



**METROPOLITAN COAL
CONSTRUCTION MANAGEMENT PLAN**

SURFACE WORKS ASSESSMENT FORM

**EXPLORATION DRILLHOLES AND DEEP
GROUNDWATER MONITORING**

OCTOBER 2017

Metropolitan Coal

Proposed Installation of Longwall 301 and 302 Groundwater Monitoring

Background

The Longwalls 301 – 303 Extraction Plan was approved by the NSW Department of Planning and Environment (DP&E) on 11 May 2017 (the Extraction Plan Approval). The Extraction Plan Approval permits the mining of Longwalls 301 and 302 subject to a range of specific conditions.

Condition 2 of the Extraction Plan Approval requires Metropolitan Coal to engage independent experts to prepare a Woronora Reservoir Impact Strategy, which will provide a staged plan of action for further investigations (e.g. additional monitoring).

As a component of the strategy, additional groundwater monitoring in the vicinity of Longwall 303 is proposed in order to supplement the previously proposed bores above Longwalls 301 and 302. In addition, Metropolitan Coal is seeking approval to establish:

- One shallow groundwater transect bore (T6) as discussed with WaterNSW;
- One replacement deep groundwater bore (9EGW2-4); and
- Three coal exploration holes.

A summary of the drillholes proposed in this Surface Works Assessment Form is provided in Table 1.

**Table 1
Drillhole Summary**

Site ID	Easting	Northing	Approximate Depth	Planned Timing
TBS3a	312647	6216691	230 m	2018
TBS3b	312647	6216691	230 m	Post-mining of Longwall 301
T6	311447	6217375	130 m	Late 2017
9EGW2-4 Replacement	311216	6216986	550 m	Late 2017
PHEX01 Exploration 1	312540	6216670	600 m	Late 2017
PHEX02 Exploration 2	312460	6217290	600 m	2018
PHEX03 Exploration 3	312168	6218255	600 m	2018

The planned timing of the drillholes is subject to approval of this Surface Works Assessment Form.

The proposed construction and environmental management works outlined in this Surface Works Assessment Form append the general management measures as outlined in Metropolitan Coal's Construction Management Plan as approved by DP&E on 25 August 2015.

These sites are located within the Woronora Special Area in the local government area (LGA) of Wollongong City Council. The Woronora Special Area covers a region of approximately 75 square kilometres (km²) and includes the catchment of Woronora Dam. Water NSW manages the Woronora Special Area and public access is restricted.

The proposed activities are situated within the Metropolitan Coal mining lease (Consolidated Coal Lease (CCL) 703). The township of Helensburgh is located approximately 5 km to the east.

The boreholes will have a diameter of approximately 96 millimetres (mm) and will be drilled using a truck mounted rig and track mounted rod handler. The boreholes will be drilled to various depths as summarised in Table 1.

Water Management and Cuttings Containment:

Each borehole will require approximately 40,000 litres of water to lubricate the drill bit and flush the well of cuttings which will then be deposited into a closed reticulated system (i.e. the above ground containerised drill water sumps).

Delivery of drilling water to the borehole site will involve deployment of water tanks to the drill site, to act as a large volume reservoir for supply water.

Drill cuttings and fines will be captured in the containerised drill water settling tanks. Solids from these tanks will be pumped out by enclosed vacuum truck as required and disposed of at a registered landfill site or utilised back at the mine site.

Borehole Casing:

Steel casing will be installed to approximately one twentieth of the depth of each of the groundwater monitoring bores. Casing will be grouted in place using a cement-based grout. A steel blowout preventer unit would be bolted onto the steel surface casing and would be removed on completion of drilling.

Installation and Operation of Equipment:

The coal exploration drillholes and TBS3b will be grouted following the completion of relevant testwork.

T6 will be installed as a piezometer screening to a depth of approximately 130 m.

Vibrating wire piezometers will be installed down TBS3a and 9EGW2-4 Replacement, linked to a data logger for water level monitoring data collection. The nested piezometers would be attached to steel tubing placed in the borehole and grouted in place. Steel casing will extend to a height of up to 2 m above the ground level to allow for installation of solar panels associated with data capture and telemetry. A lockable steel cover would be fitted to the steel surface casing and a lockable steel box would also be installed to enclose the data logger. Piezometers will be monitored at least monthly via downloading the logger data with a 3G wireless set up.

An inclinometer will also be installed in TBS3a.

Site Rehabilitation:

Post Construction:

The area disturbed by the footprint of the drill rig, rod carriers, settling tanks and access tracks will be remediated with the exception of the following items:

- Maintenance of the 3G telemetry box and solar panels will need to be carried out routinely (i.e. at a minimum on an annual basis). Post construction site remediation works will reflect the need to maintain of a 2m wide walking track to the surface collar point from nearby existing access tracks).
- For the expected lifespan of the monitoring bores an Asset Protection Zone clearing will be maintained around the well heads (5 m radius clearing) to assist in bushfire survivability.

Post Cessation of Use

At the completion of operational activities the well head pipe and telemetry box will be removed and the full site rehabilitated in accordance with Metropolitan Coal's Rehabilitation Management Plan.

Fuel Management:

Equipment (e.g. drill rigs, pumps) will be regularly inspected for leaks of oil/fuel/coolant. Impervious bunding will be provided with greater than 110% of the capacity of the item being banded. Spill containment/treatment resources (i.e. spill kits) will be provided and personnel will be trained in their use. The spill kits will include: absorbent material 40 L bag of Organic Oil/Fuel absorbent; absorbent pads: 20 of 480 X 430 mm pads; garbage bags; shovel; and a bag of rags.

Any spill that occurs will be immediately cleaned up and reported to:

- the site supervisor;
- the MCPL Manager – Technical Services
- Water NSW (via the incident Management Number 1800 061 069).

The site supervisor and the MCPL Manager – Technical Services will investigate any spills.

8. Human Waste Water:

A portable toilet serviced by Coates Hire Pty Ltd will be located at the drill sites. The toilet will be serviced with a vacuum truck.

**Construction Management Plan
Surface Works Assessment Form**

**Note, this form must be completed in full
prior to the commencement of surface disturbance works**

Date: 10 October 2017

Name and position: Stephen Love (Environment and Community Superintendent)

Register number (i.e. Number 1, 2, etc.): 9

RMP register number:

Site name:

- TBS3a
- TBS3b
- T6
- 9EGW2-4 Replacement
- PHEX01 Exploration 1
- PHEX02 Exploration 2
- PHEX03 Exploration 3

Site type: Groundwater Monitoring and Coal Exploration

Site co-ordinates (easting/northing):

Site ID	Easting	Northing
TBS3a	312647	6216691
TBS3b	312647	6216691
T6	311447	6217375
9EGW2-4	311216	6216986
PHEX01	312540	6216670
PHEX02	312460	6217290
PHEX03	312168	6218255

Expected duration of works: 8 weeks (weather permitting)

Works schedule:

- Describe the activities (including timing) to be conducted during construction works.

- Risk Assessment
- Personnel training and awareness - prior to commencement of activities.
- Establishment and implementation of pre-construction management measures (e.g. erosion and sediment controls, vegetation clearance) - approximately 5 days.
- Drilling of Boreholes (approximately 12 weeks).

- Installation of Piezometers, inclinometer and undertaking of testwork (e.g. packer tests)
- Monitoring during construction - prior to, and following daily construction activities.
- Site clean-up (e.g. removal of equipment, materials and waste) - approximately half a day.
- Monitoring at completion of construction.
- Remediation works on drill pad area (brushmatting etc).

Review of baseline information - site features (refer Section 5 of the ConMP)

Are any of the following features located within the proposed disturbance area or immediate surrounds?

Are there occurrences of the Southern Sydney Sheltered Forest on Transitional Sandstone Soils EEC in the general area? **No**

Are there occurrences of the O'Hares Creek Shale Forest EEC in the general area? **Yes**

Are upland swamps located in the general area? **Yes**

Are there records of known threatened flora species in the general area? **Yes**

Are there records of known threatened fauna species in the general area? **No**

Are existing (or proposed) monitoring sites located nearby? **No**

What vegetation type is present?

Exposed Sandstone Scribbly Gum Woodland, Sandstone Gully Apple-Peppermint Forest and Rock Pavement Heath, Rock Plate Heath-Mallee, Woronora Tall Mallee Heath. None of the proposed borehole sites will impact any Threatened Ecological Communities.

Are known Aboriginal heritage sites present? **Yes**

Is this an area in which disturbance is to be avoided and/or limited? (refer Sections 6.1.1 and 6.1.2 of the ConMP) **No**

- Southern Sydney Sheltered Forest on Transitional Sandstone Soils EEC
- O'Hares Creek Shale Forest EEC
- Upland swamps
- Environmental monitoring sites

If the proposed disturbance area is located in an area to be avoided or limited, relocate site where appropriate in accordance with the requirements of the ConMP

Threatened flora survey (refer Section 6.1.3 of the ConMP)

Date of survey for threatened flora. 12 September 2017

Name of suitably qualified ecologist conducting survey.

Alex Christie (Niche Environment and Heritage)

Have any threatened flora been identified within the proposed disturbance area or immediate surrounds. **Yes**

Scientific names of threatened flora species recorded.

Pultenaea aristata

Will works be relocated to avoid or minimise impacts on the threatened flora species?

Yes – All *Pultenaea aristata* have been marked with orange flagging tape. *Pultenaea aristata* individuals will be demarcated with barrier fence and their location made known to project personnel so they can be avoided and protected during works. With the mitigation measures in place, no impact to *Pultenaea aristata* is expected as a result of the proposed works.

If it is not feasible to relocate the works, have the impacts of the proposed works on the population of the threatened flora species been assessed by a suitably qualified and experienced ecologist?

NA

If No, do not proceed

Has the assessment concluded that the proposed surface activities are likely to have a significant impact on a population of the threatened flora species?

No

If Yes, the proposed works are to be modified to avoid such an outcome

Flora survey report attached (Appendix 1)

Vegetation clearance and site access (refer Section 6.1.6 of ConMP)

Is vegetation clearing required for the construction works? If yes, describe extent (e.g. m²) and method of clearing (e.g. slashing/lopping branches/removal)?

Yes

The proposal seeks to minimise disturbance by using previously developed tracks where possible. It would result in approximately 0.27 hectares of vegetation disturbance, 0.12 ha of which is secondary clearing along the edges of an existing track.

Use of a large tractor with a “trittering” attachment to prepare the borehole site (where required). The “trittering” attachment effectively mulches the vegetation in situ, which leaves root balls intact under the ground surface. This results in much faster vegetative regeneration than standard land clearing techniques, and the mulch left on the surface provides excellent protection against erosion. Most of the proposed sites are on cleared Fire Trail verges and will not require additional clearing.

Describe the access requirements for the construction site (e.g. vehicle/pedestrian/helicopter) and where the access will be from (e.g. which fire road).

Existing access roads will be used for siting/delivery of equipment and for access to sites. Access arrangements for each site is summarised below.

Site ID Access

PHEX01 Access to the borehole site is directly off the Princes Highway from the southbound lane. The borehole site utilises a site that is largely previously cleared. The site will require some additional primary clearing of up to approximately 0.06 ha MU29 - Exposed Sandstone Scribbly Gum Woodland.

PHEX02 Access to the borehole site is via Fire Trail 9I from the catchment gate off the Woronora Dam Road or Princes Highway. The borehole site will be set up lengthways along the cleared road verge so no primary clearing will be necessary. Some slashing of regrowth on the road verge may be necessary.

<u>Site ID</u>	<u>Access</u>
PHEX03	Access to the borehole site is via Fire Trail 9I from the catchment gate off the Woronora Dam Road. The borehole site will be set up lengthways along the cleared road verge so no primary clearing will be necessary. Some slashing of regrowth on the road verge may be necessary.
9EGW2-4	Access to the borehole site is via Fire Trail 9 and 9E from the catchment gate off Darkes Forest Road. The borehole site will be set up lengthways along the cleared road verge so no primary clearing will be necessary. Some slashing of regrowth on the road verge may be necessary.
TBS3a/b	Access to the borehole site would utilise an existing track from the south accessed from the catchment gate off the Princes Highway. The access track may require secondary clearing of 0.5 m of vegetation either side of the track (MU39 – Rock Plate Heath-Mallee and MU38 – Rock Pavement Heath MU29 - Exposed Sandstone Scribbly Gum Woodland). The borehole site requires the primary clearing of approximately 900m ² of native vegetation (MU39 – Rock Plate Heath-Mallee) on the west side of the track.
T6	Access to the borehole site is via Fire Trail 9 and 9E from the catchment gate off Darkes Forest Road. The borehole site will be set up within the clear area of rock shelf so no primary clearing will be necessary apart from some minor slashing.

Is vegetation clearing required for site access? If yes, describe the extent and method of clearing? **Yes – refer above for description of clearing at each site.**

Vegetation management measures to be implemented (refer Section 6.1.4 of the ConMP)

Disturbance would be appropriately limited by the following mitigation measures:

- Particular care would be taken to avoid disturbance to native vegetation.
- Existing fire trails, tracks and exposed bedrock will be used for access and placement of equipment, where practical.
- There will be no access through, or vegetation clearance within upland swamps.
- Vegetation disturbance at each site would be kept to the minimum necessary.
- *Pultenaea aristata* have been marked with orange flagging tape. *Pultenaea aristata* individuals will be demarcated with barrier fence and their location made known to project personnel so they can be avoided and protected during works.

Site Layout Plan (refer Section 6.1.5 of ConMP)

Has a Site Layout Plan been prepared and attached to the Works Assessment Form?

Yes (Refer Figures in Attachment 1)

Have the following been indicated on the Site Layout Plan?

Yes

- Site location
- Works design
- Management measures (e.g. erosion and sediment controls, spill kits)
- Access track/s (indicate type of access, e.g. pedestrian/vehicle. Also indicate location of nearest fire trail where access will be from)
- Areas of vegetation clearance
- Location of equipment (e.g. pump, generator, fuel storage, portable toilets)
- Equipment storage areas
- Safety equipment (e.g. fire extinguisher and first aid kit)

Attach photographs, where appropriate

Description of Photographs:



Borehole Site 9EGW2 – 4 Replacement looking south west along the drill site



Borehole Site 9EGW2 – 4 Replacement looking north east along the drill site



Borehole Site PHEX03 Exploration 3 looking south along the drill site



Borehole Site PHEX03 Exploration 3 looking north along the drill site



Borehole Site PHEX02 Exploration 2 facing south east



Borehole Site PHEX02 Exploration 2 facing north west



Borehole Site PHEX01 Exploration 1 facing west



Borehole Site PHEX01 Exploration 1 facing east



Borehole Site for boreholes TBS3a and TBS3b looking south along the access track



Borehole Site for boreholes TBS3a and TBS3b looking north along the access track

Aboriginal heritage pre-clearance survey (refer Section 6.2 of the ConMP)

Date of pre-clearance survey for Aboriginal heritage sites.

12 September 2017

Name of survey attendees.

Renee Regal – Niche Environment and heritage

Are any Aboriginal heritage sites identified within the proposed disturbance area or immediate surrounds?

No

Description of recorded Aboriginal heritage sites.

N/A

Will works be relocated to avoid impacts on the Aboriginal heritage site?

N/A

If it is not feasible to relocate the works to avoid impacts to the Aboriginal heritage site, management and/or mitigation measures to be implemented in accordance with the Metropolitan Mine Heritage Management Plan. Describe measures below.

N/A

Where avoidance is not practicable, has a comprehensive baseline record been obtained and salvage considered in consultation with Aboriginal stakeholders prior to disturbance.

N/A

[Attach any relevant archaeological reports to this assessment form]

Aboriginal heritage preclearance survey report attached.

Known Aboriginal heritage sites located close to surface disturbance works

No Aboriginal heritage sites have been identified in proximity to the proposed drilling area.

N/A

Erosion or sediment control measures required?

- Is any erosion or sediment control required? **Yes**
- If yes, has an Erosion and Sediment Control Plan been prepared and attached to the Surface Works Assessment Form? **Yes**

Fuel and spill management measures required?

- Are compressors and pumps bunded and with sufficient capacity? **Yes**
- Where fuels are used, are spill kits available at the construction site? **Yes**
- Have personnel been trained in spill clean-up procedures? **Yes**

List Hazardous Materials and Storage Requirements

- What hazardous materials are required to be used and how will they be stored on site?

Diesel Fuel
Unleaded Fuel

Large quantities of fuel will not be stored on site. Fuel will be transported in a closed purpose built fuel tank secured in a 4 wheel drive vehicle. Re-fuelling will be conducted using a low voltage electric pump and bowser. Care will be taken not to spill fuel. Oil/fuel absorbent materials or other containment materials will be made available at the site to prevent contact with the surrounding environment.

Unleaded fuel for pumps will be stored in 10 litre containers and stored in a bunded area

- Are Materials Safety Data Sheets (MSDS) for hazardous materials located at the construction site? **Yes**

Bushfire Preparedness and Management

- Have MCPL staff and contractors been provided with fire awareness and fire safety training? **Yes**
- Has a Hot Work Permit been obtained from the Water NSW if required? **N/A**

Not required - Items will take offsite for hot works. Metropolitan Coal will contact WaterNSW to obtain a Hot Work Permit if an item cannot be removed before working on it.

Erosion and Sediment Control Plan

Correct location, design of the work site and work practices will minimise the risk of erosion at each of the sites. Effectively managing this issue will be achieved by carrying out the following:

- Minimise the disturbance area of the access trails and work site, this will accordingly reduce the likelihood and severity of erosion needing to be controlled
- Slashing or vegetation disturbance will be conducted following the strategies listed in the vegetation management section above;
- Correct aspect and site location. The sites have been selected in appropriate areas that will minimise the risk of erosion ie flat sites, not on hard rock;
- Sediment control will be managed in accordance with the Blue Book (Volume 1 and Volume 2E), including the installation of sediment fences as per the standard drawing 6-8 of the Blue Book Volume 1;
- Whilst drilling is being conducted, the collar of the drill hole will have a t section installed to allow sediment to be deposited directly into a baffled tank for collection. Cuttings will be removed at the half way point of each drilling program and then again upon completion of the bore;
- All workers will be trained in the appropriate work practices and the drilling operation will be constantly manned whilst in operation.

Attachment 1

**Flora, Fauna and Archaeological Assessment
(Niche Environment and Heritage)**



Metropolitan Coal Exploration and Groundwater Monitoring Boreholes

Flora, Fauna and Archaeological Assessment

Prepared for Metropolitan Coal

October 2017

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Cover photograph: Borehole Site PHEX02 Exploration 2 – Cleared Fire Trail shoulder to be utilised as drill site.

Niche Environment and Heritage

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Cairns

Executive summary

Niche Environment and Heritage (Niche) has undertaken an assessment of the ecological and archaeological constraints and potential impacts associated with the development of three proposed groundwater monitoring borehole sites and three proposed exploration borehole sites by Metropolitan Coal.

The proposed borehole sites are required for exploration and groundwater monitoring investigations. This includes three proposed groundwater investigation borehole sites (9EGW2-4 Replacement, TBS3a & TBS3b, T6) and three proposed exploration borehole sites (PHEX01 Exploration 1, PHEX02 Exploration 2 and PHEX03 Exploration 3).

The proposal seeks to minimise disturbance by using previously developed tracks for the most part. It would result in approximately 0.27 hectares of vegetation clearing, 0.12 ha of which is secondary clearing of an existing track.

Provided the mitigation measures are implemented, the proposal will not cause any significant impact to any Threatened Ecological Communities (TEC) or threatened biodiversity listed on the NSW *Biodiversity Conservation Act 2016* (BC Act) and Commonwealth *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act).

The proposed sites have been inspected by an archaeologist. An Aboriginal Objects Due Diligence Assessment has concluded there will be no adverse effects to Aboriginal cultural heritage sites as a result of the proposed borehole sites and access tracks (refer Annex 3).

The relevant management measures as outlined in the Metropolitan Coal Construction Management Plan shall be implemented in order to minimise impacts to the environment.

This reports supports the Surface Works Assessment Form required to be completed for the proposed activities under the Metropolitan Coal Construction Management Plan. Metropolitan Coal will provide the details of the proposed surface construction works (in the form of a completed Surface Works Assessment Form to the DP&E and WaterNSW for comment).

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1. Introduction

1.1 Context

Niche Environment and Heritage (Niche) has undertaken an assessment of the ecological constraints and potential impacts associated with the development of three proposed groundwater monitoring borehole sites and three proposed exploration borehole sites by Metropolitan Coal.

The proposed borehole sites are required for exploration and groundwater monitoring investigations. This includes three proposed groundwater investigation borehole sites (9EGW2-4 Replacement, TBS3a and TBS3b at the same site, T6) and three proposed exploration borehole sites (PHEX01 Exploration 1, PHEX02 Exploration 2 and PHEX03 Exploration 3). Refer Figures 1-5.

1.2 Proposed works

1.2.1 Boreholes

Location details, including site specific environmental constraints, safeguards, and access considerations are outlined below in Table 1. Site plans are provided in Annex 1 and site photos are provided in Annex 2.

Borehole development occurs in two main stages, site preparation and drilling.

Site preparation will involve:

- Use of an existing tracks wherever possible, negating the need to prepare a new access track.
- Use of a large tractor with a “trittering” attachment to prepare the borehole site (where required). The “trittering” attachment effectively mulches the vegetation in situ, which leaves root balls intact under the ground surface. This results in much faster vegetative regeneration than standard land clearing techniques, and the mulch left on the surface provides excellent protection against erosion. Most of the proposed sites are on cleared Fire Trail verges and will not require additional clearing (refer Table 1).
- Use of an excavator to prepare borehole site including a level drill pad, a broader set down and work area (approximately 30 m x 30 m) or nominally 900m². In order to reduce vegetation clearing requirements and maximise the use of linear clearing along previous Fire Trails, borehole sites will be set up in a rectangular shape (e.g. 15 m x 60 m or similar) where appropriate. Regardless, approval is sought for the establishment of a 900m² site. Proposed site geometry is provided for each site in Annex 1.
- Installation of two above ground containerised drill water sumps (nominally 4 m x 2 m x 1.5 m in volume). Above ground containerised drill water sumps are preferred by WaterNSW rather than in ground sumps which require excavation and therefore surface disturbance.
- Installation of erosion and sediment controls (diversion bunding, silt fencing, silt sausages, filter cloth) around the site to divert stormwater runoff around the site or remove suspended solids from site runoff water.
- Installation of appropriate ground covering material in areas of high activity to reduce soil disturbance at the drill site. Such material may include rubber lattice or a temporary layer of sandstone aggregate on top of geofabric to facilitate local drainage of the surface area.

- The use of large metal plates (3m x 6m x 0.25m) may be used from time to time on access tracks and borehole sites to minimise soil disturbance and provide access to heavy vehicles like water trucks.

Drilling of boreholes will involve:

- Delivery and deployment of tray and track mounted drill rigs to site. Delivery vehicles may include custom designed tilt tray trucks or skid steer units.
- Delivery and deployment of ancillary equipment including rod truck/stand, pumps, consumables, core boxes and testing equipment.
- Water delivery to site (see below).
- Use of rotary or hammer drilling to target drilling depth. Drill diameter is typically 96 mm.
- Use of appropriate drilling techniques to prevent well head pressure loss and aquifer contamination.
- Recovering any core samples from the drill column, cataloguing them and removing them from site.

Each borehole will use approximately 40 000 litres of water to lubricate the drill bit and flush the well of cuttings which will then be deposited into a closed reticulated system (i.e. the above ground containerised drill water sumps). Delivery of drilling water to the borehole site by water tanker may also be supplemented by deployment of water tanks to the drill site, to act as a large volume reservoir for supply water.

Site closure and rehabilitation will involve the following:

- Sealing the borehole to the surface with a cement/bentonite mix as per the standard requirements of Division of Resources and Geoscience (DRG).
- Capping and reporting the sealed borehole to the standards required by the DRG.
- Tanker access to the drill sites will be required upon completion of drilling operations to empty the above ground containerised drill water sumps of waste water and drill cuttings. These materials are transported off-site to an approved disposal site.
- Use of an excavator to scarify compacted soils to enhance the bed for seed and new vegetative growth, if required.
- Use of an excavator to place larger items (notably rocks and logs) back over the site, if required, in order to arrest water flow over the disturbed ground and provide a structure for emergent seedlings and other regenerating plants to shelter.

Revegetation, if required, may involve the following:

- **Brush Matting:** using hand held vegetation cutting equipment to source seed bearing branches from shrubs adjacent to the disturbance footprint and placing those limbs on the disturbed area. Brush matting introduces both locally sourced seed and a physical structure for seedling establishment to a disturbed site.
- **Direct Seeding:** direct seeding may be used to deliver larger quantities of seed to a disturbed site. Direct seeding may use locally sourced or 'provenance' seed or commercially available, sterile cover

grass mixes. The use of cover grass seed is not typically the preferred seed type used in catchment lands as it has potential to increase the presence of weed species in the area. Cover grass seed will only be used if requested by WaterNSW and under strict management of the site.

- Planting: Planting of locally sourced or 'provenance' tubestock may be used on very large disturbance footprints to supplement brush matting and or direct seeding. Planting tubestock is typically undertaken to introduce more mature plants to a disturbed site to assist faster regeneration.

Given the nature of the disturbance footprint (typically narrow linear disturbance adjacent to Fire Trails) and the existence of high quality native vegetation adjacent to each borehole site, only brush matting, in association with the excavator replacing larger items (logs and rocks) on the disturbed sites, if required, is proposed.

A typical site layout is shown below in Diagram 1.

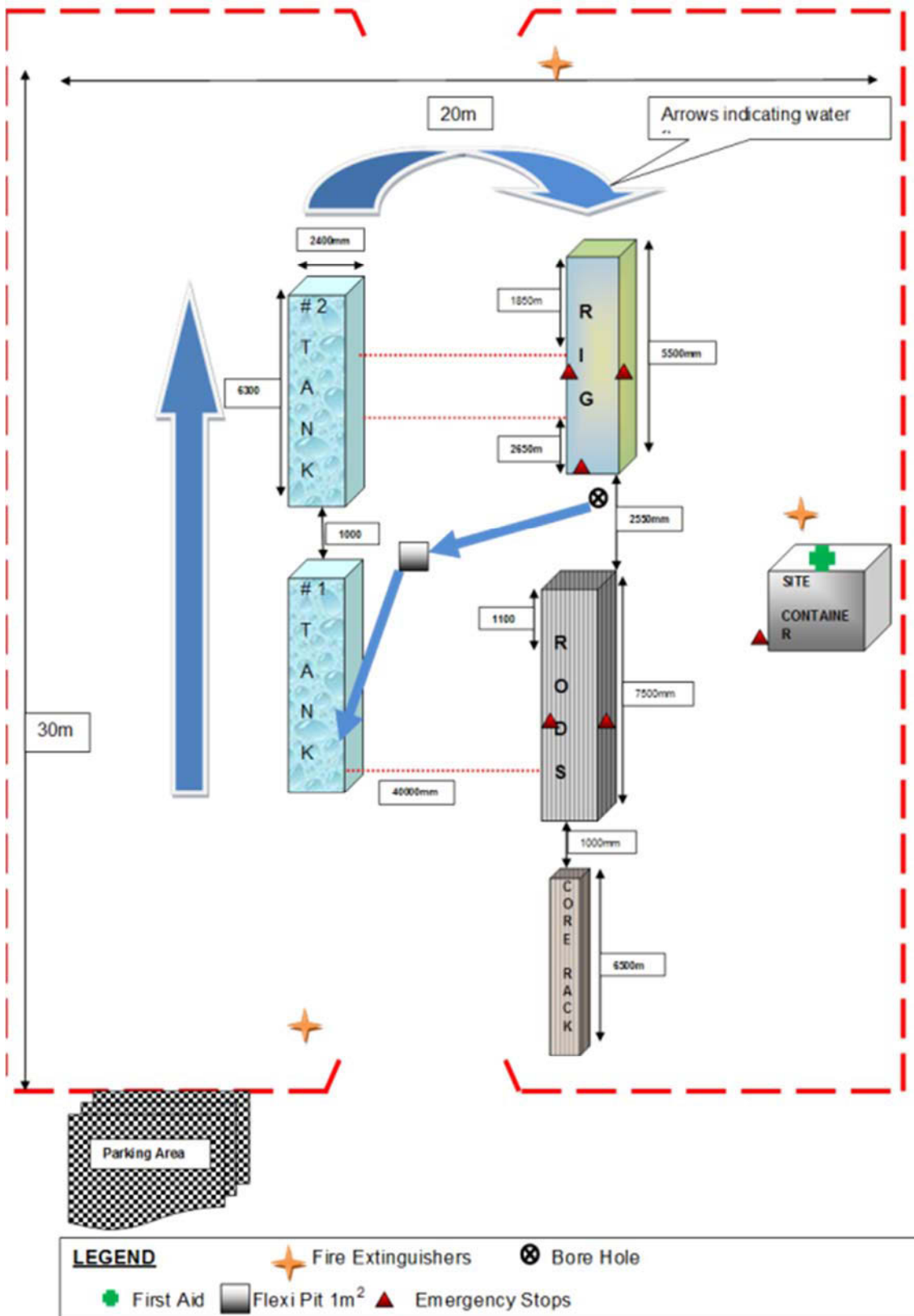


Diagram 1 Typical site layout

2. Proposed borehole locations

Details of the proposed borehole locations, access, site specific constraints and safeguards are detailed in Table 1 with an impact assessment in the following sections. Refer to attached Figures and Borehole Site Plans in Annex 1 and Plates in Annex 2.

Table 1. Location of proposed boreholes

Borehole	MGA56 E	MGA N	Purpose	Hole Furniture	Access and Site Preparation Requirements	Site-specific constraints and Environmental Safeguards
PHEX01 Exploration 1	312540	6216670	Exploration Hole – 600m PQ Hole (Coring Bulli and Balgownie)	Nil-grouted post drilling	<ul style="list-style-type: none"> Access to the borehole site is directly off the Princes Highway from the southbound lane. A Key is required to access a small clearing beyond a locked cable fence (currently used for groundwater monitoring). The borehole site utilises a site that is largely previously cleared. The site will require some additional primary clearing of up to approximately 0.06 ha MU29 - Exposed Sandstone Scribbly Gum Woodland. 	<ul style="list-style-type: none"> Vegetation disturbance will be minimised to the smallest footprint required. Avoid hollow bearing trees and large fallen logs which occur throughout the general area (refer borehole site plan). Areas on the west of the site are quite steep and constrained by rocky outcrops. Sediment controls to be implemented as appropriate on downslope sides of the site.
PHEX02 Exploration 2	312460	6217290	Exploration Hole – 600m PQ Hole (Coring Bulli and Balgownie)	Nil-grouted post drilling	<ul style="list-style-type: none"> Access to the borehole site is via Fire Trail 9I from the catchment gate off the Woronora Dam Road or Princes Highway. The site is located immediately adjacent Fire Trail 9I on slashed road verge. The borehole site will be set up lengthways along the cleared road verge so no primary clearing will be necessary. Some slashing of regrowth on the road verge may be necessary. Refer Borehole Site Plan in Annex 1. 	<ul style="list-style-type: none"> Vegetation disturbance will be minimised to the smallest footprint required (within the road verge/shoulder). Sediment controls to be implemented as appropriate on downslope sides of the site to protect the drainage line south of the site. Project personnel are to be notified of the Aboriginal sites (shelters containing art and deposits) to the north east and south east of the site and must be avoided.
PHEX03 Exploration 3	312168	6218255	Exploration Hole – 600m PQ Hole (Coring Bulli and Balgownie)	Nil-grouted post drilling	<ul style="list-style-type: none"> Access to the borehole site is via Fire Trail 9I from the catchment gate off the Woronora Dam Road. The site is located immediately adjacent Fire Trail 9I on slashed road verge. The borehole site will be set up lengthways along the cleared road verge so no primary clearing will be necessary. Some slashing of regrowth on the road verge 	<ul style="list-style-type: none"> Ecologist to be present when establishing borehole site to demarcate and fence off a <i>Pultenaea aristata</i> individual (threatened flora species). Project personnel are to be notified of the threatened plant and the requirement it must be avoided and protected. Vegetation disturbance will be minimised to the

Borehole	MGA56 E	MGA N	Purpose	Hole Furniture	Access and Site Preparation Requirements	Site-specific constraints and Environmental Safeguards
					may be necessary. Refer Borehole Site Plan in Annex 1.	<p>smallest footprint required (within the road verge/shoulder).</p> <ul style="list-style-type: none"> Sediment controls to be implemented as appropriate on downslope sides of the site.
9EGW2-4 Replacement	311216	6216986	Deep groundwater – 550m HQ	4 x VWP's	<ul style="list-style-type: none"> Access to the borehole site is via Fire Trail 9 and 9E from the catchment gate off Darkes Forest Road. The site is located immediately adjacent Fire Trail 9E on slashed road verge. The borehole site will be set up lengthways along the cleared road verge so no primary clearing will be necessary. Some slashing of regrowth on the road verge may be necessary. Refer Borehole Site Plan in Annex 1. 	<ul style="list-style-type: none"> Vegetation disturbance will be minimised to the smallest footprint required and limited to pruning/slashing along the existing road verge. Sediment controls to be implemented as appropriate on downslope sides of the site.
TBS3a , TBS3b	312647	6216691	TBS3a Medium ground characterisation and water monitoring – 230m HQ (Pre-mining packer testing)	2 x VWP's 1 x Piezometer 1 x Inclinator	<ul style="list-style-type: none"> Access to the borehole site would utilise an existing track from the south accessed from the catchment gate off the Princes Highway. The access track may require secondary clearing of 0.5 m of vegetation either side of the track (MU39 – Rock Plate Heath-Mallee and MU38 – Rock Pavement Heath MU29 - Exposed Sandstone Scribbly Gum Woodland). The borehole site requires the primary clearing of approximately 900m² of native vegetation (MU39 – Rock Plate Heath-Mallee) on the west side of the track. 	<ul style="list-style-type: none"> Vegetation disturbance will be minimised to the smallest footprint required. Sediment controls to be implemented as appropriate on downslope sides of the site. Project personnel are to be notified of <i>Pultenaea aristata</i> individuals on the track to the south of the site adjacent to the access track (refer Borehole Plan). These are to be demarcated, avoided and protected. When undertaking secondary clearing of 0.5 m either side of the unnamed access track to borehole site, an ecologist should be present to ensure no threatened plants are impacted.
			TBS3b Medium ground characterisation – 230m HQ (Post-mining packer testing)	Nil-grouted post drilling		

Borehole	MGA56 E	MGA N	Purpose	Hole Furniture	Access and Site Preparation Requirements	Site-specific constraints and Environmental Safeguards
T6	311447	6217375	Shallow Water Western Transect – 130m HQ Hole	1 x Screed Piezometer	<ul style="list-style-type: none"> Access to the borehole site is via Fire Trail 9 and 9E from the catchment gate off Darkes Forest Road. The site is located on the rock shelf at the end of Fire Trail 9E. The borehole site will be set up within the clear area of rock shelf so no primary clearing will be necessary apart from some minor slashing. 	<ul style="list-style-type: none"> <i>Pultenaea aristata</i> off the existing track near the borehole site should be demarcated and project personnel should be notified. These are to be avoided and protected. Vegetation disturbance will be minimised to the smallest footprint required and limited to pruning/slashing on the clear rock shelf. Sediment controls to be implemented as appropriate on downslope sides of the site.

3. Environmental assessment

3.1 Site assessment

Site assessments were conducted on 12 September 2017 by Alex Christie (Botanist), Renée Regal (Senior Heritage Team Leader) and Chris McEvoy (Principal, Environmental Approvals) of Niche.

The site assessment involved traversing the proposed areas of disturbance for each of the borehole sites and access tracks. The field survey included assessing any environmental constraints, marking any constraints to be avoided in orange flagging tape and recording on GPS.

3.2 Impact assessment

Vegetation disturbance

Vegetation mapping of the study area is included in the Biodiversity Management Plan for Longwalls 301-303 (Peabody Energy 2016). The vegetation mapping is provided in Figure 3. The distribution and composition of the vegetation within the study area, as observed in the field, was broadly in conformity with that mapped in the Peabody Energy (2016) Biodiversity Management Plan, with minor differences in vegetation community boundaries.

The proposal seeks to minimise disturbance by using previously developed tracks where possible. It would result in approximately 0.27 hectares of vegetation disturbance, 0.12 ha of which is secondary clearing along the edges of an existing track.

The vegetation disturbance associated with the proposed borehole sites is provided in Table 2, and photos of each borehole site are provided in Annex 2 of this report. Native vegetation communities that will be impacted by the proposal include: Exposed Sandstone Scribbly Gum Woodland, Sandstone Gully Apple-Peppermint Forest and Rock Pavement Heath, Rock Plate Heath-Mallee, Woronora Tall Mallee Heath. None of the proposed borehole sites will impact any Threatened Ecological Communities (TECs). Upland swamp will be avoided by accessing TBS3a & b from the south.

After decommissioning, the sites will be rehabilitated, monitored, and actions taken as required to ensure no active erosion is occurring.

Table 2. Vegetation disturbance

Site	Exposed sandstone scribbly gum woodland (Primary clearing – borehole site)	Rock Plate Heath-Mallee (Primary clearing - borehole site)	Mixed Vegetation Communities (Secondary clearing – Access Track)	Total (ha)
PHEX01 Exploration 1	0.06			0.06
PHEX02 Exploration 2				
PHEX03 Exploration 3				
9EGW2-4 Replacement				
TBS3a		0.09	0.12	0.21
TBS3b				
T6				
Total	0.06	0.09	0.12	0.27

Threatened ecological communities

A list of threatened ecological communities (TECs) occurring or potentially occurring within the locality was determined from database searches (the NSW Bionet Database Search tool and EPBC Act Protected Matters Search Tool).

Based on the database searches, two (TECs) exist near the study area; Coastal Upland Swamp (MU44) and O'Hares Creek Shale Forest (MU17). Coastal Upland Swamp is listed as endangered on both the BC and EPBC Acts. O'Hares Creek Shale Forest is listed as endangered on the BC Act.

Based on the results of the field survey, no TECs occur within the area to be disturbed and all disturbance has been positioned away from Upland Swamps. Therefore, no further assessment of TECs is required.

Threatened flora

A total of 41 threatened flora, as listed on the BC and/or EPBC Acts, were considered in this assessment (Annex 4). These records were derived from the Atlas of NSW Wildlife and the EPBC Act Protected Matters Search tool.

Thirteen threatened flora were considered to have a High or Moderate likelihood of occurrence in the study area: *Acacia baueri* subsp. *baueri*, *A. bynoeana*, *Astrotricha crassifolia*, *Callistemon linearifolius*, *Callitris endlicheri*, *Cryptostylis hunteriana*, *Epacris purpurascens* var. *purpurascens*, *Eucalyptus camfieldii*, *Genoplesium baueri*, *Leucopogon exolasius*, *Melaleuca deanei*, *Persoonia hirsuta* and *Pultenaea aristata*.

Several *Pultenaea aristata* individuals were recorded during the survey of the proposed boreholes. Individuals were recorded near PHEX03, T6 and south of TBS3a & b adjacent to the access track (refer Borehole Site Plans in Annex 1). All *Pultenaea aristata* have been marked with orange flagging tape. *Pultenaea aristata* individuals will be demarcated with barrier fence and their location made known to project personnel so they can be avoided and protected during works. With the mitigation measures in place, no impact to *Pultenaea aristata* is expected as a result of the proposed works.

Most of the other species are relatively conspicuous and were not detected during the current survey or previous surveys in the study area. Surveys were conducted just outside the flowering period of *Cryptostylis hunteriana* (November to February) and *Genoplesium baueri* (February and March), however with only two previous records within a 10 km radius of the study area (located between approximately 2.8 and 7 km from the study area) and associate orchids not recorded, they are considered unlikely to be present in the study area.

The proposed borehole site locations and access tracks are therefore unlikely to impact any threatened flora species. No further assessment of threatened flora species is required.

Fauna

The vegetation communities provide a wide range of food and shelter for vertebrate fauna. Trees from the family Myrtaceae (mostly *Eucalyptus* spp.) generally dominate the upper canopy in these areas and supply direct (foliage, nectar, exudates) and indirect food (arthropods) for a range of vertebrates, particularly birds and arboreal mammals.

Tree hollows (formed in stags and mature trees) provide nesting and roosting habitat for hollow-dwelling fauna and are important habitat components of native forests. No tree hollows will be removed by the proposal.

Threatened fauna

No threatened fauna species were recorded during the current survey.

A total of 87 threatened fauna have previously been recorded (Atlas of NSW Wildlife) or are predicted to have habitat (EPBC Act) within 10 km of the study area (Annex 4). The analysis (Annex 4) resulted in 26 threatened fauna being rated as having a moderate or high likelihood within the study area (Table 3).

Developments can impact upon fauna in a number of ways. The significance of an impact would be greatest if any of the following situations occur:

- Death or injury of individuals.
- Loss or disturbance of limiting foraging resources.
- Loss or disturbance of limiting breeding resources.

Limiting resources are those that are of particular importance for the survival of a species.

All these species may have potential foraging habitat within the study area, however the bushland immediately adjacent to the study area is extensive and likely to provide a variety of habitat features, such as hollow bearing trees, stags, termite mounds, dense shrubs and mature trees. Furthermore, the current proposal will not remove any hollow bearing trees, stags or mature trees and occur in part on pre-existing tracks. It is therefore unlikely that the proposal will result in a significant loss of habitat or direct impact to any threatened fauna species. Seven Part Tests and Significant Impact Criteria Assessments are therefore not required.

Table 3. Affected threatened fauna (NSW and Commonwealth)

Species	BC Act	EPBC Act	Likelihood of Occurrence	Potential to be affected by the proposal
Red-crowned Toadlet <i>Pseudophryne australis</i>	V	-	Moderate	Potential habitat for a variety of uses in small ephemeral drainages of the study area. No impacts likely as no drainage lines would be impacted.
Barking Owl <i>Ninox connivens</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the study area. Hollow bearing trees will be avoided and thus impacts are likely to be negligible.
Dusky Woodswallow <i>Artamus cyanopterus cyanopterus</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the study area. Impacts are likely to be negligible.
Eastern Bristlebird <i>Dasyornis brachypterus</i>	E	E	Moderate	None; no limiting foraging or breeding habitat within the study area. Impacts are likely to be negligible.
Gang-gang Cockatoo <i>Callocephalon fimbriatum</i>	V	-	High	None; no limiting foraging or breeding habitat within the study area. Hollow bearing trees will be avoided and thus impacts are likely to be negligible.
Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the study area. Hollow bearing trees will be avoided and thus impacts are likely to be negligible.

Species	BC Act	EPBC Act	Likelihood of Occurrence	Potential to be affected by the proposal
Little Eagle <i>Hieraaetus morphnoides</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the study area. Impacts are likely to be negligible.
Powerful Owl <i>Ninox strenua</i>	V	-	High	None; no limiting foraging or breeding habitat within the study area. Hollow bearing trees will be avoided and thus impacts are likely to be negligible.
Sooty Owl <i>Tyto tenebricosa</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the study area. Hollow bearing trees will be avoided and thus impacts are likely to be negligible.
Swift Parrot <i>Lathamus discolor</i>	E	E	Moderate	None; no limiting foraging or breeding habitat within the study area. Impacts are likely to be negligible.
Varied Sittella <i>Daphoenositta chrysoptera</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the study area. Impacts are likely to be negligible.
Eastern Bentwing-bat <i>Miniopterus schreibersii oceanensis</i>	V	-	High	None; no limiting foraging or breeding habitat within the study area. Impacts negligible. Sparse occurrence if present. Important habitat features would not be affected.
Eastern False Pipistrelle <i>Falsistrellus tasmaniensis</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the study area. Impacts negligible. Sparse occurrence if present. Important habitat features would not be affected.
Eastern Freetail-bat <i>Mormopterus norfolkensis</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the study area. Impacts negligible. Sparse occurrence if present. Important habitat features would not be affected.
Eastern Pygmy-possum <i>Cercartetus nanus</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the study area. Impacts negligible. Sparse occurrence if present. Important habitat features would not be affected.
Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	V	V	Moderate	None; no limiting foraging or breeding habitat within the study area. Impacts negligible. Sparse occurrence if present. Important habitat features would not be affected.
Koala <i>Phascolarctos cinereus</i>	V	V	Known	None; no limiting foraging or breeding habitat within the study area. Impacts negligible. Sparse occurrence if present. Important habitat features would not be affected.
Large-eared Pied Bat <i>Chalinolobus dwyeri</i>	V	V	Moderate	None; no limiting foraging or breeding habitat within the study area. Impacts negligible. Sparse occurrence if present. Important habitat features would not be affected.
Little Bentwing-bat <i>Miniopterus australis</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the study area. Impacts negligible. Sparse occurrence if present. Important habitat features would not be affected.

Species	BC Act	EPBC Act	Likelihood of Occurrence	Potential to be affected by the proposal
New Holland Mouse <i>Pseudomys novaehollandiae</i>	-	V	Moderate	None; no limiting foraging or breeding habitat within the study area. Impacts negligible. Sparse occurrence if present. Important habitat features would not be affected.
Spotted-tailed Quoll <i>Dasyurus maculatus maculatus</i>	V	E	Moderate	None; no limiting foraging or breeding habitat within the study area. Impacts negligible. Important habitat features would not be affected.
Spotted-tailed Quoll <i>Dasyurus maculatus maculatus</i>	V	E	Moderate	None; no limiting foraging or breeding habitat within the study area. Impacts negligible. Sparse occurrence if present. Important habitat features would not be affected.
Squirrel Glider <i>Petaurus norfolcensis</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the study area. Impacts negligible. Sparse occurrence if present. Important habitat features would not be affected.
Broad-headed Snake <i>Hoplocephalus bungaroides</i>	E	V	High	Small areas of preferred habitat (exfoliating sandstone) are located near T6 though will be largely avoided. Impacts are likely to be negligible.
Rosenberg's Goanna <i>Varanus rosenbergi</i>	V	-	High	Potential habitat for a variety of uses in small ephemeral drainages of the study area None; no limiting foraging or breeding habitat within the study area. Termite mounds will not be impacted. Impacts are likely to be negligible.

3.3 Recommendations

The proposal aims to avoid disturbance to the following:

- Large trees and stags
- Hollow bearing trees
- Rock outcrops
- Termite mounds
- Large hollow logs; and
- Removing bush-rock.

It is recommended the following mitigation measures are implemented:

- *Pultenea aristata* individuals near PHEX03, T6 and south of TBS3a & b be demarcated with barrier fence and their location made known to project personnel so they can be avoided and protected during works.
- When undertaking secondary clearing of 0.5 m either side of the unnamed access track to borehole site TBS3a & b, an ecologist should be present to ensure no threatened plants are impacted.
- Project personnel are to be notified of the Aboriginal sites (shelters containing art and deposits) to the north east and south east of the PHEX02 site and must be avoided.

To further minimise impacts to flora, fauna and their habitat, the management measures outlined in the Metropolitan Coal Construction Management Plan shall be adhered to.

4. Conclusion

The proposed borehole sites will result in up to approximately 0.27 ha of vegetation clearing, 0.12 ha of which is secondary clearing along the edges of an existing track.

With the proposed mitigation measures in place, the proposal will not result in a significant impact on any TEC, or threatened species listed under the BC Act and/or EPBC Act.

The proposed sites have been inspected by an archaeologist. An Aboriginal Objects Due Diligence Assessment has concluded there will be no adverse effects to Aboriginal cultural heritage sites as a result of the proposed borehole sites and access tracks (refer Annex 3).

The relevant management measures as outlined in the Metropolitan Coal Construction Management Plan shall be implemented in order to minimise impacts to the environment.

This report supports the Surface Works Assessment Form required to be completed for the proposed activities under the Metropolitan Coal Construction Management Plan. Metropolitan Coal will provide the details of the proposed surface construction works (in the form of a completed Surface Works Assessment Form to the DP&E and Water NSW for comment).

References

Atlas of NSW Wildlife (accessed January 2017), NSW Office of Environment and Heritage (OEH), Goulburn St, Sydney.

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Eco Logical Australia (2016) Longwalls 301-303 Upland Swamp Vegetation Mapping and Proposed Monitoring Program. Report prepared for Metropolitan Coal. August 2016.

OEH Threatened Species Profiles Database, accessed February 2017 and, cited as OEH (2017). Also provides access to threatened species Final Determinations by the NSW Scientific Committee.

Peabody Energy (2015). Metropolitan Coal Construction Management Plan. Revision ConMP-R01-D. August 2015.

Peabody Energy (2016) Longwalls 301-303 Biodiversity Management Plan. Dated November 2016.

SPRAT Database and Protected Matters Search Tool (accessed January 2017), <http://www.environment.gov.au/>, Commonwealth Department of Sustainability, Environment, Water, Population and Communities. Provides access to threatened species profiles, recovery plans and final determinations by the Commonwealth Scientific Committee.

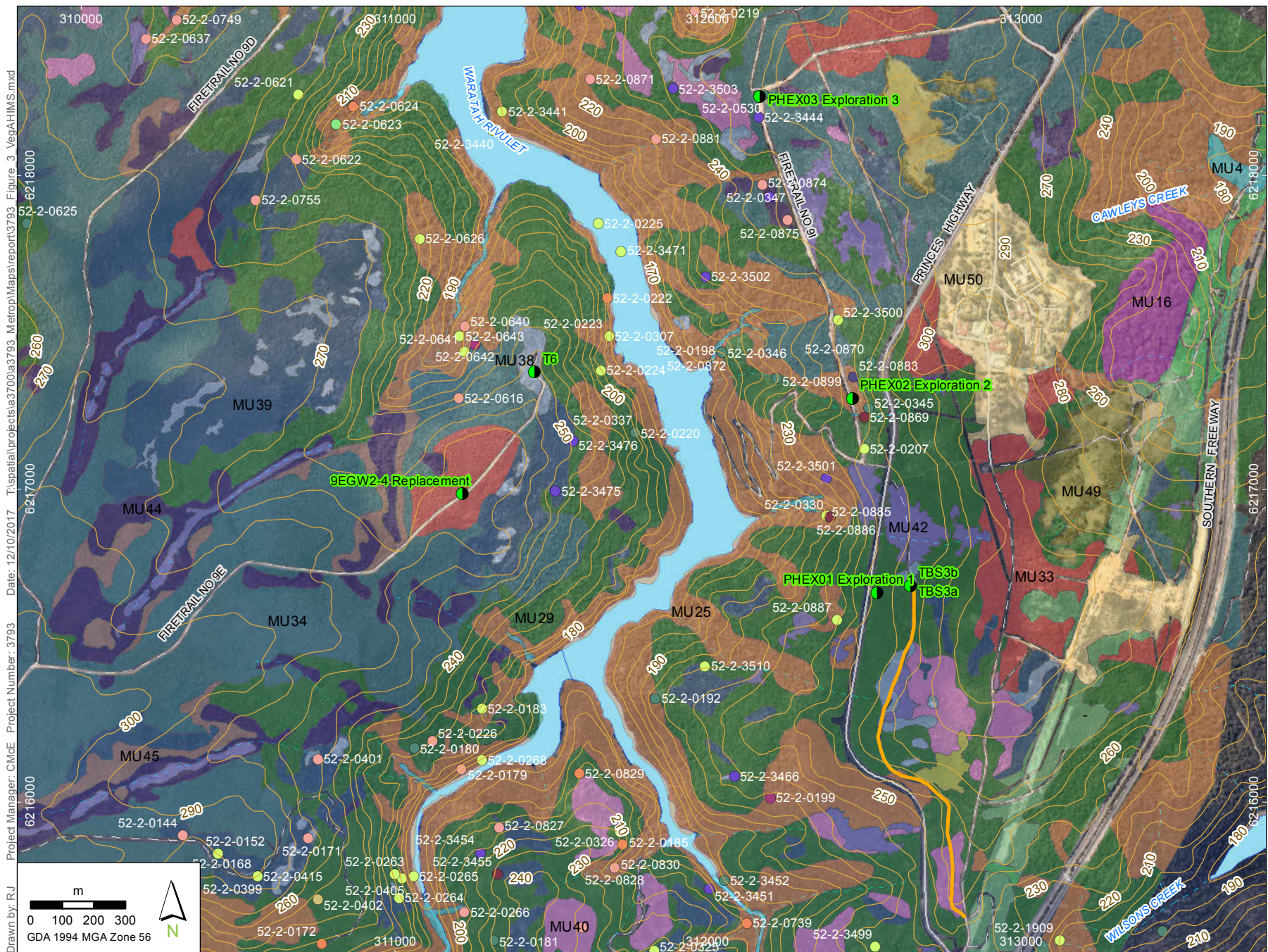
Annex 1 Figures



Location map

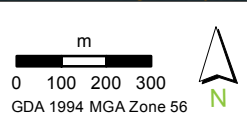
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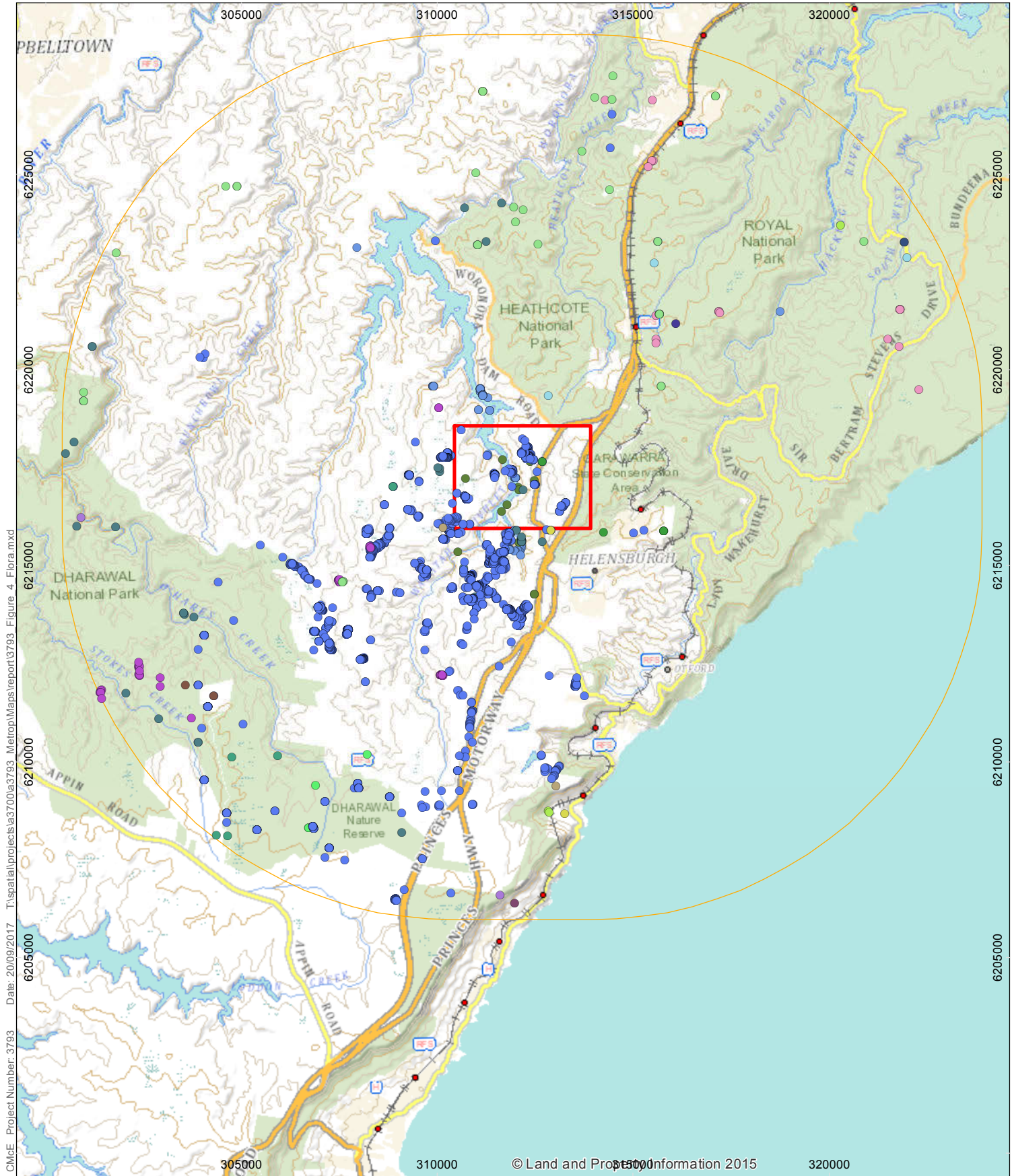




- Boreholes
 - Artefact(s)
 - Axe Grinding Groove
 - Axe Grinding Groove, Open Camp Site
 - Axe Grinding Groove, Rock Engraving
 - Axe Grinding Groove, Shelter with Art, Shelter with Deposit
 - Shelter with
 - Shelter with Art, Shelter with Deposit
 - Shelter with Art, Shelter with Midden
 - Shelter with Deposit
 - Shelter with Deposit, Shelter with Midden
- Access tracks
- Secondary clearing required
 - Upland Swamp: Banksia
 - Disturbed - Regenerating Sandstone Gully Apple-Peppermint Forest
 - Disturbed and/or Regenerating Sandstone or Lateritic Communities
 - MU16, Southern Sydney Sheltered Forest on Transitional Sandstone Soils
 - MU25, Sandstone Gully Apple-Peppermint Forest
 - MU29, Exposed Sandstone Scribbly Gum Woodland
 - MU33, Silvertop Ash Ironstone Woodland
 - MU34, Sandstone Heath-Woodland
 - MU38, Rock Pavement Heath
 - MU39, Rock Plate Heath-Mallee
 - MU4, Sandstone Riparian Scrub
 - MU40, Woronora Tall Mallee-heath
 - MU42, Upland Swamp: Banksia Thicket
 - MU44, Upland Swamp: Sedgeland-heath Complex
 - MU45, Upland Swamp: Fringing Eucalypt Woodland
 - MU49, Acacia
 - MU50, Introduced - Weeds and Exotic Species

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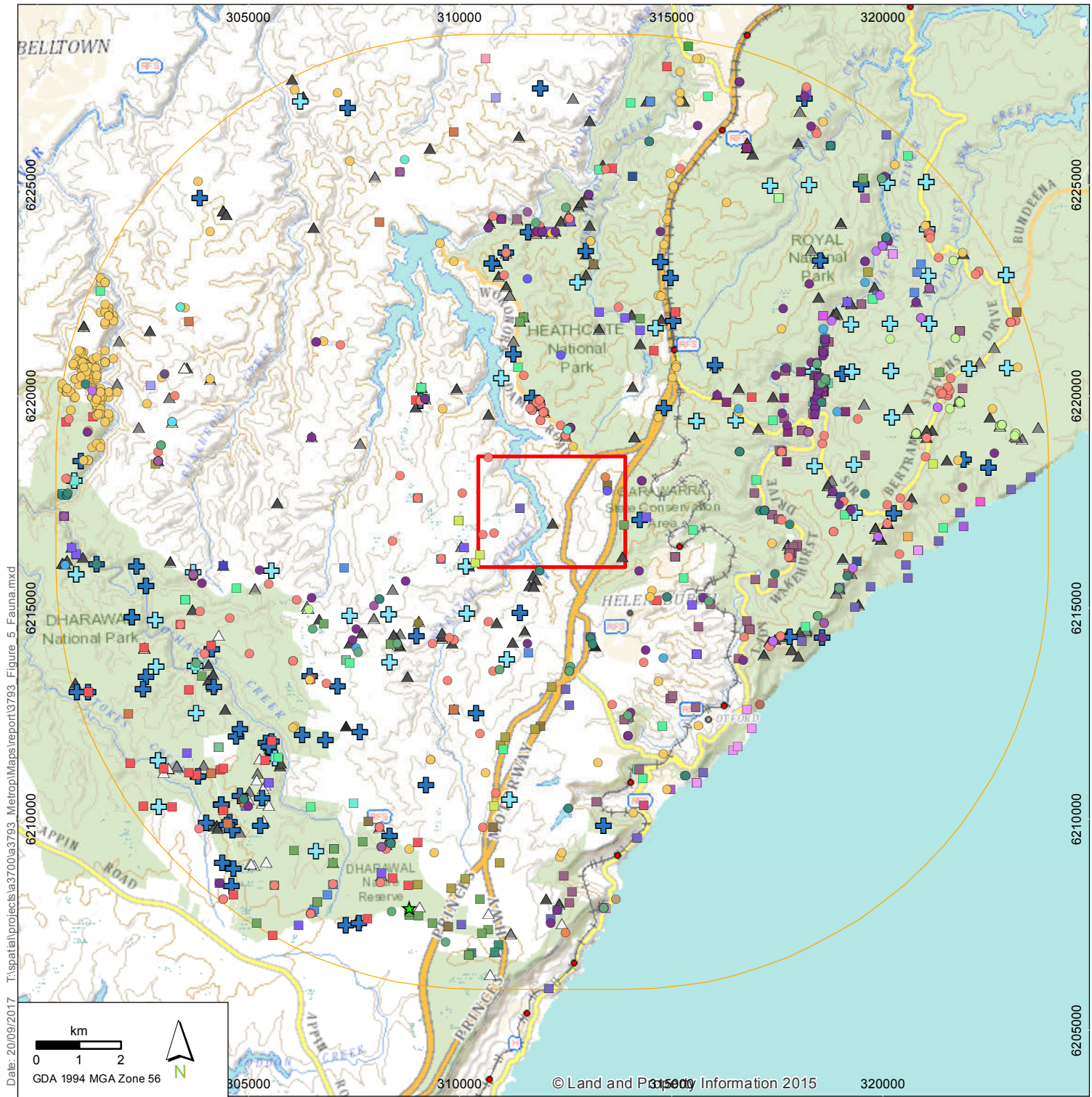


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Threatened flora records within 10km

Metropolitan Exploration and Monitoring Boreholes Environmental Assessment



Threatened fauna records within 10km

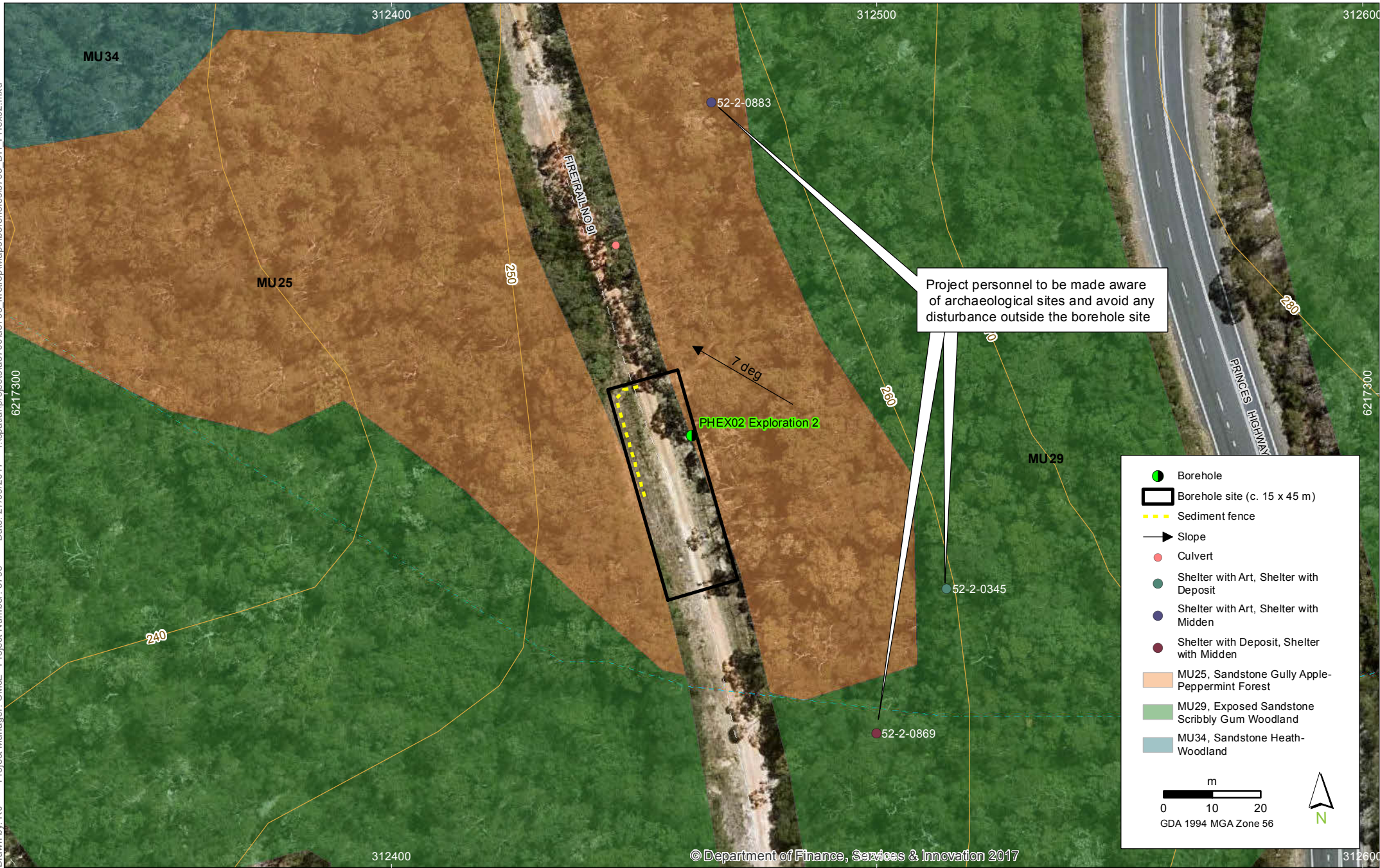
Metropolitan Exploration and Monitoring Boreholes Environmental Assessment



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PHEX03 Exploration 3

Metropolitan Exploration and Monitoring Boreholes Environmental Assessment

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- Borehole
- Borehole site (15 x 45 m)
- Sediment fence
- Slope
- MU33, Silvertop Ash Ironstone Woodland
- MU34, Sandstone Heath-Woodland
- MU38, Rock Pavement Heath
- MU39, Rock Plate Heath-Mallee
- MU44, Upland Swamp: Sedgeland-heath Complex

m
0 10 20
GDA 1994 MGA Zone 56

9EGW2-4 Replacement

Metropolitan Exploration and Monitoring Boreholes Environmental Assessment



Imagery: (c) LPI 2013



Access from the south requires secondary clearing or trimming of track edges

TB 3a, TB 3b

Metropolitan Exploration and Monitoring Boreholes Environmental Assessment

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Demarkate *Pultenea aristata* individuals with barrier fence.
 Avoid and protect during works.
 No clearing/trimming to occur without ecologist supervision.

- Borehole
- Borehole site (30 x 30 m)
- Sediment fence
- Slope
- *Pultenea aristata*
- MU25, Sandstone Gully Apple-
Peppermint Forest
- MU29, Exposed Sandstone
Scribbly Gum Woodland
- MU34, Sandstone Heath-
Woodland
- MU38, Rock Pavement Heath
- MU39, Rock Plate Heath-Mallee

0 10 20
m
GDA 1994 MGA Zone 56

N

Annex 2 Plates



Borehole Site 9EGW2 – 4 Replacement looking south west along the drill site



Borehole Site 9EGW2 – 4 Replacement looking north east along the drill site



Borehole Site PHEX03 Exploration 3 looking south along the drill site



Borehole Site PHEX03 Exploration 3 looking north along the drill site



Borehole Site PHEX02 Exploration 2 facing south east



Borehole Site PHEX02 Exploration 2 facing north west



Borehole Site PHEX01 Exploration 1 facing west



Borehole Site PHEX01 Exploration 1 facing east



Borehole Site for boreholes TBS3a and TBS3b looking south along the access track



Borehole Site for boreholes TBS3a and TBS3b looking north along the access track

Annex 3 Aboriginal Objects Due Diligence Assessment

13 September 2017

Mr Jon Degotardi
Technical Services Manager
Peabody Energy- Metropolitan Coal
Parkes Street
Helensburgh NSW 2508

Via Email: jdegotardi@peabodyenergy.com

Dear Mr Degotardi,

Re: Borehole site assessment for Metropolitan Colliery - Aboriginal Objects Due Diligence Assessment

Niche Environment and Heritage was commissioned by Peabody Energy Metropolitan Colliery (Peabody Energy) to conduct an Aboriginal Objects Due Diligence Assessment for the proposed investigations at the five proposed groundwater monitoring borehole sites (PHEX01 Exploration 1, 9EGW2-4 Replacement, TBS3a, TBS3b, PHEX02 Exploration 2, PHEX03 Exploration 3 and T6), located off the Princes Highway Helensburgh NSW, within the Peabody Energy Metropolitan Colliery Mine lease area (Figures 1 -3). The following assessment has been prepared to satisfy the NSW Minerals Council (2010) *NSW Minerals Industry Due Diligence Code of Practice for the Protection of Aboriginal Objects*, referred to as 'The Code.'

Step 1. Are there any relevant confirmed site records or other associated landscape feature information on AHIMS?

Yes.

An extensive search of the Aboriginal Heritage Information Management System (AHIMS) was conducted on 13 December 2016 (AHIMS ID 258551, 258553, 258556, 258557, 258558 and 258559). There was three previously recorded Aboriginal archaeological site within close proximity to the proposed boreholes. Two of these sites are located approximately 50 m south east of proposed borehole PHEX02 Exploration 2. These sites comprise of two sandstone shelter sites with art (AHIMS ID# 52-2-0869 and 52-2-0345). At proposed borehole location PHEX03 Exploration 3 there is a sandstone shelter with art registered on AHIMS (AHIMS ID # 52-2-0530). After the site inspection, it has been noted that this AHIMS site location has been incorrectly recorded on AHIMS, and will not be disturbed by the proposed works (Figure 2). There is no risk of harm to Aboriginal objects at such a distance from the proposed boreholes.

Step 2. Is the activity defined as a 'low impact activity', as defined by the NPW Regulation?

No.

The activity is not low impact as defined under Clause 80B (1)-(3) of the Code.

Step 3. Are there landscape features that are likely to indicate the presence of Aboriginal objects?

Yes.

The proposed investigation sites are located within the WaterNSW drinking water catchment area. A number of previous archaeological assessments have been carried out within proximity to the Subject Area.

These studies suggest that the majority of the Aboriginal site types within the WaterNSW drinking water catchment areas are sandstone shelters containing art, artefacts and/ or potential archaeological deposit or sandstone rock platforms containing axe grinding grooves.

During the site assessment no further Aboriginal sites were identified within the Subject Area.

Step 4: Does a desktop assessment and visual inspection confirm that there are Aboriginal objects or that they are likely?

A visual inspection was conducted on 13 September 2017. The inspection was conducted by Renée Regal (Heritage Team Leader, Niche).

No Aboriginal objects were found during the survey. The desktop assessment and visual inspection has confirmed that there are no known Aboriginal objects or sites within the Subject Area. This field survey, previous partial surveys of the WaterNSW Catchment Area, and surveys of the surrounding areas have found little evidence of past Aboriginal land use within the area of the proposed boreholes.

Step 5: Can the activity be relocated away from the known/ Likely area for Aboriginal Objects?

Not applicable. The results of this assessment indicate there is a negligible risk of harm to Aboriginal objects, meaning harm is avoided, so there is no compelling reason to avoid the activity.

Step 6. Further investigations and impact assessment

No Aboriginal objects were discovered during the site inspection survey. The desktop assessment and site inspection undertaken in accordance with the Code and consideration of previous Aboriginal cultural heritage assessments indicates that Aboriginal objects are not likely to be present within the proposed investigation area. Therefore, no further investigations or impact assessment is necessary.

The following recommendations are made:

- Standard work procedures for protection and reporting of Aboriginal objects of Metropolitan Colliery and sites be implemented;
- Project personnel to be made aware of the archaeological sites near PHEX02 Exploration 2 and to avoid any disturbance outside the borehole site.
- Should Aboriginal objects or sites be identified during any works, works should cease in the vicinity of the find and a qualified archaeologist should be consulted on appropriate management actions.

In conclusion there are no constraints relating to Aboriginal cultural heritage for the proposed investigation works, and the works may proceed with caution.

Please do not hesitate to contact me if you would like to discuss this assessment further.

Yours sincerely



Renée Regal

Niche Environment and Heritage

Annex 4 Threatened flora and fauna likelihood of occurrence

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
Frogs				
Giant Burrowing Frog <i>Heleioporus australiacus</i>	V	V	The Giant Burrowing Frog has been recorded breeding in a range of water bodies associated with more sandy environments of the coast and adjacent ranges from the Sydney Basin south the eastern Victoria. It breeds in hanging swamps, perennial non-flooding creeks and occasionally permanent pools, but permanent water must be present to allow its large tadpoles time to reach metamorphosis.	Low
Green and Golden Bell Frog <i>Litoria aurea</i>	E	V	Inhabits a very wide range of water bodies including marshes, dams and streams, particularly those containing emergent vegetation such as bullrushes or spikerushes. It also inhabits numerous types of man-made water bodies including quarries and sand extraction sites. Optimum habitat includes water-bodies that are un-shaded, free of predatory fish such as Plague Minnow, have a grassy area nearby and diurnal sheltering sites available.	Low
Littlejohn's Tree Frog <i>Litoria littlejohni</i>	V	V	Occurs in wet and dry sclerophyll forests and heathland associated with sandstone outcrops between 280 and 1000 m on the eastern slopes of the Great Dividing Range from the Central Coast down into Victoria. Individuals have been collected from a wide range of water bodies that includes semi-permanent dams, permanent ponds, temporary pools and permanent streams, with calling occurring from fringing vegetation or on the banks. Individuals have been observed sheltering under rocks on high exposed ridges during summer and within deep leaf litter adjacent to the breeding site. Calling occurs in all months of the year, often in association with heavy rains. The tadpoles are distinctive, being large and very dark in colouration.	Low
Red-crowned Toadlet <i>Pseudophryne australis</i>	V	-	Occurs on wetter ridge tops and upper slopes of sandstone formations on which the predominant vegetation is dry open forests and heaths. This species typically breeds within small ephemeral creeks that feed into larger semi-perennial streams. After rain these creeks are characterised by a series of shallow pools lined by dense grasses, ferns and low shrubs and usually contain leaf litter for shelter. Eggs are terrestrial and laid under litter, vegetation or rocks where the tadpoles inside will reach a relatively late stage of development before waiting for flooding waters before hatching will occur.	High
Southern Bell Frog <i>Litoria raniformis</i>	E	V	A highly adaptable and wide-ranging large frog found in a very wide range of habitats to the west of the Great Dividing Range in SW NSW. This includes permanent and ephemeral black box-lignum-nitre goosefoot swamps, lignum-typha swamps and river red gum swamps or billabongs along floodplains and river valleys as well as irrigated rice crops and farm dams in agricultural environments. they prefer areas with emergent aquatic vegetation that they can use for shelter and for basking sites. Individuals can be found sheltering and overwintering under debris or in vegetation immediately adjacent to the breeding sites.	None

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
Stuttering Frog <i>Mixophyes balbus</i>	E	V	Associated with streams in dry sclerophyll and wet sclerophyll forests and rainforests of more upland areas of the Great Dividing Range of NSW and down into Victoria. Breeding occurs along forest streams with permanent water where eggs are deposited within nests excavated in riffle zones by the females and the tadpoles swim free into the stream when large enough to do so. Outside of breeding, individuals range widely across the forest floor and can be found hundreds of metres from water.	Low
Birds				
Australasian Bittern <i>Botaurus poiciloptilus</i>	E	E	The Australasian Bittern is widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes and spikerushes.	Low
Australian Painted Snipe <i>Rostratula australis</i>	E	E, M	In NSW, this species has been recorded at the Paroo wetlands, Lake Cowell, Macquarie Marshes and Hexham Swamp. Most common in the Murray-Darling Basin. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds.	None
Barking Owl <i>Ninox connivens</i>	V	-	Generally found in open forests, woodlands, swamp woodlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country.	Moderate
Barred Cuckoo-shrike <i>Coracina lineata</i>	V	-	Rainforest, eucalypt forests and woodlands, clearings in secondary growth, swamp woodlands and timber along watercourses. They are usually seen in pairs or small flocks foraging among foliage of trees for insects and fruit. They are active birds, frequently moving from tree to tree.	Low
Beach Stone-curlew <i>Esacus neglectus</i>	CE	-	Beach Stone-curlews are found exclusively along the coast, on a wide range of beaches, islands, reefs and in estuaries, and may often be seen at the edges of or near mangroves. They forage in the intertidal zone of beaches and estuaries, on islands, flats, banks and spits of sand, mud, gravel or rock, and among mangroves. Beach Stone-curlews breed above the littoral zone, at the backs of beaches, or on sandbanks and islands, among low vegetation of grass, scattered shrubs or low trees; also among open mangroves.	None

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
Black Falcon <i>Falco subniger</i>	V	-	Widely, but sparsely, distributed in NSW, mostly occurring in inland regions. In NSW there is assumed to be a single population that is continuous with a broader continental population, given that falcons are highly mobile, commonly travelling hundreds of kilometres. The Black Falcon inhabits woodland, shrubland and grassland in the arid and semi-arid zones, especially wooded watercourses and agricultural land with scattered remnant trees.	Low
Black-faced Monarch <i>Monarcha melanopsis</i>	-	M	Found along the coast of eastern Australia, becoming less common further south. Inhabits rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating.	Low
Brown Treecreeper <i>Climacteris picumnus victoriae</i>	V	-	Found in eucalypt woodlands (including box-gum woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and river red gum forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains.	Low
Bush Stone-curlew <i>Burhinus grallarius</i>	E	-	The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however and in the south-east it is either rare or extinct throughout its former range. Inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber. Largely nocturnal, being especially active on moonlit nights.	Low
Cattle Egret <i>Ardea ibis</i>	-	M	The Cattle Egret is found in grasslands, woodlands and wetlands, and is not common in arid areas. It also uses pastures and croplands, especially where drainage is poor.	Low
Curlew Sandpiper <i>Calidris ferruginea</i>	E	CE, M	The Curlew Sandpiper is distributed around most of the coastline of Australia. It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes the inland	None
Diamond Firetail <i>Stagonopleura guttata</i>	V	-	Feeds exclusively on the ground, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects (especially in the breeding season). Found in grassy eucalypt woodlands, including box-gum woodlands and snow gum woodlands. Also occurs in open forest, mallee, natural temperate grassland, and in secondary grassland derived from other communities.	Low

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
Dusky Woodswallow <i>Artamus cyanopterus cyanopterus</i>	V	-	Often reported in woodlands and dry open sclerophyll forests, usually dominated by eucalypts, including mallee associations. It has also been recorded in shrublands and heathlands and various modified habitats, including regenerating forests; very occasionally in moist forests or rainforests.	Moderate
Eastern Bristlebird <i>Dasyornis brachypterus</i>	E	E	Found in coastal woodlands, dense scrub and heathlands, particularly where it borders taller woodlands.	Moderate
Eastern Curlew <i>Numenius madagascariensis</i>	-	CE, M	A primarily coastal distribution. Found in all states, particularly the north, east, and south-east regions including Tasmania. Rarely recorded inland. Mainly forages on soft sheltered intertidal sand flats or mudflats, open and without vegetation or cover.	Low
Eastern Ground Parrot <i>Pezoporus wallicus wallicus</i>	V	-	Currently inhabits south-eastern Australia from southern Queensland through NSW to western Victoria. In NSW populations have been recorded on the north coast (Broadwater, Bundjalung, Yuraygir NPs); Myall Lakes on the central coast; south coast, particularly Barren Grounds NR, Budderoo NP, the Jervis Bay area, Nadgee NR, Morton and Ben Boyd NP. The Ground Parrot occurs in high rainfall coastal and near coastal low heathlands and sedgeland, generally below one metre in height and very dense (up to 90% projected foliage cover).	Low
Flame Robin <i>Petroica phoenicea</i>	V	-	Flame Robins are found in a broad coastal band from southern Queensland to just west of the South Australian border. The species is also found in Tasmania. The preferred habitat in summer includes eucalyptus forests and woodland, whilst in winter prefers open woodlands and farmlands. It is considered migratory. The Flame Robin breeds from about August to January.	Low
Fork-tailed Swift <i>Apus pacificus</i>	-	M	The Fork-tailed Swift is almost exclusively aerial, flying from less than one metre to at least 300 metres above ground and probably much higher.	Low
Gang-gang Cockatoo <i>Callocephalon fimbriatum</i>	V	-	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. Also occur in subalpine snow gum woodland and occasionally in temperate or regenerating forest. In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. It requires tree hollows in which to breed.	Moderate
Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i>	V	-	Inhabits forest with low nutrients, characteristically with key <i>Allocasuarina</i> spp. Tends to prefer drier forest types with a middle stratum of <i>Allocasuarina</i> below <i>Eucalyptus</i> or <i>Angophora</i> . Often confined to remnant patches in hills and gullies. Breed in hollows stumps or limbs, either living or dead. Endangered population in the Riverina.	Moderate

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
Great Egret <i>Ardea alba</i>	-	M	Great Egrets prefer shallow water, particularly when flowing, but may be seen on any watered area, including damp grasslands.	Low
Latham's Snipe <i>Gallinago hardwickii</i>	-	M	Latham's Snipe is a non-breeding migrant to the south east of Australia including Tasmania, passing through the north and New Guinea on passage. Latham's Snipe breed in Japan and on the east Asian mainland. Seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration.	None
Little Eagle <i>Hieraetus morphnoides</i>	V	-	Most abundant in lightly timbered areas with open areas nearby. Often recorded foraging in grasslands, crops, treeless dune fields, and recently logged areas. May nest in farmland, woodland and forest in tall trees.	Moderate
Little Lorikeet <i>Glossopsitta pusilla</i>	V	-	Distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range in NSW, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Mostly occur in dry, open eucalypt forests and woodlands. They feed primarily on nectar and pollen in the tree canopy. Nest hollows are located at heights of between 2 m and 15 m, mostly in living, smooth-barked eucalypts. Most breeding records come from the western slopes.	Low
Masked Owl <i>Tyto novaehollandiae</i>	V	-	Inhabits a diverse range of wooded habitat that provide tall or dense mature trees with hollows suitable for nesting and roosting. Mostly recorded in open forest and woodlands adjacent to cleared lands. Nest in hollows, in trunks and in near vertical spouts or large trees, usually living but sometimes dead. Nest hollows are usually located within dense forests or woodlands. Masked owls prey upon hollow-dependent arboreal marsupials, but terrestrial mammals make up the largest proportion of the diet.	Low
Orange-bellied Parrot <i>Neophema chrysogaster</i>	CE	CE, M	The Orange-bellied Parrot breeds in the south-west of Tasmania and migrates in autumn to spend the winter on the mainland coast of south-eastern South Australia and southern Victoria. There are occasional reports from NSW, with the most recent records from Shellharbour and Maroubra in May 2003. It is expected that NSW habitats may be more frequently utilised than observations suggest. Typical winter habitat is saltmarsh and strandline-foredune vegetation communities either on coastlines or coastal lagoons. Spits and islands are favoured but they will turn up anywhere within these coastal regions. The species can be found foraging in weedy areas associated with these coastal habitats or even in totally modified landscapes such as pastures, seed crops and golf courses.	Low
Oriental Cuckoo <i>Cuculus optatus, Cuculus saturatus</i>	-	M	Mainly inhabits coniferous, deciduous and mixed forests. Breeds in northern hemisphere. Brood parasite, laying eggs in nests of other birds.	Low

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
Osprey <i>Pandion cristatus, Pandion haliaetus</i>	V	M	Ospreys are found right around the Australian coast line, except for Victoria and Tasmania. They are common around the northern coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south-eastern Australia. Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water.	None
Painted Honeyeater <i>Grantiella picta</i>	V	V	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Inhabits boree, brigalow and box-gum woodlands and box-ironbark forests.	None
Pied Oystercatcher <i>Haematopus longirostris</i>	E	-	Inhabits marine littoral habitats, including islands. It occupies muddy, sandy, stony or rocky estuaries, inlets and beaches, particularly intertidal mudflats and sandbanks in large marine bays.	None
Pink Robin <i>Petroica rodinogaster</i>	V	-	Found in Tasmania and the uplands of eastern Victoria and far south-eastern NSW, almost as far north as Bombala. On the mainland, the species disperses north and west and into more open habitats in winter, regularly as far north as the ACT area, and sometimes being found as far north as the central coast of NSW. Inhabits rainforest and tall, open eucalypt forest, particularly in densely vegetated gullies.	None
Powerful Owl <i>Ninox strenua</i>	V	-	Occupies wet and dry eucalypt forests and rainforests. Can occupy both un-logged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully areas. It is most commonly recorded within red turpentine in tall open forests and black she-oak within open forests. Large mature trees with hollows at least 0.5 m deep are required for nesting. Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials. Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm.	Moderate
Rainbow Bee-eater <i>Merops ornatus</i>	-	M	Found throughout mainland Australia most often in open forests, woodlands and shrublands, and cleared areas, usually near water. It will be found on farmland with remnant vegetation and in orchards and vineyards. It will use disturbed sites such as quarries, cuttings and mines to build its nesting tunnels.	Low
Regent Honeyeater <i>Anthochaera phrygia</i>	CE	E,M	Mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. Has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. In some years flocks converge on flowering coastal woodlands and forests.	Low

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
Rose-crowned Fruit-dove <i>Ptilinopus regina</i>	V	-	Coast and ranges of eastern NSW and Queensland, from Newcastle to Cape York. Vagrants are occasionally found further south to Victoria. Rose-crowned Fruit-doves occur mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful.	None
Rufous Fantail <i>Rhipidura rufifrons</i>	-	M	Found along the east coast of Australia from far northern Queensland to Tasmania, including south-eastern South Australia. Inhabits tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests.	None
Satin Flycatcher <i>Myiagra cyanoleuca</i>	-	M	Mainly recorded in eucalypt forests, especially wet sclerophyll forest, often dominated by eucalypts such as Brown Barrel, <i>Eucalypt fastigata</i> , Mountain Gum, <i>E. dalrympleana</i> , Mountain Grey Gum, Narrow-leaved Peppermint, Messmate or Manna Gum, or occasionally Mountain Ash, <i>E. regnans</i> . Such forests usually have a tall shrubby understorey of tall acacias, for example Blackwood, <i>Acacia melanoxylon</i> . In higher altitude Black Sallee, <i>E. stellulata</i> , woodlands, they are often associated with tea-trees and tree-ferns. They sometimes also occur in dry sclerophyll forests and woodlands, usually dominated by eucalypts such as Blakely's Red Gum, <i>E. blakelyi</i> , Mugga Ironbark, <i>E. sideroxylon</i> , Yellow Box, White Box, <i>E. albens</i> , Manna Gum or stringybarks, including Red Stringybark, <i>E. macrorhyncha</i> and Broad-leaved Stringybark, usually with open understorey.	None
Scarlet Robin <i>Petroica boodang</i>	V	-	Found from SE Queensland to SE South Australia and also in Tasmania and SW Western Australia. In NSW, it occurs from the coast to the inland slopes. The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs.	Low
Sooty Owl <i>Tyto tenebricosa</i>	V	-	Often found in tall old-growth forests, including temperate and subtropical rainforests. In NSW mostly found on escarpments with a mean altitude less than 500 metres. Nests and roosts in hollows of tall emergent trees, mainly eucalypts often located in gullies. Nests have been located in trees 125 to 161 centimetres in diameter.	Moderate
Sooty Oystercatcher <i>Haematopus fuliginosus</i>	V	-	Occupies rocky headlands, reefs and offshore islands along the entire coast, apparently as a single continuous population.	None
Speckled Warbler <i>Chthonicola sagittata</i>	V	-	Lives in a wide range of eucalypt dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy.	None
Spectacled Monarch <i>Monarcha trivirgatus</i>	-	M	Coastal north-eastern and eastern Australia, including coastal islands, from Cape York, Queensland to Port Stephens, New South Wales. Prefers thick understorey in rainforests, wet gullies and waterside vegetation, as well as mangroves.	None

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
Spotted Harrier <i>Circus assimilis</i>	V	-	Occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania. Individuals disperse widely in NSW and comprise a single population. Occurs in grassy open woodland including acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	None
Square-tailed Kite <i>Lophoictinia isura</i>	V	-	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia. In NSW it is often associated with ridge and gully forests dominated by <i>Eucalyptus longifolia</i> , <i>Corymbia maculata</i> , <i>E. elata</i> or <i>E. smithii</i> . Individuals appear to occupy large hunting ranges of more than 100km ² . They require large living trees for breeding, particularly near water with surrounding woodland -forest close by for foraging habitat. Nest sites are generally located along or near watercourses, in a tree fork or on large horizontal limbs.	Low
Superb Fruit-dove <i>Ptilinopus superbus</i>	V	-	Occurs principally from north-eastern in Queensland to north-eastern NSW. It is much less common further south, where it is largely confined to pockets of suitable habitat as far south as Moruya. There are records of vagrants as far south as eastern Victoria and Tasmania. Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees.	None
Swift Parrot <i>Lathamus discolor</i>	E	E	Occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability.	Moderate
Turquoise Parrot <i>Neophema pulchella</i>	V	-	Range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Nests in tree hollows, logs or posts, from August to December. It lays four or five white, rounded eggs on a nest of decayed wood dust.	Low
Varied Sittella <i>Daphoenositta chrysoptera</i>	V	-	Inhabits wide variety of dry eucalypt forests and woodlands, usually with either shrubby under storey or grassy ground cover or both, in all climatic zones of Australia. Usually in areas with rough-barked trees, such as stringybarks or ironbarks, but also in paperbarks or mature Eucalypts with hollows.	Moderate
White-bellied Sea-Eagle <i>Haliaeetus leucogaster</i>	-	M	Inhabits coastal and near coastal areas, building large stick nests, and feeding mostly on marine and estuarine fish and aquatic fauna.	Low
White-fronted Chat <i>Epthianura albifrons</i>	V	-	Low vegetation in salty coastal and inland areas and crops. Runs along ground and is found in local flocks in Winter.	Low

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
White-throated Needletail <i>Hirundapus caudacutus</i>	-	M	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges.	Low
Yellow Wagtail <i>Motacilla flava</i>	-	M	Breeds in temperate Europe and Asia. The Yellow Wagtail is a regular wet season visitor to northern Australia. Increasing records in NSW suggest this species is an occasional but regular summer visitor to the Hunter River region. The species is considered a vagrant to Victoria, South Australia and southern Western Australia. Habitat requirements for the Yellow Wagtail are highly variable, but typically include open grassy flats near water. Habitats include open areas with low vegetation such as grasslands, airstrips, pastures, sports fields; damp open areas such as muddy or grassy edges of wetlands, rivers, irrigated farmland, dams, waterholes; sewage farms, sometimes utilise tidal mudflats and edges of mangroves.	None
Fish				
Australian Grayling <i>Prototroctes maraena</i>	-	V	Historically, this species occurred in coastal streams from the Grose River Valley, southwards through NSW, Vic. and Tas. It also occasionally occurred high upstream in the Snowy R. A single juvenile specimen was collected from Lake Macquarie in 1974. This species spends only part of its lifecycle in freshwater. The Tambo River population inhabits a clear, gravel-bottomed stream with alternating pools and riffles, and granite outcrops. It has also been associated with clear, gravel-bottomed habitats in the Mitchell & Wonnangatta Rivers but was present in a muddy-bottomed, heavily silted habitat in the Tarwin R.	Low
Macquarie Perch <i>Macquaria australasica</i>	E (FM Act)	E	Found in the Murray-Darling Basin (particularly upstream reaches) of the Lachlan, Murrumbidgee and Murray rivers, and parts of south-eastern coastal NSW, including the Hawkesbury and Shoalhaven. Macquarie perch are found in both river and lake habitats, especially the upper reaches of rivers and their tributaries.	Low
Murray Cod <i>Maccullochella peelii peelii</i>	-	V	Found in a wide range of warm water habitats, from clear, rocky streams to slow-flowing turbid rivers and billabongs. Generally, they are found in waters up to 5 m deep and in sheltered areas with cover from rocks, timber or overhanging banks. The species is highly dependent on wood debris for habitat, using it to shelter from fast-flowing water.	Low
Silver Perch <i>Bidyanus bidyanus</i>	V	-	Once widespread and abundant throughout most of the Murray-Darling river system. Only one remaining secure and self sustaining population occurs in NSW in the central Murray River downstream of Yarrawonga weir, as well as several anabranches and tributaries. Silver perch seem to prefer fast-flowing, open waters, especially where there are rapids and races, however they will also inhabit warm, sluggish water with cover provided by large woody debris and reeds. They are omnivorous, feeding on small aquatic insects, molluscs, earthworms and green algae.	Low

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
Trout Cod <i>Maccullochella macquariensis</i>	-	E	Endemic to the southern Murray-Darling river system, including the Murrumbidgee and Murray Rivers, and the Macquarie River in central NSW. The species was once widespread and abundant in these areas but has undergone dramatic declines in its distribution and abundance over the past century. The last known reproducing population of Trout Cod is confined to the Murray River below Yarrawonga downstream to Tocumwal.	Low
Mammals				
Brush-tailed Rock-wallaby <i>Petrogale penicillata</i>	E	V	Found in rocky areas in a wide variety of habitats including rainforest gullies, wet and dry sclerophyll forest, open woodland and rocky outcrops in semi-arid country. Commonly sites have a northerly aspect with numerous ledges, caves and crevices.	Low
Eastern Bentwing-bat <i>Miniopterus schreibersii oceanensis</i>	V	-	Eastern Bent-wing Bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young.	Moderate
Eastern False Pipistrelle <i>Falsistrellus tasmaniensis</i>	V	-	Inhabit sclerophyll forests, preferring wet habitats where trees are more than 20 m high. Two observations have been made of roosts in stem holes of living eucalypts. There is debate about whether or not this species moves to lower altitudes during winter, or whether they remain sedentary but enter torpor. This species also appears to be highly mobile and records showing movements of up to 12 km between roosting and foraging sites.	Moderate
Eastern Freetail-bat <i>Mormopterus norfolkensis</i>	V	-	Most records are from dry eucalypt forests and woodlands to the east of the Great Dividing Range. Appears to roost in trees, but little is known of this species' habits.	Moderate
Eastern Pygmy-possum <i>Cercartetus nanus</i>	V	-	Inhabits rainforest through to sclerophyll forest and tree heath. Banksias and myrtaceous shrubs and trees are a favoured food source. Will often nest in tree hollows, but can also construct its own nest. Because of its small size it is able to utilise a range of hollow sizes including very small hollows. Individuals will use a number of different hollows and an individual has been recorded using up to 9 nest sites within a 0.5ha area over a 5 month period.	High
Eastern Quoll <i>Dasyurus viverrinus</i>	E	-	No recent sightings of this species in NSW. Occurs in dry sclerophyll forest, scrub, heathland and cultivated land. Opportunistic carnivore with insects as it's most important prey.	Low
Golden-tipped Bat <i>Kerivoula papuensis</i>	V	-	Distributed along the east coast of Australia in scattered locations from Cape York Peninsula in Queensland to Bega in southern NSW. Found in rainforest and adjacent sclerophyll forest. Roost in abandoned hanging Yellow-throated Scrubwren and Brown Gerygone nests located in rainforest gullies on small first- and second-order streams.	Low

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
Greater Broad-nosed Bat <i>Scoteanax rueppellii</i>	V	-	Prefer moist gullies in mature coastal forests and rainforests, between the Great Dividing Range and the coast. They are only found at low altitudes below 500 m. In dense environments they utilise natural and human-made opening in the forest for flight paths. Creeks and small rivers are favoured foraging habitat. This species roosts in hollow tree trunks and branches.	Low
Greater Glider <i>Petauroides volans</i>	-	V	The greater glider is restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows.	Low
Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	V	V	A canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Bats commute daily to foraging areas, usually within 15 km of the day roost although some individuals may travel up to 70 km.	Moderate
Koala <i>Phascolarctos cinereus</i>	V	V	Inhabits eucalypt forests and woodlands. The suitability of these forests for habitation depends on the size and species of trees present, soil nutrients, climate and rainfall.	High
Large-eared Pied Bat <i>Chalinolobus dwyeri</i>	V	V	Located in a variety of drier habitats, including the dry sclerophyll forests and woodlands to the east and west of the Great Dividing Range. Can also be found on the edges of rainforests and in wet sclerophyll forests. This species roosts in caves and mines in groups of between 3 and 37 individuals.	Moderate
Little Bentwing-bat <i>Miniopterus australis</i>	V	-	Coastal north-eastern NSW and eastern Queensland. Little Bent-wing Bat is an insectivorous bat that roost in caves, in old mines, in tunnels, under bridges, or in similar structures. They breed in large aggregations in a small number of known caves and may travel hundreds of kilometres from feeding home ranges to breeding sites. Little Bent-wing Bat has a preference for moist eucalypt forest, rainforest or dense coastal banksia scrub where it forages below the canopy for insects.	Moderate
New Holland Mouse <i>Pseudomys novaehollandiae</i>	-	V	Currently has a disjunct, fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes.	Moderate
Southern Brown Bandicoot (eastern) <i>Isodon obesulus obesulus</i>	E	-	Prefers sandy soils with scrubby vegetation and-or areas with low ground cover that are burn from time to time. A mosaic of post fire vegetation is important for this species.	Low
Southern Myotis <i>Myotis macropus</i>	V	-	Found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage.	Low

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
Spotted-tailed Quoll <i>Dasyurus maculatus maculatus</i>	V	E	Found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Queensland. Only in Tasmania is it still considered common. Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	Moderate
Squirrel Glider <i>Petaurus norfolcensis</i>	V	-	Generally occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range. Requires abundant hollow bearing trees and a mix of eucalypts, banksias and acacias. There is only limited information available on den tree use by Squirrel gliders, but it has been observed using both living and dead trees as well as hollow stumps. Within a suitable vegetation community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked. Endangered population in the Wagga Wagga LGA.	Moderate
Yellow-bellied Glider <i>Petaurus australis</i>	V	-	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south. Found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria.	Low
Yellow-bellied Sheathtail-bat <i>Saccolaimus flaviventris</i>	V	-	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory.	Low
Invertebrates				
Cumberland Plain Land Snail <i>Meridolum corneovirens</i>	E	-	The species is a shale-influenced habitat specialist, which occurs in low densities along the northwest fringes of the Cumberland Plain on shale-sandstone transitional landscapes.	None
Giant Dragonfly <i>Petalura gigantea</i>	E	-	Found along the east coast of NSW from the Victorian border to northern NSW. It is not found west of the Great Dividing Range. There are known occurrences in the Blue Mountains and Southern Highlands, in the Clarence River catchment, and on a few coastal swamps from north of Coffs Harbour to Nadgee in the south. Live in permanent swamps and bogs with some free water and open vegetation. Adults emerge from late October and are short-lived, surviving for one summer after emergence.	Low
Reptiles				
Broad-headed Snake <i>Hoplocephalus bungaroides</i>	E	V	Occurs almost exclusively in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they spend most of the year sheltering in and under rock crevices and exfoliating rock. However, some individuals will migrate to tree hollows to find shelter during hotter parts of summer.	High

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
Rosenberg's Goanna <i>Varanus rosenbergi</i>	V	-	This species is a Hawkesbury-Narrabeen sandstone outcrop specialist. Occurs in coastal heaths, humid woodlands and both wet and dry sclerophyll forests.	High
Plants				
<i>Acacia baueri</i> subsp. <i>baueri</i>	V	-	Occurs in low, damp heathlands, often on exposed rocky outcrops over a wide range of climatic and topographical conditions. Appears to prefer open conditions; rarely observed where there is any shrub or tree canopy development; and many of the observations of this species have been made following fire, suggesting the species prefers early successional habitats. Restricted to the Sydney region, occurring on the Kings Tableland in the central Blue Mountains and with sporadic occurrences on the Woronora Plateau in the Royal National Park, Mt. Keira district and at Wedderburn. May also occur on the escarpment-Woronora Plateau in the Flat Rock Junction and Stanwell Tops area of the Illawarra.	High
<i>Acacia bynoeana</i> Bynoe's wattle	E	V	Grows mainly in heath and dry sclerophyll forest in sandy soils. Mainly south of Dora Creek-Morriset area to Berrima and the Illawarra region, west to the Blue Mountains, also recorded from near Kurri Kurri in the Hunter Valley and from Morton National Park.	High
<i>Acacia pubescens</i>	V	V	Concentrated around the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. Occurs on alluviums, shales and at the intergrade between shales and sandstones. The soils are characteristically gravelly soils, often with ironstone. Grows in open woodland and forest, in a variety of plant communities, including Cooks River-Castlereagh Ironbark forest, Shale-Gravel Transition forest and Cumberland Plain woodland.	None
<i>Allocasuarina diminuta</i> subsp. <i>mimica</i>	EP	-	The endangered population occurs along sandstone ridges and upper hillsides in the region northwest from Heathcote, towards Menai and Holsworthy, in heathy and low open woodland communities. It is restricted to the Local Government Areas listed in this instance (Sutherland and Liverpool).	None
<i>Allocasuarina glareicola</i>	E	E	Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool. Grows in Castlereagh woodland on lateritic soil.	None
<i>Asterolasia elegans</i>	E	E	Occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby local government areas. Also likely to occur in the western part of Gosford local government area. Known from only seven populations, only one of which is wholly within a conservation reserve. Occurs on Hawkesbury sandstone in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest.	None
<i>Astrotricha crassifolia</i>	V	V	Occurs near Patonga (Gosford LGA), and in Royal NP and on the Woronora Plateau (Sutherland and Campbelltown LGAs). There is also a record from near Glen Davis (Lithgow LGA). Also in Victoria. Occurs in dry sclerophyll woodland on sandstone.	High

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
<i>Caladenia tessellata</i> Thick-lip spider orchid	E	V	Found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil. Known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct.	Low
<i>Callistemon linearifolius</i>	V	-	Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Recorded in 2000 at Coalcliff in the northern Illawarra. For the Sydney area, recent records are limited to the Hornsby Plateau area near the Hawkesbury River. Grows in dry sclerophyll forest on the coast and adjacent ranges.	Moderate
<i>Callitris endlicheri</i>	EP	-	This population represents the coastal limit of the species' range and is disjunct from other known populations of the species. The Woronora Plateau population is restricted to a single outcrop of sandstone about two hectares in area. The soils at this site are skeletal sandy loams and the heathlands on sandstone outcrops in the area are restricted and highly distinctive.	Moderate
<i>Chorizema parviflorum</i>	EP	-	This endangered population has been recorded from between Austinmer and Albion Park in the local government areas of Wollongong and Shellharbour. All known sites (excluding the site at Austinmer) occupy woodland or forest dominated by <i>Eucalyptus tereticornis</i> and-or <i>E. longifolia</i> . At Austinmer, the species is recorded from a coastal headland.	None
<i>Cryptostylis hunteriana</i> Leafless tongue-orchid	V	V	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations typically occur in woodland dominated by Scribbly Gum (<i>Eucalyptus sclerophylla</i>), Silvertop Ash (<i>E. sieberi</i>), Red Bloodwood (<i>Corymbia gummifera</i>) and Black Sheoak (<i>Allocasuarina littoralis</i>); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (<i>C. subulata</i>) and the Tartan Tongue Orchid (<i>C. erecta</i>).	Moderate
<i>Cynanchum elegans</i> White-flowered wax plant	E	E	Recorded from rainforest gullies scrub and scree slopes from the Gloucester district to the Wollongong area and inland to Mt Dangar.	None
<i>Daphnandra johnsonii</i> Illawarra socketwood	E	E	Occupies the rocky hillsides and gullies of the Illawarra lowlands, occasionally extending onto the upper escarpment slopes.	None
<i>Darwinia biflora</i>	V	V	Recorded in Ku-ring-gai, Hornsby, Baulkham Hills and Ryde local government areas. The northern, southern, eastern and western limits of the range are at Maroota, North Ryde, Cowan and Kellyville, respectively. Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. The vegetation structure is usually woodland, open forest or scrub-heath.	None
<i>Epacris purpurascens</i> var. <i>purpurascens</i>	V	-	Recorded from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South. Found in a range of habitat types, most of which have a strong shale soil influence.	Moderate

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
<i>Eucalyptus camfieldii</i> Heart-leaved Stringybark	V	V	Restricted distribution in a narrow band with the most northerly records in the Raymond Terrace Area south to Waterfall. Poor coastal country in shallow sandy soils overlying Hawkesbury sandstone. Coastal heath mostly on exposed sandy ridges. Occurs mostly in small scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas.	Moderate
<i>Eucalyptus nicholii</i> Narrow-leaved Black Peppermint	V	V	Typically grows in dry grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile soils derived from granite or metasedimentary rock. Seedling recruitment is common, even in disturbed soils, if protected from grazing and fire.	Low
<i>Genoplesium baueri</i> Bauer's midge orchid	E	E	Grows in dry sclerophyll forest and moss gardens over sandstone. Flowers February to March. Has been recorded between Ulladulla and Port Stephens. Currently the species is known from just over 200 plants across 13 sites. The species has been recorded in Berowra Valley Regional Park, Royal National Park and Lane Cove National Park and may also occur in the Woronora, O'Hare's, Metropolitan and Warragamba Catchments.	Moderate
<i>Grammitis stenophylla</i> Narrow-leaf Finger Fern	E	-	Moist places, usually near streams, on rocks or in trees, in rainforest and moist eucalypt forest.	Low
<i>Grevillea parviflora</i> subsp. <i>parviflora</i> Small-flowered Grevillea	V	V	Grows in sandy or light clay soils usually over thin shales. Occurs in a range of vegetation types from heath and shrubby woodland to open forest. Found over a range of altitudes from flat, low-lying areas to upper slopes and ridge crests. Often occurs in open, slightly disturbed sites such as along tracks.	Low
<i>Haloragis exalata</i> subsp. <i>exalata</i> Square raspwort	V	V	Occurs in 4 widely scattered localities in eastern NSW. It is disjunctly distributed in the central coast, south coast and north-western slopes botanical subdivisions of NSW. The species appears to require protected and shaded damp situations in riparian habitats.	Low
<i>Leucopogon exolasius</i> Woronora beard-heath	V	V	Grows in woodland on sandstone. Restricted to the Woronora and Grose Rivers and Stokes Creek, Royal National Park.	Moderate
<i>Melaleuca biconvexa</i> Biconvex paperbark	V	V	Grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. Scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north.	None
<i>Melaleuca deanei</i> Deane's paperbark	V	V	Grows in wet heath on sandstone in coastal districts from Berowra to Nowra.	Moderate

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
<i>Pelargonium sp. striatellum</i> Omeo's stork's-bill	E	E	Flowering occurs from October to March. Occurs in habitat usually located just above the high water level of irregularly inundated or ephemeral lakes. During dry periods, the species is known to colonise exposed lake beds. The species is known to form clonal colonies by rhizomatous propagation.	None
<i>Persoonia bargoensis</i> Bargo geebung	E	V	The Bargo Geebung occurs in woodland or dry sclerophyll forest on sandstone and on heavier, well drained, loamy, gravelly soils.	Low
<i>Persoonia hirsuta</i> Hairy geebung	E	E	Distributed from Singleton in the north, along the east coast to Bargo in the south and the Blue Mountains to the west. A large area of occurrence, but occurs in small populations, increasing the species' fragmentation in the landscape. Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone. Usually present as isolated individuals or very small populations. Probably killed by fire (as other <i>Persoonia</i> spp. are) but will regenerate from seed.	Moderate
<i>Persoonia nutans</i> Nodding geebung	E	E	Confined to aeolian and alluvial sediments and occurs in a range of sclerophyll forest and woodland vegetation communities, with the majority of individuals occurring within Agnes Banks woodland or Castlereagh Scribbly Gum woodland. Restricted to the Cumberland Plain in western Sydney, between Richmond in the north and Macquarie Fields in the south.	Low
<i>Pimelea curviflora</i> var. <i>curviflora</i>	V	V	Confined to the coastal area of Sydney between northern Sydney in the south and Maroota in the north-west. Former range extended south to the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly. Occurs on shale-lateritic soils over sandstone and shale-sandstone transition soils on ridgetops and upper slopes amongst woodlands.	Low
<i>Pimelea spicata</i> Spiked rice-flower	E	E	Once widespread on the Cumberland Plain, the Spiked Rice-flower occurs in two disjunct areas; the Cumberland Plain (Narellan, Marayong, Prospect Reservoir areas) and the Illawarra (Lansdowne to Shellharbour to northern Kiama). In both the Cumberland Plain and Illawarra environments this species is found on well-structured clay soils. On the inland Cumberland Plain sites it is associated with grey box and Ironbark. In the coastal Illawarra it occurs commonly in Coast Banksia open woodland with a better developed shrub and grass understorey.	Low
<i>Pomaderris adnata</i>	E	-	Known only from one site at Sublime Point, north of Wollongong. Occurs near the edge of the plateau behind the Illawarra escarpment. Associated vegetation is silver-top ash - red bloodwood forest. Soil is a sandy loam over sandstone.	Low
<i>Pomaderris brunnea</i> Brown Pomaderris	V	V	The species is expected to live for 10 - 20 years, while the minimum time to produce seed is estimated to be 4 - 6 years. Found in a very limited area around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area. It also occurs at Walcha on the New England Tableland and in far eastern Gippsland in Victoria.	Low

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
<i>Prostanthera densa</i>	V	V	Generally grows in sclerophyll forest and shrubland on coastal headlands and near coastal ranges, chiefly on sandstone, and rocky slopes near the sea.	Low
<i>Prostanthera marifolia</i>	CE	CE	Occurs in localised patches in or in close proximity to the endangered Duffys forest ecological community. Located on deeply weathered clay-loam soils associated with ironstone and scattered shale lenses, a soil type which only occurs on ridge tops and has been extensively urbanised.	Low
<i>Pterostylis gibbosa</i>	E	E	Grows in open forest or woodland, on flat or gently sloping land with poor drainage. Known from a small number of populations in the Hunter region (Milbrodale), the Illawarra region (Albion Park and Yallah) and the Shoalhaven region (near Nowra).	Low
<i>Pterostylis saxicola</i> Sydney plains greenhood	E	E	Restricted to western Sydney between Freemans Reach in the north and Picton in the south. Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines. The vegetation communities above the shelves where <i>Pterostylis saxicola</i> occurs are sclerophyll forest or woodland on shale-sandstone transition soils or shale soils.	Low
<i>Pultenaea aristata</i> (prickly bush-pea)	V	V	Grows in moist, dry sclerophyll woodland to heath on sandstone, specifically the drier areas of Upland Swamps. Restricted to the Woronora Plateau, a small area between Helensburgh, south of Sydney, and Mt Keira above Wollongong.	Known
<i>Syzygium paniculatum</i> Magenta lilly pilly	E	V	Found only in NSW, in a narrow, linear coastal strip from Bulahdelah to Conjola State forest. On the south coast the species occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral rainforest. On the central coast it occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities	None
<i>Thelymitra kangaloonica</i> Kangaloon sun orchid	CE	CE	Found in swamps in sedgeland over grey silty grey loam soils.	None
<i>Thesium australe</i> Austral toadflax	V	V	Grows in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Occurs in grassland or grassy woodland. Grows on kangaroo grass tussocks but has also been recorded within the exotic Coolatai grass.	None

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