that is commercial-in-confidence, you must clearly identify such information and the reason for its confidentiality at the time of making the referral. The Minister cannot be satisfied that particular information included in a referral is commercial-in-confidence unless you demonstrate to the Minister (by providing reasons in writing) that:

- release of the information would cause competitive detriment to the person; and
- the information is not in the public domain; and
- the information is not required to be disclosed under another law of the Commonwealth, a State or a Territory; and
- the information is not readily discoverable.

The Department is subject to certain legislative and administrative accountability and transparency requirements of the Australian Government including disclosures to the Parliament and its Committees. While the Department will treat all referral information provided in this referral sensitively, any information contained in or relating to a referral, including information identified by a person as commercial-in-confidence, may be disclosed by the Department:

- to its employees and advisers in order to evaluate or assess a referral;
- to the Parliamentary Secretary;
- within the Department or other agencies where this serves the legitimate interest of the Australian Government;
- in response to a request by a House or Committee of the Parliament of the Commonwealth of Australia;
- where information is authorised or permitted by law to be disclosed; and
- where the information is in the public domain other than by the Department's disclosure of that information.

Attachment C
Parcels of Land within the Action Area

Tenure Type	Lot Number	Deposited Plan Number
Freehold	A	DP33149
Freehold	B	DP33149
Freehold	C	DP33149
Freehold	3	DP753817
Freehold	4	DP753817
Freehold	5	DP753817
Freehold	6	DP753817
Freehold	10	DP753817
Freehold	22	DP753817
Freehold	66	DP753817
Freehold	67	DP753817
Freehold	73	DP753817
Freehold	113	DP753817
Freehold	208	DP753817
Muswellbrook Shire Council or Department of Lands (Crown)	Other roads located between or adjacent to the above parcels of land	