

# RAVENSWORTH OPERATIONS

## ECOLOGICAL ASSESSMENT TAILINGS PIPELINE

### RAVENSWORTH OPERATIONS TO MT OWEN COMPLEX



REPORT TO

RAVENSWORTH OPERATIONS PTY LIMITED

10 NOVEMBER 2015

Forest Fauna Surveys Pty Ltd  
Eastcoast Flora Survey

**Ravensworth Operations Pty Limited**  
  
**Ecological Assessment**  
**Proposed Tailings Pipeline**  
**Ravensworth Operations to Mt Owen Complex**

**Report prepared for**  
  
**Ravensworth Operations Pty Limited**

This report prepared by

Michael Murray B.Sc.(Hons)  
Director  
**Forest Fauna Surveys Pty Ltd**

Stephen Bell (Ph.D)  
Principal  
**Eastcoast Flora Survey**

**Document History**

Document No.	Prep. Date	Version	Checked by	Date
00344.b	7 August 2015	Draft	G. Newton, D. Ryba, J. Martin	10 August 2015
00344.c	19 August 2015	Final Draft	D. Ryba	20.08.2015
00344.0	21 August 2015	FINAL		
00344.1	10 November 2015	Revised FINAL		

## Table of Contents

EXECUTIVE SUMMARY .....	iv
1.0 INTRODUCTION .....	5
2.0 METHODOLOGY .....	6
2.1 Vegetation Assessment .....	6
2.2 Fauna Habitats and Species .....	6
3.0 RESULTS.....	7
3.1 Vegetation .....	7
3.1.1 Plant Species .....	7
3.1.2 Vegetation Communities .....	7
3.2 Fauna Habitats and Species .....	11
3.2.1 Open Space .....	11
3.2.2 Open Grassland .....	11
3.2.3 Regrowth Woodland .....	12
3.2.4 Riparian Habitat .....	12
3.2.5 Farm Dams .....	12
3.3 Threatened Flora / Fauna / Endangered Ecological Communities Recorded along route. ....	13
4.0 Impact Assessment .....	16
4.1 Central Hunter Valley Eucalypt forest and woodland endangered ecological community (EPBC Act 1999)	16
4.2 Hunter Valley Weeping Myall Woodland Endangered Population .....	16
4.3 Central Hunter Grey Box – Ironbark Woodland (TSC Act 1995) .....	16
4.4 Central Hunter Ironbark – Spotted Gum – Grey Box Forest.....	16
4.5 Hunter Floodplain Red Gum Woodland .....	16
4.6 River Oak vegetation in the River-Flat Eucalypt Forest on Coastal Floodplain. ....	17
4.7 Tiger Orchid <i>Cymbidium canaliculatum</i> Endangered Population.....	17
4.8 Pine Donkey Orchid <i>Diurus tricolor</i> Endangered Population in the Muswellbrook LGA .....	17
4.9 River Red Gum Population in the Hunter Catchment and Slaty Red Gum .....	17
4.10 Trailing Woodruff <i>Asperula asthenes</i> .....	17
4.11 <i>Ozothamnus tessellatus</i> .....	17
4.12 Green and Golden Bell Frog .....	18
4.13 Blue-billed Duck, Freckled Duck, Black-necked Stork.....	18
4.14 Spotted Harrier, Little Eagle.....	18
4.15 Brown Treecreeper, Speckled Warbler, Grey-crowned Babbler, Hooded Robin .....	18
4.16 Spotted-tail Quoll.....	19
4.18 Grey-headed Flying Fox, microbats (Eastern Freetail-bat, Eastern Bent-wing Bat, Southern Myotis, Greater Broad-nosed Bat, Eastern Cave Bat) .....	19
5.0 DISCUSSION.....	21
6.0 CONCLUSION .....	22

7.0	REFERENCES .....	22
APPENDIX 1.	Plant Species List .....	23

### List of Tables

<b>Table 1.</b>	Threatened plant species within ~10 km radius of the proposed site .....	6
<b>Table 2.</b>	Vegetation Communities along pipeline route .....	7
<b>Table 3.</b>	Endangered Ecological Communities and Threatened Species in Locality .....	14

### List of Figures

<b>Figure 1.</b>	Proposed tailings pipeline route .....	5
<b>Figure 2.</b>	Example of Derived Grassland adjacent to existing conveyor belt, and site of proposed pipeline. ....	8
<b>Figure 3.</b>	Riparian Swamp Oak Forest around old dam, adjacent to proposed pipeline easement.....	8
<b>Figure 4.</b>	Riparian River Oak Forest at Bowmans Creek crossing, showing weedy understorey. ....	9
<b>Figure 5.</b>	Vegetation Communities, Western sector, Ravensworth Operations. ....	10
<b>Figure 6.</b>	Vegetation Communities, central sector, Ravensworth Operations. ....	10
<b>Figure 7.</b>	Vegetation Communities, eastern sector, Ravensworth Operations.....	11

## EXECUTIVE SUMMARY

This report was prepared to assess any potential ecological impact associated with the construction of a new tailings pipeline to be located between Ravensworth Complex coal preparation plant and the Ravensworth East – West Pit Void approved tailings emplacement area. An additional section of tailings pipeline from Liddell Coal Operations preparation plant joins the proposed tailings pipeline north of Foy Brook (also termed Baywater Creek). This section has previously been assessed by MOD 5 of DA 305-11-01 (Umwelt, 2013).

Four vegetation communities were delineated for the proposed pipeline route, and these have been equated to the regional classification developed by Peake (2006) and listed Threatened Ecological Communities (TECs) under both the federal and NSW threatened species legislation. All of these communities are severely disturbed and / or are in an early colonising phase after previous land clearing. Isolated trees and small regenerating patches of *Eucalyptus crebra* and *Eucalyptus moluccana* allude to the recently listed *EPBC Act 1999 Critically Endangered Ecological Community - Central Hunter Grey Box – Ironbark Woodland TEC* formerly present in the area. However, such patches are very small and unlikely to be disturbed during ground works. Additionally, the riparian River Oak vegetation along Bowmans Creek may be considered in the *NSW TSC Act 1995 - River-Flat Eucalypt Forest on Coastal Floodplains TEC*, but the lack of eucalypts and dominance by *Casuarina* precludes this community also.

Fauna habitats identified along the pipeline route align closely with the described vegetation communities, but also include aquatic habitats associated with farm dams and several creek lines. Where the pipeline will cross these creek lines, existing structures occur. Consequently disturbance associated with construction of new structures may not occur. However, there may be a requirement for some maintenance of these structures, particularly across Bowmans Creek, and measures are recommended to minimise any disturbance to native vegetation.

The pipeline is proposed to be located between a number of farm dams in proximity to York's Creek near Ravensworth East. Should the pipeline be placed at ground level, this may present a barrier to movement between the dams by smaller terrestrial and aquatic vertebrates such as frogs and reptiles. Measures are recommended to minimise this potential impact, including elevating the pipeline above ground in a number of locations, constructing soil ramps over the pipeline, or burying the pipeline.

A total of 18 threatened fauna species have been recorded in the general locality (<10km radius of the study area). For the majority of these threatened species, no suitable habitat exists along the pipeline route, hence very low likelihood of these species occurring. However, for a small number of threatened species, suitable habitat is located within the vicinity of the pipeline route, and may support populations of threatened species. Such habitat includes small farm dams for frogs and waterbirds, small pockets of regrowth woodland as foraging habitat for threatened woodland birds and microbats, and riparian habitat along Bowmans Creek.

The proposed route of the pipeline will mostly avoid disturbance to these habitat areas, but there may be some minor clearing associated with construction activities.

The ecological assessment prepared for threatened species, endangered ecological communities, matters of national environmental significance and fauna habitats has concluded that the proposed action would not result in a significant impact. It is considered there is no requirement for a referral to the federal Department of the Environment (DoE), or preparation of a species impact statement under the NSW TSC Act (1995). However, where the pipeline may result in modification to fauna movements, measures are recommended to ameliorate this action.

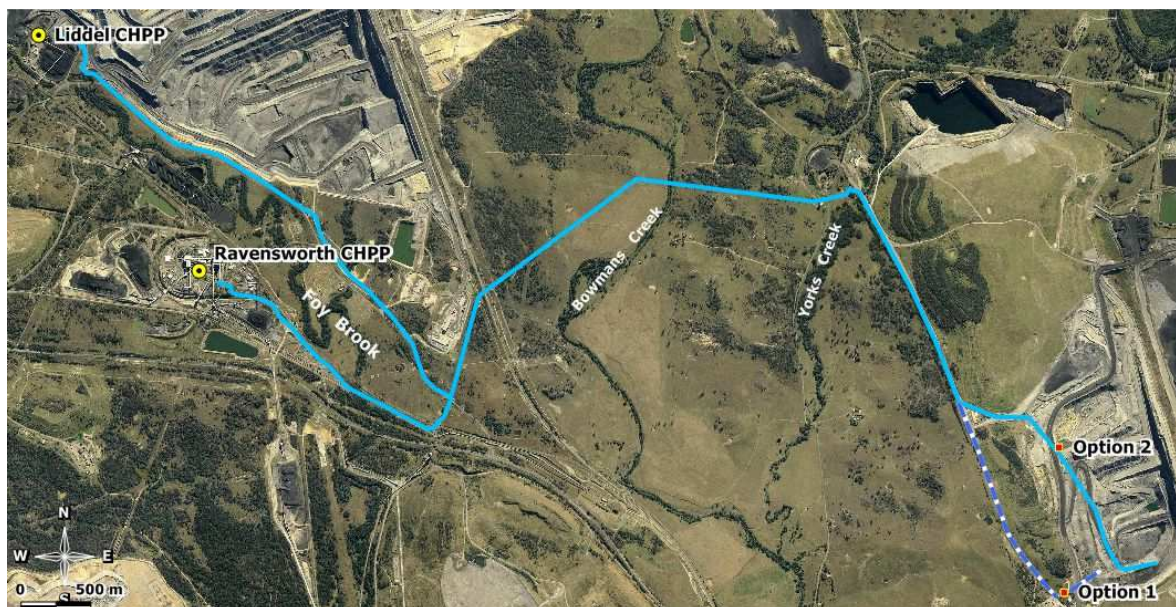
## 1.0 INTRODUCTION

### Background

The scope of this report was to undertake a due diligence ecological inspection along the route of a proposed tailings pipeline. The pipeline will extend from the Ravensworth Complex Preparation Plant (RCPP) to the Ravensworth East – West Pit Void approved tailings emplacement area. An additional section of tailings pipeline from Liddell Coal Operations joins the tailings pipeline north of Foy Brook. This section has previously been assessed by MOD 5 of DA 305-11-01 (Umwelt, 2013). A summary of the ecological assessment is briefly presented in this report.

The ecological assessment along the length of the proposed RCPP to Ravensworth East void was conducted to identify the vegetation communities and fauna habitat. The assessment also sought to identify if the proposed action would impact on vegetation communities and fauna habitat, and whether any ameliorative actions are required to minimise the impact. The ecological assessment was conducted on Monday 4 August 2015.

Since preparation of the initial RCPP to Ravensworth East void ecological assessment in August 2015, two options for placement of a flocculant plant referred to as Option 1 and Option 2 is being considered. This revised report accounts for the alternative alignments considered. A map illustrating the proposed pipeline route is presented below in **Figure 1**.



**Figure 1.** Proposed tailings pipeline route.

## 2.0 METHODOLOGY

### 2.1 Vegetation Assessment

The route of the proposed pipeline was inspected from a vehicle, and at selected locations foot traverses were made along the proposed pipeline route. The majority of the route runs through former grazing lands or over existing ground disturbances (existing haul roads, conveyor easements, etc.) associated with current and former mining operations. Inspections on foot targeted areas where significant remnant vegetation remained, where the likelihood of significant species or vegetation communities was greater. Notes were made at various inspection points along the route, tied to GPS locations.

A search of the OEH Atlas (4 August 2015) was undertaken to identify records of threatened species recorded within a 10km radius of the study area (referred to as the *locality*) as defined in the *Threatened Species Conservation Act 1995*. The search revealed the potential for seven plant species to be present (**Table 1**).

**Table 1.** Threatened plant species within ~10 km radius of the proposed site.

Entity	NSW Status	Potential on site
<i>Acacia pendula</i>	Endangered Population	possible, but see Bell & Driscoll 2014
<i>Cymbidium canaliculatum</i>	Endangered Population	Possible, recorded to north of pipeline route (Umwelt, 2013)
<i>Diuris tricolor</i>	Vulnerable	possible, dependent on grassland condition
<i>Eucalyptus camaldulensis</i>	Endangered Population	possible
<i>Eucalyptus glaucina</i>	Vulnerable	possible
<i>Asperula asthenes</i>	Vulnerable	unlikely; habitat absent; no vouchered record
<i>Ozothamnus tesellatus</i>	Vulnerable	unlikely; habitat absent

### 2.2 Fauna Habitats and Species

In concert with the vegetation assessment, the route was inspected by a combination of walking and vehicular observations of habitat for fauna. The assessment sought to identify the presence of habitat that may support fauna species, such as stands of remnant vegetation, ground cover either natural or created, and presence of habitat trees for tree hollow dependent fauna. Natural or constructed structures that provide sheltering habitat for fauna, such as ground logs, rock piles, construction materials, constructed structures such as bridges and culverts can provide sheltering habitat for a suite of fauna species such as birds, microbats, reptiles and amphibians.



## 3.0 RESULTS

### 3.1 Vegetation

#### 3.1.1 Plant Species

**Appendix 1** lists plant species observed along the proposed route. The vast majority of these are weeds or non-endemic native species, typical of former grazing lands. No species currently listed as rare or threatened under the federal EPBC Act 1999 or NSW TSC Act 1995 were observed along the proposed route. Grassland habitats inspected are unlikely to support viable populations of *Diuris tricolor* given the extent of exotic grass species dominance. In addition, the nearest known record for this species lies ~12 km to the north-west, near Muswellbrook.

#### 3.1.2 Vegetation Communities

Four vegetation communities have been delineated for the proposed pipeline route, and these have been equated to the regional classification developed by Peake (2006) and listed Threatened Ecological Communities (TECs) (**Table 2**). The 4 communities are severely disturbed and / or are in an early colonising phase after previous land clearing. Isolated trees and small regenerating patches of *Eucalyptus crebra* and *Eucalyptus moluccana* allude to the Central Hunter Grey Box – Ironbark Woodland TEC, which would have formerly been present in the local area.

**Table 2.** Vegetation Communities along pipeline route

Community	Peake (2006) Equivalent	TEC Equivalent
1. Derived Grassland	no equivalent	no equivalent
2. Riparian Swamp Oak Forest	Central Hunter Swamp Oak Forest (MU28)	no equivalent
3. Riparian River Oak Forest	Hunter Valley River Oak Forest (MU30)	no equivalent
4. Regrowth Ironbark-Box Woodland	Central Hunter Box-Ironbark Woodland (MU10)	Central Hunter Grey Box – Ironbark Woodland

Following is a general description of each vegetation community present.

**1. Derived Grassland (Figure 2).** The bulk of the proposed pipeline route comprises previously cleared grassland associated with grazing, or other areas that have been cleared as part of current mining disturbances. These areas are dominated largely by weedy grass species, particularly *Chloris gayana*, *Hyparrhenia hirta* and *Cynodon dactylon*. Some native grasses (eg: *Aristida ramosa*, *Cymbopogon refractus*, *Chloris ventricosa*) remain, but most areas are now dominated by exotics. *Acacia salicina*, *Casuarina glauca* and *Allocasuarina luehmanii* occur in some areas as early colonising species, and with time these will form dense stands or thickets. Where the proposed route occurs adjacent to existing haul roads, the vegetation comprises almost exclusively of *Chloris gayana* and the invasive *Acacia salicina* along bund walls.

**2. Riparian Swamp Oak Forest (Figure 3).** Former drainage lines and adjacent areas support often monospecific stands of *Casuarina glauca*, in some places occurring with *Angophora floribunda* and with the exotic *Ricinus communis* in the shrub layer. Although native to the region, *Casuarina glauca* is an aggressive invader of previously cleared lands where stock has been removed. Few other species co-occur in these stands, but in places emergent *Eucalyptus crebra* or *Eucalyptus blakelyi* may be present. Peake (2006) identified this vegetation type as Central Hunter Swamp Oak Forest, considered to be highly restricted and under threat. However, the aggressive and expansive nature of the domineering *Casuarina glauca* suggests that it is an invasive and non-endemic community in the central Hunter Valley, displacing the



endemic Riparian River Oak Forest from major creek lines. The lack of eucalypts and dominance by *Casuarina* in this community precludes its inclusion in the River-Flat Eucalypt Forest on Coastal Floodplains TEC.



**Figure 2.** Example of Derived Grassland adjacent to existing conveyor belt, and site of proposed pipeline.

Dominant grasses are *Chloris gayana* and *Cynodon dactylon*.



**Figure 3.** Riparian Swamp Oak Forest around old dam, adjacent to proposed pipeline easement.



**3. Riparian River Oak Forest (Figure 4)** – Bowmans Creek in the middle of the proposed route currently supports *Casuarina cunninghamii* along both creek banks, over a weedy ground layer of *Cynodon dactylon*, *Pennisetum clandestinum*, *Galium aparine*, *Bidens pilosa* and *Ricinus communis*. The weedy condition of this riparian vegetation is typical of similar areas elsewhere in the Hunter Valley (Peake 2006). Although other workers in the Hunter Valley have previously included riparian River Oak vegetation in the River-Flat Eucalypt Forest on Coastal Floodplains TEC, the lack of eucalypts and dominance by *Casuarina* precludes this.



**Figure 4.** Riparian River Oak Forest at Bowmans Creek crossing, showing weedy understorey.

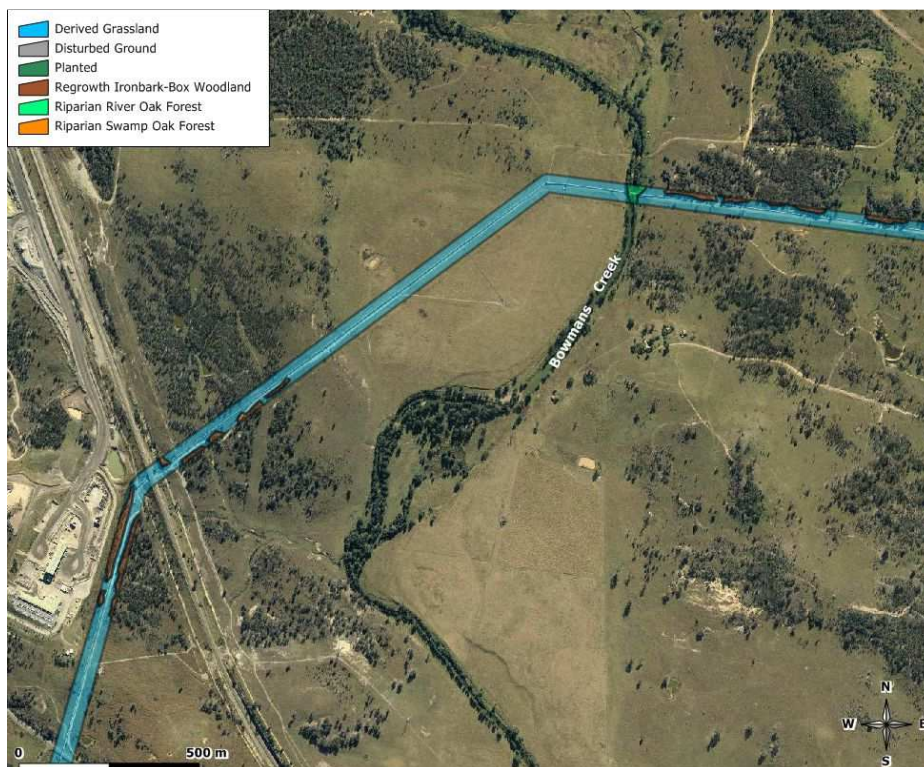
**4. Regrowth Ironbark-Box Woodland** – small regrowth stands of former *Eucalyptus crebra* and *Eucalyptus moluccana* woodlands are present along some parts of the proposed route. These areas have become established following stock removal, and are present in the form of small trees associated with *Allocasuarina luehmanii* thickets. The invasive native wattle *Acacia salicina* is also abundant in these areas. In some sections, former plantings of non-endemic species are also evident, including *Grevillea robusta*, *Eucalyptus cladocalyx* and *Melaleuca armillaris*. Although broadly included in the Central Hunter Grey Box – Ironbark Woodland TEC, any ground disturbance to these small, highly fragmented stands will not be significant.

A map illustrating the general vegetation communities along the proposed pipeline route is presented below in **Figures 5 - 7**. Please note that the vegetation mapping illustrates an approximate 40 metre wide community, when in fact disturbance by the proposal will be limited to less than 10 metres in width.



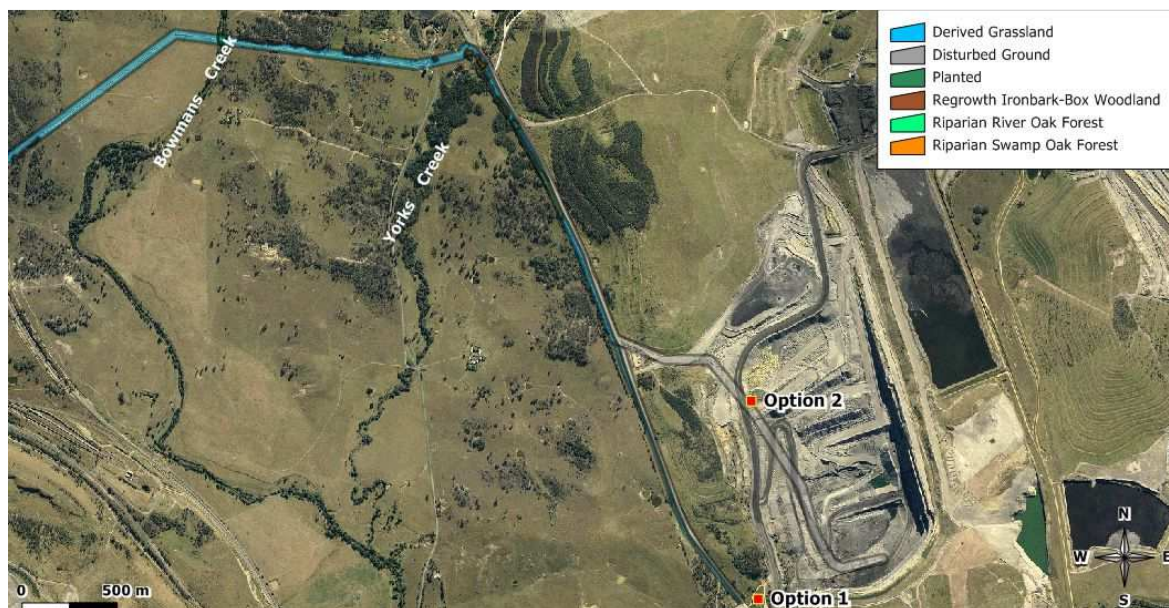


**Figure 5.** Vegetation Communities, Western sector, Ravensworth Operations.



**Figure 6.** Vegetation Communities, central sector, Ravensworth Operations.





**Figure 7.** Vegetation Communities, eastern sector, Ravensworth Operations.

## 3.2 Fauna Habitats and Species

Fauna habitats located along the proposed tailings pipeline route include open space associated with existing mining infrastructure, grassland with very scattered understorey and or emergent trees, riparian creek lines, farm dams and regrowth woodland.

### 3.2.1 Open Space

The open space areas contain either operational infrastructure, or storage areas for mining equipment. These open space areas provide minimal fauna habitat, although a small number of avian species utilise the aerial space for foraging, and may use structures for resting and possibly nesting sites. Such species include Australian Magpie, Australian Raven, Fairy Martin and Welcome Swallow. A small number of nocturnal species such as Tawny Frogmouth and microbats may also forage in these open areas. Very limited habitat exists for native mammals, but several small and large reptiles may shelter beneath equipment placed at ground level. The majority of open space habitat is associated with the Ravensworth Complex coal preparation plant area in the western part of the pipeline route, but also along the access tracks associated with the now disused conveyor belt which follows the proposed route.

### 3.2.2 Open Grassland

Along the majority of the pipeline route, where vegetation occurs it is dominated by open grassland. Within this community, scattered stems of low regrowth *Acacia salicina*, eucalypt or casuarina plants sometimes occur. The dominant grass in this habitat type is *Chloris gayana*, forming dense tufts that provide sheltering and foraging habitat for a number of small fauna species. A number of weeds also dominate this habitat. Where trees occur, they are usually individual stems that are very young in age, with no evidence of tree hollows present. The value of this habitat for fauna is very limited, although a small number of bird species were observed foraging in the aerial space above the grasslands. Very limited ground cover in the form of ground logs or rocks occur. Typical fauna species that dominate this habitat include the introduced House Mouse. Several reptile species such as skinks and larger snakes may also occur.

### 3.2.3 Regrowth Woodland

Very small stands of regrowth woodland occur alongside the proposed pipeline route, and are unlikely to be disturbed by the proposal, apart from where infrastructure may require improved access for construction activities. Taller trees to 15 metres in height occur, although no mature trees with hollows are present. Tree species diversity include Narrow-leaved Ironbark, Grey Box and Rough-barked Apple, although none appeared in flower during field inspection. This small area of regrowth remnant vegetation provides higher value habitat than the open space and open grassland, but the disturbed landscape surrounding this habitat limits the diversity and abundance of fauna species that are typically associated with this habitat type.

### 3.2.4 Riparian Habitat

The proposed pipeline crosses two areas of riparian habitat, Foy Brook in the west and Bowmans Creek in the central part of the route. Another creek line, York's Creek, is located in the eastern part of the study area, but is modified from past land uses and does not support comparable riparian habitat.

At the Foy Brook crossing point, the pipeline will be constructed on an existing metal bridge that spans the creek line. Tree species along this creek line include Rough-barked Apple and Swamp Oak. Again, no mature habitat trees with hollows occur due to the young age of the trees. The creek line itself contained a small narrow pond with emergent aquatic vegetation, but dense shading by the trees limits the potential of this pond to support a population of the endangered Green and Golden Bell Frog. The Green and Golden Bell Frog has previously been recorded from a number of nearby locations including Ravensworth Operations (2009), Liddell (2008), Cumnock (2000) and Ravensworth State Forest (1999).

The metal bridge does not provide sheltering and roost habitat for many fauna species, in particular, the threatened Large-footed Myotis *Myotis macropus*, which often roost in old timber bridges in proximity to open water. Understorey vegetation associated with the Foy Brook is a mix of grasses and dense stand of the introduced weed Castor Oil plant. A small number of bird species such as Superb Fairy-wren and Rose Robin were observed or heard in this habitat type.

At the Bowmans Creek crossing point, again another metal bridge spans the waterway. The creek line supports tall stems of River Oak *Casuarina cunninghamii*, with understorey including Castor Oil plant and juvenile river oaks, and ground layer dominated by mix of grasses and weeds. Bowmans Creek contains a large deep pool of water, which would provide fish habitat and also foraging habitat for a suite of fauna species, such as the Large-footed Myotis and a number of aquatic and semi-aquatic bird species. During fieldwork, Pacific Black Duck and a Little Pied Cormorant were observed in the water. Reptile species such as the Eastern Water Dragon and Eastern Snake-necked Turtle would most likely occur along and within Bowmans Creek. The presence of tall emergent aquatic vegetation such as Cumbungi *Typha orientalis* is very limited along the creek line, possibly due to grazing by cattle. This limits the extent of habitat suitable for frog species such as the Green and Golden Bell Frog, which are dependent on this microhabitat.

### 3.2.5 Farm Dams

Three large farm dams occur adjacent to Yorks Creek in the eastern portion of the pipeline route. One dam is located upslope from the pipeline route, but has limited habitat quality for some frog species due to lack of emergent or fringing aquatic vegetation. However, two dams downslope of the pipeline route provide higher quality aquatic habitat for a number of frog species. All three dams provide a permanent water source for a number of fauna species such as macropods, birds, microbats and reptiles. One dam downslope of the pipeline route in particular, supports tall stands of Cumbungi and open water, providing habitat for frog species such as the endangered Green and Golden Bell Frog. This dam and a number of nearby dams have been subjected to periodic inspections as part of the wider Mt Owen

Complex monitoring for the Green and Golden Bell Frog, particularly as the dam has high habitat quality for the species. However, no presence of the Green and Golden Bell Frog has been recorded at the Mt Owen Complex since 1999. The distance between the proposed pipeline and this dam is approximately 50 metres, and will not be directly impacted by construction activities. It is noted that the construction of pipeline will not impact on any of these dams.

### 3.3 Threatened Flora / Fauna / Endangered Ecological Communities Recorded along route.

No threatened flora, fauna or endangered ecological communities were recorded along the proposed pipeline route during the field inspection. A literature review was conducted on known threatened species and endangered ecological communities known to occur within the locality, and whether those species have the potential to occur, based on suitable habitat. The review included comprehensive surveys conducted within the wider Liddell project area, which included parts of Foy Brook, also referred to as Bayswater Creek, and also Bowmans Creek (Umwelt, 2013).

The list of known threatened species is presented below in **Table 3**.

**Table 3.** Endangered Ecological Communities and Threatened Species in Locality

Endangered Ecological Communities	EPBC Act	TSC Act	Presence in Study Area
Central Hunter Valley eucalypt forest and woodland	CE		Regrowth form
Hunter Valley Weeping Myall ( <i>Acacia pendula</i> ) Woodland	CE	E3	None present
Central Hunter Grey Box – Ironbark Woodland	CE	E3	Very small regrowth stands. A total of 120 hectares of 4 variants of this community mapped for the Liddell Project Area (Umwelt, 2013).
Central Hunter Ironbark – Spotted Gum – Grey Box Forest	V	E3	None present
Hunter Floodplain Red Gum Woodland		E3	None present
River Oak vegetation in the River-Flat Eucalypt Forest on Coastal Floodplains			None present

Threatened Flora		EPBC Act	TSC Act	Presence in Study Area
Weeping Myall	<i>Acacia pendula</i>	CE	E	No evidence of individual plants along pipeline route
Tiger Orchid Endangered Pop'n	<i>Cymbidium canaliculatum</i>		EP	No evidence of individual plants along pipeline route. However, individual plant recorded to the north of the pipeline route (Umwelt, 2013)
Pine Donkey Orchid	<i>Diuris tricolor</i>		EP	Possible, dependent upon grassland condition
River Red Gum	<i>Eucalyptus camaldulensis</i>		EP	No evidence of individual plants along pipeline route
Slaty Red Gum	<i>Eucalyptus glaucina</i>	V	V	No evidence of individual plants along pipeline route
Trailing Woodruff	<i>Asperula asthenes</i>	V	V	unlikely , no habitat present
	<i>Ozothamnus tessellatus</i>	V	V	Unlikely, no habitat present

Threatened Fauna		EPBC Act	TSC Act	Habitat presence in Study Area
Green and Golden Bell Frog	<i>Litoria aurea</i>	V	E	Yes, farm dams, Bowmans Creek
Blue-billed Duck	<i>Oxyura australis</i>		V	Yes, farm dams, Bowmans Creek. Has been recorded in the Liddell Project area (Umwelt, 2013)
Freckled Duck	<i>Stictonetta naevosa</i>		V	Yes, farm dams, Bowmans Creek
Black-necked Stork	<i>Ephippiorhynchus asiaticus</i>		V	Yes, farm dams, Bowmans Creek
Spotted Harrier	<i>Circus assimilis</i>		V	Yes, Open Grassland. The species was recorded in the wider Liddell project area (Umwelt, 2013).
Little Eagle	<i>Hieraaetus morphnoides</i>		V	Yes, Open Grassland



Threatened Fauna		EPBC Act	TSC Act	Habitat presence in Study Area
Eastern Grass Owl	<i>Tyto longimembris</i>		V	Limited extent of dense grassland along route. The species was recorded in the wider Liddell project area (Umwelt, 2013).
Brown Treecreeper	<i>Climacteris picumnus victoriae</i>		V	No mature ironbark forest woodland present along pipeline route.. The species was recorded in the wider Liddell project area (Umwelt, 2013).
Speckled Warbler	<i>Chthonicola sagittata</i>		V	Yes, Open Grassland, Regrowth Woodland. The species was recorded in the wider Liddell project area (Umwelt, 2013).
Grey-crowned Babbler	<i>Pomatostomus temporalis temporalis</i>		V	Yes, Regrowth Woodland. The species was recorded along parts of the pipeline route, and also in wider Liddell project area (Umwelt, 2013).
Hooded Robin	<i>Melanodryas cucullata cucullata</i>		V	No, requires mature woodland, none present along pipeline route. The species was recorded in the wider Liddell project area (Umwelt, 2013).
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	V	V	Yes, Open Grassland, Regrowth Woodland. The species was recorded in the wider Liddell project area, including several locations upstream of the crossing point on Bowmans Creek, and Bayswater Creek (Umwelt, 2013)
Koala	<i>Phascolarctos cinereus</i>	V	V	Yes, Bowmans Creek
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>		V	Yes, Regrowth Woodland
Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>		V	Yes, Regrowth Woodland, aerial space. The species was recorded foraging along part of the pipeline route north of Bayswater Creek, and in the wider Liddell project area (Umwelt, 2013).
Eastern Bentwing-bat	<i>Miniopterus schreibersii oceanensis</i>		V	Yes, Regrowth Woodland, aerial space. The species was recorded foraging in the wider Liddell project area (Umwelt, 2013).
Southern Myotis	<i>Myotis macropus</i>		V	Yes, Bowmans Creek, Farm Dams. The species was recorded foraging along part of the pipeline route north of Bayswater Creek, and in the wider Liddell project area (Umwelt, 2013).
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>		V	Yes Regrowth Woodland, aerial space. The species was recorded foraging in open space along part of the pipeline route north of Bayswater Creek, and in the wider Liddell project area (Umwelt, 2013).
Eastern Cave Bat	<i>Vespadelus troughtoni</i>	V	V	No, Regrowth Woodland, aerial space. The species was recorded foraging in the wider Liddell project area (Umwelt, 2013).

## 4.0 Impact Assessment

An appraisal of each threatened species with potential to occur along the proposed route was undertaken. Those species identified as potentially occurring along the proposed route were then assessed as to whether the proposed action would impact on the habitat of those species, such that a significant impact could occur. The term *significant impact* is referenced from the significance test outlined in s.5A of the *Environmental Planning and Assessment Act 1979*, as amended by the *NSW Threatened Species Conservation Act 1995*. Based on the evaluation of threatened species outlined above in **Table 3**, the following threatened species are assessed in detail as to whether the proposed action would impact upon the species and or their habitat.

The majority of the proposed pipeline route follows an existing conveyor easement and access track, which also contain a water pipeline. Placement of the proposed pipeline will occur within the existing infrastructure easement. Consequently, the level of disturbance to native vegetation and fauna habitat associated with placement of the pipeline is minimal. However, there may be a requirement for disturbance to small areas of vegetation for construction and access related activities.

### 4.1 Central Hunter Valley Eucalypt forest and woodland endangered ecological community (EPBC Act 1999)

The listing of this community as critically endangered under the EPBC Act 1999 follows the same description as the Central Hunter Grey Box – Ironbark Woodland under the NSW TSC Act 1995. A discussion on this community is presented below in Section 4.3.

### 4.2 Hunter Valley Weeping Myall Woodland Endangered Population

No evidence of the Weeping Myall *Acacia pendula* was observed along the proposed pipeline route. Therefore, no impact upon the Weeping Myall critically endangered population is likely by the proposed action

### 4.3 Central Hunter Grey Box – Ironbark Woodland (TSC Act 1995)

Small regrowth woodland stands of *Eucalyptus crebra* and *Eucalyptus moluccana* are present along parts of the proposed route. These areas have become re-established following stock removal, and are present in the form of small trees associated with BullOak *Allocasuarina luehmannii* thickets. Although broadly included in the Central Hunter Grey Box – Ironbark Woodland TEC, any ground disturbance to these small, highly fragmented stands will not be significant.

No impact upon the Central Hunter Grey Box – Ironbark Woodland endangered ecological community is considered by the proposed action.

### 4.4 Central Hunter Ironbark – Spotted Gum – Grey Box Forest

No evidence of this forest community was recorded along the proposed pipeline route. No impact upon this endangered ecological community is considered by the proposed action.

### 4.5 Hunter Floodplain Red Gum Woodland

No evidence of Hunter Floodplain Red Gum Woodland community was recorded along the proposed pipeline route. No impact upon this endangered ecological community is considered by the proposed action.

#### 4.6 River Oak vegetation in the River-Flat Eucalypt Forest on Coastal Floodplain.

Although the River Oak stands along Bowmans Creek resemble this endangered ecological community, the absence of eucalyptus and dominance by *Casuarina sp.* precludes this threatened community from the study area. No impact upon this endangered ecological community is considered by the proposed action.

#### 4.7 Tiger Orchid *Cymbidium canaliculatum* Endangered Population

An endangered population of the Tiger Orchid is described for the Hunter Valley, with known populations of the plant to the immediate north of the pipeline route (Uwelt, 2013), and also in the locality. This is a distinct plant that is easily detected when present. No individual plants were observed along the proposed pipeline route. Consequently, no impact upon an endangered population of this species is considered by the proposed action.

#### 4.8 Pine Donkey Orchid *Diurus tricolor* Endangered Population in the Muswellbrook LGA

The small terrestrial orchid *Diurus tricolor* occurs in a wide range of vegetation communities, including open grassland, albeit with minimal disturbance. Where found, the species can be very abundant and widespread. The species is difficult to detect outside of the flowering period, which is typically late winter, and could potentially occur along the pipeline route. No individuals of the species were recorded along the pipeline route, although surveys were not conducted during optimal survey time to detect its presence. Based on the degree of disturbance to the vegetation communities along the proposed pipeline route, it is considered low likelihood of occurrence. The extent of disturbance to native vegetation communities associated with construction activities is small in area, there is unlikely to be a significant impact upon any populations of this species.

#### 4.9 River Red Gum Population in the Hunter Catchment and Slaty Red Gum

Endangered population of the River Red Gum *Eucalyptus camaldulensis* and Slaty Red Gum *Eucalyptus glaucina* are described for the Hunter Valley, with known populations of the plant in the wider locality. However, no individual plants of either species were observed along the proposed pipeline route. Consequently, no impact upon either endangered population is considered by the proposed action.

#### 4.10 Trailing Woodruff *Asperula asthenes*

This species, although recorded on the NSW BioNet, has not been recorded by the author (S. Bell) in the Hunter Valley. Most known locations of the species occur along a narrow strip of the mid-north coast from Bulahdelah in the south to Kempsey in the north. Where found, occurs in damp sites often along river banks (OEH BioNet species profile). This would restrict the potential habitat of the species to the creek banks of Foy Brook, Bowmans and Yorks Creek. All three areas are heavily disturbed by past grazing and introduced weeds. Additionally, if present, the proposed works would not disturb this habitat, such that an impact on the species is likely.

#### 4.11 *Ozothamnus tessellatus*

This species predominantly occurs in the Goulburn River valley on Permian footslopes (Bell, 2008), and it is very rare in the Muswellbrook area. There is one record in the locality at Mt Owen (Mike Cole, University of Newcastle, pers. comm.). Searches for the species failed to detect its presence, combined with absence of suitable habitat, suggest no occurrence of the species along the proposed pipeline route.

No impact upon the plant *Ozothamnus tessellatus* is considered by the proposed action

#### 4.12 Green and Golden Bell Frog

The Green and Golden Bell Frog is associated with small to large permanent or ephemeral water bodies with tall emergent aquatic vegetation. The vegetation is utilised for basking and advertisement of their characteristic call. Within the locality, the species has been recorded at a number of locations, including Ravensworth Operations, Lake Liddell and Mt Owen Complex. The most recent record of the species is 2009 at Ravensworth Operations, and has not been recorded at Mt Owen Complex since 1999, Liddell in 2008 and Lake Liddell in 1975. Suitable habitat exists for the species at one of the 3 dams located off Hebden Road in the Glendell Mine landholding.

The proposed action will result in placement of an approximate 400mm diameter pipe upslope of the most suitable dam for the species. The pipeline will be placed at an approximate distance of 30 metres from this dam, so there will be no direct disturbance to this potential habitat. However, placement of the pipeline at ground level may present a movement barrier to dispersal between dams. To prevent the potential for creation of a movement barrier, consideration should be given to having the pipeline elevated at least 20mm above ground in a number of locations, or bury a series of short sections (i.e. 5.0 metres in length), or the entire length of the pipeline (approximately 40-50 metres) in proximity to the dams.

No impact upon the Green and Golden Bell Frog is considered by the proposed action

#### 4.13 Blue-billed Duck, Freckled Duck, Black-necked Stork

These three species were combined for this assessment as they have similar habitat requirements (aquatic ponds and larger water bodies). The Blue-billed Duck was recorded in the wider Liddell project area (Umwelt, 2013). Suitable habitat exists for each of the species in the farm dams located off Hebden Road, and also Bowmans Creek. The proposed action will not directly or indirectly impact on the species, or their aquatic habitat. The pipeline will be located on terrestrial habitat that will not require disturbance to aquatic habitat. Where the pipeline will cross aquatic habitat, such as Bowmans Creek, an existing structure is already in place to support the pipeline, and presently does not impact upon aquatic habitat for these species.

No impact upon each species is considered by the proposed action

#### 4.14 Spotted Harrier, Little Eagle

The Spotted Harrier and Little Eagle both forage over vast expanses of open ground searching for prey. No nest sites for either species were observed along, or in proximity to the pipeline route. Habitat to be disturbed by the proposed pipeline is very restricted in extent and quality, in relation to the extent of suitable habitat present in the wider locality and region.

No impact upon either species is considered by the proposed action.

#### 4.15 Brown Treecreeper, Speckled Warbler, Grey-crowned Babbler, Hooded Robin

Four threatened woodland birds have been recorded in the general locality, including the Liddell project area. For the Brown Treecreeper, no evidence of the species, or habitat suitable is considered to occur along the proposed pipeline route. However, the species has been recorded in the general location, including Foy Brook (or Bayswater Creek)(Umwelt, 2013). The Brown Treecreeper is dependent upon mature ironbark woodland. At the Mt Owen Complex, the species has not been recorded in regeneration or rehabilitation habitat over a 19 year monitoring period. The species has only been recorded in mature Spotted Gum Ironbark woodland, where habitat trees with hollows are

utilised as nesting sites, and mature trees and ground logs provide foraging habitat. None of these habitat resources exist along the proposed pipeline route to suggest its possible occurrence.

The Speckled Warbler occurs in a range of habitat types, and has been recorded at the Mt Owen Complex in mature woodland, revegetation and rehabilitation habitat, and open grassland. The Speckled Warbler has been recorded previously along parts of the pipeline route (Umwelt, 2013). Suitable habitat exists along parts of the pipeline route, particularly in proximity to regrowth woodland. However, the proposed pipeline will not result in significant disturbance to any of the habitats such that a potential impact upon the Speckled Warbler is likely.

The Grey-crowned Babbler is a relatively common threatened woodland bird species in the mid- to upper Hunter Valley. The Grey-crowned Babbler has been recorded previously along parts of the pipeline route (Umwelt, 2013). The species is most commonly encountered in regrowth woodland and forest, where it favours tall understorey and low canopy trees for construction of nesting sites. The species is also reliant on suitable ground cover such as decorticated bark and logs to provide foraging habitat. Very limited habitat suitable for the Grey-crowned Babbler occurs along the route of the proposed pipeline. Where potential habitat exists, this habitat occurs outside of the pipeline footprint and will not be disturbed.

The Hooded Robin is dependent upon mature forest and or woodland for foraging and nesting habitat. The species has been detected foraging in open grassland adjoining remnant woodland, but is rarely recorded away from mature woodland. It is considered no suitable habitat exists along the proposed pipeline route for the Hooded Robin.

No impact upon each of the threatened woodland bird species is considered by the proposed action.

#### 4.16 Spotted-tail Quoll

There are a number of records of the Spotted-tail Quoll in the locality, including a road kill recorded on Hebden Road immediately adjacent to the pipeline route (May 2013, M. Murray, personal observations), and along Bowmans Creek near Liddell Coal operations landholdings (Umwelt, 2013, OEH Atlas, August 2015). Very limited habitat for the species exists along the pipeline route, but the species ranges widely across the landscape, including expanses of unsuitable habitat such as grassland. No habitat trees that could be utilised as denning sites exist along the pipeline route.

No impact upon the Spotted-tail Quoll is considered by the proposed action.

#### 4.17 Koala

There is one record of Koala in the locality, with no suitable habitat located along the pipeline route. No food trees (as listed on Schedule 2 of SEPP 44 – Koala Habitat Protection) occur along the pipeline route.

No impact on the Koala is considered by the proposed action.

#### 4.18 Grey-headed Flying Fox, microbats (Eastern Freetail-bat, Eastern Bent-wing Bat, Southern Myotis, Greater Broad-nosed Bat, Eastern Cave Bat)

There is no camp of the Grey-headed Flying-fox along the pipeline route. Foraging habitat (in the form of flowering *Eucalyptus* sp. and *Angophora floribunda*) occurs in the form of small stands of regrowth woodland, but the extent of habitat is very small and isolated from more extensive woodland stands. The Grey-headed Flying-fox may frequent trees along the pipeline route when these trees flower. However, it is anticipated that the pipeline footprint will not result in disturbance to these trees.

For the microchiropteran bats recorded in the locality, there is very limited roost habitat (in the form of tree hollows or old timber bridges) along the pipeline route. Some River Oak trees along Bowmans Creek may provide sheltering sites beneath decorticated bark for some microbats. A small number of culverts occur, such as beneath the Main Northern Railway and across small creek crossings. However, these culverts are unsuitable as roost sites for microbats. Each culvert is very short in distance, allowing too much light and unable to create suitable micro-climatic conditions essential for cave roosting bat species.

The crossing of the pipeline across Bowmans Creek will not impact upon foraging habitat for the Southern Myotis, which would most likely forage along this creek line.

No impact on the Grey-headed Flying-fox or five threatened microchiropteran bats is considered by the proposed action.

## 5.0 DISCUSSION

The proposed pipeline route traverses a highly modified landscape with limited ecological value. The four vegetation communities identified during field inspections are all representative of low-quality vegetation, and only one (Regrowth Ironbark-Box Woodland) can be considered part of a listed Threatened Ecological Community. In this case, small regrowth patches of former Central Hunter Grey Box – Ironbark Woodland occur, but are of very low quality. Disturbance will be minimal to these areas as new works will follow existing easements.

A total of 18 threatened fauna species have been recorded in the general locality (<10km radius of the study area). For the majority of these threatened species, limited habitat suitable for the majority of these species exist along the pipeline route. However, small farm dams for frogs and waterbirds, pockets of regrowth woodland as foraging habitat for threatened woodland birds and microbats, and riparian habitat along Bowmans Creek provide habitat for a number of species recorded in the immediate area. The proposed route of the pipeline will mostly avoid disturbance to these habitat areas, but there may be some minor clearing associated with construction activities. There may also be a requirement for clearing or pruning of several River Oak trees for maintenance and access to the existing steel bridge over Bowmans Creek (refer to **Figure 3**). Should these trees require removal, it is recommended that compensatory plantings of River Oak *Casuarina cunninghamiana subsp. cunninghamiana* occur along the creek bank in proximity to the bridge.

The location of the pipeline in proximity to several farm dams near Yorks Creek (in the eastern portion of the route) may impact upon movement of terrestrial frogs between ponds. If the pipeline is to be positioned at ground level, this may create a barrier to fauna movements between ponds. Therefore, it is recommended that at several points the pipe is elevated (20cms or so) for a short distance, i.e. 5 metres. Material such as a timber sleeper placed beneath the pipeline at a regular spacing would suffice. Alternatively, a series of soil mounds or ramps on each side of the pipeline would enable fauna movements over the pipeline. This would allow terrestrial vertebrates that cannot climb, such as ground frogs and reptiles (turtles, snakes) to pass either beneath or over the pipe when moving between dams.

Another option could be the pipeline is buried at this location. If buried, it is recommended that during the excavation of an open trench to accommodate the pipeline, a daily inspection is undertaken to locate and remove any fauna that fall into the trench and become trapped. If the trench is to be open for a number of days, it is recommended that temporary escape structures, such as large sticks, posts or small ramps, be placed in the trench to enable animals to climb out.

A modification to the original pipeline route has been considered since the original ecological assessment. This option identified 2 locations for installation of a flocculant plant near the Ravensworth East void. Both options 1 and 2 are aligned along disturbed grassland and an existing disused mine road. No additional impact was identified by either option. A previous detailed ecological assessment of habitats along Foy Brook (or also referred to as Bayswater Creek) identified a number of threatened species along the pipeline route. However, the proposed route of the pipeline will mostly avoid disturbance to these habitat areas, although there may be some minor clearing associated with construction activities.



## 6.0 CONCLUSION

Ecological assessments have been prepared for a proposed tailings pipeline between Ravensworth Operations and Liddell Coal Operations and the Ravensworth East – West Pit Void approved tailings emplacement area (this report, Umwelt, 2013). The assessment sought to determine whether the action would impact on threatened species, endangered ecological communities, matters of national environmental significance and fauna habitats. The assessment has concluded that the proposed action would not result in a significant impact. It is considered there is no requirement for a referral to the federal Department of the Environment (DoE), or preparation of a species impact statement under the NSW TSC Act (1995). However, where the pipeline may result in some disturbance to existing vegetation, or modification to fauna movements, measures are recommended to ameliorate this action.

## 7.0 REFERENCES

- Bell, S.A.J. (2008) Rare or threatened vascular plant species of Wollemi National Park, central eastern New South Wales. *Cunninghamia* 10(3): 331-371.
- Bell, S.A.J. & Driscoll, C. (2014) *Acacia pendula* (Weeping Myall) in the Hunter Valley of New South Wales: early explorers' journals, database records and habitat assessments raise doubts over naturally occurring populations. *Cunninghamia* 14: 179-200.
- Peake, T.C. (2006) *The Vegetation of the Central Hunter Valley, New South Wales. A report on the findings of the Hunter Remnant Vegetation Project*. Hunter-Central Rivers Catchment Management Authority, Paterson.
- Umwelt (2013). *Liddell Coal Operations, Ecological Assessment – Appendix H*. In Ecological Assessment, Liddell Coal Operations Extension Project, September 2013. Prepared for Liddell Coal Operations Pty Ltd.

## APPENDIX 1. Plant Species List

Family	Species
Aizoaceae	<i>Galenia pubescens</i> *
Apiaceae	<i>Dichondra repens</i> <i>Foeniculum vulgare</i> *
Apocynaceae	<i>Araujia sericifera</i> * <i>Gomphocarpus fruticosus</i> *
Asteraceae	<i>Bidens pilosa</i> * <i>Cirsium vulgare</i> * <i>Conyza bonariensis</i> * <i>Hypochaeris radicata</i> * <i>Senecio madagascariensis</i> * <i>Senecio quadridentatus</i> <i>Xanthium spinosum</i> *
Cactaceae	<i>Opuntia stricta</i> var. <i>stricta</i> *
Caryophyllaceae	<i>Paronychia brasiliensis</i> *
Casuarinaceae	<i>Allocasuarina luehmannii</i> <i>Casuarina cunninghamiana</i> subsp. <i>cunninghamiana</i> <i>Casuarina glauca</i>
Cyperaceae	<i>Carex inversa</i>
Euphorbiaceae	<i>Ricinus communis</i> *
Fabaceae: Faboideae	<i>Glycine tabacina</i>
Fabaceae: Mimosoidea	<i>Acacia baileyana</i> * <i>Acacia salicina</i> <i>Acacia saligna</i> *
Lomandraceae	<i>Lomandra multiflora</i> subsp. <i>multiflora</i>
Malvaceae	<i>Modiola caroliniana</i> * <i>Sida rhombifolia</i> *
Myrtaceae	<i>Angophora floribunda</i> <i>Corymbia torelliana</i> * <i>Eucalyptus blakelyi</i>

Family	Species
	<i>Eucalyptus cladocalyx</i> *
	<i>Eucalyptus crebra</i>
	<i>Eucalyptus moluccana</i>
	<i>Melaleuca armillaris</i> subsp. <i>armillaris</i> *
Oleaceae	<i>Olea europaea</i> subsp. <i>cuspidata</i> *
Phormiaceae	<i>Dianella longifolia</i> var. <i>longifolia</i>
Phytolaccaceae	<i>Phytolacca octandra</i> *
Plantaginaceae	<i>Plantago lanceolata</i> *
Poaceae	<i>Aristida ramosa</i>
	<i>Bothriochloa decipiens</i> var. <i>decipiens</i>
	<i>Chloris gayana</i> *
	<i>Chloris ventricosa</i>
	<i>Cymbopogon refractus</i>
	<i>Cynodon dactylon</i> *
	<i>Eragrostis leptostachya</i>
	<i>Hyparrhenia hirta</i> *
	<i>Imperata cylindrica</i> var. <i>major</i>
	<i>Melinis repens</i> *
	<i>Panicum maximum</i> var. <i>maximum</i> *
	<i>Paspalum dilatatum</i> *
	<i>Pennisetum clandestinum</i> *
	<i>Setaria gracilis</i> *
Proteaceae	<i>Grevillea robusta</i> *
Pteridaceae	<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>
Rubiaceae	<i>Galium aparine</i> *
Solanaceae	<i>Solanum cinereum</i>
Verbenaceae	<i>Verbena bonariensis</i> *

\* = weed or non-endemic species