



METROPOLITAN COAL CONSTRUCTION MANAGEMENT PLAN

SURFACE WORKS ASSESSMENT FORM

LONGWALLS 311-316 MONITORING PROGRAM WORKS

JANUARY 2025

Metropolitan Coal

Proposed Installation of Access Tracks, Groundwater Piezometers, Exploration Boreholes, Autosampler, Subsidence Monitoring Survey Line Extension and Fireroad Repairs

Background

The subject Surface Works Assessment Form (SWAF) is submitted to Department of Planning, Housing & Infrastructure (DPHI) and WaterNSW for the proposed vegetation disturbance to undertake:

- The extension of one subsidence survey cross line (300XL);
- Cutting of eight 1 metre wide access tracks to undertake monitoring including water quality and level monitoring and cliff and overhang monitoring;
- Vegetation clearance at three swamp groundwater piezometer sites used for groundwater monitoring (located in swamps Bee Creek Swamp and Swamp 77).
- Vegetation clearance at four sites where deep groundwater piezometers are proposed (9D-GW-76-90 & 9D-GW-76-150, 9E-GW-77, S92-GT-01 and S92-GW-02)
- Pruning (secondary clearing) and repair of an existing unsealed fireroad (Swamp 92 road)
- Vegetation clearance for installation of a water quality autosampler monitoring site (ETAU-WQ-Sampler).

Creating defined paths will allow surveyors and monitoring program personnel to walk the same route in order to lessen the potential impacts to vegetation. The surveys will be used for a number of monitoring operations in accordance with the Metropolitan Coal Project Approval and associated Environmental Management Plans and Monitoring Programs under the Metropolitan Coal Longwalls 311-316 Extraction Plan

Deep groundwater boreholes will be drilled using a truck mounted rig to a depth of up to 550m. Vibrating wire piezometers (VWP) will be installed at various depths to measure groundwater behaviour.

A summary of the activities proposed in this SWAF is provided in Table 1.

Table 1

Site	Easting	Northing	Vegetation Disturbance	Activities/Instrumentation
300XL Survey Cross Line Extension	309594	6216750	0.622 ha	Survey Line
Honeysuckle Creek Access Track	309050	6216830	0.182 ha	Access Track for monitoring
Swamp 106 Link Track	309560	6217455	0.025 ha	Access Track for monitoring
Swamp 104 Link Track	309041	6216323	0.007 ha	Access Track for monitoring
COH18 Access Track	310930	6217008	0.05 ha	Access Track for monitoring
COH19 Access Track	310503	6217998	0.06 ha	Access Track for monitoring
Bee Creek Swamp 1	308924	6219798	0.012 ha	Shallow groundwater piezometers

Bee Creek Swamp 3	309036	6217836	0.019 ha	Shallow groundwater piezometers
Swamp 77	310774	6217103	0.027 ha	Shallow groundwater piezometer
9D-GW-76	309956	6217297	0.097 ha	Deep groundwater piezometers
9E-GW-77	310346	6216596	0.067 ha	Deep groundwater piezometer
S92-GW-01	309455	6215972	0.119 ha	Deep groundwater piezometer
S92-GW-02	310399	6215820	0.069 ha	Deep groundwater piezometer
Swamp 92 Fireroad	309822	6215853	0.562	Fire road repairs and maintenance
ETAU-WQ-Sampler	312155	6215641	0.001ha	Autosampler for water monitoring

This SWAF provides details of construction and environmental management measures for the proposed works as outlined in the Metropolitan Coal Construction Management Plan (ConMP), approved by DP&E on 17 April 2018.

Site Location

The site is 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. WaterNSW 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.

Water Management and Cuttings Containment

Shallow boreholes will require a small containerised above-ground sump to reticulate water and flush cuttings which will be removed from site. Boreholes will be drilled utilising open hole hammer techniques using a small remote access rig or man portable drill rig.

Each deep groundwater 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). A typical site layout is provided in Figure 1.

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 and water 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.

Installation and Operation of Equipment

Shallow boreholes will be installed with a 50mm PVC Screen and a sand gravel mix sealed with bentonite and cement grout to surface. Each monitoring borehole will be protected by a steel monument with water level data logger and telemetry units.

Deep groundwater boreholes will be installed with vibrating wire piezometers (VWP) and grouted to surface. At the surface the VWPs will be protected by a concrete plinth with telemetry installed.

Site Rehabilitation

Construction sites will be rehabilitated in accordance with Metropolitan Coal's Rehabilitation Management Plan.

The area disturbed by the footprint of the drill rig, rod carriers, settling tanks and access tracks will be remediated with brushmatting and biodegradable sediment controls (coir logs) where needed.

Fuel Management

Large quantities of fuel will not be stored on site with fuel brought to site for refuelling only if and when required. 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.

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. The spill kits will include: Organic Oil/Fuel absorbent pads, garbage bags, a shovel and rags.

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

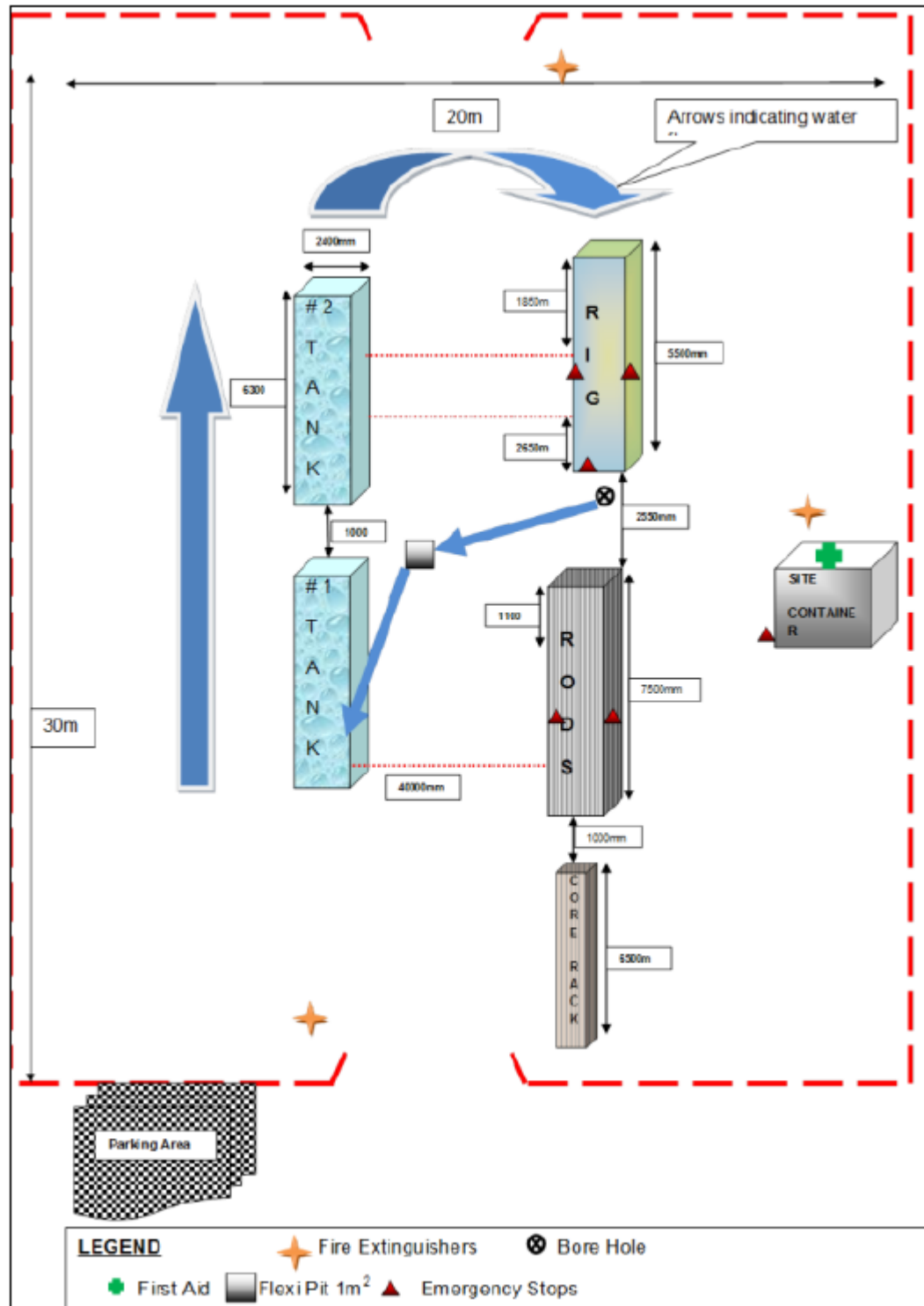
- the site supervisor;
- the Metropolitan Coal Environment & Community Superintendent (Stephen Love 0417 584 121); and
- WaterNSW (via the incident Management Number 1800 061 069).

The site supervisor and the Metropolitan Coal Environment & Community Superintendent will investigate any spills.

Human Waste Water

A portable toilet will be located on a proximal access road near the construction sites. The toilet will be serviced fortnightly.

Figure 1: Typical Deep Groundwater Borehole Drill Site Layout



Construction Management Plan Surface Works Assessment Form

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

Date: 23 January 2025

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

RMP register number: 19

Site names:

300XL Survey Cross Line Extension
Honeysuckle Creek Access Track
Swamp 106 Link Track
Swamp 104 Link Track
COH18 Access Track
COH19 Access Track
Bee Creek Swamp 1
Bee Creek Swamp 3
Swamp 77
9D-GW-76
9E-GW-77
S92-GW-01
S92-GW-02
Swamp 92 Fireroad
ETAU-WQ-Sampler

Site type:

Survey lines (300XL), access tracks, shallow and deep groundwater piezometers, fireroad maintenance and water autosampler installation.

Site co-ordinates (easting/northing):

Site	Easting	Northing
300XL Survey Cross Line Extension	309594	6216750
Honeysuckle Creek Access Track	309050	6216830
Swamp 106 Link Track	309560	6217455
Swamp 104 Link Track	309041	6216323
COH18 Access Track	310930	6217008
COH19 Access Track	310503	6217998
Bee Creek Swamp 1	308924	6219798
Bee Creek Swamp 3	309036	6217836
Swamp 77	310774	6217103
9D-GW-76	309956	6217297
9E-GW-77	310346	6216596
S92-GW-01	309455	6215972
S92-GW-02	310399	6215820
Swamp 92 Fireroad	309822	6215853
ETAU-WQ-Sampler	312155	6215641

Expected duration of works: 20 weeks (weather permitting)

Works schedule:

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

- *Establishment and implementation of pre-construction management measures (e.g. erosion and sediment controls, vegetation clearance)*

VWP Boreholes

Borehole site development occurs in two (2) stages: site preparation and drilling

Site preparation will involve:

- *Use of existing tracks and fire trails, negating the need to prepare a new access track*
- *Use of trittering attachment to mulch vegetation in-situ*
- *Excavator to prepare each borehole site (including a level drill pad and border set down and work area)*
- *Erosion and sediment controls*

Drilling of boreholes will involve:

- *Delivery of tray and track mounted drill rigs to site (including ancillary equipment)*
- *Water delivery (each borehole will use approximately 40,000 litres of water to lubricate and flush cuttings which will be deposited into a closed reticulated system i.e. an above-ground containerised drill water sump). Containerised drill water and cuttings will be removed from site.*
- *Use of rotary or hammer drilling to target depth using appropriate drilling techniques to prevent well head pressure loss and aquifer contamination*
- *Installation of vibrating wire piezometers (where required)*
- *Sealing of VWP Borehole(s) to the surface with a cement/bentonite mix as per the standard requirements of Division of Resources and Geoscience (DRG)*
- *Revegetation (Brush Matting, planting and/or direct seeding)*
- *Site clean-up (e.g. removal of equipment, materials and waste)*

Swamp Piezometers

Drilling of boreholes will involve:

- *Delivery of drill rig to site (including ancillary equipment)*
- *Water delivery (water to lubricate and flush cuttings which will be deposited into a closed reticulated system i.e. an above-ground containerised drill water sump).*
- *The deep (10m) and shallow (1m) boreholes will be drilled utilising open hole hammer techniques. Groundwater monitoring bores will have a diameter of up to 100 mm. The 10 m deep bores will be drilled using a small remote access drill rig or man portable drill rig, while the shallow swamp sediment bores will be drilled with a hand auger. An air compressor will be located on adjacent access trails with a pressure rated airline secured along the access track. Due to the shallow nature and moisture content of the bores dust generated during drilling is expected to be very minor, cuttings will be collected and disposed of offsite.*
- *PVC borehole screen (50 mm) with blank PVC casing will be installed and packed with a sand gravel mix sealed with bentonite and cement grout to surface. Each monitoring borehole to be protected by installation of a steel monument with water level logger and telemetry units.*

300XL Subsidence Monitoring Survey Line Extension and Access Tracks

Survey lines will entail a 3m wide trail by trittering the vegetation above ground level and leaving the lower stems and roots in-situ to maximise the potential for natural regrowth. The

survey line will be reduced to 1m width through Upland Swamp vegetation in order to further minimise disturbance through this EEC. Access Tracks will be similarly cut to a 1m width.

Swamp 92 Fireroad Maintenance

Disturbance of vegetation on Swamp 92 Fireroad will be limited to the existing road corridor to enable safe vehicle access. Once these works are completed, Metropolitan will engage Soil Conservation Service or other provider suitable to WaterNSW to undertake road maintenance works which will be limited to the existing road footprint. Works will include importation of virgin crushed sandstone to rebuild the road profile and reestablishment of existing drains along the road corridor.

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? **No**

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

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

The proposal aims to avoid threatened flora.

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

The proposal aims to avoid threatened fauna.

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

What vegetation type is present?

- PCT 3590: Southern Sydney Scribbly Gum Woodland
- PCT 3595: Sydney Coastal Sandstone Gully Forest
- PCT 3598: Woronora Plateau Scribbly Gum Woodland
- PCT 3810: Southern Sydney Rockplate Heath
- PCT 3814: Woronora Plateau Heath-Mallee
- PCT 3923: Sydney Coastal Sandstone Creekline Swamp Heath
- PCT 3924: Sydney Coastal Upland Swamp Heath
- PCT 3925: Sydney Sandstone Button Grass Sedgeland

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**

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

Date of survey for threatened flora.

17, 18, 23 July, 12, 13 September, 2, 11 October 2024

Name of suitable qualified ecologist conducting survey

Ecology consultants Amanda Melvaine, Tamika Flanigan and Justin Merdith (Niche Environment & Heritage)

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

Scientific names of threatened flora species recorded.

Six Pultenaea aristata individuals were recorded on Swamp 106 Link Track, 300XL Survey Line and S92-GW-02

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

The Exploration Borehole construction sites and Subsidence Monitoring Survey Line Extension have been located to avoid the known records of Pultenaea aristata. Individuals will be demarcated and their location made known to project personnel so they can be avoided and protected during works. With the mitigation measures in place, no direct impacts to Pultenaea aristata are 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? **N/A**

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

[Attach any relevant ecological reports to this assessment form]

Ecological Assessment Metropolitan Coal – LW 311-316 Surface Works (Attachment 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 proposed borehole sites, subsidence monitoring survey line and access tracks will result in up to approximately 1.357 hectares of vegetation slashing. Additionally, the proposed fire road maintenance works will require 0.562 ha of pruning of previously cleared road corridor along existing Swamp 92 Fireroad. With the proposed mitigation measures in place, the proposal is unlikely to result in any significant impact on any TEC or threatened species listed.

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).

Wherever possible existing fireroads and trails will be used for siting/delivery of equipment and for access to sites.

Is vegetation clearing required for site access? If yes, describe the extent and method of clearing? **No**

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

Disturbance would be appropriately limited by the following mitigation measures:

- *Care will be taken to minimise disturbance to vegetation.*
- *Pultenea aristata individuals demarcated with tape and their location made known to project personnel so they can be avoided and protected during works.*
- *Existing fire trails, tracks and exposed bedrock will be used for access and placement of equipment.*
- *Erosion and sediment controls to be implemented as appropriate on downslope sides of the site as per Metropolitan Coal Construction Management Plan to ensure that no sediment from drilling or other earth works enters adjacent table drains.*
- *Cleared vegetation will be placed within the footprint of clearing and not on adjacent vegetation.*

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 to 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

See Annex 02 of Attachment 1

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

Date of pre-clearance survey for Aboriginal heritage sites.

A visual inspection was conducted over nine days on 17, 18, 23 and 25 July, 12 and 13 September and 2 and 11 October 2024 with an extensive search of the Aboriginal Heritage Information Management System (AIMS) on the 19 July, 26 August and 8 November 2024.

Name of suitably qualified archaeologist conducting survey

Heritage Consultant Olivier Rochecouste (Niche Environment & 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

Metropolitan Longwall 311-317 Monitoring Locations Aboriginal Objects Due Diligence Assessment is attached

Known Aboriginal heritage sites located close to surface disturbance works

Details of demarcation (e.g. fencing, sign-posting or temporary flagging) implemented to avoid accidental damage to known Aboriginal heritage sites located close to surface disturbance works.

An Aboriginal Objects Due Diligence Assessment has concluded there will be negligible risk of harm to Aboriginal objects.

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?

If fuel (diesel or petrol) is required at the sites it will be stored on-site during construction works in bunded containers.

- 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?
- Has a Hot Work Permit been obtained from the Water NSW if required?

Yes

N/A

Erosion and Sediment Control Plan

Correct location, design of the work site and work practices will minimise the risk of erosion and sedimentation 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 (i.e. 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 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

*Ecological and Archaeological Assessments – Metropolitan Coal LW 311-316 Surface Works
18 November 2024*



Ecological Assessment Metropolitan Coal – LW 311-316 Surface works

Helensburgh NSW

Prepared for Metropolitan Coal Pty Ltd | 18 November
2024



Document control

Project number	Client	Project manager	LGA
8737	Metropolitan Coal	Justin Merdith	Wollongong City Council

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D1	Justin Merdith	Kayla McGregor	Draft		7 November 2024
Rev1	Jesse Cass Justin Merdith	Kayla McGregor	Final		17 January 2024
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Executive Summary

Niche Environment and Heritage (Niche) has undertaken an assessment of the ecological constraints and potential impacts associated with the proposed works. The proposed works are for:

Construction of:

- The extension of one subsidence survey cross line (300XL)
- Vegetation clearance for eight proposed 1 metre wide access tracks that are associated with the proposed (HSC 1-21 track, S106c Link Track, S104a Link Track, BS1 Track, BS3 Track, S77 track, COH18 Track and COH19 Track)
- Vegetation clearance at three swamp groundwater piezometer sites used for groundwater monitoring (located in swamps BS1, BS3 and S77).
- Vegetation clearance at four sites where deep groundwater piezometers is proposed (9D-GW-76-90 & 9D-GW-76-150, 9E-GW-77, S92-GT-01 and S92-GW-02)
- Pruning (secondary clearing) and repair of an existing unsealed road (Swamp 92 road)
- Vegetation clearance around an existing monitoring site (ETAU-WQ-Sampler).

Biannual subsidence monitoring will include:

- Subsidence surveying along the 300XL cross line
- Personnel on-foot utilising access tracks to gain access to piezometers, creek surveying/sampling sites and cliff overhangs.
- Deep groundwater piezometer monitoring: this site will be accessed via vehicle, along Swamp 92 access road, and vehicle parking will be confined to existing cleared areas, along the road verge.

The sites listed above are required to undertake groundwater and subsidence monitoring within *Coastal Upland Swamp in the Sydney Basin Bioregion* (Coastal Upland Swamp) which is listed Threatened Ecological Communities (TEC) under the NSW *Biodiversity Conservation Act 2016* (BC Act) and Commonwealth *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act).

The purpose of the monitoring is to assess potential mine induced subsidence impacts in order to meet Agency requirements. These sites are discussed in more detail in Table 1 and also refer Figure 2 and Figure 3.

The Metropolitan Coal Construction Management Plan (Peabody Energy 2018) outlines the relevant measures for managing impacts on the environment. To minimize and avoid these impacts, several actions will be taken. Access tracks will require a width of up to one metre to be cleared, while each proposed swamp piezometer site will need a 5 metre by 5-metre area to be cleared (0.0025 hectares [ha] at each location). Additionally, for the proposed subsidence 300XL survey cross line will be 1800 metre length with a width of up to three meter will be cleared, this width will be reduced to a one metre width through



Coastal Upland Swamp TEC. In total, up to 1.273 hectares of native vegetation, including 0.16 hectares of Coastal Upland Swamp, would be cleared at the subject site.

If the mitigation measures detailed in the management plan and this report are properly implemented, the proposal is unlikely to cause significant impact on any TEC (Threatened Ecological Community) or threatened biodiversity listed on the BC Act (Biodiversity Conservation Act) and EPBC Act (Environment Protection and Biodiversity Conservation Act).

The proposed sites have been assessed by Olivier Rochecouste (Heritage Consultant- Niche) and Justin Merdith, Tamika Flanigan and Amanda Melvaine (Ecological Consultants – Niche).

This report, accompanied with an Aboriginal Objects Due Diligence Assessment also prepared by Niche, 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 DPE and WaterNSW for comment.



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01 Introduction

1.1 Context

Niche has undertaken an assessment of the ecological constraints and potential impacts associated with the proposed removal of native vegetation for the extension of one (1) subsidence survey cross line, four (4) areas for deep groundwater piezometers, three (3) swamp groundwater piezometers, and associated eight (8) access tracks. The proposal will also require vegetation pruning (secondary clearing) and the repair of the Swamp 92 access road and clearing of one (1) existing water level gauge station monitoring site (collectively referred to as the 'subject site'). The piezometer sites are required to undertake groundwater monitoring within upland swamps in relation to potential mine induced subsidence impacts in order to meet Agency requirements.

1.2 Proposed work

1.2.1 Overview

The subject site is located within the Woronora special area (drinking water catchment) managed by WaterNSW, located off the Princes Highway at Helensburgh (Figure 1 and Figure 2) and part of Peabody Energy Metropolitan Colliery Mine lease area (Figure 3). Location details, site specific environmental constraints, safeguards, and access considerations are outlined in Table 1. All figures are provided in Annex 1 and site photos are provided in Annex 2.

The proposed activity includes the installation, maintenance, use and decommissioning of the subject site.

The 300XL Survey line will be slashed by hand to 10 cm of the ground and up to 3 m wide and 1 m wide through Coastal Upland Swamp TEC. The direct impact of the 300XL Survey Line is depicted in Figure 2.

Each swamp groundwater piezometers site will be augured using a combination of a remote access mini drill rig and a petrol-powered post hole auger. The disturbance of each of the bore site will be approximately 5 m x 5 m (25 m²).

The remote access mini drill rig will be tracked to each swamp location (BS1, BS3 and S77) along the nominated access tracks. Eight narrow tracks (approximately 1 m wide) are required for all access tracks. Vegetation clearing to head height, sufficient to allow a person to walk through single file. Direct impacts of this are depicted in Table 2.

The removal of native vegetation for the proposed deep groundwater boreholes will clear up to 1200 m² (0.12 ha), Table 4 shows the exact impact area for each site. A large, trucked drill rig will be required to drill the boreholes, which will be between 90 and 150 m deep and consist of single HQ size boreholes, fully grouted surface to seam. This will access the site by the existing fire trails and repaired Swamp 92 Road.



Pruning and repairing of Swamp 92 road will require construction of a turning bay at the end of the road, importing crushed sandstone VENM material to rebuild the road surface, pruning of vegetation to allow for a 4.5 m high by 5.0 m wide corridor.

Existing water level gauge station monitoring site requires a new sampler to be installed next to the existing concrete weir. A concrete pad to support the sampler is also required.

1.3.1 Access and Equipment

Access to all sites will be from existing Fire Trails (9, 9D, 9E and 9G) (Figure 2).

Equipment that is required for the work is:

- small remote access drill rig
- truck mounted drill rig
- hand augur
- chainsaws
- ride-on mower.

Equipment will be removed from the site after use.

1.4.1 Drilling

Both shallow and deep swamp groundwater piezometers boreholes will have a diameter of up to 100 mm. The shallow swamp sediment bores will be drilled with a hand auger, while the deep swamp bores will be drilled using a small remote access drill rig. Drilling will take up to 2 days per drill site.

Drilling of the deep groundwater piezometers (90 m - 550 m deep) will be completed using a truck mounted drill rig with above ground, covered sediment tanks. Key drilling mitigation measures include sediment and erosion controls, and an on-site spill kit to mitigate any indirect impacts to surrounding vegetation or watercourses.

1.5.1 Water Management and Cuttings Containment

Drilling will occur during forecast dry weather wherever practicable. Water will be used to clear the drill cuttings.

The shallow monitoring boreholes (10 m deep) will be chipped from surface minimising the drill pad clearance requirements and to reducing the manual handling associated with coring. Drilling muds will not be required for drilling the shallow monitoring boreholes, instead fresh water will be used to lift cuttings from the bore, and these will be disposed of at the mine.

Drill water will be delivered as needed to each location by pumping it from an Intermediate Bulk Container positioned at the closest vehicle access track to the drill site, utilising a hose.



Deep groundwater boreholes will be drilled with both chipping and coring methodology. Drilling muds will be used where necessary to ensure effective removal of drill cuttings for the deep groundwater boreholes. The drill muds will be recirculated and recycled using above ground, covered sediment tanks.

Drill water will be supplied as necessary to each location by water cart, with sediment removed by vac truck. All cutting fluids and solids 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.

1.6.1 Bore Casing Specifications

10 metre monitoring bores: PVC bore screen installed to approximately 5 m below ground level (mbgl) with blank PVC casing from 5 mbgl to the surface. A sand gravel pack to 4 mbgl, a bentonite seal to 3 mbgl and a cement grout to the surface.

Swamp sediment monitoring bores: PVC well screen installed to the full depth of the hole with a sand gravel pack to the surface.

The PVC screen and casing for each monitoring bore would be up to 50 mm in diameter.

Blank PVC casing would extend to a height of 1 m above the ground for each monitoring bore with a steel monument to protect the casing from damage.

1.7.1 Monitoring Equipment

A water level/moisture sensor will be installed at each borehole and ETAU-WQ-Sampler site will have monitoring device installed on the bank next to an existing weir. Monitoring of these will continue until mine closure.

1.8.1 Fuel Management

Large quantities of fuel will not be stored on site. Fuel will be transported in closed containers (e.g. jerry cans). 60 L plastic containers will be used to hold fuel cans after use. Re-fuelling will be conducted using an appropriately sized funnel. Refuelling of equipment will be completed before the equipment is transported to the drill site so as to reduce the requirement of transporting fuel. 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.

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.

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

- The site supervisor.
- The Metropolitan Coal Environment & Community Superintendent (Stephen Love 0417 584 121); and



- Water NSW (via the incident Management Number 1800 061 069).
- The site supervisor and the Metropolitan Coal Environment & Community Superintendent will investigate any spills.

1.9.1 Human Wastewater

Portable toilets will be installed on fire trail proximal to works for duration of the drilling and access works.

1.10.1 Expected duration of works:

Approximately one to two days per borehole site for drilling and groundwater bore installation. Access tracks, roads and borehole areas would be cleared or maintained prior to the drilling. A summary of the expected duration of works is provided below:

- The 300XL survey line is expected to be completed within a two-week period
- Access tracks (four weeks)
- Deep groundwater piezometers (16 weeks)
- Road repair (two weeks)
- Water sampler (one week)
- Swamp Piezometer (four weeks).

The entire construction campaign is expected to take approximately 20 weeks, weather permitting.

Monitoring is expected to be conducted for several years (before, during mining, and post mining [for at least two years post mining]).



1.3 Site closure and rehabilitation

Construction sites will be rehabilitated in accordance with Section 7 of the Metropolitan Coal's Rehabilitation Management Plan. Site closure and rehabilitation would involve the following:

- For deep bores only:
 - 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.
 - Replacement of 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.

The access tracks will be maintained over time to allow safe access for personnel to revisit the borehole sites and water monitoring locations.

Given the limited nature of the disturbance footprint (narrow linear disturbance adjacent to Fire Trails) and the existence of high-quality native vegetation adjacent to each borehole site/track, it is not expected active revegetation measures (e.g. planting of tube stock) will be necessary.

1.4 Justification and Alternatives

Micrositing to avoid significant ecological constraints

The original proposed 300XL survey line traversed directly through an area of known Broad-headed Snake (*Hoplocephalus bungaroides*) habitat, a species listed as Endangered under the BC Act and EPBC Act. Broad-headed Snake was confirmed present within the impact footprint by Niche staff during a field survey in 2024. The original survey line also ran adjacent to an occurrence of Prickly Bush-pea (*Pultenaea aristata*), listed as Vulnerable under the BC Act and the EPBC Act.

After consultation with Peabody Energy (Monday 19th August 2024), the proposed survey line location was relocated approximately 90 m south (see figure 7), to the outer most edges of the 100 m buffer around potential Broad-headed Snake habitat. Although the survey line could not be relocated any further south due to safety concerns associated with the positions of the longwalls, the revised location of the survey line is expected to greatly reduce potential impacts to Broad-headed Snake and its associated habitat. Impacts to the Broad-headed Snake and Prickly Bush-pea could be further reduced through the implementation of pre-clearance surveys.

Reduced native vegetation clearance

The original 300XL survey line proposed a clearance width of 3 metres for the entire 1800 m length (0.54 ha). After consultation with Peabody Energy, this was reduced to a 1m width through Coastal Upland Swamp TEC, to reduce impacts to threatened species habitat and the TEC. The revised footprint reduced the overall impact area from 0.54 ha to 0.51 ha in total.



Reduced Coastal Upland Swamp impacts

Coastal Upland Swamp has recently been awarded a Serious and Irreversible Impact (SAIL) listing under principle 4: *"Principle 4 – species or ecological community that is unlikely to respond to management and is therefore irreplaceable"*.

Advice provided by Stephen Love (Environment & Community Superintendent – Peabody Energy) via email (dated 16 December 2024), stated the following:

"We've received legal advice regarding the SAIL. While there are concerns about the process followed by DCCEEW, the recommendation in the meantime is for the specialists preparing the environmental assessment (Niche) to include an acknowledgement of the SAIL 'listing' but clarifying that the relevant construction activities detailed in the SWAF do not give rise to a serious and irreversible impact (assuming that this is a finding Niche can make based on your environmental assessment)."

Approximately 498 ha of Coastal Upland Swamp exists within 5 km of the subject site and approximately 0.16 ha of Coastal Upland Swamp would be modified by vegetation clearing for subject sites. This is less than 1% of the total community within the 5 km radius and temporary in nature. The small extent of partial impact (trimming), and management of residual impacts from the proposal, means that the community would not likely be significantly impacted. In relation to Principal 4 under the SAIL criteria, given the partial clearing of Coastal Upland Swamp for the proposed 300XL survey line is unlikely to significantly reduce extent, or floristic diversity, as tube stock and understorey will be primarily intact/not impacted, the works are unlikely to facilitate a serious and irreversible impact on the TEC.



1.5 Proposed Borehole Site location and mitigation measures

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

Table 1: Location of Proposed subject sites and mitigation measures

Site	GDA94 Easting	GDA94 Northing	Access and Site Preparation Requirements	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
Survey lines					
300XL Survey Cross Line	309594	6216750	Access to the site is off Fire Trail 9, 9E and 9D and will require primary clearing of up to a 3 m wide corridor (reduced to 1 m through TEC), with a total area approximately equating to	Plate 1	Vegetation disturbance will be minimised, where practical. long-term ground cover disturbance. Avoid habitat features such as rocky outcrops, hollow bearing trees and large fallen logs which occur throughout the broader general area. No vegetation clearance is to occur outside the limits of the proposed access track footprint (the 300XL Survey Cross Line extent will be marked with flagging tape to ensure no encroachment to native vegetation and associated habitats outside the proposed clearing limits). A pre-clearance assessment is recommended to be undertaken by a suitably qualified ecologist, at least a week prior to the proposed clearing works to identify, map and flag threatened



Site	GDA94 Easting	GDA94 Northing	Access and Site Preparation Requirements	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
			0.512 ha. Direct impacts to native vegetation will consists of: 0.234 ha of PCT 3590 Southern Sydney Scribbly Gum Woodland, 0.079 ha of PCT 3595 Sydney Coastal Sandstone Gully Forest 0.057 ha of PCT 3598 Woronora Plateau Scribbly Gum Woodland		flora, significant habitat features, and any other significant ecological constraints within the 300XL Survey Cross Line. Sediment controls to be implemented as appropriate.



Site	GDA94 Easting	GDA94 Northing	Access and Site Preparation Requirements	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
			0.111 ha of PCT 3814 <i>Woronora Plateau Heath-Mallee</i> 0.016 ha of PCT 3923 <i>Sydney Coastal Sandstone Creekline Swamp Heath</i> and 0.015 ha of PCT 3924 <i>Sydney Coastal Upland Swamp Heath</i>		
Access tracks					
Honeysuckle Creek Pools 1-21	309050	6216830	Access to the site is off Fire Trail 9 and will require	Plate 2	Vegetation disturbance will be minimised to the smallest footprint required.



Site	GDA94 Easting	GDA94 Northing	Access and Site Preparation Requirements	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
			primary clearing of the access track, up to approximately 0.182 ha. Direct impacts to native vegetation will consists of: 0.135 ha of PCT 3595 <i>Sydney Coastal Sandstone Gully Forest</i> 0.012 ha of PCT 3598 <i>Woronora Plateau Scribbly Gum Woodland</i> 0.005 ha of PCT 3814		Avoid habitat features such as rocky outcrops, hollow bearing trees and large fallen logs which occur throughout the broader general area. Sediment controls to be implemented as appropriate.



Site	GDA94 Easting	GDA94 Northing	Access and Site Preparation Requirements	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
			<i>Woronora Plateau Heath-Mallee</i> 0.010 ha of PCT 3923 <i>Sydney Coastal Sandstone Creekline Swamp Heath</i> 0.019 ha of PCT 3924 <i>Sydney Coastal Upland Swamp Heath</i> 0.0004 ha of 3925 <i>Sydney Sandstone Button Grass Sedgeland.</i>		
S106c Link Track	309560	6217455	Access to the site is off Fire	Plate 3	Vegetation disturbance will be minimised to the smallest footprint required.



Site	GDA94 Easting	GDA94 Northing	Access and Site Preparation Requirements	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
			Trail 9D and will require primary clearing of the access track, up to approximately 0.025 ha. Direct impacts to native vegetation will consists of: 0.004 ha of <i>PCT 3595 Sydney Coastal Sandstone Gully Forest</i> 0.009 ha of <i>PCT 3814 Woronora Plateau Heath-Mallee</i>		Avoid habitat features such as rocky outcrops, hollow bearing trees and large fallen logs which occur throughout the broader general area. Sediment controls to be implemented as appropriate.



Site	GDA94 Easting	GDA94 Northing	Access and Site Preparation Requirements	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
			0.0003 ha of PCT 3923 <i>Sydney Coastal Sandstone Creekline Swamp Heath</i> 0.012 ha of PCT 3924 <i>Sydney Coastal Upland Swamp Heath</i>		
S104a Link Track	309041	6216323	Access to the site is off Fire Trail 9D and will require primary clearing of the access track, up to approximately 0.007 ha. Direct impacts to native		Vegetation disturbance will be minimised to the smallest footprint required. Avoid habitat features such as rocky outcrops, hollow bearing trees and large fallen logs which occur throughout the broader general area. Sediment controls to be implemented as appropriate.



Site	GDA94 Easting	GDA94 Northing	Access and Site Preparation Requirements	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
			vegetation will consists of: 0.002 ha of PCT 3598 <i>Woronora Plateau Scribbly Gum Woodland</i> 0.004 ha of PCT 3923 <i>Sydney Coastal Sandstone Creekline Swamp Heath</i> 0.0006 ha of PCT 3924 <i>Sydney Coastal Upland Swamp Heath</i>		
COH18 Track	310930	6217008	Access to the site is off Fire Trail 9E and	Plate 4	Vegetation disturbance will be minimised to the smallest footprint required.



Site	GDA94 Easting	GDA94 Northing	Access and Site Preparation Requirements	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
			will require primary clearing of the access track, up to approximately 0.050 ha. Direct impacts to native vegetation will consists of: 0.005 ha of PCT 3595 <i>Sydney Coastal Sandstone Gully Forest</i> 0.024 ha of PCT 3598 <i>Woronora Plateau Scribbly Gum Woodland</i>		Avoid habitat features such as rocky outcrops, hollow bearing trees and large fallen logs which occur throughout the broader general area. Sediment controls to be implemented as appropriate.



Site	GDA94 Easting	GDA94 Northing	Access and Site Preparation Requirements	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
			0.021 ha of PCT 3924 <i>Sydney Coastal Upland Swamp Heath</i>		
COH19 Track	310503	6217998	Access to the site is off Fire Trail 9D and will require primary clearing of the access track, up to approximately 0.060 ha. Direct impacts to native vegetation will consists of: 0.021 ha of PCT 3595 <i>Sydney Coastal</i>	Plate 5	Vegetation disturbance will be minimised to the smallest footprint required. Avoid habitat features such as rocky outcrops, hollow bearing trees and large fallen logs which occur throughout the broader general area. Sediment controls to be implemented as appropriate.



Site	GDA94 Easting	GDA94 Northing	Access and Site Preparation Requirements	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
			<i>Sandstone Gully Forest</i> 0.007 ha of PCT 3814 <i>Woronora Plateau Heath-Mallee</i> 0.016 ha of PCT 3923 <i>Sydney Coastal Sandstone Creekline Swamp Heath</i> 0.010 ha of PCT 3924 <i>Sydney Coastal Upland Swamp Heath</i> 0.005 ha of 3925 <i>Sydney Sandstone Button Grass Sedgeland</i>		



Site	GDA94 Easting	GDA94 Northing	Access and Site Preparation Requirements	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
BS-1 Track	308924	6219798	Access to the site is off Fire Trail 9 and will require primary clearing of the access track, up to approximately 0.009 ha. Direct impacts to native vegetation will consists of: 0.009 ha of PCT 3924 <i>Sydney Coastal Upland Swamp Heath</i>	Plate 6	Vegetation disturbance will be minimised to the smallest footprint required. Avoid habitat features such as rocky outcrops, hollow bearing trees and large fallen logs which occur throughout the broader general area. Sediment controls to be implemented as appropriate. Avoid <i>Pultenaea aristata</i> as marked in Figure 7. Clearing to be supervised by botanist. Clearing will be reduced and completed by hand for areas of dense threatened flora (see Figure 5)
BS-3 Track	309036	6217836	Access to the site is off Fire Trail 9 and will require	Plate 7	Vegetation disturbance will be minimised to the smallest footprint required.



Site	GDA94 Easting	GDA94 Northing	Access and Site Preparation Requirements	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
			primary clearing of the access track, up to approximately 0.016 ha. Direct impacts to native vegetation will consists of: 0.007 ha of PCT 3598: <i>Woronora Plateau Scribbly Gum Woodland</i> 0.010 ha of PCT 3924: <i>Sydney Coastal Upland Swamp Heath</i>		Avoid habitat features such as rocky outcrops, hollow bearing trees and large fallen logs which occur throughout the broader general area. Sediment controls to be implemented as appropriate.



Site	GDA94 Easting	GDA94 Northing	Access and Site Preparation Requirements	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
Swamp 77 Track	310774	6217103	Access to the site is off Fire Trail 9D and will require primary clearing of the access track and bore site, up to approximately 0.024 ha. Direct impacts to native vegetation will consists of: 0.015 ha of PCT 3598: <i>Woronora Plateau Scribbly Gum Woodland</i> 0.005 ha of PCT 3923 <i>Sydney</i>	Plate 8	Vegetation disturbance will be minimised to the smallest footprint required. Avoid habitat features such as rocky outcrops, hollow bearing trees and large fallen logs which occur throughout the broader general area. Sediment controls to be implemented as appropriate.



Site	GDA94 Easting	GDA94 Northing	Access and Site Preparation Requirements	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
			<i>Coastal Sandstone Creekline Swamp Heath</i> 0.004 ha of PCT 3924: <i>Sydney Coastal Upland Swamp Heath</i>		
Deep groundwater boreholes					
9D-GW-76-90 & 9D-GW-76-150	309956	6217297	Access to the site is off Fire Trail 9D and will require primary clearing of the bore site, up to approximately 0.097 ha. Direct impacts to native vegetation	Plate 9	Vegetation disturbance will be minimised to the smallest footprint required. Avoid habitat features such as rocky outcrops, hollow bearing trees and large fallen logs which occur throughout the broader general area. Sediment controls to be implemented as appropriate on downslope sides of the site. Avoid <i>Pultenaea aristata</i> as marked in Figure 7. Clearing to be supervised by botanist. Clearing will be reduced and completed by hand for areas of dense threatened flora (see Figure 5).



Site	GDA94 Easting	GDA94 Northing	Access and Site Preparation Requirements	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
			will consists of: 0.097 ha of PCT 3590: <i>Southern Sydney Scribbly Gum Woodland</i>		
9E-GW-77	310346	6216596	Access to the site is off Fire Trail 9E and will require primary clearing of the bore site, up to approximately 0.067 ha. Direct impacts to native vegetation will consists of: 0.067 ha of PCT 3598:	Plate 10	Vegetation disturbance will be minimised to the smallest footprint required. Avoid habitat features such as rocky outcrops, hollow bearing trees and large fallen logs which occur throughout the broader general area. Sediment controls to be implemented as appropriate on downslope sides of the site.



Site	GDA94 Easting	GDA94 Northing	Access and Site Preparation Requirements	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
			Woronora Plateau Scribbly Gum Woodland		
S92-GT-01	309455	6215972	Access to the site is off Swamp 92 Road and will require primary clearing of the bore site, up to approximately 0.119 ha. Direct impacts to native vegetation will consists of: 0.119 ha of PCT 3590: <i>Southern Sydney</i>	Plate 11	Vegetation disturbance will be minimised to the smallest footprint required. Avoid habitat features such as rocky outcrops, hollow bearing trees and large fallen logs which occur throughout the broader general area. Sediment controls to be implemented as appropriate on downslope sides of the site.



Site	GDA94 Easting	GDA94 Northing	Access and Site Preparation Requirements	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
			<i>Scribbly Gum Woodland</i>		
S92-GW-02	310399	6215820	Access to the site is off Swamp 92 Road and will require primary clearing of the bore site, up to approximately 0.069 ha. Direct impacts to native vegetation will consists of: 0.002 ha of PCT 3810: <i>Southern Sydney Rockplate Heath</i>	Plate 12	Vegetation disturbance will be minimised to the smallest footprint required. Avoid habitat features such as rocky outcrops, hollow bearing trees and large fallen logs which occur throughout the broader general area. Sediment controls to be implemented as appropriate on downslope sides of the site.



Site	GDA94 Easting	GDA94 Northing	Access and Site Preparation Requirements	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
			0.067 ha of PCT 3814 <i>Woronora Plateau Heath-Mallee</i>		
Road Maintenance					
Swamp 92 Road	309822	6215853	Access to the site is off Fire Trail 9E and will require trimming of overhanging branches, covering an area of 0.562 ha.		Vegetation disturbance will be minimised to the smallest footprint required. Avoid habitat features such as rocky outcrops, hollow bearing trees and large fallen logs which occur throughout the broader general area. Sediment controls to be implemented as appropriate on downslope sides of the site.
Gauge station					
ETAU-WQ-Sampler	312155	6215641	Access to the site is off Fire Trail 9G and will require the primary clearing of the	Plate 13	Vegetation disturbance will be minimised to the smallest footprint required. Avoid habitat features such as rocky outcrops, hollow bearing trees and large fallen logs which occur throughout the broader general area.



Site	GDA94 Easting	GDA94 Northing	Access and Site Preparation Requirements	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
			sampler site, covering an area of 0.001 ha. Direct impacts to native vegetation will consists of: 0.001 ha of <i>PCT 3595 Sydney Coastal Sandstone Gully Forest</i>		Sediment controls to be implemented as appropriate on downslope sides of the site.
Swamp groundwater piezometers site					
BS-1	308880	6219784	Access to the site is off Fire Trail 9 and will require primary clearing of the bore site, up to	Plate 14	Vegetation disturbance will be minimised to the smallest footprint required. Avoid habitat features such as rocky outcrops, hollow bearing trees and large fallen logs which occur throughout the broader general area. Sediment controls to be implemented as appropriate on downslope sides of the site.



Site	GDA94 Easting	GDA94 Northing	Access and Site Preparation Requirements	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
			approximately 0.003 ha. Direct impacts to native vegetation will consists of: 0.003 ha of PCT 3924: <i>Sydney Coastal Upland Swamp Heath</i>		
BS-3	308969	6217875	Access to the site is off Fire Trail 9 and will require primary clearing of the bore site, up to approximately 0.003 ha. Direct impacts to native	Plate 15	Vegetation disturbance will be minimised to the smallest footprint required. Avoid habitat features such as rocky outcrops, hollow bearing trees and large fallen logs which occur throughout the broader general area. Sediment controls to be implemented as appropriate on downslope sides of the site.



Site	GDA94 Easting	GDA94 Northing	Access and Site Preparation Requirements	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
			vegetation will consists of: 0.003 ha of PCT 3924: <i>Sydney Coastal Upland Swamp Heath</i>		
Swamp 77	310676	6217098	Access to the site is off Fire Trail 9E and will require primary clearing of the bore site, up to approximately 0.002 ha. Direct impacts to native vegetation will consists of:	Plate 16	Vegetation disturbance will be minimised to the smallest footprint required. Avoid habitat features such as rocky outcrops, hollow bearing trees and large fallen logs which occur throughout the broader general area. Sediment controls to be implemented as appropriate on downslope sides of the site.



Site	GDA94 Easting	GDA94 Northing	Access and Site Preparation Requirements	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
			0.002 ha of PCT 3924: <i>Sydney Coastal Upland Swamp Heath</i>		



02 Ecological Assessment

1.6 Site Assessment

An ecological assessment of the proposed subject site was conducted over nine days (17, 18 and 23 July 2024; 12 and 13 September 2024; and 2, and 11 October 2024) by Niche ecologists, Amanda Melvaine (Ecology Consultant), Tamika Flanigan (Ecology Consultant) and Justin Merdith (Ecology Consultant).

The site assessment involved ground-truthing the entire subject site to validate the vegetation mapping, and map ecological constraints (e.g. significant habitat features, incidental sightings, and/or threatened species [direct or indirect signs of presence]) (Section 3.2).

03 Findings

1.7 Native vegetation of the subject site

The subject site has been mapped by NSW State Vegetation Type Map (SVTM) (State Government of NSW and Department of Planning and Environment, 2022) and Niche validated vegetation map (2024). The vegetation mapping is provided in Figure 3 of Annex 1. The TEC Coastal Upland Swamp, in Figure 7, have been mapped as a result of the Longwalls 301-303 Upland Swamp Vegetation Mapping and Proposed Monitoring Program (Eco Logical 2016), which provides a layer that is mapped with greater accuracy by a combination of field validation and LiDAR.

The vegetation disturbance associated with the proposed borehole sites is provided in Table 3, 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:

- PCT 3590: Southern Sydney Scribbly Gum Woodland (0.478 ha)
- PCT 3595: Sydney Coastal Sandstone Gully Forest (0.245 ha)
- PCT 3598: Woronora Plateau Scribbly Gum Woodland (0.186 ha)
- PCT 3810: Southern Sydney Rockplate Heath (0.002 ha)
- PCT 3814: Woronora Plateau Heath-Mallee (0.200 ha)
- PCT 3923: Sydney Coastal Sandstone Creekline Swamp Heath (0.050 ha)
- PCT 3924: Sydney Coastal Upland Swamp Heath (0.106 ha)
- PCT 3925: Sydney Sandstone Button Grass Sedgeland (0.006 ha)

Of the eight (8) vegetation communities three (3) of these communities align to the TEC Coastal Upland Swamps (PCT 3923, PCT 3924 and PCT 3925).



1.8 Threatened flora

A total of thirty-six 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 (DPE, 2023a) and the EPBC Act Protected Matters Search tool (DAWE, 2023).

13 threatened flora species were considered to have a high or moderate likelihood of occurrence in the subject site prior to field survey:

- *Acacia baueri* subsp. *baueri*
- *Acacia bynoeana*
- *Astrotricha crassifolia*
- *Callistemon linearifolius*
- *Cryptostylis hunteriana*
- *Epacris purpurascens* var. *purpurascens*
- *Eucalyptus camfieldii*
- *Genoplesium baueri*
- *Leucopogon exolasius*
- *Melaleuca deanei*
- *Persoonia hirsuta*
- *Pultenaea aristata*.

Six *Pultenaea aristata* individuals were recorded during the survey along 106c link track, 300XL Survey Line and at S92-GW-02 (see Figure 7 and Table 3-5) and the species is known to be locally abundant.

1.9 Fauna habitat

The vegetation within the subject site supports a wide range of food and sheltering resources for vertebrate fauna. Trees from the family *Myrtaceae* (mostly *Eucalyptus* spp.) generally dominate the canopy 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 hollow-bearing trees will be removed by the proposal.

Some sandstone outcrops were present along sections of access tracks and sometimes included exfoliation surfaces and crevices. These habitat features may provide refuge for a range of reptile species, including the threatened Broad-headed Snake and Rosenberg's Goanna. These species rely on these habitats for over-wintering, thermoregulation, and shelter, and as a refuge for juveniles and prey species. The Proposal will avoid rock outcrops where practicable and will not alter or remove the exfoliating surfaces and crevices.



1.10 Threatened fauna

A total of 62 threatened fauna have previously been recorded (Atlas of NSW Wildlife) or are predicted to have habitat (EPBC Act) within 10 km of the subject site (Annex 4). The analysis (Annex 4) identified 25 threatened fauna species with a moderate or high likelihood within the subject site (Table 4), these species include:

- Giant Burrowing Frog (*Heleioporus australiacus*)
- Littlejohn's Tree Frog (*Litoria littlejohni*)
- Stuttering Frog (*Mixophyes balbus*)
- Red-crowned Toadlet (*Pseudophryne australis*)
- Dusky Woodswallow (*Artamus cyanopterus cyanopterus*)
- Gang-gang Cockatoo (*Callocephalon fimbriatum*)
- Glossy Black-Cockatoo (*Calyptorhynchus lathami*)
- Varied Sittella (*Daphoenositta chrysoptera*)
- Eastern Bristlebird (*Dasyornis brachypterus*)
- Little Eagle (*Hieraaetus morphnoides*)
- Swift Parrot (*Lathamus discolor*)
- Powerful Owl (*Ninox strenua*)
- Eastern Ground Parrot (*Pezoporus wallicus wallicus*)
- Eastern Pygmy-possum (*Cercartetus nanus*)
- Large-eared Pied Bat (*Chalinolobus dwyeri*)
- Spotted-tailed Quoll (*Dasyurus maculatus*)
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
- Little Bentwing-bat (*Miniopterus australis*)
- Squirrel Glider (*Petaurus norfolcensis*)
- Greater Glider (*Petauroides volans*)
- Koala (*Phascolarctos cinereus*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*)
- Giant Dragonfly (*Petalura gigantea*)
- Broad-headed Snake (*Hoplocephalus bungaroides*)
- Rosenberg's Goanna (*Varanus rosenbergi*).



04 Impact assessment

1.11 Vegetation disturbance

The nature of the native vegetation disturbance required within the subject site includes:

- Full clearance of up to 1.27 ha of high condition, native vegetation by hand tools which comprise of PCTs PCT 3590: *Southern Sydney Scribbly Gum Woodland*, PCT 3595: *Sydney Coastal Sandstone Gully Forest*, PCT 3598: *Woronora Plateau Scribbly Gum Woodland*, PCT 3810: *Southern Sydney Rockplate Heath*, PCT 3814: *Woronora Plateau Heath-Mallee*, PCT 3923: *Sydney Coastal Sandstone Creekline Swamp Heath*, PCT 3924: *Sydney Coastal Upland Swamp Heath* and PCT 3925: *Sydney Sandstone Button Grass Sedgeland*.
- Trittering of existing Swamp 92 Road (trittering of mid-storey and groundcover and trimming canopy species (i.e. mature trees and hollow-bearing trees would not be removed).

The “trittering” attachment effectively mulches the vegetation *in situ* leaving the root balls intact and does not disturb the soil seedbank. This means that the natural soil profile is not disturbed and the resilience (i.e. the natural capacity for regeneration) of the native vegetation remains high.

The Proposal would result in up to approximately 1.27 ha of direct impacts to native vegetation (via vegetation clearing) (Table 2 and Table 3). Of the 1.27 ha of native vegetation to be cleared, 0.16 ha of native vegetation that conforms to the Coastal Upland Swamp TEC will be cleared.

The direct and indirect impacts to Coastal Upland Swamp TEC have been assessed via an Assessment of Significance (AoS) under the BC Act, and under the Significant Impact Criteria (SIC) under the EPBC Act (Annex 4 and 5). The outcome of the AoS and SIC assessment determined, that provided the direct and indirect impacts to Coastal Upland Swamp TEC are appropriately mitigated in accordance with Section 5, the proposal is unlikely to significantly impact any Threatened Ecological Communities (TECs) due to the small extent of impact, and management of residual impacts from the proposal.

Table 2: Summary of direct impacts to native vegetation

PCT	PCT Name	Area of direct impact (ha)
3590	<i>Southern Sydney Scribbly Gum Woodland</i>	0.478
3595	<i>Sydney Coastal Sandstone Gully Forest</i>	0.245



PCT	PCT Name	Area of direct impact (ha)
3598	<i>Woronora Plateau Scribbly Gum Woodland</i>	0.186
3810	<i>Southern Sydney Rockplate Heath</i>	0.002
3814	<i>Woronora Plateau Heath-Mallee</i>	0.200
3923	<i>Sydney Coastal Sandstone Creekline Swamp Heath</i>	0.050
3924	<i>Sydney Coastal Upland Swamp Heath</i>	0.106
3925	<i>Sydney Sandstone Button Grass Sedgeland</i>	0.006
Total		1.273



Table 3: Proposed vegetation clearing for survey line (ha)

Sites	Presence of <i>P. aristata</i>	PCT 3590	PCT 3595	PCT 3598	PCT 3810	PCT 3814	PCT 3923	PCT 3924	PCT 3925	Total (ha)
							Coastal Upland Swamps (TEC)			
300XL Survey Line	Yes	0.234	0.079	0.057	-	0.111	0.016	0.015	-	0.512
Total impacts	See threatened flora below for more detail	0.234	0.079	0.057	-	0.111	0.016	0.015	-	0.512



Table 4: Proposed vegetation clearing for 1 m wide access tracks (ha)

Sites	Presence of <i>P. ariststa</i>	PCT 3590	PCT 3595	PCT 3598	PCT 3810	PCT 3814	PCT 3923	PCT 3924	PCT 3925	Total (ha)
							Coastal Upland Swamps (TEC)			
Honeysuckle Creek Track	-	-	0.135	0.012	-	0.006	0.010	0.019	0.0004	0.182
S106c Link Track	Yes	-	0.004	-	-	0.009	0.0003	0.012	-	0.025
S104a Link Track	-	-	-	0.002	-	-	0.004	0.0006	-	0.007
COH18 Track	-	-	0.005	0.024	-	-	-	0.021	-	0.050
COH19 Track	-	-	0.021	-	-	0.007	0.016	0.010	0.005	0.060
BS-1 Track	-	-	-	-	-	-	-	0.009	-	0.009
BS-3 Track	-	-	-	0.007	-	-	-	0.010	-	0.017
S77 Track	-	-	-	0.015	-	-	0.005	0.004	-	0.024
Total impacts	See threatened flora below for more detail	-	0.165	0.060	-	0.022	0.035	0.086	0.006	0.374



Table 5: Proposed vegetation clearing for groundwater borehole sites (ha)

Sites	Presence of <i>P. aristata</i>	PCT 3590	PCT 3595	PCT 3598	PCT 3810	PCT 3814	PCT 3923	PCT 3924	PCT 3925	Total (ha)
							Coastal Upland Swamps (TEC)			
9D-GW-76-90 and 9D-GW-76-150	-	0.097	-	-	-	-	-	-	-	0.097
9E-GW-77	-	-	-	0.066	-	-	-	-	-	0.066
S92-GT-01	-	0.119	-	-	-	-	-	-	-	0.119
S92-GW-02	Yes	-	-	-	0.002	0.067	-	-	-	0.069
Total impacts	See threatened flora below for more detail	0.216	-	0.066	0.002	0.067	-	-	-	0.351



Table 6: Proposed vegetation clearing for the Gauge Station site (ha)

Sites	Presence of <i>P. ariststa</i>	PCT 3590	PCT 3595	PCT 3598	PCT 3810	PCT 3814	PCT 3923	PCT 3924	PCT 3925	Total (ha)
							Coastal Upland Swamps (TEC)			
ETAU-WQ-Sampler	-	-	0.001	-	-	-	-	-	-	0.001
Total impacts	See threatened flora below for more detail	-	0.001	-	-	-	-	-	-	0.001



Table 7: Proposed vegetation clearing for swamp piezometer sites (ha)

Sites	Presence of <i>P. ariststa</i>	PCT 3590	PCT 3595	PCT 3598	PCT 3810	PCT 3814	PCT 3923	PCT 3924	PCT 3925	Total (ha)
							Coastal Upland Swamps (TEC)			
BS-1	-	-	-	-	-	-	-	0.003	-	0.003
BS-3	-	-	-	-	-	-	-	0.003	-	0.003
S77	-	-	-	-	-	-	-	0.002	-	0.002
Total impacts	See threatened flora below for more detail	-	-	-	-	-	-	0.008	-	0.008



1.12 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, one TEC exists near the subject site; Coastal Upland Swamp (PCT 3923 and PCT 3924). Coastal Upland Swamp is listed as endangered on both the BC and EPBC Acts.

The results of the field survey found that Coastal Upland Swamps TEC occurs within the area to be disturbed at the 300XL Survey Line and all of the swamp groundwater piezometer sites and sections of each of the tracks, with a total impact of up to 0.16 ha proposed (Table 2, Table 3 and Table 7).

Vegetation disturbance will be minimised to the smallest footprint required. An assessment of significance under the BC Act (5-part test) (Annex 5) and Commonwealth Assessment of Significance has been completed (Annex 6). Both assessments found the proposed clearing disturbance will not significantly impact the threatened ecological community. Approximately 498 ha of Coastal Upland Swamp exists within 5 km of the subject site and approximately 0.16 ha of Coastal Upland Swamp would be modified by vegetation clearing for subject sites. This is less than 1% of the total community within the 5 km radius and temporary in nature. The small extent of impact, and management of residual impacts from the proposal, mean that the community would not likely be significantly impacted.

Coastal Upland Swamp has recently been awarded a Serious and Irreversible Impact (SAIL) listing under principle 4: "Principle 4 – species or ecological community that is unlikely to respond to management and is therefore irreplaceable".

Advice provided by Stephen Love (Environment & Community Superintendent – Peabody Energy) via email (dated 16 December 2024), stated the following:

"We've received legal advice regarding the SAIL. While there are concerns about the process followed by DCCEE, the recommendation in the meantime is for the specialists preparing the environmental assessment (Niche) to include an acknowledgement of the SAIL 'listing' but clarifying that the relevant construction activities detailed in the SWAF do not give rise to a serious and irreversible impact (assuming that this is a finding Niche can make based on your environmental assessment)."

In relation to Principal 4 under the SAIL criteria, given the partial clearing of Coastal Upland Swamp for the proposed 300XL survey line is unlikely to significantly reduce extent, or floristic diversity, as understorey species will be primarily intact/not impacted, the works are unlikely to facilitate a serious and irreversible impact on the TEC.



1.13 Threatened flora

A total of thirty-six (36) 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 (DPE, 2023a) and the EPBC Act Protected Matters Search tool (DAWE, 2023).

Thirteen (13) threatened flora were considered to have a High or Moderate likelihood of occurrence in the subject site prior to field survey: *Acacia baueri* subsp. *baueri*, *A. bynoeana*, *Astrotricha crassifolia*, *Callistemon linearifolius*, *Cryptostylis hunteriana*, *Epacris purpurascens* var. *purpurascens*, *Eucalyptus camfieldii*, *Genoplesium baueri*, *Leucopogon exolasius*, *Melaleuca deanei*, *Persoonia hirsuta* and *Pultenaea aristata*.

Six *Pultenaea aristata* individuals were recorded during the survey along 106c link track, 300XL Survey Line and at S92-GW-02 (Figure 7) and the species is known to be locally abundant. Within areas of where *Pultenaea aristata* have been recorded, individuals will be demarcated with flagging tape, and the vegetation clearing will be reduced and completed by hand-held devices, this will ensure the proposed works avoid any individuals. The proposed access tracks are narrow and can avoid any individuals, minimising the impact to *Pultenaea aristata*, such that no direct impacts are expected. The 300XL Survey Line and S92-GW-02 site will be reduced to avoid impacting the *Pultenaea aristata* individuals. An Assessments of Significance (under the BC Act and EPBC Act) has been conducted for this species (See Annex 5 and Annex 6) and safeguards will be in place to protect them, for instance, pre-clearing survey and ecological supervision to ensure that no individuals are impacted (Section 5).

Most of the other threatened species are relatively conspicuous and were not detected during the current survey or previous surveys in the subject site.

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.

1.14 Fauna habitat

Threatened fauna

One Broad-headed Snake (*Hoplocephalus bungaroides*) individual was observed along the first design of the 300XL survey line. After consultation with Peabody Energy (dated 15th August 2024), the survey line was revised (diverted further to the south) to avoid Broad-headed Snake habitat in the locality.

Giant Burrowing Frog, Littlejohn's Tree Frog, Stuttering Frog, Red-crowned Toadlet, Eastern Bristlebird, Eastern Ground Parrot, Eastern Pygmy-possum, Giant Dragonfly, Broad-headed Snake, Rosenberg's Goanna, are all species that were considered to known to the locality or have suitable habitat within the subject site. These species have been considered further in Annex 4 and Annex 5.

All candidate threatened species in Table 8 may have potential foraging or move-through habitat within the subject site, however important features such as hollow bearing trees, stags, termite mounds, dense shrubs and mature trees have been avoided. The native vegetation of the subject site is in high condition,



located within areas of high landscape connectivity, and provides a variety of important habitat features. The current proposal will not remove any hollow-bearing trees, stags or mature trees. Given the above factors, it is unlikely that the proposal will result in any measurable loss of habitat or direct impact to any threatened fauna species. However, an Assessments of Significance (under the BC Act) has been conducted for the Red-crowned Toadlet and Littlejohn's Tree Frog (See Annex 5 for Assessment of significance).



Table 8: Affected threatened fauna (NSW and Commonwealth)

Species	BC Act	EPBC Act	Likelihood of Occurrence	Potential to be affected by the proposal
Giant Burrowing Frog <i>Heleioporus australiacus</i>	V	V	High	High ; 1.27 ha of habitat impact in total, including 0.22 ha of breeding habitat (track on ephemeral stream) impact.
Littlejohn's Tree Frog <i>Litoria littlejohni</i>	E	E	High	High ; 1.27 ha of habitat impact in total, including 0.22 ha of breeding habitat (track on ephemeral stream) impact.
Stuttering Frog <i>Mixophyes balbus</i>	E	V	Moderate	Moderate ; 0.22 ha of breeding habitat (track on ephemeral stream) impact.
Red-crowned Toadlet <i>Pseudophryne australis</i>	V	-	High	High ; 1.27 ha of habitat impact in total.
Dusky Woodswallow <i>Artamus cyanopterus cyanopterus</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the subject site. Impacts are likely to be negligible.
Gang-gang Cockatoo <i>Callocephalon fimbriatum</i>	V	-	High	None; no limiting foraging or breeding habitat within the subject site would be impacted. 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
Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the subject site would be impacted. Hollow bearing trees will be avoided and thus impacts are likely to be negligible.
Varied Sittella <i>Daphoenositta chrysoptera</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the subject site would be impacted. Hollow bearing trees will be avoided and thus impacts are likely to be negligible.
Eastern Bristlebird <i>Dasyornis brachypterus</i>	E	E	Moderate	Moderate , foraging or breeding habitat within the subject site.
Little Eagle <i>Hieraaetus morphnoides</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the subject site. Impacts are likely to be negligible.
Swift Parrot <i>Lathamus discolor</i>	E	E	Moderate	None; no limiting foraging or breeding habitat within the subject site. Impacts are likely to be negligible.
Powerful Owl <i>Ninox strenua</i>	V	-	High	None; no limiting foraging or breeding habitat within the subject site. 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
Eastern Ground Parrot <i>Pezoporus wallicus wallicus</i>	V	-	Moderate	Moderate , foraging or breeding habitat within the subject site.
Eastern Pygmy-possum <i>Cercartetus nanus</i>	V	-	Moderate	Moderate , foraging or breeding habitat within the subject site.
Large-eared Pied Bat <i>Chalinolobus dwyeri</i>	V	V	Moderate	None; no limiting foraging or breeding habitat within the subject site. Impacts negligible. Sparse occurrence if present. Important habitat features would not be affected.
Spotted-tailed Quoll <i>Dasyurus maculatus</i>	V	E	Moderate	None; no limiting foraging or breeding habitat within the subject site. 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 subject site. 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 subject site. 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
Squirrel Glider <i>Petaurus norfolcensis</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the subject site. Impacts negligible. Sparse occurrence if present. Important habitat features would not be affected.
Greater Glider	E	E	Moderate	None; no foraging or breeding habitat within the subject site. Impacts negligible. Sparse occurrence if present. Important habitat features would not be affected.
Koala <i>Phascolarctos cinereus</i>	V	V	Moderate	None; no limiting foraging or breeding habitat within the subject site would be impacted. 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 subject site. Impacts negligible. Sparse occurrence if present. Important habitat features would not be affected.
Giant Dragonfly <i>Petalura gigantea</i>	E	-	High	Moderate , foraging or breeding habitat within the subject site.
Broad-headed Snake <i>Hoplocephalus bungaroides</i>	E	V	Known	Moderate , Small areas of preferred habitat (exfoliating sandstone) are located near BS1, though marginal and will be avoided.
Rosenberg's Goanna <i>Varanus rosenbergi</i>	V	-	High	Moderate , Potential habitat for a variety of uses in small ephemeral drainages of the subject site. Termite mounds will not be impacted.



05 Mitigation measures

The proposal aims to avoid and/or minimise disturbance to the following:

- Threatened flora and fauna
- TECs
- Mature trees
- Hollow bearing trees and stags
- Riparian habitats and streams
- Rock outcrops
- Termite mounds
- Large hollow logs; and
- Bush-rock.

A table of recommended biodiversity mitigation measures is provided below in Table 9.

Table 9: Impact mitigation and recommendations

Impact	Proposed mitigation	Procedure
Protection of Threatened biodiversity	Reduce the extent of direct impacts (vegetation removal) to Coastal Upland Swamp TEC	• Reduce direct impact: Reduce clearing footprint to less than 1 m wide through the Coastal Upland Swamps. • Use of protective mats: Where access is essential, use ground mats to disperse weight and reduce soil compaction in sensitive TEC areas. Mats should be removed immediately upon project completion to avoid long-term ground cover disturbance.
Removal of vegetation/	Native vegetation avoidance	• An exclusion zone (no go zone) will be established and marked to indicate the limit of clearing boundary.



Impact	Proposed mitigation	Procedure
construction impacts		- Disturbance would be restricted to the removal of shrubs and small trees (diameter at breast height <10 cm), with the root ball of plants to be left intact to aid in rehabilitation which would be made possible by utilisation of a “mechanical trittering” attachment on the excavator. The trittering attachment mulches the vegetation to ground level, rather than ripping or excavating vegetation out of the ground. - Trees are to be felled to fall into the clearing area and away from adjacent vegetation or exclusion zones.
	Weed management	- Vehicles to be free of weeds prior to commencing construction. - All weed material removed during the construction works should be disposed of in a suitable waste facility and not mulched onsite to avoid the reintroduction and further spread of weeds in the area.
	Habitat, and threatened biodiversity avoidance – pre-clearing activities	- The project ecologist is to mark and identify all hollow-bearing trees and/or threatened biodiversity that has been previously recorded (e.g. <i>Pultenaea aristata</i>) at S106c Link, S92-GW-02, and the 300XL cross line. Assess for alternative routes to avoid impact. If an alternative route isn’t possible clearly mark individual plants with flagging tape. - Mark identified biodiversity constraints with flagging tape and establish barricades. - Rock outcrops with potential habitat for the endangered Broad-headed Snake and its prey species (such as exfoliating sandstone or crevices) to be avoided where practical. - Movement or disturbance of large hollow logs to be avoided wherever practical. Any hollow log that is moved to be placed on the side of the track and used in the site’s post-works rehabilitation. - Movement or disturbance bush-rock to be avoided wherever practical. Any bush-rock that is moved to be placed on the side of the track and used in the site’s post-works rehabilitation. - Works within proximity of creeks and drainage lines that contain flowing or still water to avoid any impacts on the stream channel. Impacts to small ephemeral drainage lines should also be avoided and/or minimised through sediment and erosion controls detailed further below.



Impact	Proposed mitigation	Procedure
		- Special care should also be taken when removing any woody debris (e.g., hollowed out logs), myrtaceous shrubs with potential cup nests/dreys as this could provide sheltering habitat for Eastern Pygmy-possum (if present). - Where works are required in the immediate vicinity of confirmed Red-crowned Toadlet, Broad-headed Snake or <i>Pultenaea aristata</i> habitat, ecological supervision is recommended to ensure threatened entities are protected and impacts associated with the works are mitigated. - Monitoring: Assign an ecologist to monitor confirmed Red-crowned Toadlet, Broad-headed Snake or <i>Pultenaea aristata</i> habitat post-construction.
	Training	- An induction process should be put in place for the training of relevant construction personnel to ensure: - Awareness and understanding of management procedures detailed in this table. - Awareness and understanding of potential threatened species on site. - Awareness and understanding of the unexpected threatened species find procedure (below). - During ongoing monitoring effort, personnel are to remain within the subject site to minimise new disturbance (minimise trampling). - Awareness of the barricade and its purpose.
	Pre-clearing inspection/Ecological supervision	- Pre-clearing targeted surveys for candidate threatened biota within suitable habitat. - All vegetation/habitat to be removed should be inspected immediately prior to (on the day of) clearing by a suitably qualified ecologist to identify the presence of any native fauna and allow for relocation or dispersal into adjacent habitat. - In the case where displaced fauna is encountered on site during clearing activities, works are to be suspended until otherwise advised by the supervising ecologist and onsite supervisor. - Felled trees should be inspected for small hollows that may not have been observed from the ground during surveys. If present, hollows should be inspected, and any native fauna be relocated or allowed to disperse into adjacent habitat. - All trees to be felled should be inspected immediately prior to (on the day of) felling by a suitably qualified ecologist. Inspections should include decorticating bark, where present.



Impact	Proposed mitigation	Procedure
		- In the event that fauna is injured during clearing, the NSW Wildlife Information, Rescue and Education Service (WIRES) will be contacted to handle and collect for appropriate care and rehabilitation. - In the instance that mature canopy trees require removal: - Hollow-bearing trees that potentially contain roosting and breeding habitat for threatened microbats or other fauna must be identified by a suitably qualified ecologist. These trees should be retained wherever possible. All trees identified as “to be retained” within the subject site following Project ecologist pre-clearing review, will be clearly marked onsite, with an easily visible and removable means of identification. - Clearing should be undertaken in a two-staged process. Non-habitat vegetation is to be removed a minimum of 48-hours prior to the removal of habitat containing vegetation (habitat to be clearly identified and demarcated prior by a suitably qualified and experienced Ecologist). This process will allow unassisted exodus of remaining fauna prior to felling/removal of habitat.
	Unexpected Finds	- In the case where a threatened species is encountered on site during construction or clearing activities, the following procedure is to be followed: - Work is to stop. - Notify the Project environment manager or Project supervisor. - Notify the Project ecologist. The ecologist is to undertake an impact assessment and determine if a significant impact is likely to occur, development management options and notify the appropriate departments. - If it is determined that no significant impact will occur, work can resume. - If it is determined that a significant impact is likely, consultation with the appropriate departments must be undertaken, and all necessary approvals obtained. - Work may recommence upon the advice of the ecologist and in consultation with Peabody.
Changes to hydrology and introduction of pollutants	Sediment and pollutant control	- Install sediment barriers such as silt fences along the riparian zones of COH18, COH19, and HSC 1-21 tracks to prevent sediment runoff into nearby streams. Monitor the condition of fences periodically and after rainfall events. Promptly repair if the fence is damaged. - Schedule works during dry periods when water flows are minimal, reducing the risk of sediment-laden runoff entering the streams.



Impact	Proposed mitigation	Procedure
		- Fuel Management – Spill kits to be kept with machinery, and trail staff fully trained in use. - Localised buffer zones and spill apparatus to be available on-site at all times. - All plant and machinery to be retained in good working order.
Infection of frogs by amphibian chytrid fungus causing the disease <i>chytridiomycosis</i>	Hygiene protocols	Measures to prevent the spread of Chytrid fungus would be employed in accordance with DPIE guidelines; sanitizing boots and machinery with an ethanol spray each day (DECC 2008).
potential risk of <i>Phytophthora cinnamomi</i>	Hygiene protocols	Hygiene protocols exist to minimise spread and prevent introduction of <i>Phytophthora cinnamomi</i> (IESCA Plan of Management [NPWS 2018]; and the Threat abatement plan for disease in natural ecosystems caused by <i>Phytophthora cinnamomi</i> [DAWE 2014]).



06 Conclusion and recommendations

The proposed works will result in up to approximately 1.27 ha of direct impacts and associated indirect impacts to native vegetation and habitats.

With the proposed mitigation measures in place, and the reduce impact footprint, the proposal is unlikely to result in a significant impact on any TEC, or threatened species listed under the BC Act and/or EPBC Act. Further, the partial clearing of Coastal Upland Swamp for the proposed 300XL survey line is unlikely to significantly reduce extent, or floristic diversity, as tube stock and understorey will be primarily intact/not impacted, the works are unlikely to facilitate a serious and irreversible impact on the TEC.

The relevant management measures as outlined in Section 6 of the Metropolitan Coal Construction Management Plan, shall be implemented in order to minimise impacts to the environment.

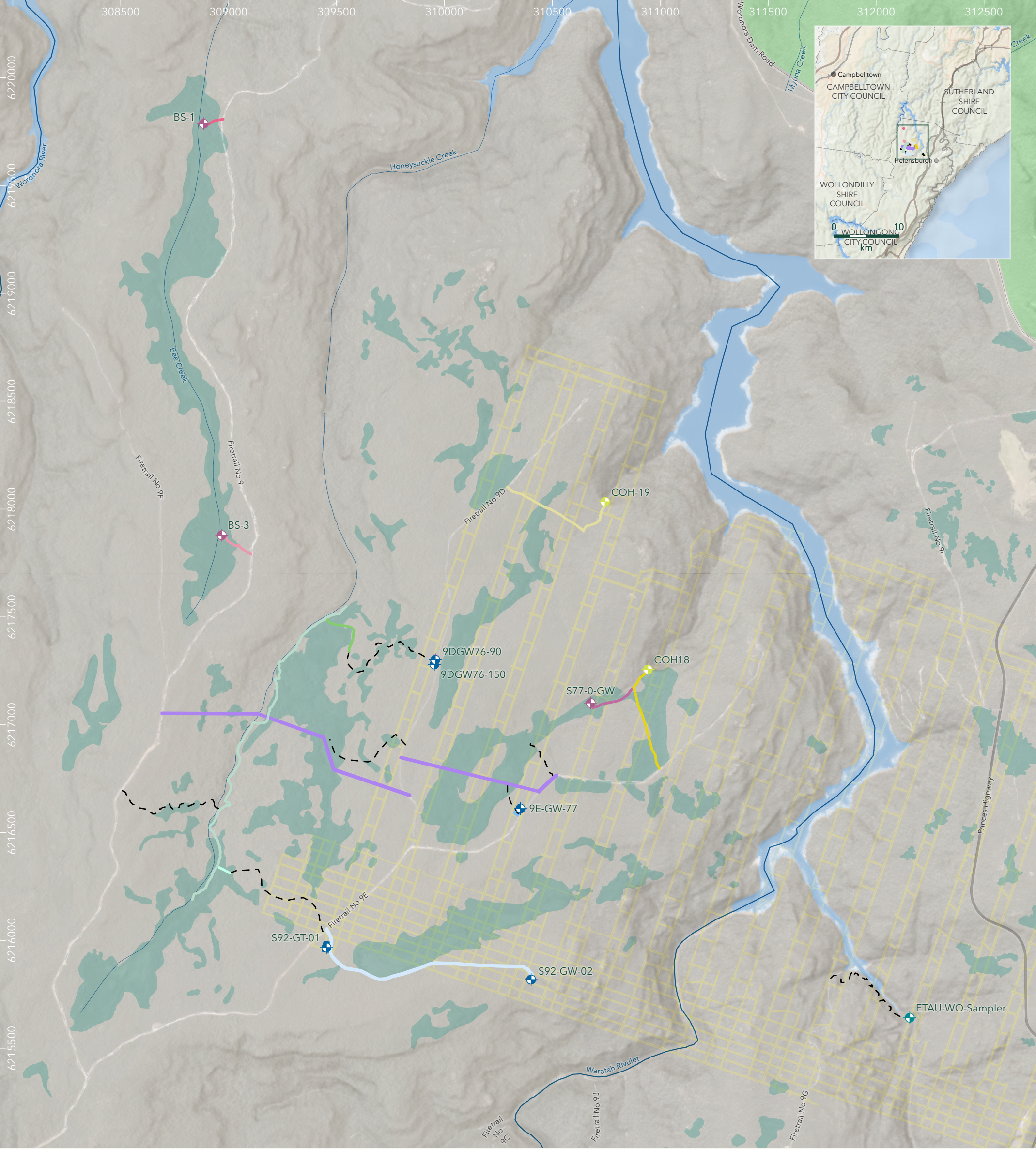
This report supports the Surface Works Assessment Form required to be completed for the proposed activities under the Metropolitan Coal Construction Management Plan. Metropolitan Coal will provide the details of the proposed surface construction works (in the form of a completed Surface Works Assessment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



07 Annex 1 Figures



Figure 1: Locality Map



Subject area

Monitoring site

Groundwater borehole

ETAU-WQ-Sampler

Swamp Piezometers

Cliff overhang

Monitoring site access

Survey Line

300XL (Cross line)

Road

Swamp 92 Road

Access tracks

BS-1

BS-3

S77-0

Honeysuckle Creek - Pool 1-21

S104a Link Track

S106c Link Track

COH18

COH19

Existing Access Track

Groundwater borehole footprint

9DGW76-90 and 9DGW76-150

9E-GW-77

S92-GT-01

S92-GW-02

Water sampler footprint

ETAU-WQ-Sampler

Longwalls 311-316

Indicative swamp extent (Peabody)

Roads and trails

Firetrail

Major road

Minor road

Hydrography

Perennial Stream

Non Perennial Stream

Waterbody

Protected Areas of NSW

National Park

0500

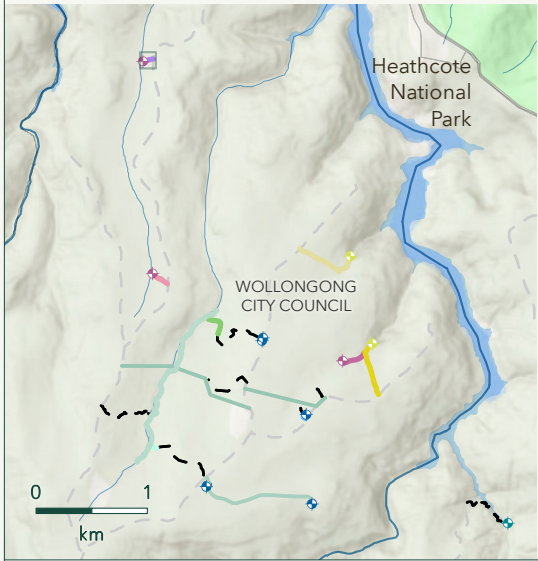
m

GDA2020 MGA Zone 56



Figure 2: Site Plan (Subject Site)

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Subject area

Disturbance footprint

Monitoring site

Swamp Piezometers

Monitoring site access

Access tracks

BS-1

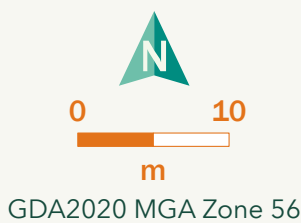
Roads and trails

Firetrail

Minor road

Hydrography

Non Perennial Stream



GDA2020 MGA Zone 56

Figure 2.1

Subject Subject Area- BS-1

LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy



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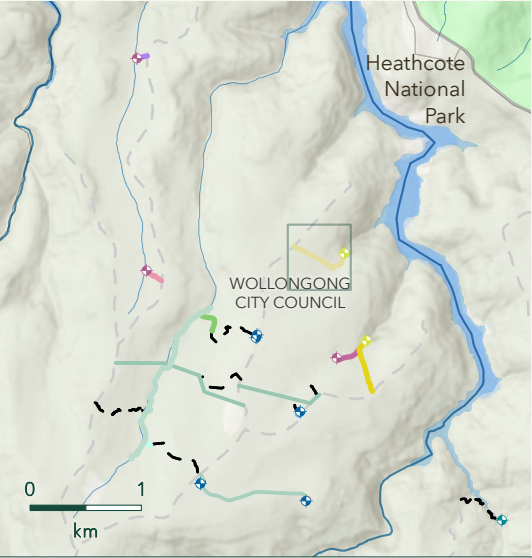
Figure 2.2

Subject Subject Area- BS-3
LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy

Hillshade: Esri, Geoscience Australia, NASA, NGA, USGS/ Hillshade: Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community/ World_Ocean_Base: NIWA, GeosciencesAustralia, Esri, Garmin, NaturalVue/ public/NSW_imagery: © Department of Customer Service 2020 | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.

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Subject area

Disturbance footprint

Monitoring site

Cliff overhang

Monitoring site access

Access tracks

COH19

Roads and trails

Firetrail

Minor road



GDA2020 MGA Zone 56



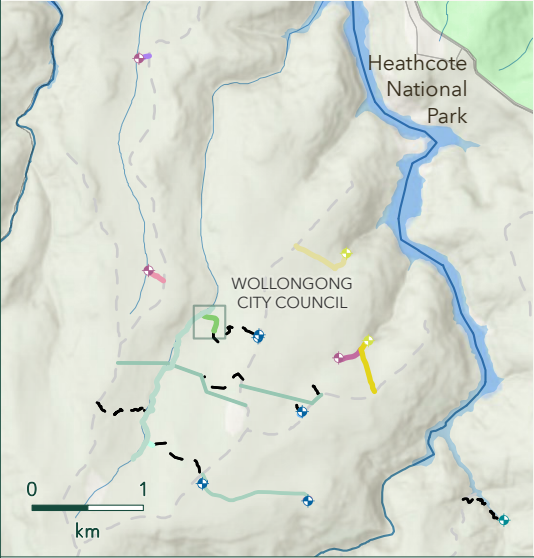
Figure 2.3

Subject Subject Area- COH19
LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy

Hillshade: Esri, Geoscience Australia, NASA, NGA, USGS/ Hillshade: Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community/ World_Ocean_Base: NIWA, GeosciencesAustralia, Esri, Garmin, NaturalVue/ public/NSW_imagery: © Department of Customer Service 2020 | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.

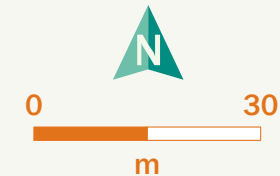
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Subject area
Disturbance footprint

Monitoring site access
Access tracks
Honeysuckle Creek - Pool 1-21
S106c Link Track

Existing Access Track
Hydrography
Non Perennial Stream



GDA2020 MGA Zone 56

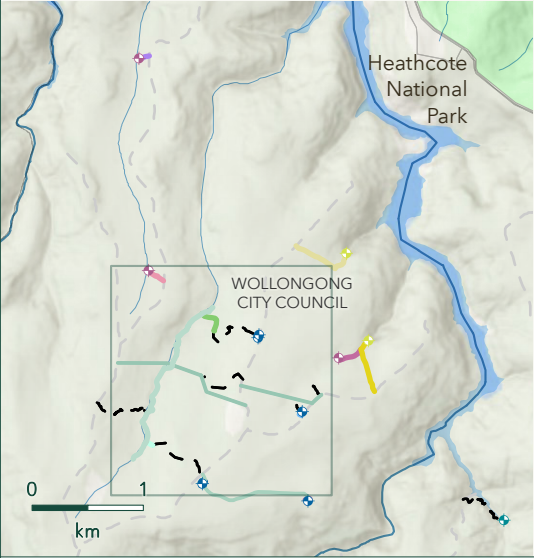


Figure 2.4
Subject Subject Area- S106c Link Track
LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy

Hillshade: Esri, Geoscience Australia, NASA, NGA, USGS/ Hillshade: Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community/ World_Ocean_Base: NIWA, GeosciencesAustralia, Esri, Garmin, NaturalVue/ public/NSW_Imagery: © Department of Customer Service 2020 | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.

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Subject area

Disturbance footprint

Monitoring site

Groundwater borehole

Swamp Piezometers

Monitoring site access

Survey Line

300XL (Cross line)

Road

Swamp 92 Road

Access tracks

BS-3

Honeysuckle Creek - Pool 1-21

S104a Link Track

S106c Link Track

COH19

Existing Access Track

Groundwater borehole footprint

9DGW76-90 and 9DGW76-150

9E-GW-77

S92-GT-01

Roads and trails

Firetrail

Minor road

Hydrography

Non Perennial Stream

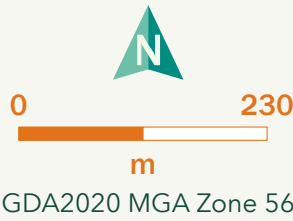
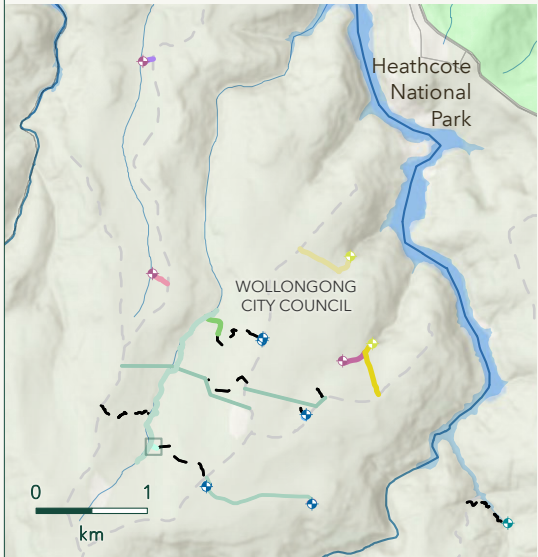
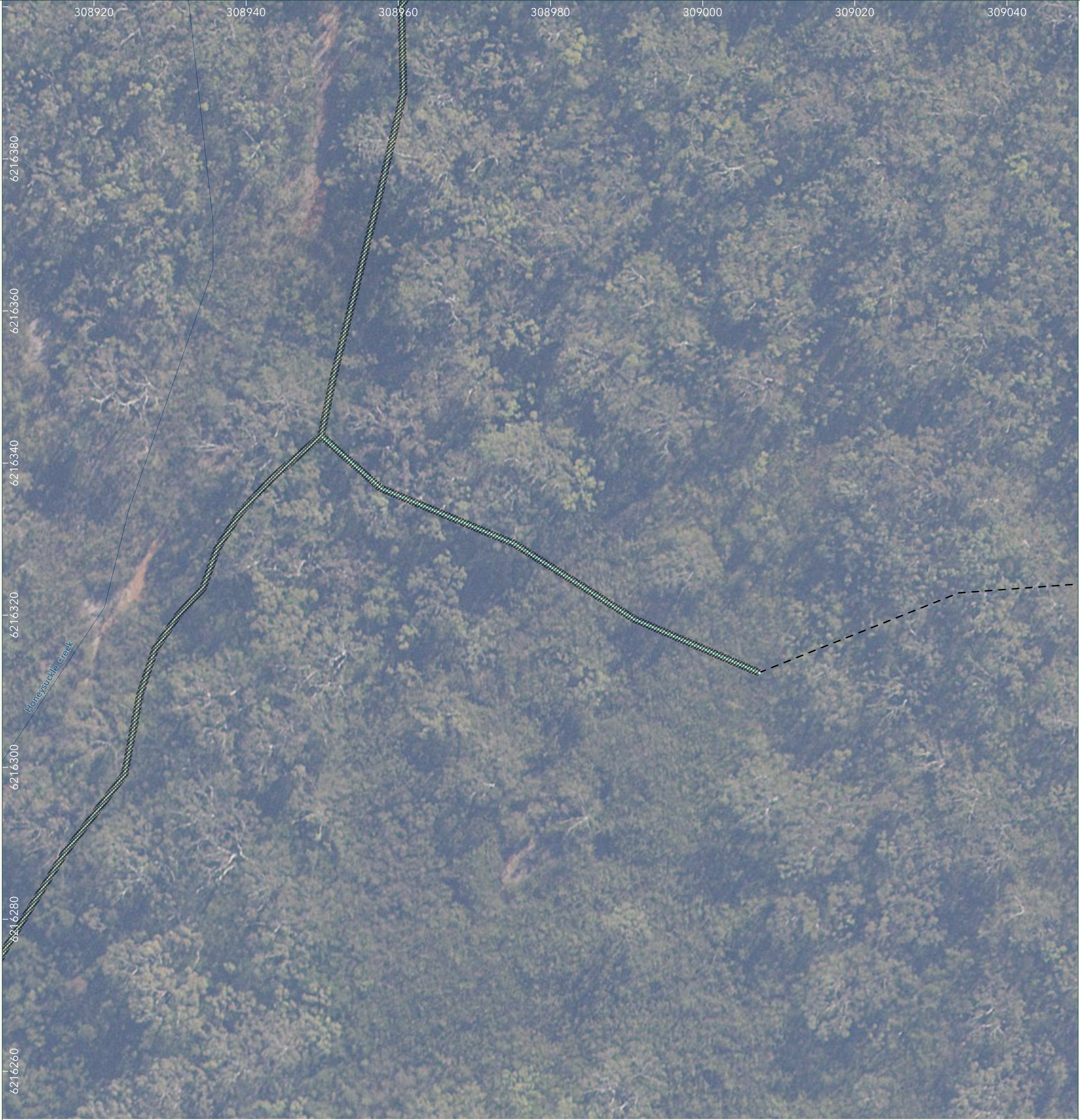


Figure 2.6
Subject Subject Area- 300XL (Cross line)
LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy

Hillshade: Esri, Geoscience Australia, NASA, NGA, USGS/ Hillshade: Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodastystyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community/ World_Ocean_Base: NIWA, GeosciencesAustralia, Esri, Garmin, NaturalVue/ public/NSW_Imagery: © Department of Customer Service 2020 | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.

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Subject area

Disturbance footprint

Monitoring site access

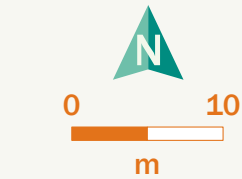
Access tracks

Honeysuckle Creek - Pool 1-21
S104a Link Track

Existing Access Track

Hydrography

Non Perennial Stream



GDA2020 MGA Zone 56

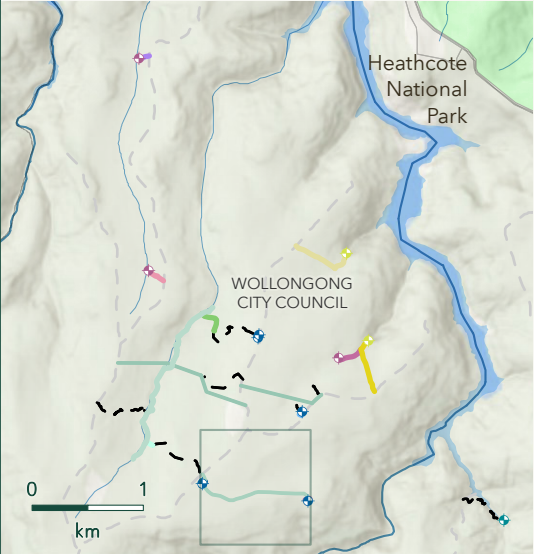


Figure 2.7
Subject Subject Area- S104a Link Track
LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy

Hillshade: Esri, Geoscience Australia, NASA, NGA, USGS/ Hillshade: Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community/ World_Ocean_Base: NIWA, GeosciencesAustralia, Esri, Garmin, NaturalVue/ public/NSW_imagery: © Department of Customer Service 2020 | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.

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Subject area

Disturbance footprint

Monitoring site
Groundwater borehole

Monitoring site access

Road
Swamp 92 Road
Existing Access
Track

Groundwater borehole footprint

S92-GT-01
S92-GW-02

Roads and trails

Firetrail
Minor road



GDA2020 MGA Zone 56

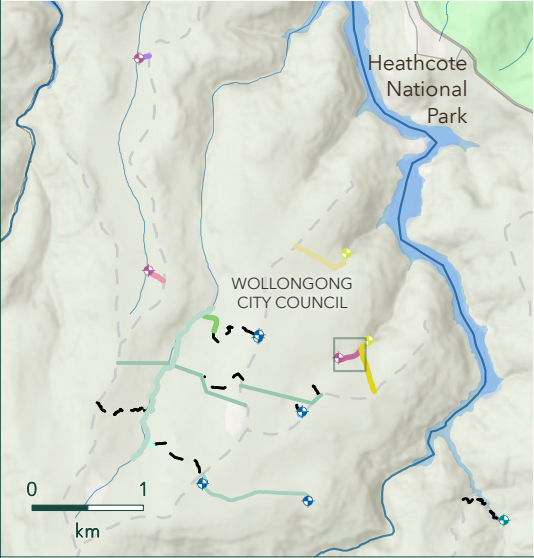
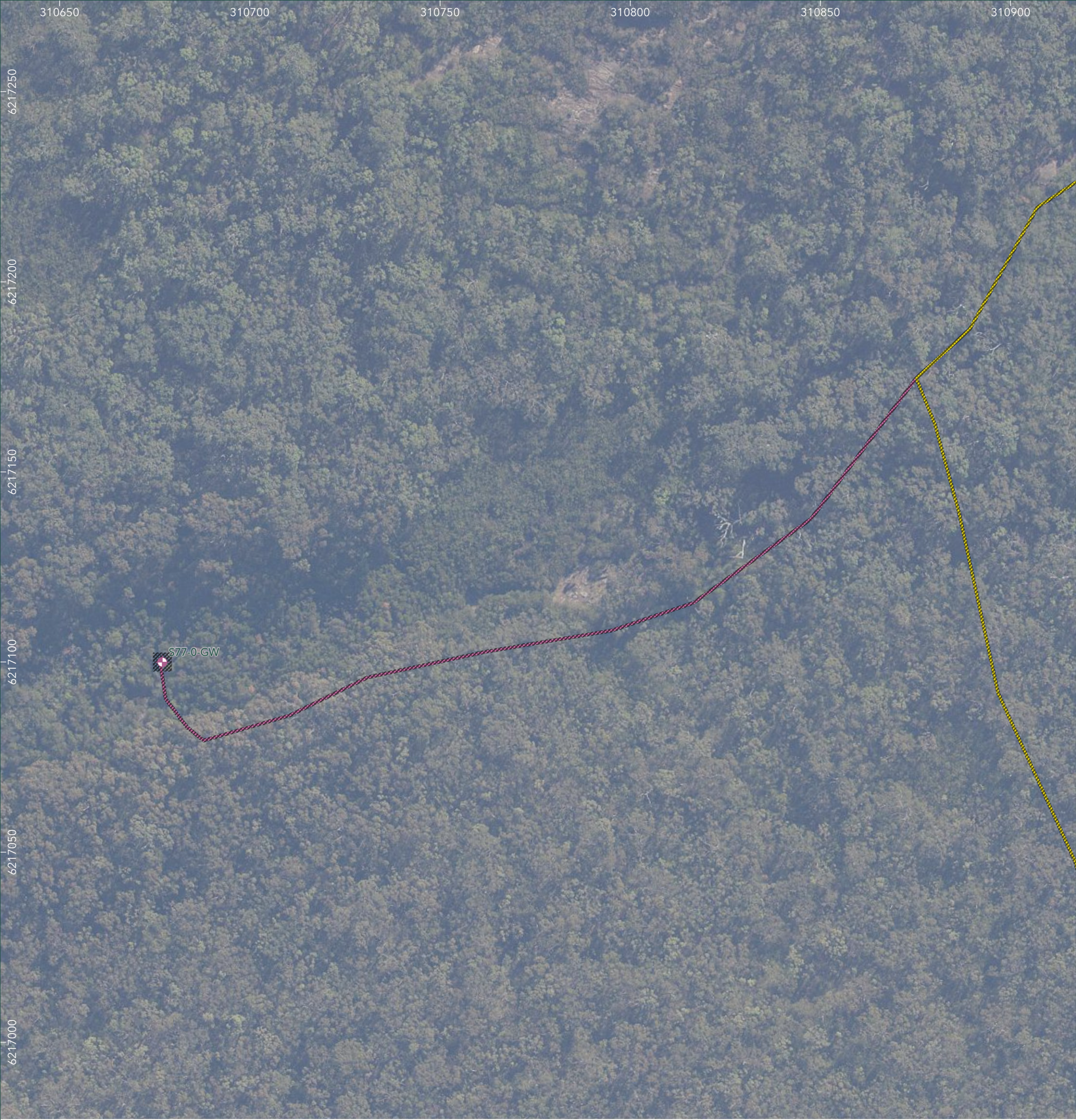


Figure 2.8
Subject Subject Area- Swamp 92 Road
LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy

Hillshade: Esri, Geoscience Australia, NASA, NGA, USGS/ Hillshade: Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community/ World_Ocean_Base: NIWA, GeosciencesAustralia, Esri, Garmin, NaturalVue/ public/NSW_Imagery: © Department of Customer Service 2020 | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.

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Subject area
Disturbance footprint

Monitoring site
Swamp Piezometers

Monitoring site access
Access tracks
S77-0
COH18

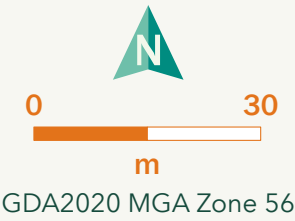
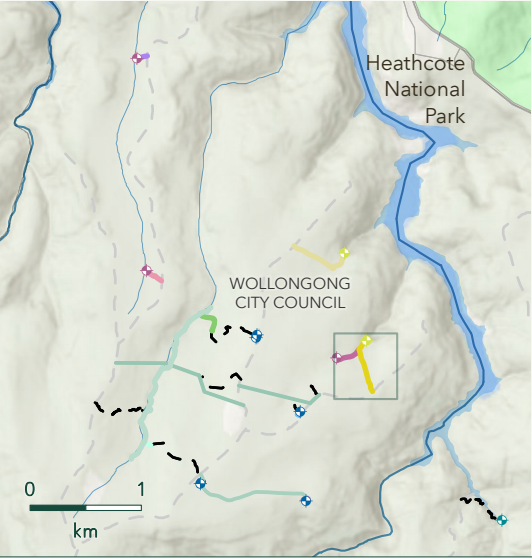


Figure 2.9
Subject Subject Area- S77-0
LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy

Hillshade: Esri, Geoscience Australia, NASA, NGA, USGS/ Hillshade: Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community/ World_Ocean_Base: NIWA, GeosciencesAustralia, Esri, Garmin, NaturalVue/ public/NSW_imagery: © Department of Customer Service 2020 | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.

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- | | | |
|------------------------|------------------------|-------------------------|
| Subject area | Cliff overhang | COH18 |
| Disturbance footprint | Monitoring site access | Roads and trails |
| Monitoring site | Access tracks | Firetrail |
| Swamp | S77-0 | Minor road |
| Piezometers | | |

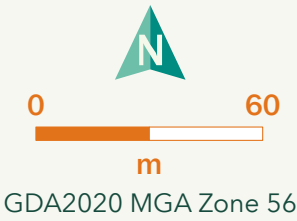


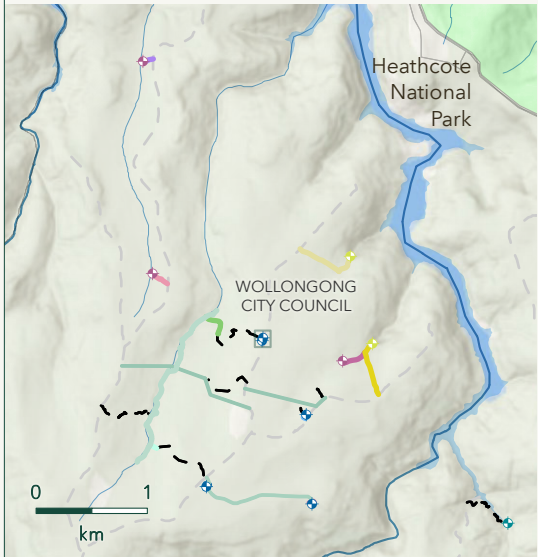
Figure 2.10

Subject Subject Area- COH18
LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy

Hillshade: Esri, Geoscience Australia, NASA, NGA, USGS/ Hillshade: Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community/ World_Ocean_Base: NIWA, GeosciencesAustralia, Esri, Garmin, NaturalVue/ public/NSW_Imagery: © Department of Customer Service 2020 | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.

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- | | | |
|------------------------|--------------------------------|-------------------------|
| Subject area | Existing Access | Roads and trails |
| Disturbance footprint | Existing Access Track | Firetrail |
| Monitoring site | Groundwater borehole footprint | Minor road |
| Groundwater borehole | 9DGW76-90 and 9DGW76-150 | |

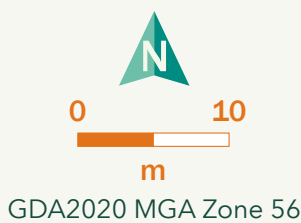
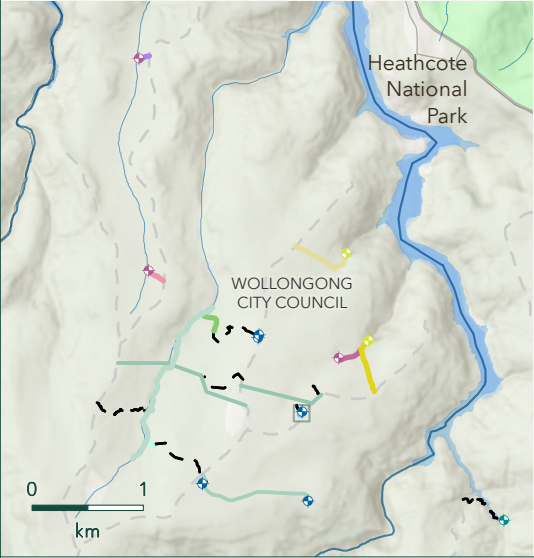
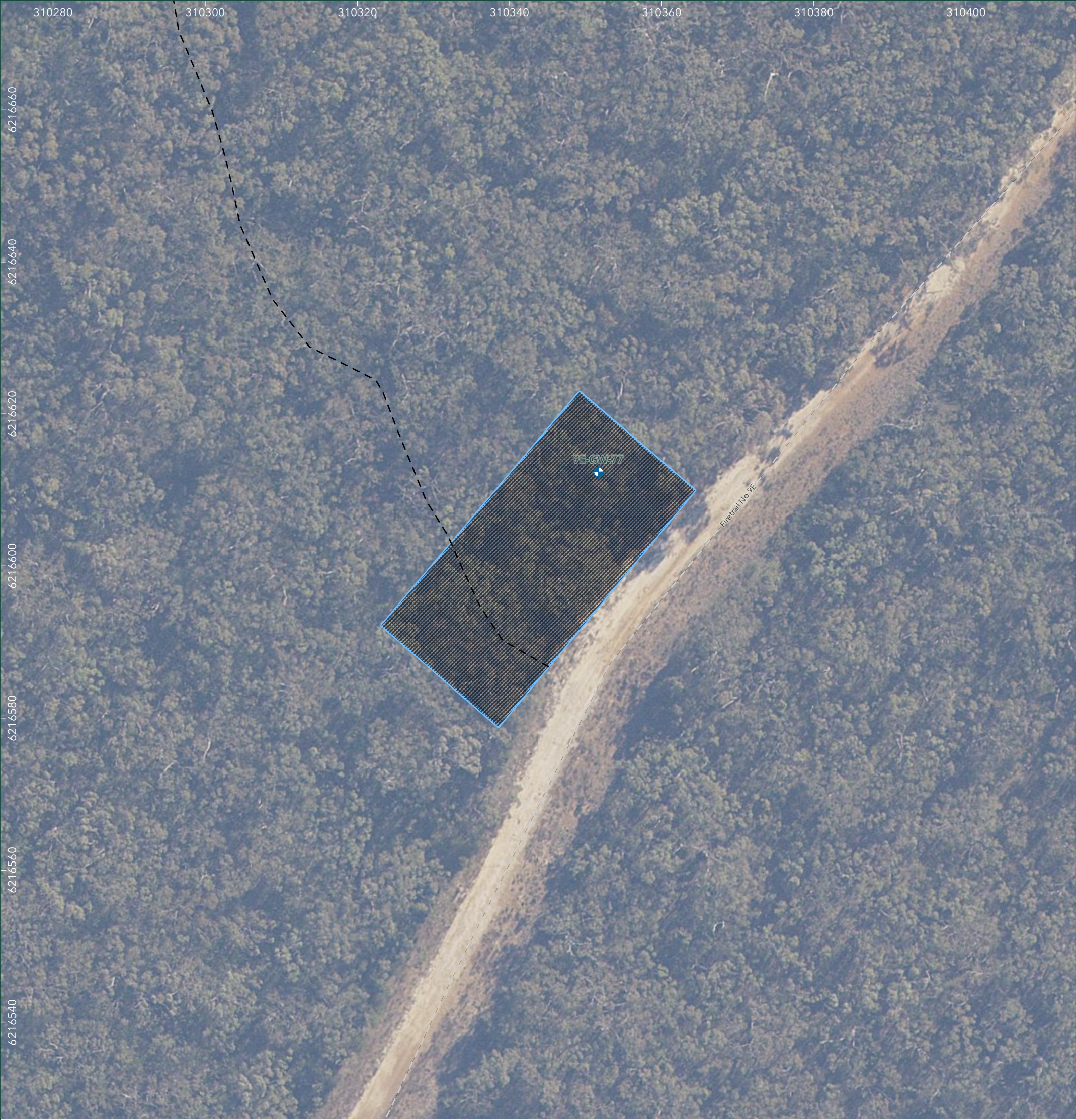


Figure 2.11

Subject Subject Area- 9DGW76-90 and 9DGW76-150
LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy

Drawn by: MatthewZajackowski File: C:\OneDriveSync\Folder\Niche\GIS - APRX - APRX\8700\8737_LW311_316_NSWPro\8737_LW311_316_Ecology_NSW_ECO.aprx Last updated: 11/03/2025 4:59 PM



Subject area

Disturbance footprint

Monitoring site

Groundwater borehole

Existing Access Track

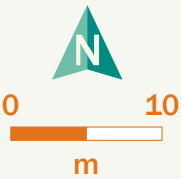
Groundwater borehole footprint

9E-GW-77

Roads and trails

Firetrail

Minor road



GDA2020 MGA Zone 56



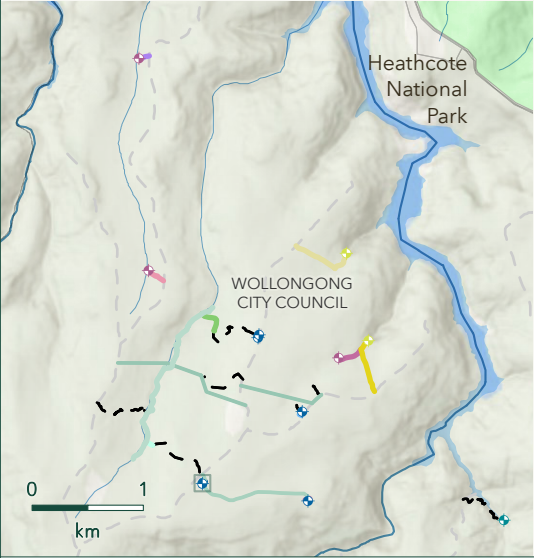
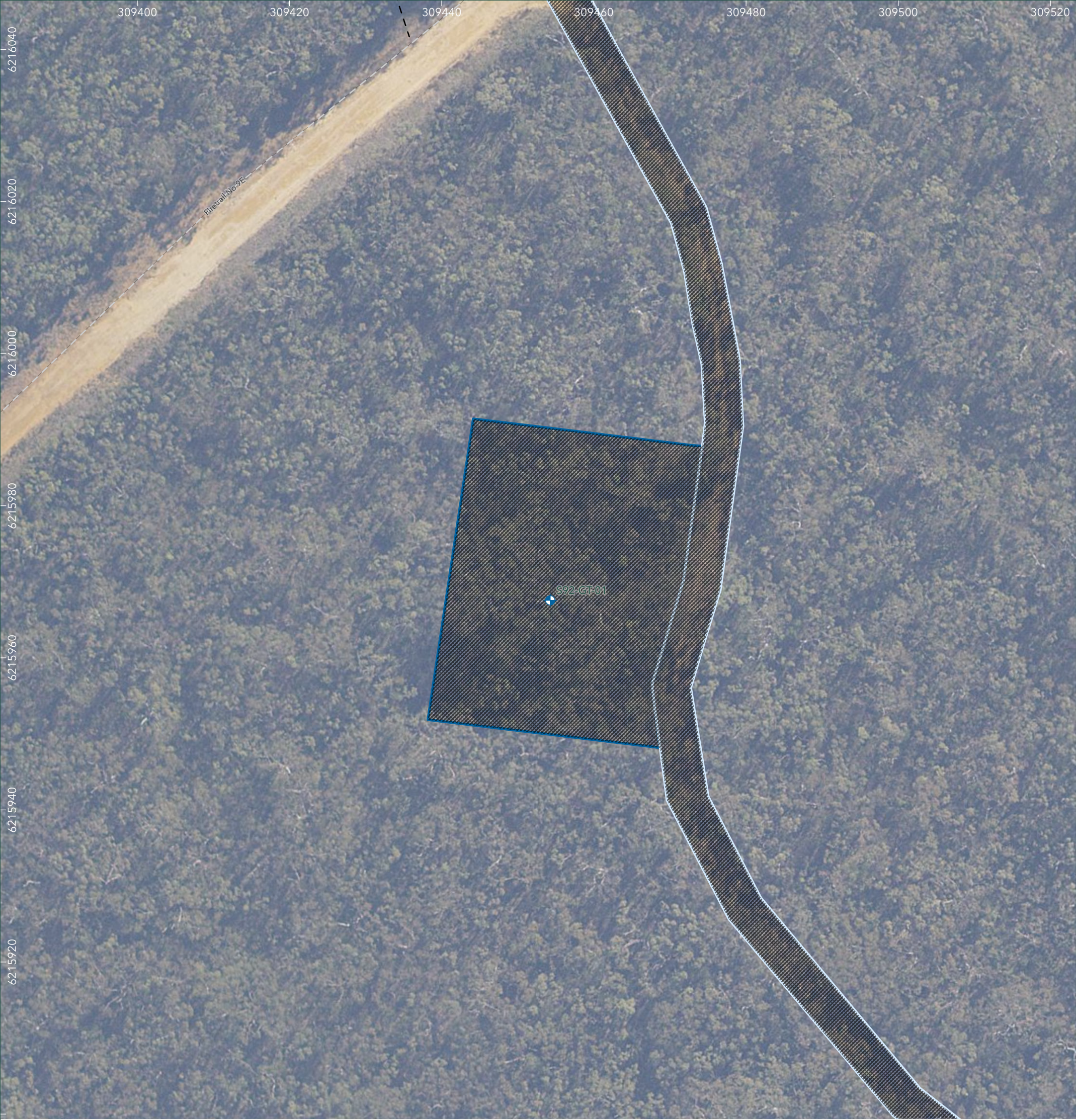
Figure 2.12

Subject Subject Area- 9E-GW-77
LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy

Hillshade: Esri, Geoscience Australia, NASA, NGA, USGS/ Hillshade: Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community/ World_Ocean_Base: NIWA, GeosciencesAustralia, Esri, Garmin, NaturalVue/ public/NSW_Imagery: © Department of Customer Service 2020 | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.

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Subject area

Disturbance footprint

Monitoring site

Groundwater borehole

Monitoring site access

Road

Swamp 92 Road

Existing Access Track

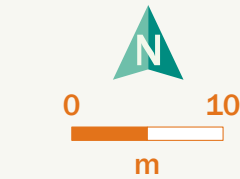
Groundwater borehole footprint

S92-GT-01

Roads and trails

Firetrail

Minor road



GDA2020 MGA Zone 56



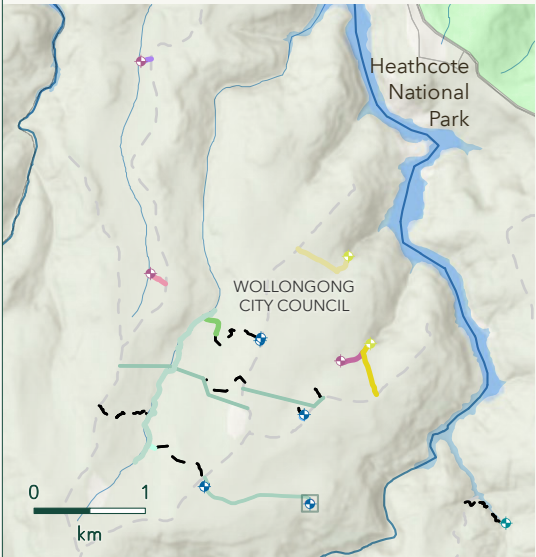
Figure 2.13

Subject Subject Area- S92-GT-01
LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy

Hillshade: Esri, Geoscience Australia, NASA, NGA, USGS/ Hillshade: Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community/ World_Ocean_Base: NIWA, GeosciencesAustralia, Esri, Garmin, NaturalVue/ public/NSW_Imagery: © Department of Customer Service 2020 | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.

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Subject area

Disturbance footprint

Monitoring site

Groundwater borehole

Monitoring site access

Road

Swamp 92 Road

Groundwater borehole footprint

S92-GW-02



GDA2020 MGA Zone 56

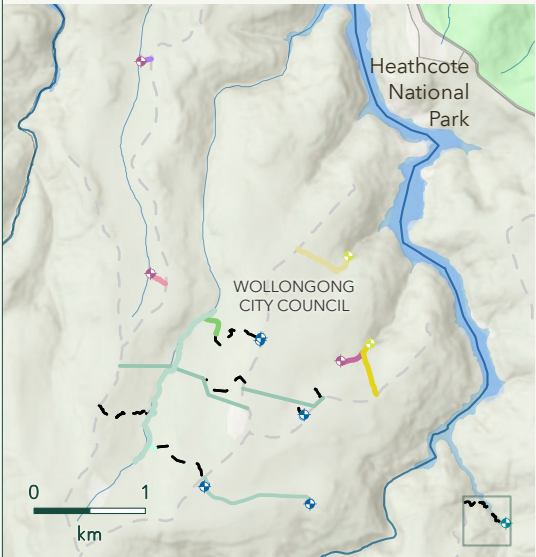


Figure 2.14
Subject Subject Area- S92-GW-02
LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy

Hillshade: Esri, Geoscience Australia, NASA, NGA, USGS/ Hillshade: Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community/ World_Ocean_Base: NIWA, GeosciencesAustralia, Esri, Garmin, NaturalVue/ public/NSW_Imagery: © Department of Customer Service 2020 | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.

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Subject area

Disturbance footprint

Monitoring site

ETAU-WQ-Sampler

Existing Access Track

Water sampler footprint

ETAU-WQ-Sampler

Roads and trails

Firetrail

Minor road

Hydrography

Waterbody

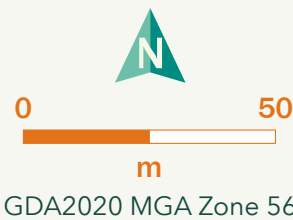


Figure 2.15
Subject Subject Area- ETAU-WQ-Sampler
LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy

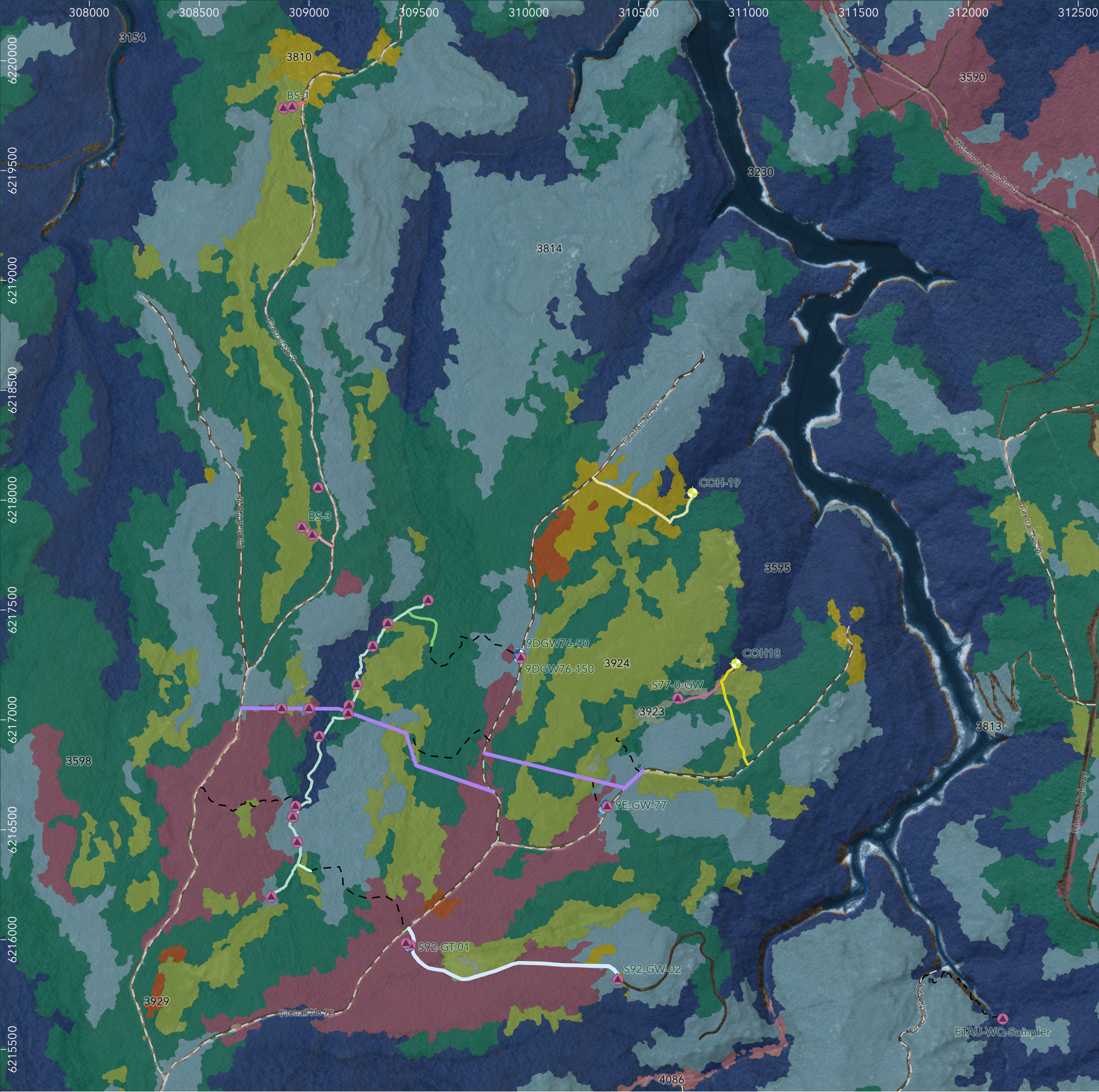
Hillshade: Esri, Geoscience Australia, NASA, NGA, USGS/ Hillshade: Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community/ World_Ocean_Base: NIWA, GeosciencesAustralia, Esri, Garmin, NaturalVue/ public/NSW_imagery: © Department of Customer Service 2020 | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.



Figure 3: Land Tenure and Leases



Figure 4: Native vegetation

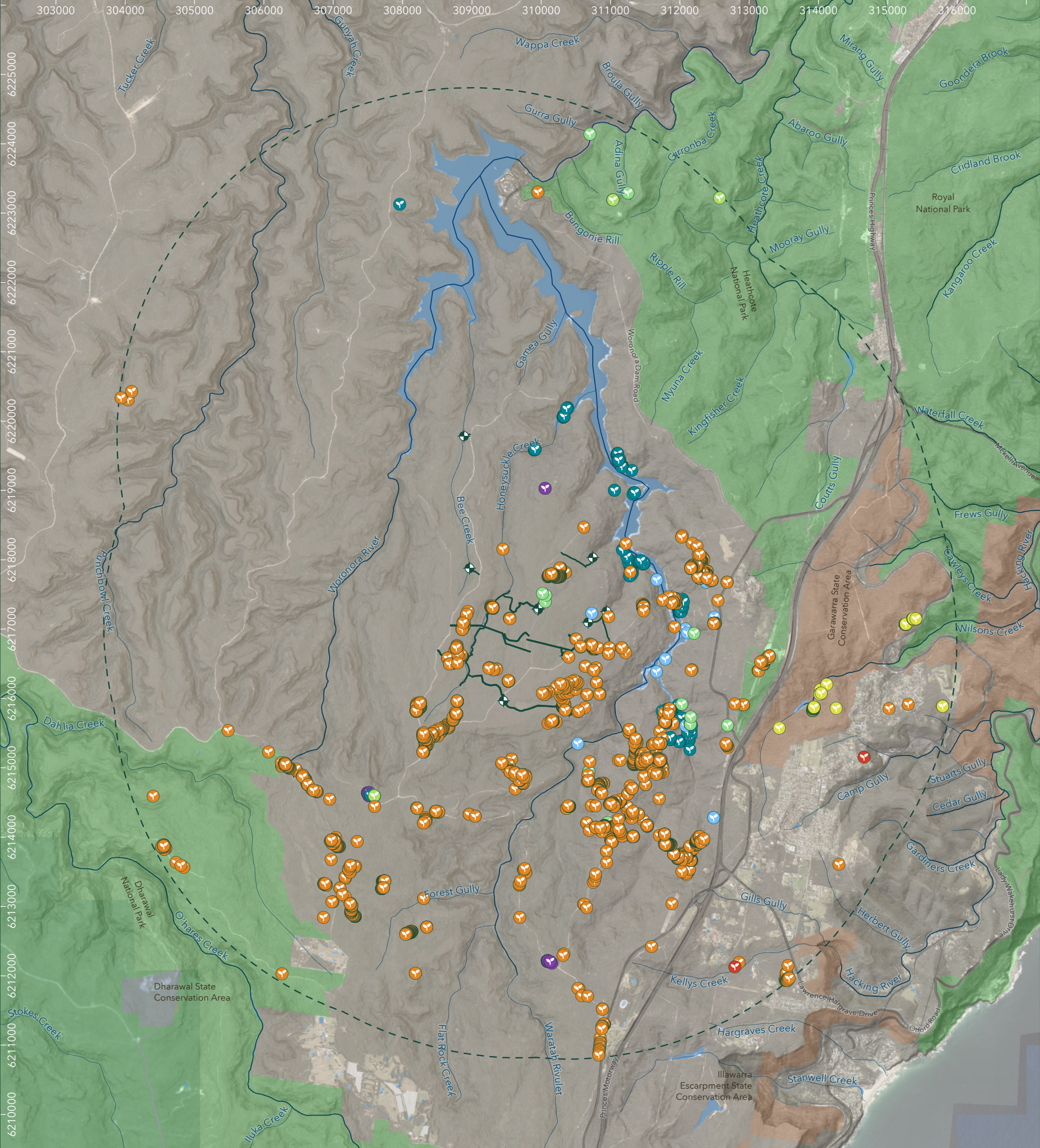


Hillshade: Esri, Geoscience Australia, NASA, NGA, USGS/ public/NSW_Imagery: © Department of Customer Service 2020 | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.

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Figure 5: Threatened flora within 5 km



Subject area

Monitoring site

Access and survey line

Existing Access Track

5km buffer

Threatened Flora (BioNet, 2024)

Acacia baueri subsp. *aspera*

Acacia bynoeana

Astrotricha crassifolia

Epacris purpurascens var. *purpurascens*

Leucopogon exolasius

Melaleuca deanei

Prostanthera densa

Pultenaea aristata

Rhodamnia rubescens

* Sensitive species not displayed

Callistemon linearifolius

Cryptostylis hunteriana

Genoplesium baueri

Roads and trails

Major road

Minor road

Rail

Hydrography

Perennial Stream

Non Perennial Stream

Waterbody

Protected Areas of NSW

National Park

State Conservation Area

N

02

km

GDA2020 MGA Zone 56

Figure 5

Threatened Flora Records (within 5 km of activity area)

LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith

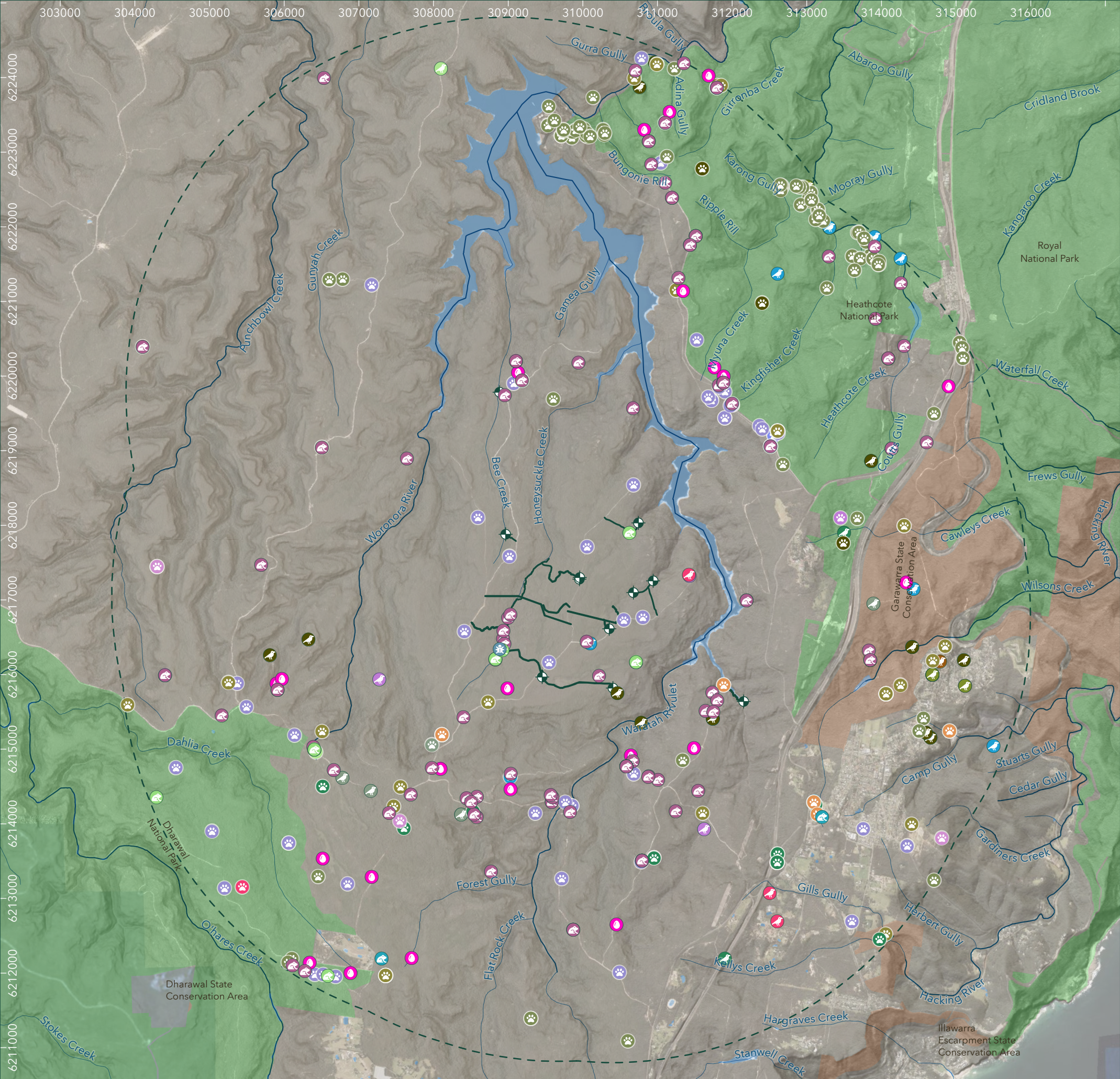
Niche Proj. #: 8737

Client: Peabody Energy

NSW Office of Environment and Heritage's BioNet Atlas, which holds the data from a number of custodians. Data Obtained 23/10/2024. | Hillshade: Esri, Geoscience Australia, NASA, NGA, USGS/ public/NSW_Imagery: © Department of Customer Service 2020 | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.



Figure 6: Threatened fauna within 5 km



Subject area

Monitoring site

Access and survey line

Existing Access Track

5km buffer

Threatened Fauna (BioNet, 2024)

Insecta

Giant Dragonfly

Amphibia

Giant Burrowing Frog

Green and Golden Bell Frog

Littlejohn's Tree Frog

Red-crowned Toadlet

Reptilia

Rosenberg's Goanna

Mammalia

Eastern Coastal Free-tailed Bat

Eastern False Pipistrelle

Eastern Pygmy-possum

Greater Broad-nosed Bat

Grey-headed Flying-fox

Koala

Large Bent-winged Bat

Little Bent-winged Bat icon"/> Little Bent-winged Bat

New Holland Mouse

Southern Greater Glider

Southern Myotis

Spotted-tailed Quoll

Squirrel Glider

Yellow-bellied Glider

Aves

Black-necked Stork

Brown Treecreeper (eastern subspecies)

Dusky Woodswallow

Little Eagle

Little Lorikeet

Pilotbird icon"/> Pilotbird

Scarlet Robin

Swift Parrot

Varied Sittella

White-bellied Sea-Eagle

White-throated Needle-tail

Hydrography

Perennial Stream

Non Perennial Stream

Waterbody

Protected Areas of NSW

National Park

State Conservation Area

* Sensitive species not displayed

Broad-headed Snake

Eastern Ground Parrot

Gang-gang Cockatoo

Powerful Owl

Regent Honeyeater

Sooty Owl

South-eastern Glossy Black-Cockatoo

Square-tailed Kite

Turquoise Parrot

N

0

2

km

GDA2020 MGA Zone 56

Figure 6

Threatened Fauna Records (within 5 km of subject area)

LW311-316 Ecology Archaeological assessment

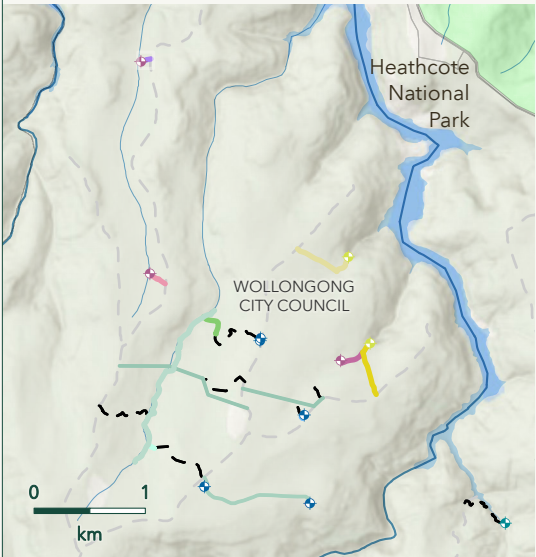
Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy

NSW Office of Environment and Heritage's BioNet Atlas, which holds the data from a number of custodians. Data Obtained 23/10/2024. | Hillshade: Esri, Geoscience Australia, NASA, NGA, USGS/ public/NSW_Imagery: © Department of Customer Service 2020 | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.



Figure 7: Constraints

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Subject area

Monitoring site

- Swamp
- Piezometers

Monitoring site access

Access tracks

BS-1

Fauna habitat point

- Rocky outcrop

Threatened Ecological Community (TEC)

- 3924: Sydney Coastal Upland Swamp Heath

Roads and trails

- Firetrail
- Minor road

Hydrography

- Strahler stream order
- 1



Figure 7.1

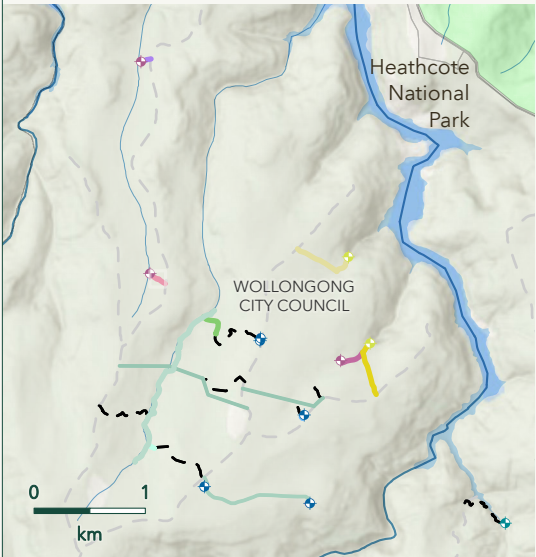
Constraint Map - BS-1

LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy

Hillshade: Esri, Geoscience Australia, NASA, NGA, USGS/ Hillshade: Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community/ World_Ocean_Base: NIWA, GeosciencesAustralia, Esri, Garmin, NaturalVue/ public/NSW_Imagery: © Department of Customer Service 2020 | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.

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Subject area
Monitoring site
Swamp
Piezometers

Monitoring site access
Access tracks
BS-3

Threatened Ecological Community (TEC)
3924: Sydney
Coastal Upland
Swamp Heath

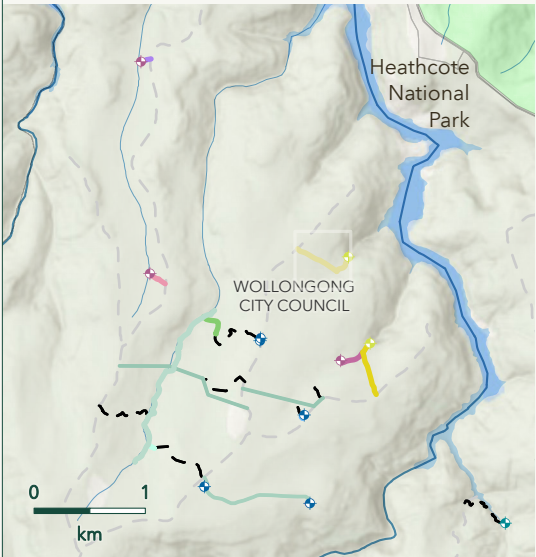
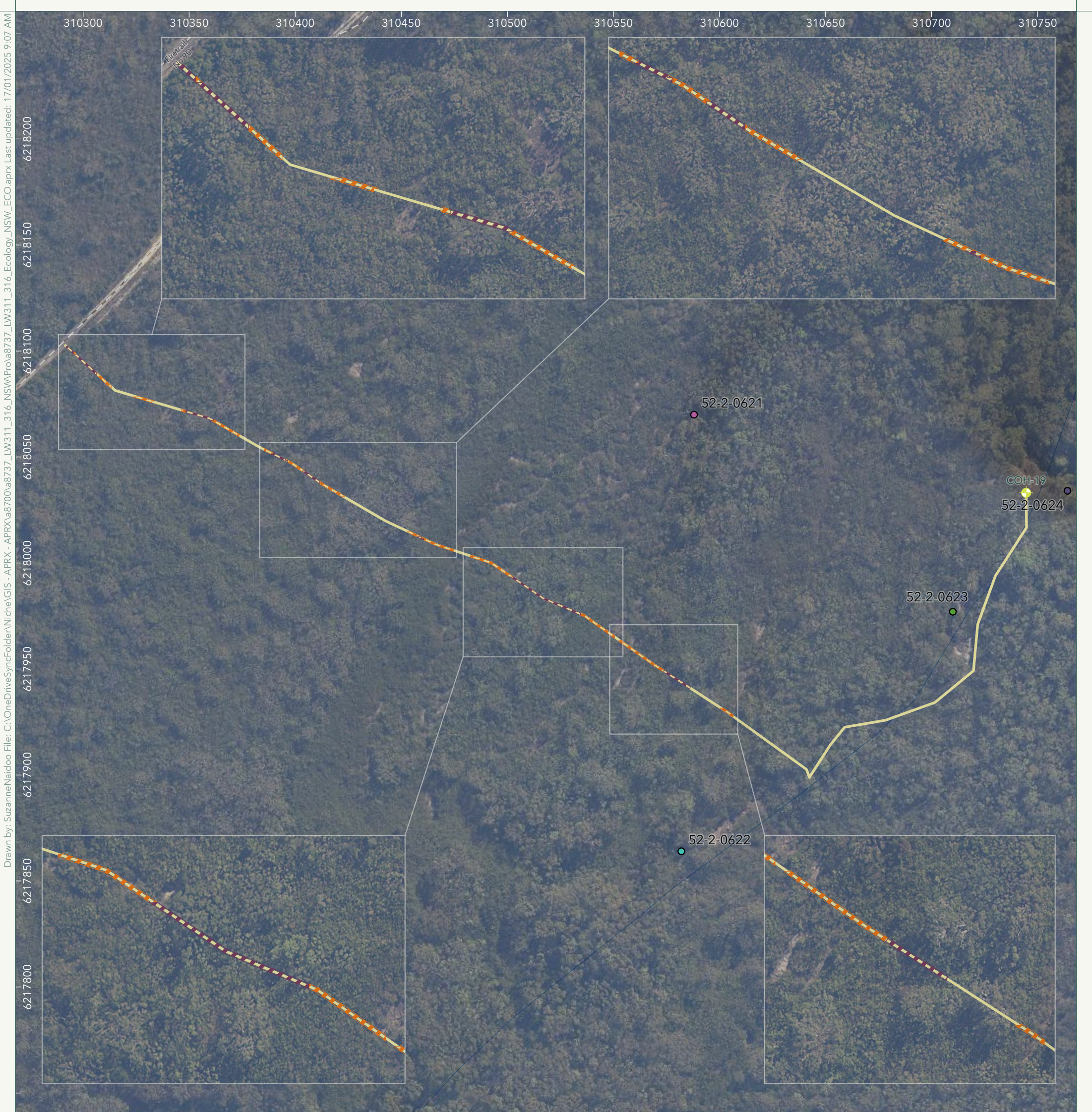
Roads and trails
Firetrail
Minor road



Figure 7.2
Constraint Map - BS-3
LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy

Hillshade: Esri, Geoscience Australia, NASA, NGA, USGS/ Hillshade: Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community/ World_Ocean_Base: NIWA, GeosciencesAustralia, Esri, Garmin, NaturalVue/ public/NSW_Imagery: © Department of Customer Service 2020 | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.



Subject area
Monitoring site
Cliff overhang
Monitoring site access
Access tracks
COH19

Threatened Ecological Community (TEC)
3923: Sydney Coastal Sandstone Creekline Swamp Heath
3924: Sydney Coastal Upland Swamp Heath
AHIMS
Grinding Groove(s)

Grinding Groove(s), Rock Engraving
Shelter with Art
Shelter with PAD
Roads and trails
Firetrail
Minor road
Hydrography
Strahler stream order
1

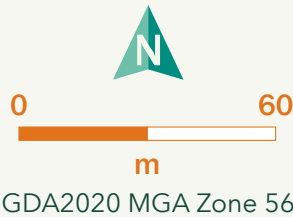
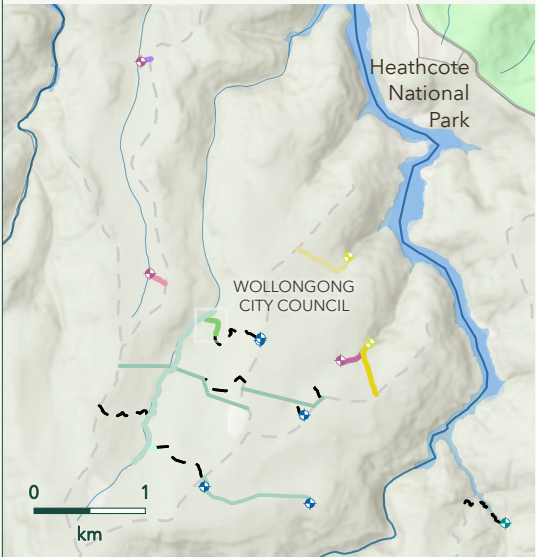


Figure 7.3
Constraint Map - COH19
LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy

Hillshade: Esri, Geoscience Australia, NASA, NGA, USGS/ Hillshade: Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community/ World_Ocean_Base: NIWA, GeosciencesAustralia, Esri, Garmin, NaturalVue/ public/NSW_Imagery: © Department of Customer Service 2020 | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.

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Monitoring site access
Access tracks
Honeysuckle Creek
- Pool 1-21
S106c Link Track
Existing Access
Track

Incidental flora
 *Pultenaea aristata*
(Prickly Bush-pea)

Threatened
Ecological
Community (TEC)
3923: Sydney
Coastal Sandstone
Creekline Swamp
Heath
3924: Sydney
Coastal Upland
Swamp Heath

AHIMS
 Grinding Groove(s)
 Shelter with Art and
PAD
Hydrography
Strahler stream order
2

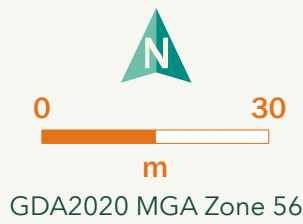


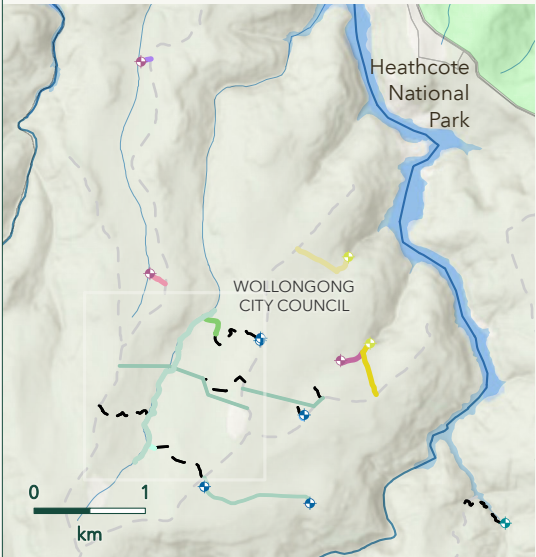
Figure 7.4

Constraint Map - S106c Link Track

LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy

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Subject area

Monitoring site

- Groundwater borehole

Monitoring site access

- Survey Line
- 300XL (Cross line)

- Road
- Swamp 92 Road

Access tracks

- Honeysuckle Creek
- Pool 1-21

- S104a Link Track

- S106c Link Track

- Existing Access Track

- Groundwater borehole footprint

- 9DGW76-90 and 9DGW76-150

Fauna habitat point

- Rocky outcrop

Incidental flora

- Pultenaea aristata* (Prickly Bush-pea)

Threatened Ecological Community (TEC)

- 3923: Sydney Coastal Sandstone Creekline Swamp Heath
- 3924: Sydney Coastal Upland Swamp Heath

AHIMS

- Grinding Groove(s)

- Grinding Groove(s), Water Hole/Well
- Shelter with Art
- Shelter with Art and PAD

Roads and trails

- Firetrail
- Minor road

Hydrography

- Strahler stream order
- 1
- 2

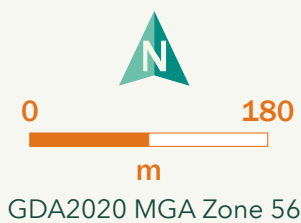


Figure 7.5

Constraint Map - COH19

LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy



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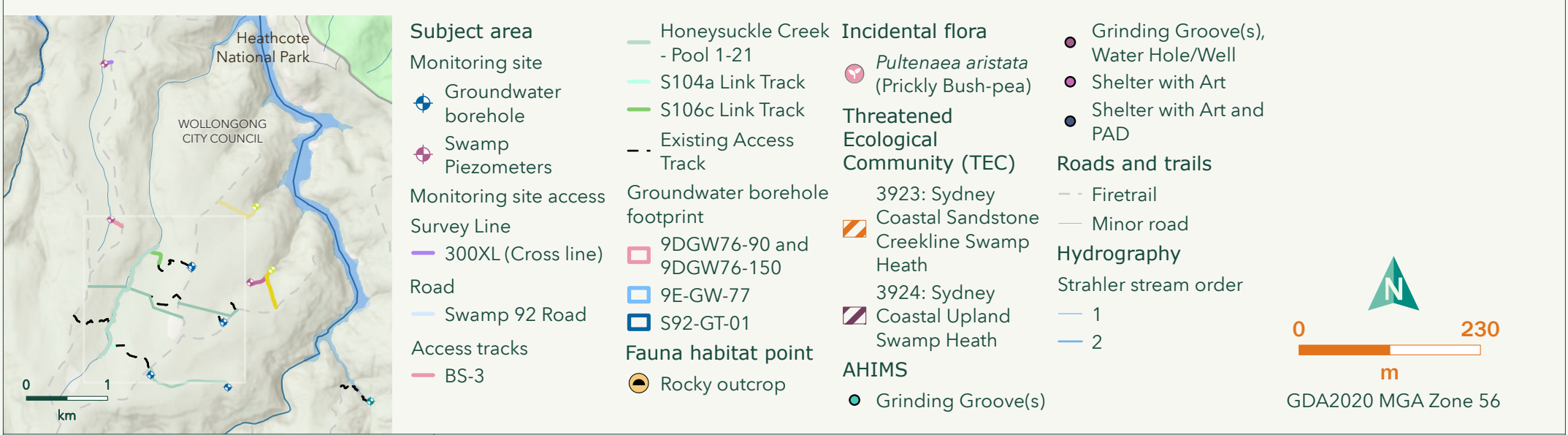
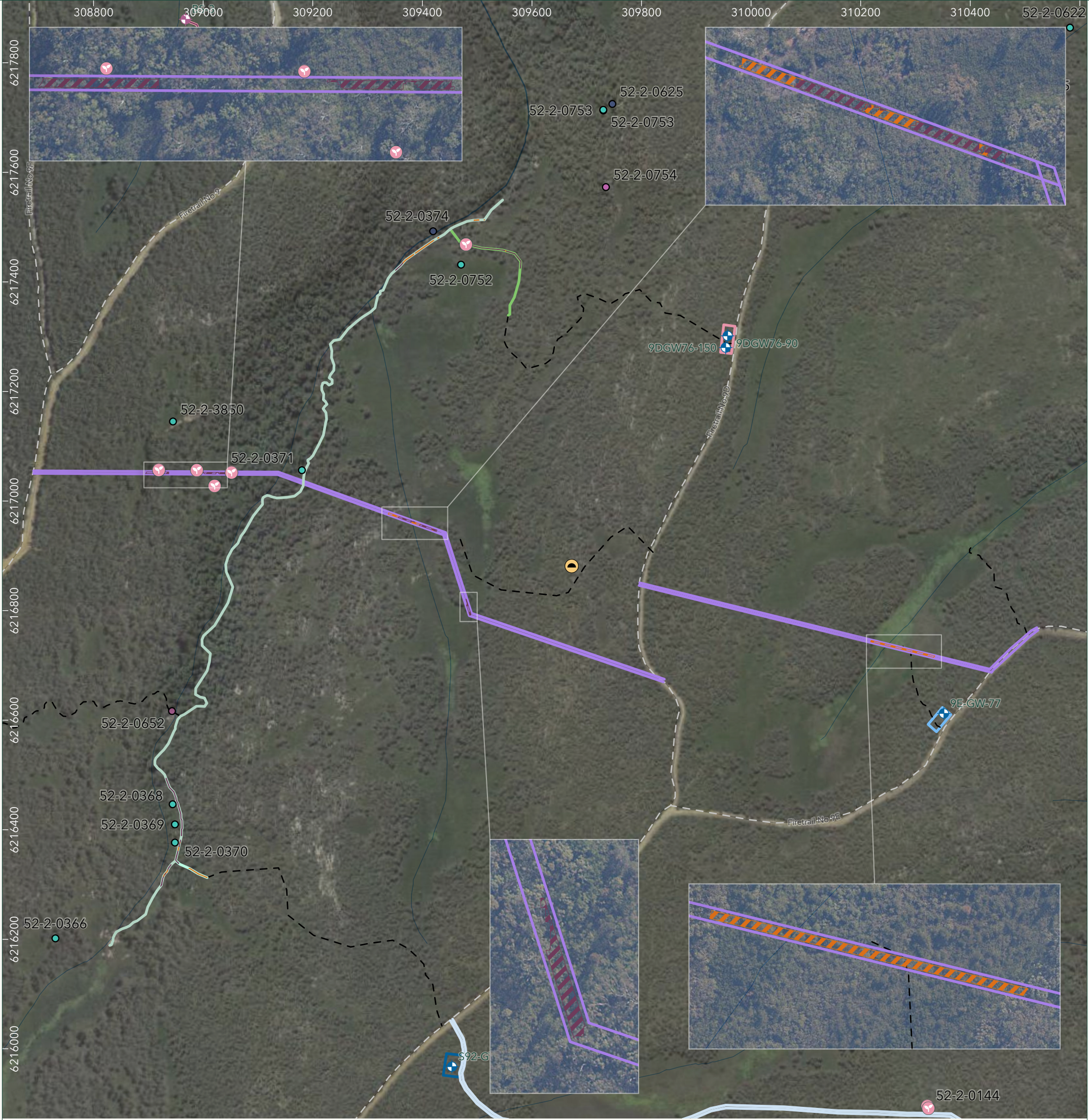


Figure 7.6

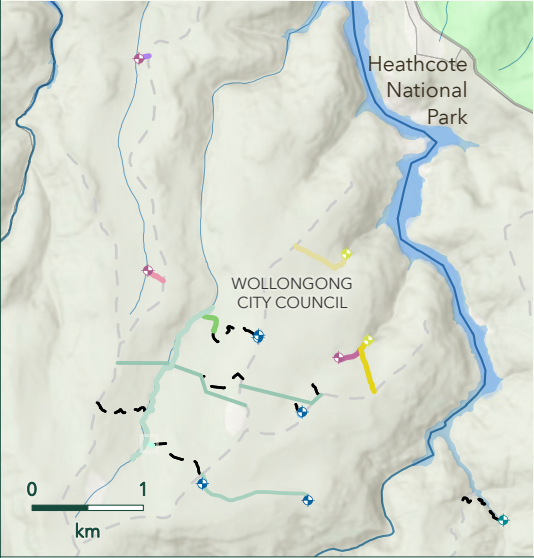
Constraint Map - COH19

LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy

Hillshade: Esri, Geoscience Australia, NASA, NGA, USGS/ Hillshade: Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodastystyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community/ World_Ocean_Base: NIWA, GeosciencesAustralia, Esri, Garmin, NaturalVue/ public/NSW_Imagery: © Department of Customer Service 2020 | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.

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Monitoring site access
Access tracks
— Honeysuckle Creek
- Pool 1-21
— S104a Link Track
- - Existing Access Track

Threatened Ecological Community (TEC)
3923: Sydney
Coastal Sandstone
Creekline Swamp
Heath

3924: Sydney
Coastal Upland
Swamp Heath
AHIMS
● Grinding Groove(s)

Hydrography
Strahler stream order
— 1

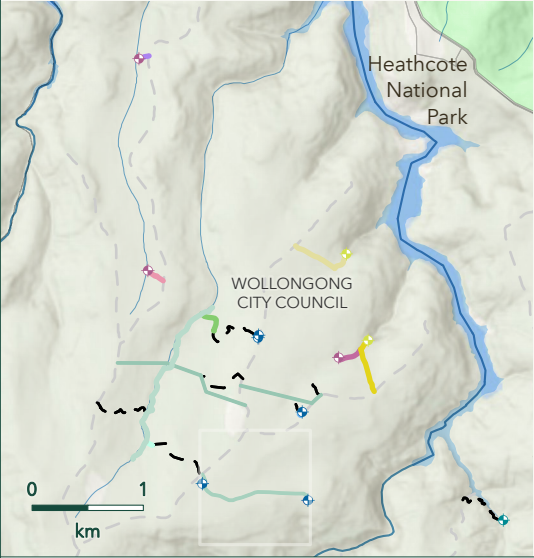


Figure 7.7
Constraint Map - S104a Link Track
LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy

Hillshade: Esri, Geoscience Australia, NASA, USGS/ Hillshade: Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community/ World_Ocean_Base: NIWA, GeosciencesAustralia, Esri, Garmin, NaturalVue/ public/NSW_imagery: © Department of Customer Service 2020 | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.

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Subject area

Monitoring site

Groundwater borehole

Monitoring site access

Road

Swamp 92 Road

Existing Access Track

Groundwater borehole footprint

S92-GT-01

S92-GW-02

Incidental flora

Pultenaea aristata (Prickly Bush-pea)

AHIMS

Artefact(s)

Grinding Groove(s)

Shelter with Art

Shelter with Art and Artefact(s)

Shelter with Art and PAD

Shelter with PAD

Roads and trails

Firetrail

Minor road

Hydrography

Strahler stream order

1



GDA2020 MGA Zone 56



Figure 7.8

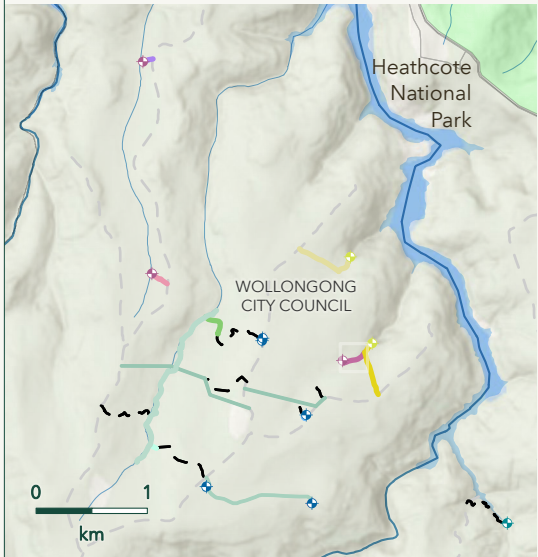
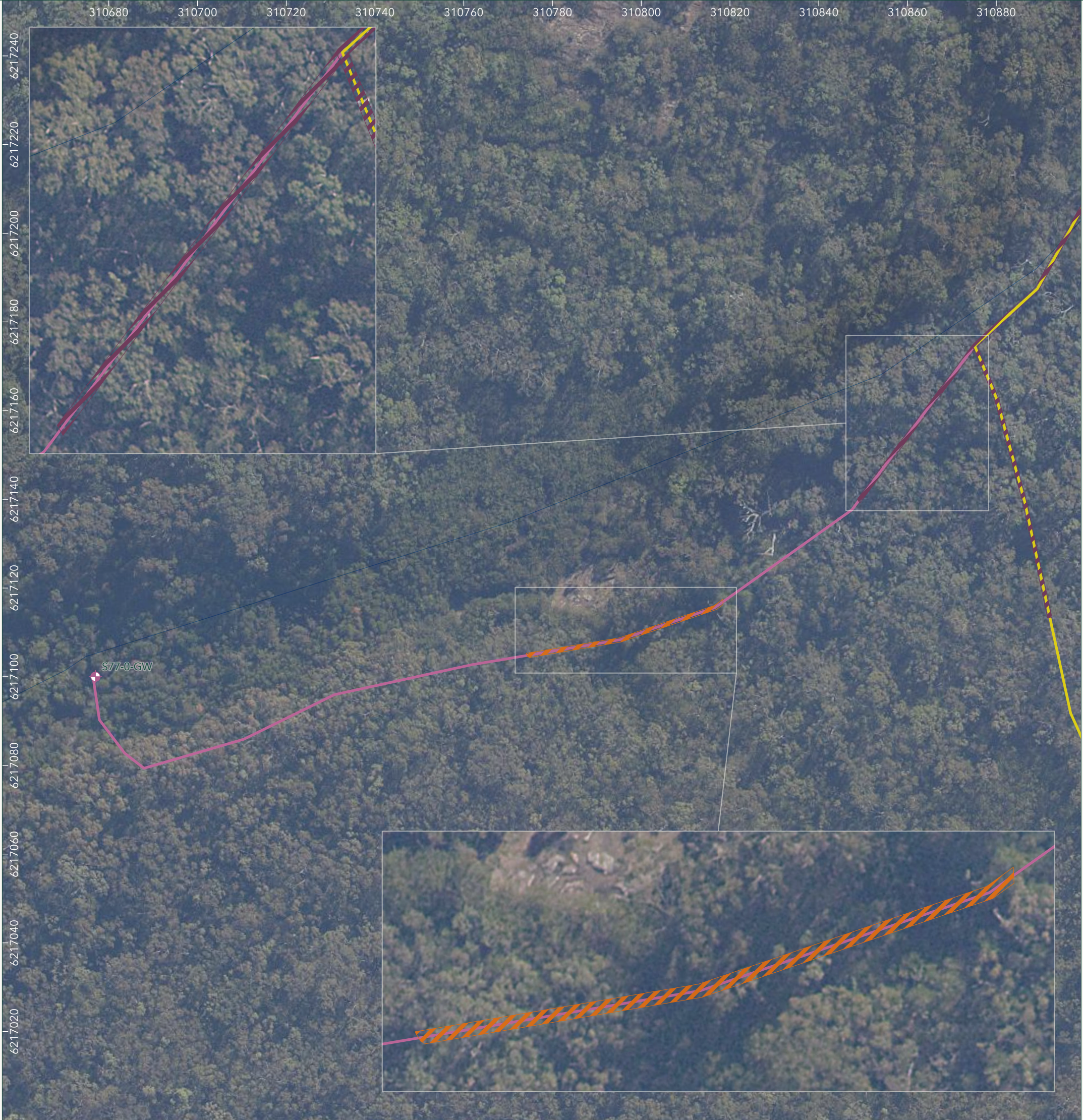
Constraint Map - Swamp 92 Road

LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy

Hillshade: Esri, Geoscience Australia, NASA, NGA, USGS/ Hillshade: Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community/ World_Ocean_Base: NIWA, GeosciencesAustralia, Esri, Garmin, NaturalVue/ public/NSW_Imagery: © Department of Customer Service 2020 | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.

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Subject area

Monitoring site

- Swamp Piezometers

Monitoring site access

- Access tracks
- S77-0

COH18

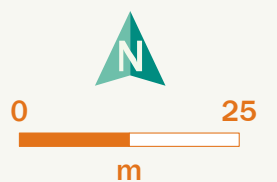
Threatened Ecological Community (TEC)

- 3923: Sydney Coastal Sandstone Creekline Swamp Heath

3924: Sydney Coastal Upland Swamp Heath

Hydrography

- Strahler stream order
- 1



GDA2020 MGA Zone 56



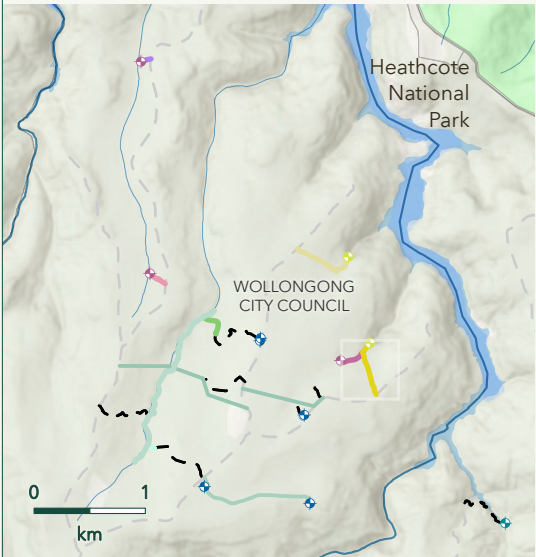
Figure 7.9

Constraint Map - COH19

LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy

Hillshade: Esri, Geoscience Australia, NASA, NGA, USGS/ Hillshade: Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community/ World_Ocean_Base: NIWA, GeosciencesAustralia, Esri, Garmin, NaturalVue/ public/NSW_Imagery: © Department of Customer Service 2020 | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.



Subject area

Monitoring site

Cliff overhang

Monitoring site access

Access tracks

S77-0

COH18

Threatened Ecological Community (TEC)

3923: Sydney Coastal Sandstone Creekline Swamp Heath

3924: Sydney Coastal Upland Swamp Heath

AHIMS

Shelter with Art, Artefacts and PAD

Shelter with Art, Artefacts, PAD, Grinding Groove(s)

Roads and trails

Firetrail

Minor road

Hydrography

Strahler stream order

1



GDA2020 MGA Zone 56



Figure 7.10

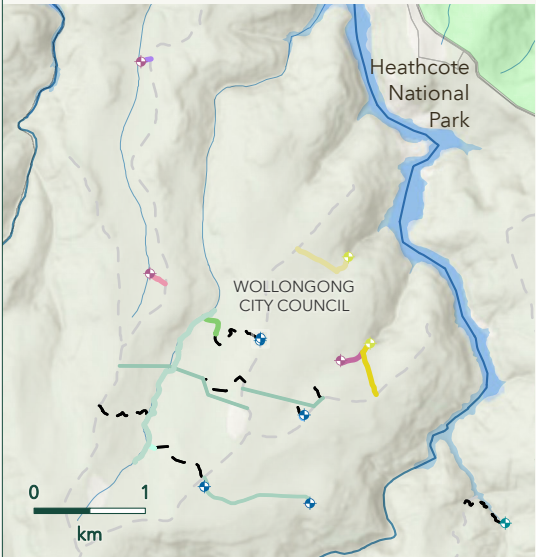
Constraint Map - COH19

LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy

Hillshade: Esri, Geoscience Australia, NASA, NGA, USGS/ Hillshade: Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community/ World_Ocean_Base: NIWA, GeosciencesAustralia, Esri, Garmin, NaturalVue/ public/NSW_Imagery: © Department of Customer Service 2020 | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.

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Subject area
Monitoring site

Groundwater
borehole

Existing Access
Track

Groundwater borehole
footprint

9DGW76-90 and
9DGW76-150

Roads and trails

Firetrail

Minor road

Hydrography

Strahler stream order

1



0 10
m

GDA2020 MGA Zone 56



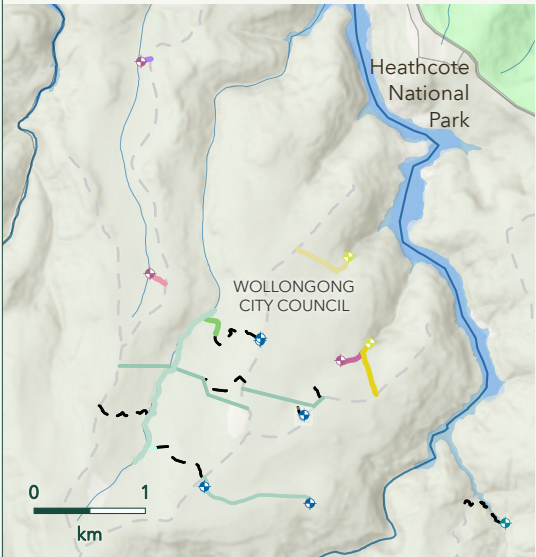
Figure 7.11

Constraint Map - 9DGW76-90 and 9DGW76-150
LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy

Hillshade: Esri, Geoscience Australia, NASA, NGA, USGS/ Hillshade: Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community/ World_Ocean_Base: NIWA, GeosciencesAustralia, Esri, Garmin, NaturalVue/ public/NSW_Imagery: © Department of Customer Service 2020 | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.

Drawn by: SuzanneNaidoo File: C:\OneDriveSyncFolder\Niche\GIS - APRX - APRX\8700\8737_LW311_316_Ecology_NSW_ECO.aprx Last updated: 17/01/2025 9:07 AM



Subject area
Monitoring site

Groundwater
borehole

Existing Access
Track

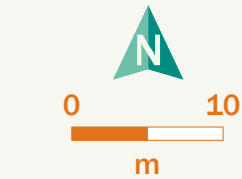
Groundwater borehole
footprint

9E-GW-77

Roads and trails

Firetrail

Minor road



GDA2020 MGA Zone 56

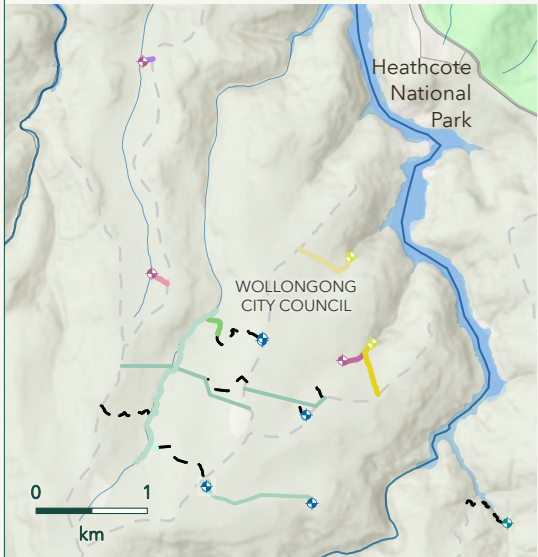


Figure 7.12
Constraint Map - 9E-GW-77
LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy

Hillshade: Esri, Geoscience Australia, NASA, NGA, USGS/ Hillshade: Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community/ World_Ocean_Base: NIWA, GeosciencesAustralia, Esri, Garmin, NaturalVue/ public/NSW_Imagery: © Department of Customer Service 2020 | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.

Drawn by: SuzanneNaidoo File: C:\OneDriveSyncFolder\Niche\GIS - APRX - APRX\8700\8737_LW311_316_Ecology_NSW_ECO.aprx Last updated: 17/01/2025 9:07 AM



Subject area

Monitoring site

Groundwater borehole

Monitoring site access
Road

Swamp 92 Road

Existing Access
Track

Groundwater borehole
footprint

S92-GT-01

Roads and trails

Firetrail

Minor road

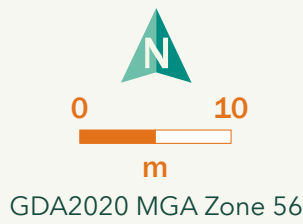


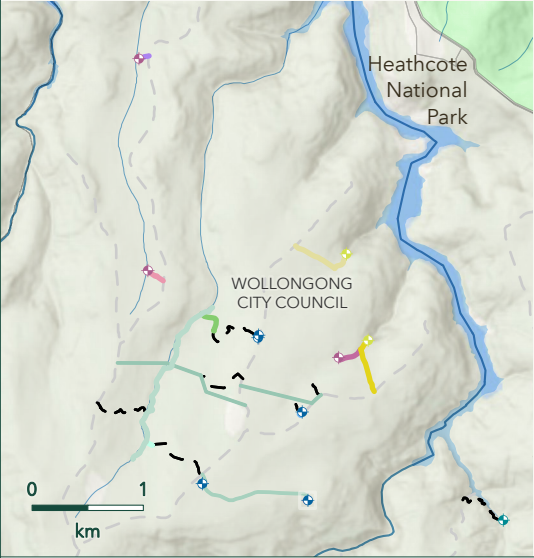
Figure 7.13

Constraint Map - S92-GT-01

LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy





Subject area

Monitoring site

Groundwater borehole

Monitoring site access

Road

Swamp 92 Road

Groundwater borehole footprint

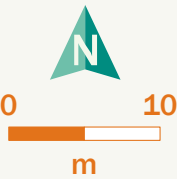
S92-GW-02

Incidental flora

Pultenaea aristata
(Prickly Bush-pea)

AHIMS

Shelter with Art, Artefacts and PAD



GDA2020 MGA Zone 56



Figure 7.14

Constraint Map - S92-GW-02

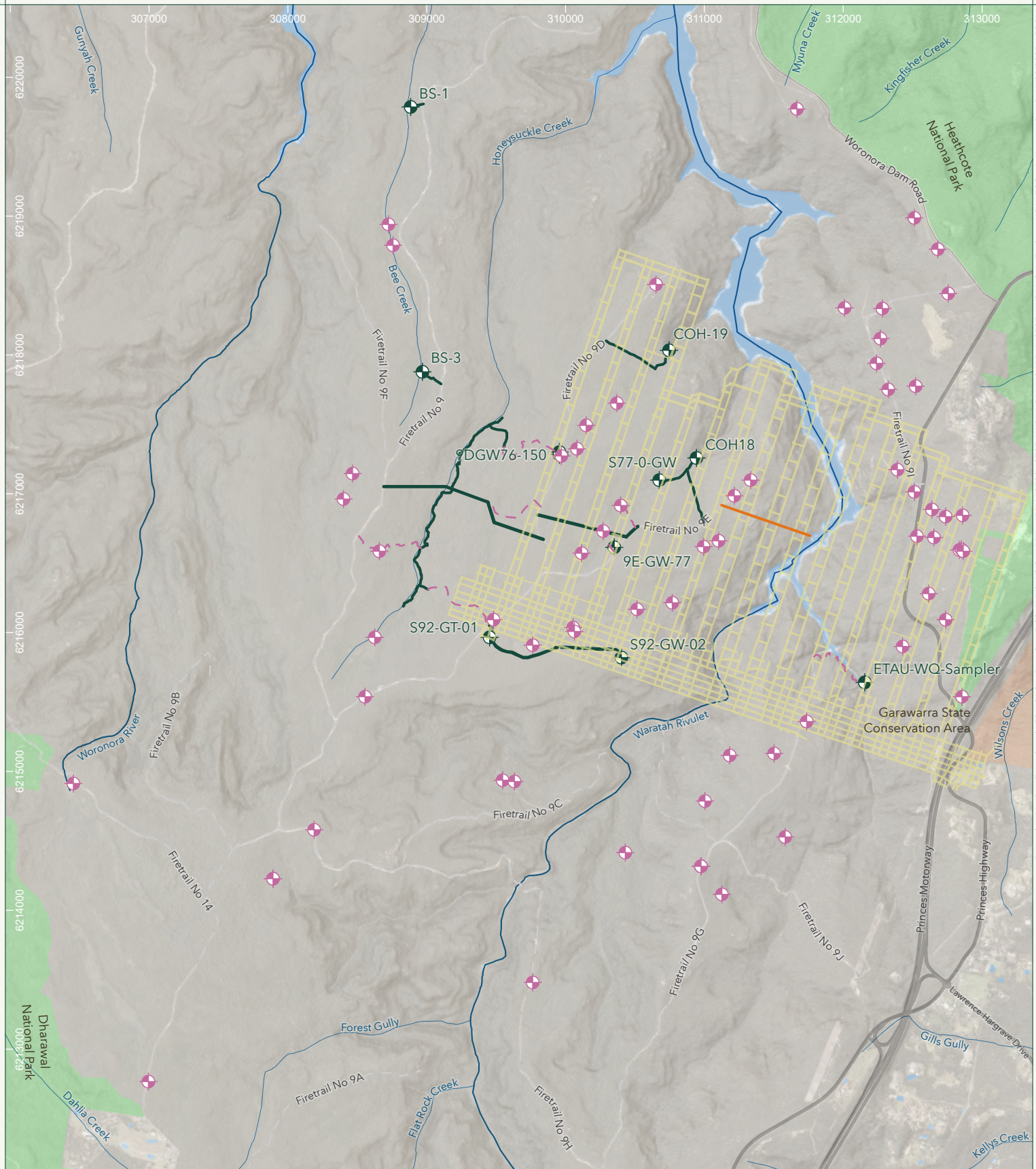
LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy

Hillshade: Esri, Geoscience Australia, NASA, NGA, USGS/ Hillshade: Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community/ World_Ocean_Base: NIWA, GeosciencesAustralia, Esri, Garmin, NaturalVue/ public/NSW_Imagery: © Department of Customer Service 2020 | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.



Figure 8: Previously assessed boreholes, survey lines and access tracks



Previously assessed boreholes, survey lines and access tracks

- Previously assessed survey line 300XL-EXT 1
- GW Piezometer Sites
- Existing Access Track

LW 311-316
Proposed works

- Proposed monitoring site
- Proposed monitoring site access
- Proposed monitoring site footprint

Roads and trails

- Firetrail
- Major road
- Minor road

Hydrography

- Perennial Stream

Non Perennial Stream

Waterbody

Protected Areas of NSW

- National Park
- State Conservation Area



GDA2020 MGA Zone 56



Figure 8

Previously assessed boreholes, survey lines and access tracks

LW311-316 Ecology Archaeological assessment

Niche PM: Justin Merdith
Niche Proj. #: 8737
Client: Peabody Energy



08 Annex 2 Plates



Plate 1: 300 XL Cross Line



Plate 2: Honeysuckle Creek Track



Plate 3: S106c Link Track



Plate 4: COH18 Track



Plate 5: COH19 Track



Plate 6: BS-1 Track



Plate 7: BS-3 Track



Plate 8: Swamp 77 Track



Plate 9: 9D-GW-76-90 and 9D-GW-76-150 Groundwater Boreholes



Plate 10: 9E-GW-77 Groundwater Boreholes



Plate 11: S92-GT-01 Groundwater Boreholes

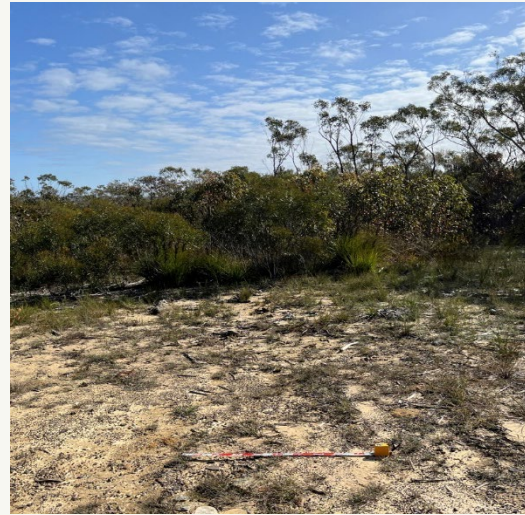


Plate 12: S92-GW-02 Groundwater Boreholes



Plate 13: ETAU-WQ-Sampler



Plate 14: BS-1 piezometer site



Plate 15: BS-3 piezometer site



Plate 16: S77 piezometer site



09 Annex 3 Threatened Flora and fauna likelihood of occurrence

Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
Amphibians							
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	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.	High	High; 1.27 ha of habitat impact in total, including 0.22 ha of breeding habitat (track on ephemeral stream) impact.
<i>Litoria aurea</i>	Green and Golden Bell Frog	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	Low	Low



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
					numerous types of man-made water bodies including quarries and sand extraction sites. Optimum habitat includes waterbodies that are un-shaded, free of predatory fish such as Plague Minnow, have a grassy area nearby and diurnal sheltering sites available.		
<i>Litoria littlejohni</i>	Littlejohn's Tree Frog	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.	High	High; 1.27 ha of habitat impact in total, including 0.22 ha of breeding habitat (track on ephemeral stream) impact.
<i>Litoria watsoni</i>	Watson's Tree Frog	-	-	E	<i>Litoria watsoni</i> distribution is highly fragmented in NSW. This species is known to breed in the upper reaches of permanent streams and in perched swamps, and non-breeding habitat is heath-based forests and woodlands where it shelters under leaf litter and low vegetation, and hunts for invertebrate prey either in shrubs or on the ground.	Low	Low



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
<i>Mixophyes balbus</i>	Stuttering Frog	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	Moderate	Moderate; 0.22 ha of breeding habitat (track on ephemeral stream) impact.
<i>Pseudophryne australis</i>	Red-crowned Toadlet	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	High; 1.27 ha of habitat impact in total.
Birds							
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	-	E, M	The Regent Honeyeater 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. The distribution of the species has contracted dramatically in the	Low	Low



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
					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.		
<i>Artamus cyanopterus</i>	Dusky Woodswallow	V	-	-	Dusky Woodswallows are widespread in eastern, southern and southwestern Australia. The species occurs throughout most of New South Wales, but is sparsely scattered in, or largely absent from, much of the upper western region. Most breeding activity occurs on the western slopes of the Great Dividing Range. Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris.	Moderate	Low - species is highly mobile, and only a small portion of potential foraging habitat will be removed as part of the proposal
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	-	E	The Australasian Bitterns 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	Low



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
<i>Calidris canutus</i>	Red Knot	-	-	E, M	The Red Knot is a non-breeding migratory visitor from Arctic regions of Siberia. In NSW it is recorded in small numbers replenishing fat stores along some of the major river estuaries and sheltered embayments of the coastline, in particular the Hunter River estuary, after which the birds proceed to Victoria by October.	Low	Low
<i>Calidris ferruginea</i>	Curlew Sandpiper	E	-	-	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	Low	Low
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	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.	High	Low – species is highly mobile, and only a small portion of potential foraging habitat will be removed as part of the proposal



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo	V	-	-	Inhabits forest with low nutrients, characteristically with key Allocasuarina spp. Tends to prefer drier forest types with a middle stratum of Allocasuarina below Eucalyptus or Angophora. 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	Low - species is highly mobile, and only a small portion of potential foraging habitat will be removed as part of the proposal
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	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	Low



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
<i>Daphoenositta chrysoptera</i>	Varied Sittella	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	Low - species is highly mobile, and only a small portion of potential foraging habitat will be removed as part of the proposal
<i>Dasyornis brachypterus</i>	Eastern Bristlebird	E	-	E	Found in coastal woodlands, dense scrub and heathlands, particularly where it borders taller woodlands.	Moderate	Moderate , foraging or breeding habitat within the subject site.
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	E	-	-	Mainly found on shallow, permanent, freshwater terrestrial wetlands, and surrounding marginal vegetation, including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters, as well as extending into adjacent grasslands, paddocks and open savannah woodlands. They also forage within or around estuaries	Low	Low



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
					and along intertidal shorelines, such as saltmarshes, mudflats and sandflats, and mangrove vegetation.		
<i>Erythrotriorchis radiatus</i>	Red Goshawk	CE	-	E	The species is very rare in NSW, extending south to about 30°S, with most records north of this, in the Clarence River Catchment, and a few around the lower Richmond and Tweed Rivers. Formerly, it was at least occasionally reported as far south as Port Stephens. Red Goshawks inhabit open woodland and forest, preferring a mosaic of vegetation types, a large population of birds as a source of food, and permanent water, and are often found in riparian habitats along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, Melaleuca swamp forest and riparian Eucalyptus forest of coastal rivers.	Low	Low
<i>Falco hypoleucos</i>	Grey Falcon	E	-	V	The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. The species is usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. It also occurs near wetlands where surface water attracts prey.	Low	Low
<i>Grantiella picta</i>	Painted Honeyeater	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	Low	Low



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
					the winter it is more likely to be found in the north of its distribution. The species inhabits Boree/ Weeping Myall (<i>Acacia pendula</i>), Brigalow (<i>A. harpophylla</i>) and Box-Gum Woodlands and Box-Ironbark Forests. It is a specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus <i>Amyema</i> .		
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	-	-	M	Inhabits coastal and near coastal areas, building large stick nests, and feeding mostly on marine and estuarine fish and aquatic fauna.	Low	Low
<i>Hieraaetus morphnoides</i>	Little Eagle	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	Low - species is highly mobile, and only a small portion of potential foraging habitat will be removed as part of the proposal
<i>Hirundapus caudacutus</i>	White-throated Needle-tail	-	-	M	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges.	Low	Low



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
<i>Lathamus discolor</i>	Swift Parrot	E	-	E	The Swift Parrot 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	Low - species is highly mobile, and only a small portion of potential foraging habitat will be removed as part of the proposal
<i>Lophoictinia isura</i>	Square-tailed Kite	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	Low
<i>Melanodryas cucullata</i>	South-eastern Hooded Robin	V	-	E	The Hooded Robin is widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. However, it is common	Low	Low



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
					in few places, and rarely found on the coast. It is considered a sedentary species, but local seasonal movements are possible. The south-eastern form (subspecies cucullata) is found from Brisbane to Adelaide and throughout much of inland NSW, with the exception of the extreme north-west, where it is replaced by subspecies picata. The species prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. It also requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.		
Neophema chrysogaster	Orange-bellied Parrot	CE	-	CE	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. 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	Low
Neophema chrysostoma	Blue-winged Parrot	-	-	V	The main populations of Blue-winged Parrots are in Tasmania and Victoria, particularly in southern Victoria and the midlands and eastern areas of Tasmania. The species is occasionally found in	Low	Low



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
					New South Wales. The species inhabits a range of habitats from coastal, sub-coastal and inland areas, right through to semi-arid zones. Throughout their range they favour grasslands and grassy woodlands. They are often found near wetlands both near the coast and in semi-arid zones. Blue-winged Parrots can also be seen in altered environments such as airfields, golf-courses and paddocks.		
<i>Neophema pulchella</i>	Turquoise Parrot	V	-	-	The Turquoise Parrot's 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	Low
<i>Ninox strenua</i>	Powerful Owl	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	Known	Low – species is highly mobile, and only a small portion of potential foraging habitat will be removed



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
					usually emergent with a diameter at breast height of at least 100 cm.		as part of the proposal
<i>Numenius madagascariensis</i>	Eastern Curlew	-	-	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. Breeds in the northern hemisphere.	Low	Low
<i>Petroica boodang</i>	Scarlet Robin	V	-	-	The Scarlet Robin is 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	Low
<i>Pezoporus wallicus</i>	Eastern Ground Parrot	V	-	-	Large populations occur on the NSW south coast, particularly Barren Grounds NR, Budderoo NP, the Jervis Bay area and Nadgee NR. Small numbers are recorded at Morton and Ben Boyd NP and other areas on the south coast. 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). These habitats provide a high abundance and diversity of food, adequate cover and suitable roosting and nesting opportunities for the Ground Parrot, which spends most of its time on or near the ground.	Moderate	Moderate , foraging or breeding habitat within the subject site.



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
<i>Pluvialis squatarola</i>	Grey Plover	P	-	C,J,K	The Grey Plover breeds around the Arctic regions and migrates to the southern hemisphere, being a regular summer migrant to Australia, mostly to the west and south coasts. It is generally sparse but not uncommon in some areas. It is occasionally found inland. The Grey Plover is almost entirely coastal, being found mainly on marine shores, inlets, estuaries and lagoons with large tidal mudflats or sandflats for feeding, sandy beaches for roosting, and also on rocky coasts.	Low	Low
<i>Pycnoptilus floccosus</i>	Pilotbird	P	-	V	Pilotbirds are strictly terrestrial, living on the ground in dense forests with heavy undergrowth. They are typically seen in pairs or occasionally in family parties, occupying small territories all year round. Birds forage mostly in pairs for insects, and occasionally eat seeds and fruits. Breeding takes places between August and January. Adults build a domed nest on or near the ground in which they usually lay two eggs.	Low	Low
<i>Rostratula australis</i>	Painted Snipe	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.	Low	Low



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
<i>Stagonopleura guttata</i>	Diamond Firetail	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	Low
<i>Sternula nereis</i>	Fairy Tern	-	-	V	Distribution includes the southern half of NSW coast. Fairy Terns utilise a variety of habitats including offshore, islands in estuaries or lakes, wetlands, beaches and spits.	Low	Low
Invertebrates							
<i>Austrocordulia leonardi</i>	Sydney Hawk Dragonfly	-	-	E	The Sydney hawk dragonfly has a very restricted distribution. The known distribution of the species includes three locations in a small area south of Sydney, from Audley to Picton. The species is known from the Hawkesbury-Nepean, Georges River, Port Hacking and Karuah drainages. The Sydney hawk dragonfly has specific habitat requirements and has only ever been collected from deep and shady riverine pools with cooler water. Larvae are found under rocks where they co-exist with <i>Austrocordulia refracta</i> .	Low	Low
<i>Petalura gigantea</i>	Giant Dragonfly	E	-	-	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. Adults spend most of their time settled on low vegetation on or adjacent to the	High	Moderate, foraging or breeding habitat within



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
					swamp. They hunt for flying insects over the swamp and along its margins. Adults fly over the swamp and along its margins hunting for flying insects. Males sometimes congregate waiting for females to mate with. Females lay eggs into moss, under other soft ground layer vegetation, and into moist litter and humic soils, often associated with groundwater seepage areas within appropriate swamp and bog habitats. The species does not utilise areas of standing water wetland, although it may utilise suitable boggy areas adjacent to open water wetlands. Larvae dig long branching burrows under the swamp. Larvae are slow growing and the larval stage may last 10 years or more. It is thought that larvae leave their burrows at night and feed on insects and other invertebrates on the surface and also use underwater entrances to hunt for food in the aquatic vegetation.		the subject site.
Reptiles							
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	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.	Known	Moderate, Small areas of preferred habitat (exfoliating sandstone) are located near BS1, though



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
							marginal and will be avoided.
<i>Varanus rosenbergi</i>	Rosenberg's Goanna	V	-	-	This species is a Hawkesbury-Narrabeen sandstone outcrop specialist. Occurs in coastal heaths, humid woodlands and both wet and dry sclerophyll forests.	High	Moderate , Potential habitat for a variety of uses in small ephemeral drainages of the subject site. Termite mounds will not be impacted.
Mammals							
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	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 0.5 ha area over a 5 month period.	Moderate	Moderate , foraging or breeding habitat within the subject site.



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	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	Low – minimal habitat being modified or removed
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	-	E	Spotted-tailed Quoll are 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	Low – minimal habitat being modified or removed
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	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	Low – minimal habitat being modified or removed
<i>Isodon obesulus</i>	Southern Brown Bandicoot (eastern)	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	Low



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat	V,P	-	-	The Eastern Freetail-bat is found along the east coast from south Queensland to southern NSW. The species typically inhabit dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. It roosts mainly in tree hollows but will also roost under bark or in man-made structures.	Low	Low
<i>Miniopterus australis</i>	Little Bentwing-bat	V	-	-	Coastal north-eastern NSW and eastern Queensland. Little Bentwing 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 100s km from feeding home ranges to breeding sites. Little Bentwing Bat has a preference for moist eucalypt forest, rainforest or dense coastal banksia scrub where it forages below the canopy for insects.	Moderate	Low – minimal habitat being modified or removed
<i>Myotis macropus</i>	Southern Myotis	V	-	-	The Large-footed Myotis is 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	Low
<i>Notamacropus parma</i>	Parma Wallaby	-	-	V	The Parma Wallaby range is now confined to the coast and ranges of central and northern NSW from the Gosford district to the Queensland border. The species preferred habitat is moist eucalypt forest with thick, shrubby understorey, often with nearby	Low	Low



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
					grassy areas, rainforest margins and occasionally drier eucalypt forest.		
<i>Petauroides volans</i>	Greater Glider	-	-	V	The Greater Glider occurs in eucalypt forests and woodlands. The Greater Glider occurs in eucalypt forests and woodlands. The species nests in hollows and are typically found in older forests. Generally, the home range for the greater glider is between 0.7-3 hectares and tends to have a population density of 0.01-5 individuals per hectare. The home ranges of females can overlap with males and females however for the males the home ranges never overlap.	Known	Moderate, foraging or breeding habitat within the subject site.
<i>Petaurus australis</i>	Yellow-bellied Glider	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	Low
<i>Petaurus norfolcensis</i>	Squirrel Glider	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	Moderate	Low - minimal habitat being modified or removed



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
					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.		
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	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	Low
<i>Phascolarctos cinereus</i>	Koala	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.	Moderate	Low – minimal habitat being modified or removed
<i>Potorous tridactylus</i>	Long-nosed Potoroo (southern mainland)	V		V	The long-nosed potoroo is found on the south-eastern coast of Australia, from Queensland to eastern Victoria and Tasmania, including some of the Bass Strait islands. In NSW it is generally restricted to coastal heaths and forests east of the Great Dividing Range, with an annual rainfall exceeding 760 mm. It inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature.	Low	Low



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	-	-	V	The New Holland Mouse 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.	Low	Low
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	-	V	This species is 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	Low – minimal habitat being modified or removed
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	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	Low
Fish							
<i>Macquaria australasica</i>	Macquarie Perch	-	E	E	Recent research indicates that there may be at least two distinct forms of Macquarie Perch, one from the western rivers (Murray-Darling Basin form) and one from the eastern rivers (the Shoalhaven and Hawkesbury-Nepean systems) (the coastal form). The species has also been stocked or translocated into a number	None – no habitat within	None



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
					of reservoirs including Talbingo, Cataract and Khancoban reservoirs and translocated into streams including the Mongarlowe River. Macquarie Perch are found in both river and lake habitats; especially the upper reaches of rivers and their tributaries	subject site	
Plants							
<i>Acacia baueri</i> <i>subsp. aspera</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.	Moderate	Low – minimal habitat being modified or removed Not detected during survey.
<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-Morisset area to Berrima and the Illawarra region, west to the Blue Mountains, also recorded from	Moderate	Low – minimal habitat being



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
					near Kurri Kurri in the Hunter Valley and from Morton National Park.		modified or removed. Not detected during survey.
<i>Acacia pubescens</i>	Downy Wattle, Hairy Stemmed Wattle	V	-	V	Occurs mainly in Bankstown-Fairfield-Rookwood and Pitt Town areas, with outliers at Barden Ridge, Oakdale and Mountain Lagoon. Grows on alluviums, shales and shale/sandstone intergrades. Soils characteristically gravely, often with ironstone. Occurs in open woodland and forest, in communities including Cooks River/ Castlereagh Ironbark Forest, Shale/ Gravel Transition Forest and Cumberland Plain Woodland. Flowers from August to October.	Low	Low
<i>Acacia terminalis</i>	Sunshine Wattle (Sydney region)	-	-	E	Very limited distribution, mainly in near-coastal areas from the northern shores of Sydney Harbour south to Botany Bay, with most records from the Port Jackson area and the eastern suburbs of Sydney. Recorded from North Head, Middle Head, Dover Heights, Parsely Bay, Nielsen Park, Cooper Park, Chifley, Watsons Bays, Wollstonecraft and Waverley.	Low	Low
<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. Found in open woodland with <i>Eucalyptus parramattensis</i> , <i>Eucalyptus</i>	Low	Low



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
					fibrosa, Angophora bakeri, Eucalyptus sclerophylla and Melaleuca decora. Common associated understorey species include Melaleuca nodosa, Hakea dactyloides, Hakea sericea, Dillwynia tenuifolia, Micromyrtus minutiflora, Acacia elongata, Acacia brownei, Themeda australis and Xanthorrhoea minor.		
<i>Astrotricha crassifolia</i>	Thick-leaf Star-hair	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.	Moderate	Low – minimal habitat being modified or removed Detected near the subject site but will be avoided.
<i>Caladenia tessellata</i>	Thick-lip Spider Orchid	E	-	V	The Tessellated Spider Orchid is 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	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	Moderate	Low – minimal



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
					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.		habitat being modified or removed. Not detected during survey.
<i>Calochilus pulchellus</i>	Pretty Beard Orchid, Pretty Beard-orchid	E	-	E	Calochilus pulchellus is known from the Sydney Basin Bioregion, where a total of less than 30 adult plants have been recorded in three sites over a range of 40 km on the South Coast of NSW, at altitudes from 20-560 m above sea level. All currently known sites are within the Shoalhaven Local Government Area. The cryptic nature of the species, with a single leaf above ground for only a few months and a flowering stem lasting a few days or a week, makes detection difficult for most of the year. It is likely that additional scattered individuals and small colonies exist within the area of occurrence.	Low	Low
<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	Moderate	Low – minimal habitat being modified or removed.



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
					association with the Large Tongue Orchid (<i>C. subulata</i>) and the Tartan Tongue Orchid (<i>C. erecta</i>).		
<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.	Low	Low
<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	Low – minimal habitat being modified or removed. Not detected during survey.
<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. Localised and scattered distribution includes sites at Norah Head (Tuggerah Lakes), Peats Ridge, Mt Colah, Elvina Bay Trail (West Head), Terrey Hills, Killara, North Head, Menai, Wattamolla and a few other sites in Royal National Park. 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	Low – minimal habitat being modified or removed. Not detected during survey.



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<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'Hares, Metropolitan and Warragamba Catchments.	Moderate	Low – minimal habitat being modified or removed.
<i>Grevillea parviflora</i>	Small-flower Grevillea	-	-	V	Sporadically distributed throughout the Sydney Basin with sizeable populations around Picton, Appin and Bargo (and possibly further south to the Moss Vale area) and in the Hunter at in the Cessnock - Kurri Kurri area (particularly Werakata NP). Separate populations are also known from Putty to Wyong and Lake Macquarie on the Central Coast.	Low	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	Low
<i>Hibbertia acaulothrix</i>		-	-	E	<i>Hibbertia acaulothrix</i> occurs on rocky outcrops within <i>E. sieberi</i> woodland or in association with black she-oak, red bloodwood and flaky-barked tea-tree. It is known from several widely separated localities in NSW, from Wadbilliga National Park in the Southern Tablelands, through the Nattai Wollondilly area in the	Low	Low



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					Southern Central Tablelands, to the Mt Baker and Mt Coricudgy (Wollemi) area in northern part of the Central Coast and Tablelands. The only estimate for subpopulation numbers is for the Nattai-Wollondilly area-south, with 40 plants observed in 2001.		
<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	Low – minimal habitat being modified or removed. Not detected during survey.
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	V	-	V	Scattered, disjunct populations in coastal areas from Jervis Bay to Port Macquarie, with most populations in the Gosford-Wyong areas. Grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	Low	Low
<i>Melaleuca deanei</i>	Deane's Paperbark	V	-	V	Grows in wet heath on sandstone in coastal districts from Berowra to Nowra.	Moderate	Low – minimal habitat being modified or



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							removed. Not detected during survey.
<i>Persicaria elatior</i>	Knotweed, Tall Knotweed	V	-	V	Tall Knotweed has been recorded in south-eastern NSW from Ulladulla to the Victorian border. In northern NSW it is known from Raymond Terrace and the Grafton area. This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	Low	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	Low - minimal habitat being modified or removed. Not detected during survey.
<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	Low



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<i>Pimelea curviflora</i> <i>var. 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 shaley-lateritic soils over sandstone and shale-sandstone transition soils on ridgetops and upper slopes amongst woodlands.	Low	Low
<i>Pomaderris brunnea</i>	Rufous Pomaderris	E	-	V	Brown Pomaderris is found in a very limited area around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area and near Camden. Brown Pomaderris grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines.	Low	Low
<i>Prasophyllum affine</i>	Jervis Bay Leek Orchid	E	-	E	Known from three areas south-east of Nowra on South Coast. These are Kinghorne Point, Wowly Gully near the town of Callala Bay, and near the township of Vincentia. Grows on poorly drained clay soils that support low heathland and sedgeland communities.	Low	Low
<i>Prostanthera densa</i>	Villous Mint-bush	V	-	V	Villous Mintbush is generally grows in sclerophyll forest and shrubland on coastal headlands and near coastal ranges, chiefly on sandstone, and rocky slopes near the sea.	Low	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	Low	Low



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
					shelves where <i>Pterostylis saxicola</i> occurs are sclerophyll forest or woodland on shale-sandstone transition soils or shale soils.		
<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	Low – all known individuals will be demarcated and avoided during proposed works
<i>Rhizanthella slateri</i>	Eastern Underground Orchid	V		E	Currently known only from 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra. The species grows in eucalypt forest but no informative assessment of the likely preferred habitat for the species is available. Flowers September and November.	Low	Low
<i>Rhodamnia rubescens</i>	Scrub Turpentine	CE	-	-	Occurs in coastal districts north from Batemans Bay in New South Wales, approximately 280 km south of Sydney, to areas inland of Bundaberg in Queensland. Populations of <i>R. rubescens</i> typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m above sea level (a.s.l) in areas with rainfall of 1,000-1,600 mm. Found in littoral, warm temperate and	Low	Low



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					subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.		
<i>Rhodomirtus psidioides</i>	Native Guava	CE		CE	Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines. This species is characterised being extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	Low	Low
<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	Low	Low
<i>Thelymitra kangaloonica</i>	Kangaloon Sun Orchid	CE	-	CE	Thelymitra sp. Kangaloon is only known to occur on the southern tablelands of NSW in the Moss Vale - Kangaloon - Fitzroy Falls area at 550-700 m above sea level. It is known to occur at three swamps that are above the Kangaloon Aquifer. It is found in swamps in sedgeland over grey silty grey loam soils	Low	Low
<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	Low	Low



Scientific Name	Common Name	BC Act	FM Act	EPB C Act	Habitat	Likelihood of Occurrence	Potential for impact
					tussocks but has also been recorded within the exotic coolatai grass.		
<i>Xerochrysum palustre</i>	Swamp Everlasting	-	-	V	Found in Kosciuszko National Park and the eastern escarpment south of Badja. Also found in eastern Victoria. Grows in swamps and bogs which are often dominated by heaths. Also grows at the edges of bog margins on peaty soils with a cover of shrubs or grasses.	Low	Low



10 Annex 4 Assessment of significance (5-part test) (BC Act)

Threatened ecological communities

Coastal Upland Swamp in the Sydney Basin Bioregion TEC (Coastal Upland Swamp)

Distribution: Coastal Upland Swamp is listed as an threatened ecological community (TEC) under Part 2 of Schedule 2 of the BC Act. The following description of Coastal Upland Swamp is from the Final Determination for the TEC (NSW Scientific Committee 2012):

“Coastal Upland Swamp in the Sydney Basin Bioregion is the name given to the ecological community in the Sydney Basin bioregion associated with periodically waterlogged soils on Hawkesbury sandstone plateaus, generally where mean annual rainfall exceeds 950 mm. Coastal Upland Swamp is generally associated with soils that are acidic and vary from yellow or grey mineral sandy loams with a shallow organic horizon to highly organic spongy black peats with pallid subsoils. They vary in depth from a few centimetres to at least 4 metres. The vegetation is dominated by sclerophyll shrubs and/or sedges, with dynamic mosaics of structural forms that may include tall scrub, open heath and/or sedgeland. Although typically treeless, Coastal Upland Swamp may include scattered trees.”

Extent: Extensive areas of Coastal Upland Swamp exist within the locality (498 ha within five km of the proposal according to NPWS 2003).

Impact summary: A maximum of 0.16 ha of Coastal Upland Swamps will be temporarily impacted by the proposed works via clearing. Portions of the 300 XL Survey Line and portions of the access tracks and all three (3) proposed swamp piezometer groundwater monitoring sites are within Coastal Upland Swamp. The works will be temporary in nature and will be rehabilitated on competition in accordance with Section 7 of the *Metropolitan Coal Rehabilitation Management Plan*.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:



Coastal Upland Swamp in the Sydney Basin Bioregion TEC (Coastal Upland Swamp)

Criteria	Address of Criteria	Likelihood
In the case of a threatened species: whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.	N/A	N/A
In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	Extent and composition Approximately 498 ha of Coastal Upland Swamp exists within five km of the subject site (NPWS 2003), which is the local occurrence of Coastal Upland Swamp in this instance. Of this local occurrence, 0.16 ha will be removed or modified by the proposal. Indirect impacts of this could cause erosion or sedimentation issues, hydrocarbon spillage, and vegetation trampling. This indirect impact has been mitigated for this project in Section 5 of this report. Assessment 0.16 ha of Coastal Upland Swamp will be temporarily removed or modified for monitoring purposes and will be rehabilitated on competition in accordance with Section 7 of the <i>Metropolitan Coal Rehabilitation Management Plan</i>. With mitigation measures for soil and vegetation the action proposed is considered unlikely to have an adverse effect on either the extent or composition of the TEC such that its local occurrence of 498 ha is placed at risk of extinction.	Unlikely



Coastal Upland Swamp in the Sydney Basin Bioregion TEC (Coastal Upland Swamp)		
In the case of an endangered ecological community or critically endangered ecological community: Whether the proposed development or activity is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.	Extent and composition Approximately 498 ha of Coastal Upland Swamp exists within five km of the subject site (NPWS 2003), which is considered to be the local occurrence of Coastal Upland Swamp in this instance. Of this local occurrence, 0.16 ha will be removed or modified by the proposal. Assessment 0.16 ha of Coastal Upland Swamp will be temporarily removed or modified. With mitigation measures for soil and vegetation the action proposed is considered unlikely to have an adverse effect on either the extent or composition of the TEC such that its local occurrence of 498 ha is placed at risk of extinction.	Unlikely
In relation to the habitat of a threatened species or ecological community: The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity.	Minimal clearing is proposed to be undertaken within areas of Coastal Upland Swamp, with impacts limited to trittering of 0.16 ha for access track and borehole site clearing to access the swamp areas to install piezometers. Therefore, the extent to which habitat is likely to be removed or modified as a result of the action proposed is considered to be minimal.	Unlikely
In relation to the habitat of a threatened species or ecological community: Whether an area of habitat is likely to become fragmented or isolated from	The proposal will result in the modification of a negligible amount of habitat, including portions of the 300 XL Survey Line and portions of the access tracks and all three (3) proposed swamp piezometer groundwater monitoring sites which are within Coastal Upland Swamp, none of which presents a hostile barrier to the movement of pollinators or the dispersal of seed. Habitat for <i>Pultenaea aristata</i> would not be fragmented as a result of the proposal.	Unlikely



Coastal Upland Swamp in the Sydney Basin Bioregion TEC (Coastal Upland Swamp)		
other areas of habitat as a result of the proposed development or activity.		
In relation to the habitat of a threatened species or ecological community: The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.	Approximately 498 ha of Coastal Upland Swamp exists within five km of the subject site and approximately 0.16 ha of Coastal Upland Swamp would be temporarily modified by hand clearing Coastal Upland Swamp portions of the 300 XL Survey Line and Coastal Upland Swamp portions of the access tracks and all three (3) proposed swamp piezometer groundwater monitoring sites. Habitat to be removed is typical of habitat for this community and representative sub-communities within the locality and is not considered to be of any special importance in regard to the long-term survival of the community. The proposal is unlikely to have a significant impact on Coastal Upland Swamp within the locality.	Unlikely
Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).	Areas of Outstanding Biodiversity Value (AOBV) in NSW include: Gould's Petrel- critical habitat declaration; Little penguin population in Sydney's North Harbour; Mitchell's Rainforest Snail in Stotts Island Nature Reserve; and Wollemi Pine. None of these areas of AOBV will be affected by the proposal.	Unlikely
Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The only KTP that will be affected as a result of the proposal is the clearing of native vegetation. In this case, the proposed program effectively equates to clearing of native vegetation structure of 1.27 ha, with only 0.16 ha being within the TEC. The proposed development is not likely to significantly increase the impact of this key threatening process.	Unlikely



Coastal Upland Swamp in the Sydney Basin Bioregion TEC (Coastal Upland Swamp)

Conclusion: Based on the above information, the local occurrence of Coastal Upland Swamp is unlikely to be significantly affected by the proposal.

Threatened flora

Pultenaea aristata and *Epacris purpurascens*

Pultenaea aristata (Prickly bush-pea) (Vulnerable) and *Epacris purpurascens* (Vulnerable)

Pultenaea aristata

Distribution: *Pultenaea aristata* (Fabaceae) is listed as a vulnerable species on the BC Act.

Pultenaea aristata is restricted to the Woronora Plateau, a small area between Helensburgh, south of Sydney, and Mt Kiera above Wollongong. The species occurs in either dry sclerophyll woodland, upland swamp or wet heath on sandstone. Extensive areas of potential habitat occur within and on the margins of Coastal Upland Swamps exist within the subject site.

Extent: Extensive areas of Coastal Upland Swamp exist within the locality (498 ha within five km of the proposal according to NPWS 2003).

Impact summary: Six individuals of *Pultenaea aristata* were recorded in the subject site along 106c link track, 300XL Survey Line and at S92-GW-0.

Overall, it is likely that there are many hundreds of plants of *Pultenaea aristata* within suitable habitat in the subject site. The preferred habitat for the species (Upland Swamps and their margins) is unavoidable by the proposal. Mitigation measures and barrier fencing will be implemented to protect individual plants so impacts to *Pultenaea aristata* would be minimal. However, given the density of the species where it occurs, there is the potential that the proposal would impact on a few individuals during construction through trampling or damage to the root zone. To minimise this impact, an ecologist would be on site during proposed clearing in the vicinity of known locations of the species to ensure the vast majority of plants are not impacted.

Epacris purpurascens

Distribution:

Recorded from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South.



Pultenaea aristata (Prickly bush-pea) (Vulnerable) and *Epacris purpurascens* (Vulnerable)

Impact summary:

While no individuals were recorded in the subject site during the survey, records have previously been recorded in the vicinity of the subject site and presence has been assumed. The preferred habitat for the species is within shale sandstone soils in sclerophyll forest, scrubs and swamps. *Epacris purpurascens* is known to occur in PCT 3924 *Sydney Coastal Upland Swamp Heath*. This preferred habitat for the species is unavoidable by the proposal. Mitigation measures and barrier fencing will be implemented to protect individual plants so impacts to *Epacris purpurascens* would be minimal. There is the potential that the proposal would impact on a few individuals during construction through trampling or damage to the root zone. To minimise this impact, an ecologist would be on site during proposed clearing in the vicinity of known locations of the species to ensure the vast majority of plants are not impacted.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

Criteria	Address of Criteria	Likelihood
In the case of a threatened species: whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.	Viable local population <i>Pultenaea aristata</i> is known extensively from the locality and probably has a population in the tens of thousands (N. Smith pers. com.). The species was recorded in the subject site at numerous locations as described above. <i>Pultenaea aristata</i> individuals at all sites will be made known to project personnel so they can be avoided and protected during works. Within dense areas of threatened plants the vegetation clearing will be reduced and completed by hand-held devices, this will ensure the proposed works avoid direct clearing of any individuals of <i>Pultenaea aristata</i>. <i>Epacris purpurascens</i> known to occur in the vicinity of the subject site. To minimise the impact on both species, an ecologist would be on site during proposed clearing of the Coastal Upland Swamp portions of the subject sites to ensure the vast majority of plants are not impacted. Life cycle factors	Unlikely



Pultenaea aristata (Prickly bush-pea) (Vulnerable) and *Epacris purpurascens* (Vulnerable)

	The following description has been paraphrased from Benson and MacDougall (1996). <i>Pultenaea aristata</i> is a small erect shrub to one metre high and lives for five to 20 years. Peak flowering is in September and fruits mature in December. The seed is hard-coated with a high germination rate after being scarified, suggesting that recruitment is mainly after fire. Fire kills the mature plants. <i>Epacris purpurascens</i> has a lifespan of 5-20 years, requiring 2-4 years before seed is produced in the wild. Assessment There is the potential that some individuals of <i>Pultenaea aristata</i> or <i>Epacris purpurascens</i> to be affected by the proposal, especially given the density of <i>Pultenaea aristata</i> and where it occurs. To minimise the impacts of the proposal on these species, an ecologist would be on site during clearing operations to ensure impacts are minimised. Therefore, the action proposed is unlikely to have an adverse effect on the life cycle of <i>Pultenaea aristata</i> or <i>Epacris purpurascens</i>, such that a viable local population of the species is likely to be placed at risk of extinction.	
In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: Is likely to have an adverse effect on the extent of the ecological community such that its local	N/A	N/A



Pultenaea aristata (Prickly bush-pea) (Vulnerable) and *Epacris purpurascens* (Vulnerable)

occurrence is likely to be placed at risk of extinction, or

- In the case of an endangered ecological community or critically endangered ecological community:

Whether the proposed development or activity is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

N/A

N/A

- In relation to the habitat of a threatened species or ecological community:

The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity.

Extent of impact on habitat

The extent of *Pultenaea aristata* and *Epacris purpurascens* habitat to be modified is up to 0.16 ha as a result of the proposed activity. Six known *Pultenaea aristata* individuals are within the subject site. These individuals will be avoided in accordance to the mitigation measure stipulated in Section 5.

Unlikely



Pultenaea aristata (Prickly bush-pea) (Vulnerable) and *Epacris purpurascens* (Vulnerable)

In relation to the habitat of a threatened species or ecological community: Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity.	Habitat fragmentation The proposal will result in the primary clearing of up to 0.16 ha of habitat, none of which presents a hostile barrier to the movement of pollinators or the dispersal of seed. Habitat for <i>Pultenaea aristata</i> and <i>Epacris purpurascens</i> would not be fragmented as a result of the proposal.	Unlikely
In relation to the habitat of a threatened species or ecological community: The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.	Importance of habitat to be impacted The proposal will have no impact on the extent of habitat for <i>Pultenaea aristata</i> or <i>Epacris purpurascens</i> within the locality and none will be fragmented.	Unlikely
Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity	Critical habitat declarations in NSW include: - Gould's Petrel- critical habitat declaration; - Little penguin population in Sydney's North Harbour; - Mitchell's Rainforest Snail in Stotts Island Nature Reserve; and - Wollemi Pine.	Unlikely



Pultenaea aristata (Prickly bush-pea) (Vulnerable) and *Epacris purpurascens* (Vulnerable)

value (either directly or indirectly).	None of these areas of critical habitat will be affected by the proposal.	
Whether the proposed development or activity is or is part of a key threatening process (KTP) or is likely to increase the impact of a key threatening process.	The only KTP that will be affected as a result of the proposal is the clearing of native vegetation. In this case, the proposed program effectively equates to clearing of native vegetation structure of 1.27 ha, with only 0.16 ha being within the TEC. This is less than 1% of the total community within the 5 km radius and therefore will not significantly impact the population.	Unlikely

Conclusion: A viable local population of *Pultenaea aristata* and *Epacris purpurascens* is unlikely to be significantly affected by the proposal as:

An ecologist would be on site during proposed clearing works in the vicinity of known and previous records of the species to ensure impacts are minimised;

The action proposed is unlikely to have an adverse effect on the life cycle of the species;

The habitat potentially affected by the proposal is likely to be of little or no importance to the long-term survival of the species in the locality;

The proposal is consistent with Keep-watch species management stream under the SoS program; and

The proposal would not exacerbate KTPs in the long term.



Leucopogon exolasius

Leucopogon exolasius (vulnerable)

Distribution: *Leucopogon exolasius* is listed as a vulnerable species on the BC Act. It is found along the upper Georges River area and in Heathcote National Park. It occurs in woodland on sandstone and flowers in August and September.

Impact summary: While no individuals were recorded in the subject site during the survey, records have previously been recorded in the vicinity of the subject site and presence has been assumed. *Leucopogon exolasius* is known to occur in PCT 3590, 3595, 3598, 3814. This preferred habitat for the species is unavoidable by the proposal. Mitigation measures and barrier fencing will be implemented to protect individual plants so impacts to *Leucopogon exolasius* would be minimal. There is the potential that the proposal would impact on a few individuals during construction through trampling or damage to the root zone. To minimise this impact, an ecologist would be on site during proposed clearing in the vicinity of known locations of the species to ensure the vast majority of plants are not impacted.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

Criteria	Address of Criteria	Likelihood
In the case of a threatened species: whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.	Viable local population <i>Leucopogon exolasius</i> has been previously recorded extensively within the catchment area and within the broader locality. A viable local population, likely to be of many hundreds of plants, is known to exist. The species was not recorded in the subject site during the survey, records have previously been recorded in the vicinity of the subject site and presence has been assumed. To minimise the impact on this species, an ecologist would be on site during proposed clearing of the subject sites to ensure the vast majority of plants are not impacted. Life cycle factors <i>Leucopogon exolasius</i> is an erect shrub that grows to a metre tall and has hairy branchlets. Its sharp-pointed leaves grow to about 15 mm long by 2.5 mm wide and have a convex upper surface and striated lower surface. Up to three drooping, white, tubular flowers grow in the angles where the leaves meet the stems, on stalks to 5 mm long. Like most beard-heaths they	Unlikely



Leucopogon exolasius (vulnerable)

	have furry throats, but also have tiny hairs on the outside of the tube. The common and similar <i>Leucopogon setiger</i> has longer flower stalks, a smooth outer surface to the flower tube and shorter, wider leaves. Flowering occurs in August and September. Assessment The action proposed is unlikely to have an adverse effect on the life cycle of <i>Leucopogon exolasius</i>, such that a viable local population of the species is likely to be placed at risk of extinction.	
In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	N/A	N/A
In the case of an endangered ecological community or	N/A	N/A



Leucopogon exolasius (vulnerable)

critically endangered ecological community:		
Whether the proposed development or activity is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.		
In relation to the habitat of a threatened species or ecological community: The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity.	Extent of impact on habitat The extent of <i>Leucopogon exolasius</i> habitat to be modified is up to 1.11 ha as a result of the proposed activity.	Unlikely
In relation to the habitat of a threatened species or ecological community: Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of	Habitat fragmentation The proposal will result in the primary clearing of up to 1.11 ha of habitat, none of which presents a hostile barrier to the movement of pollinators or the dispersal of seed. Habitat for <i>Leucopogon exolasius</i> would not be fragmented as a result of the proposal.	Unlikely



Leucopogon exolasius (vulnerable)

the proposed development or activity.		
In relation to the habitat of a threatened species or ecological community: The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.	Importance of habitat to be impacted The proposal will have no impact on the extent of habitat for <i>Leucopogon exolasius</i> within the locality and none will be fragmented.	Unlikely
Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).	Critical habitat declarations in NSW include: - Gould's Petrel- critical habitat declaration; - Little penguin population in Sydney's North Harbour; - Mitchell's Rainforest Snail in Stotts Island Nature Reserve; and - Wollemi Pine. None of these areas of critical habitat will be affected by the proposal.	Unlikely
Whether the proposed development or activity is or is part of a key threatening process (KTP) or is likely to increase the impact of a key threatening process.	The only KTP that will be affected as a result of the proposal is the clearing of native vegetation. In this case, the proposed program effectively equates to clearing of native vegetation structure of 1.27 ha, with only 0.16 ha being within the TEC. This is less than 1% of the total community within the 5 km radius and therefore will not significantly impact the population.	Unlikely



Leucopogon exolasius (vulnerable)

Conclusion: A viable local population of *Leucopogon exolasius* is unlikely to be significantly affected by the proposal as:

An ecologist would be on site during proposed clearing works in the vicinity of known and previous records of the species to ensure impacts are minimised;

The action proposed is unlikely to have an adverse effect on the life cycle of the species;

The habitat potentially affected by the proposal is likely to be of little or no importance to the long-term survival of the species in the locality;

The proposal is consistent with Keep-watch species management stream under the SoS program; and

The proposal would not exacerbate KTPs in the long term.

Astrotricha crassifolia

Astrotricha crassifolia (vulnerable)

Distribution: *Astrotricha crassifolia* is listed as a vulnerable species on the BC Act. 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). Occurs in dry sclerophyll woodland on sandstone. Flowers in spring. Resprouts from root suckers or basal stem buds after fire. Seed storage and dispersal ecology and germination requirements are unknown. Not enough data to rank sensitivity to either frequent or infrequent fires

Impact summary: While no individuals were recorded in the subject site during the survey, individuals were recorded close to the Sampler site but outside the subject site and many have previously been recorded in the vicinity of the subject site. *Astrotricha crassifolia* is known to occur in PCT 3590 and 3595. This preferred habitat for the species is unavoidable by the proposal. Mitigation measures and barrier fencing will be implemented to protect individual plants so impacts to *Astrotricha crassifolia* would be minimal. There is the potential that the proposal would impact on a few individuals during construction through trampling or damage to the root zone. To minimise this impact, an ecologist would be on site during proposed clearing in the vicinity of known locations of the species to ensure the vast majority of plants are not impacted.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:



<i>Astrotricha crassifolia</i> (vulnerable)		
Criteria	Address of Criteria	Likelihood
In the case of a threatened species: whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.	Viable local population <i>Astrotricha crassifolia</i> has been previously recorded extensively within the catchment area and within the broader locality. A viable local population is known to exist. The species was not recorded in the subject site during the survey, records have previously been recorded in the vicinity of the subject site and presence has been assumed. To minimise the impact on this species, an ecologist would be on site during proposed clearing of the subject sites to ensure the vast majority of plants are not impacted. Life cycle factors <i>Astrotricha crassifolia</i> Shrub to 2.4 m high, root-suckering; branchlets with a dense, deep, firm indumentum. Leaves broad-linear, 2–6 cm long, 0.25–0.4 cm wide; apex obtuse; margins entire; upper surface smooth or occasionally wrinkled, convex except for midvein groove; lower surface hairy; petiole 1–2 mm long. Inflorescence up to c. 10 cm long, usually with a few ascending branches, few-flowered, indumentum dense and shortly floccose throughout. Petals erect to spreading, sometimes becoming reflexed, white to cream. Fruit not winged. Flowering occurs in Spring. Assessment The action proposed is unlikely to have an adverse effect on the life cycle of <i>Astrotricha crassifolia</i>, such that a viable local population of the species is likely to be placed at risk of extinction.	Unlikely
In the case of an endangered ecological community or critically endangered ecological community,	N/A	N/A



Astrotricha crassifolia (vulnerable)

whether the proposed development or activity: Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or		
In the case of an endangered ecological community or critically endangered ecological community: Whether the proposed development or activity is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.	N/A	N/A
In relation to the habitat of a threatened species or ecological community:	Extent of impact on habitat The extent of <i>Astrotricha crassifolia</i> s habitat to be modified is up to 0.72 ha as a result of the proposed activity.	Unlikely



Astrotricha crassifolia (vulnerable)

The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity.		
In relation to the habitat of a threatened species or ecological community: Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity.	Habitat fragmentation The proposal will result in the primary clearing of up to 0.72 ha of habitat, none of which presents a hostile barrier to the movement of pollinators or the dispersal of seed. Habitat for <i>Astrotricha crassifolia</i> would not be fragmented as a result of the proposal.	Unlikely
In relation to the habitat of a threatened species or ecological community: The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.	Importance of habitat to be impacted The proposal will have no impact on the extent of habitat for <i>Astrotricha crassifolia</i> within the locality and none will be fragmented.	Unlikely



Astrotricha crassifolia (vulnerable)

Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).	Critical habitat declarations in NSW include: - Gould's Petrel- critical habitat declaration; - Little penguin population in Sydney's North Harbour; - Mitchell's Rainforest Snail in Stotts Island Nature Reserve; and - Wollemi Pine. None of these areas of critical habitat will be affected by the proposal.	Unlikely
Whether the proposed development or activity is or is part of a key threatening process (KTP) or is likely to increase the impact of a key threatening process.	The only KTP that will be affected as a result of the proposal is the clearing of native vegetation. In this case, the proposed program effectively equates to clearing of native vegetation structure of 1.273 ha, with only 0.16 ha being within TECs. This is less than 1% of the total community within the 5 km radius and therefore will not significantly impact the population.	Unlikely

Conclusion: A viable local population of *Astrotricha crassifolia* is unlikely to be significantly affected by the proposal as:

An ecologist would be on site during proposed clearing works in the vicinity of known and previous records of the species to ensure impacts are minimised;

The action proposed is unlikely to have an adverse effect on the life cycle of the species;

The habitat potentially affected by the proposal is likely to be of little or no importance to the long-term survival of the species in the locality;

The proposal is consistent with Keep-watch species management stream under the SoS program; and

The proposal would not exacerbate KTPs in the long term.



Threatened fauna

Giant Dragonfly

Giant Dragonfly (*Petalura gigantea*) (Endangered BC Act)

Distribution: The Giant Dragonfly is found along the east coast of NSW from the Victorian border to northern NSW. There is one BioNet Atlas record of the species within the locality (10 km radius).

Life cycle, habitat: Giant Dragonfly live in permanent swamps and bogs with some free surface water and open vegetation. Adults settle on low vegetation in or near swamps hunting for flying insects over swamps. Adults emerge from late October and are short-lived, surviving for one summer after emergence. Adults fly over the swamp and along its margins hunting for flying insects. Females lay eggs into moss, under other soft ground layer vegetation, and into moist litter and humic soils, often associated with groundwater seepage areas within appropriate swamp and bog habitats. The species does not utilise areas of standing water wetland, although it may utilise suitable boggy areas adjacent to open water wetlands. Larvae dig long branching burrows under the swamp. Larvae are slow growing, and the larval stage may last 10 years or more. Suitable habitat exists within PCT 3923, 3924, and 3925. Total extent of potential habitat to be directly impacted is 0.16 ha.

Test of significance: An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:

Criteria	Address of Criteria
In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	The Project would involve potential indirect impacts to the Giant Dragonfly habitat (Coastal Upland Swamp). The extent of habitat is estimated to be 498 ha within a five km radius of the subject site. 0.16 ha of direct impacts (vegetation clearing) to the suitable habitat will result from the Project. Some indirect impacts to potential habitat may include increased erosion, sedimentation, run-off, and pollution (e.g., heavy metals, dust, petrochemical biproducts). A range of stringent erosion and sediment controls, on-site spill kits will be in place during the proposed works to ameliorate these types of indirect impacts.

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Giant Dragonfly (*Petalura gigantea*) (Endangered BC Act)

	As the Project will only remove a small portion suitable habitat (0.16 ha) for this species and direct and indirect impacts to individuals and their habitat will be mitigated, the Project is considered unlikely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.
In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction	N/A
In relation to the habitat of a threatened species, population or ecological community: The extent to which habitat is likely to be removed or modified as a result of the action proposed, and Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and	The Project would involve potential indirect impacts to the Giant Dragonfly habitat (Coastal Upland Swamp). The area of habitat is not likely to increase in fragmentation or isolation from other areas of habitat as a result of the proposed activity. The trails and associated impacts will not be sufficiently wide enough to act as a barrier to movement for Giant Dragonfly that are currently able to move between pockets of Coastal upland swamp. Potential habitat for the Giant Dragonfly is to be removed. It is unknown if the species occurs within the Coastal Upland Swamp habitat in the subject site. The habitat within the impact area is unlikely to represent habitat critical to the long-term survival of the species in the locality given the large number of BioNet records in the locality at locations known to support the species. Additional habitat is available within the adjacent IESCA which would ensure their continued survival in the locality.



Giant Dragonfly (*Petalura gigantea*) (Endangered BC Act)

The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

Whether the action proposed is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)

No declared areas of outstanding biodiversity value will be impacted either directly or indirectly.

Whether the action proposed constitutes or is part of a KTP or is likely to result in the operation of, or increase the impact of, a KTP

Section 4.1.2 provides a full analysis of the potential operation of KTPs within the subject site due to the proposed works. Relevant KTPs will not be exacerbated by the Project. Recommendations for avoidance and mitigation are provided in Section 5.

Conclusion: Given that the Project will not remove suitable habitat for this species and direct and indirect impacts to individuals and their habitat will be mitigated, the Project is unlikely to result in a significant impact on the Giant Dragonfly.

Red-crowned Toadlet

Red-crowned Toadlet (*Pseudophryne australis*) (Vulnerable)

Distribution: The Red-crowned Toadlet has a restricted distribution. It is confined to the Sydney Basin, from Pokolbin in the north, the Nowra area to the south, and west to Mt Victoria in the Blue Mountains.

Habitat requirements: Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or capping. Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter. Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters. Red-crowned Toadlets have not been recorded breeding in waters that are even mildly polluted or with a pH outside the range 5.5 to 6.5. Eggs are laid in moist leaf litter, from where they are washed by heavy rain; a large proportion of the development of the tadpoles takes place in the egg. Disperses outside the breeding period, when they are found under rocks and logs on sandstone ridges and forage amongst leaf-litter. Red-crowned Toadlets are quite a localised species



Red-crowned Toadlet (*Pseudophryne australis*) (Vulnerable)

that appear to be largely restricted to the immediate vicinity of suitable breeding habitat. Red-crowned Toadlets are usually found as small colonies scattered along ridges coinciding with the positions of suitable refuges near breeding sites. Due to this tendency for discrete populations to concentrate at particular sites, a relatively small, localised disturbance may have a significant impact on a local population if it occurs on a favoured breeding or refuge site. Suitable habitat exists within PCTs 3590, 3595, 3598, 3810, 3814, 3923, 3924.

Test of significance: An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:

Criteria	Response
<i>in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction</i>	The Project will result in indirect impacts to suitable habitat for this species and direct impacts to 1.27 ha of suitable habitat (PCT 3590, 3595, 3598, 3810, 3814, 3923, and 3924). Red-crowned Toadlet was recorded (heard) within the subject site during the current survey. An individual was heard at Swamp 77 (in PCT 3924), and along Honeysuckle Creek during surveys. .is the species being also likely to utilise other areas with dense vegetation and debris beside ephemeral creeks within the subject site. The extent of Red-crowned Toadlet habitat to be directly impacted is up to approximately 1.27 ha of habitat as a result of the proposed activity. During construction, soil and sediment erosion controls and barriers will be in place to avoid any direct or indirect impacts to confirmed habitat for Red-crowned Toadlet. It is also recommended that an ecologist be present or on standby during the vegetation clearance in the immediate vicinity of where the sighting was made. As direct and indirect impacts to individuals and their habitat will be mitigated, the Project is unlikely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.
<i>in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:</i>	<i>is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or</i> <i>is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,</i> N/A



Red-crowned Toadlet (*Pseudophryne australis*) (Vulnerable)

<i>in relation to the habitat of a threatened species or ecological community:</i>	<i>the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,</i>	The Project will result in indirect impacts of suitable habitat for this species and direct impacts to 1.27 ha of suitable habitat (PCT 3590, 3595, 3598, 3810, 3814, 3923, and 3924). The area of habitat is unlikely to become fragmented or isolated from other areas of habitat as a result of the proposed activity. The trails and associated impacts will not act as a barrier to movement, and the removal of vegetation will be temporary in nature, and are unlikely to further impede movement for Red-crowned Toadlet in the locality. Ephemeral creeks and associated habitat are important feature for Red-crowned Toadlet. However, the Project largely avoids such habitat through appropriate mitigation (i.e., pre-clearing surveys). Any potential impacts will be mitigated by a suite of measures, which will aid the rapid re-establishment of ephemeral drainages within the subject site. Therefore, the negligible amount of habitat to be temporarily modified is of low importance to the long-term survival of the species in the locality.
<i>whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),</i>		No AOBV are present within the areas to be cleared or potentially impacted by the Project.
<i>whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.</i>		Section 4.1.2 provides a full analysis of the potential operation of KTPs within the subject site due to the proposed works. Relevant KTPs will not be exacerbated by the Project. Recommendations for avoidance and mitigation are provided in Section 5.
Conclusion: Given the that the Project will aim to minimise direct impacts, and indirect impacts to individuals and their habitat will be mitigated, the Project is unlikely to result in a significant impact on the Red-crowned Toadlet.		



Giant Burrowing Frog, Littlejohn's Tree Frog and Stuttering Frog

Giant Burrowing Frog (*Heleioporus australiacus*) (Vulnerable), Littlejohn's Tree Frog (*Litoria littlejohnii*) (Vulnerable), and Stuttering Frog (*Mixophyes balbus*) (Vulnerable)

Giant Burrowing Frog

Distribution: The Giant Burrowing Frog is distributed in southeastern NSW and Victoria and appears to exist as two distinct populations: a northern population largely confined to the sandstone geology of the Sydney Basin and extending as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria.

Habitat requirements: Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Spends more than 95% of its time in non-breeding habitat in areas up to 300 m from breeding sites. Whilst in non-breeding habitat it burrows below the soil surface or in the leaf litter. Individual frogs occupy a series of burrow sites, some of which are used repeatedly. The home ranges of both sexes appear to be non-overlapping suggesting exclusivity of non-breeding habitat. Home ranges are approximately 0.04 ha in size. Individuals move into the breeding site either immediately before or following heavy rain and occupy these sites for up to 10 days. Most individuals will not attempt to breed every year. The Giant Burrowing Frog has a generalist diet and studies to date indicate that they eat mainly invertebrates including ants, beetles, cockroaches, spiders, centipedes and scorpions. When breeding, frogs will call from open spaces, under vegetation or rocks or from within burrows in the creek bank. Males show strong territoriality at breeding sites. This species breeds mainly in autumn but has been recorded calling throughout the year. Egg masses are foamy with an average of approximately 500-800 eggs and are laid in burrows or under vegetation in small pools. After rains, tadpoles are washed into larger pools where they complete their development in ponds or ponded areas of the creeklines. Tadpole development ranges from around 12 weeks duration to up to 12 months with late developing tadpoles overwintering and completing development when warmer temperatures return. Breeding habitat of this species is generally soaks or pools within first or second order streams. They are also commonly recorded from 'hanging swamp' seepage lines and where small pools form from the collected water. Suitable habitat for Giant Burrowing Frog exists within suitable PCT 3590, 3595, 3598, 3810, 3814, 3923, 3924.

Littlejohn's Tree Frog

Distribution: Littlejohn's Tree Frog has a distribution that includes the plateaus and eastern slopes of the Great Dividing Range from Watagan State Forest (90 km north of Sydney) south to Buchan in Victoria. The majority of records are from within the Sydney Basin Bioregion with only scattered records south to the Victorian border, and this species has not been recorded in southern NSW within the last decade; these records are isolated and tend to be at high altitude. The species has been identified by Niche (2024), along Honeysuckle Creek.

Habitat requirements: This species breeds in the upper reaches of permanent streams and in perched swamps. Non-breeding habitat is heath based forests and woodlands where it shelters under leaf litter and low vegetation, and hunts for invertebrate prey either in shrubs or on the ground. Breeding is triggered by heavy rain and can potentially occur all year, but is usually from late summer to early spring when conditions are favourable. Males call from low vegetation close to slow flowing pools. Eggs are laid in loose gelatinous masses attached to small submerged twigs. Eggs and tadpoles are mostly found in still or slow flowing pools that receive extended exposure to sunlight, but will also use temporary isolated pools. Suitable habitat for Littlejohn's Tree Frog exists within suitable PCT 3810 and 3814.

Stuttering Frog

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Giant Burrowing Frog (*Heleioporus australiacus*) (Vulnerable), Littlejohn's Tree Frog (*Litoria littlejohnii*) (Vulnerable), and Stuttering Frog (*Mixophyes balbus*) (Vulnerable)

Distribution: Stuttering Frogs occur along the east coast of Australia from southern Queensland to north-eastern Victoria. Considered to have disappeared from Victoria and to have undergone considerable range contraction in NSW, particularly in south-east NSW. It is the only *Mixophyes* species that occurs in south-east NSW and in recent surveys it has only been recorded at three locations south of Sydney. The Dorrigo region, in north-east NSW, appears to be a stronghold for this species.

Habitat requirements: Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor. Feed on insects and smaller frogs. Breed in streams during summer after heavy rain. Eggs are laid on rock shelves or shallow riffles in small, flowing streams. As the tadpoles grow they move to deep permanent pools and take approximately 12 months to metamorphose.

Test of significance: An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:

Criteria		Response
a) <i>in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction</i>		The Project will result in indirect impacts to suitable habitat for this species and direct impacts to 1.27 ha of suitable habitat (PCT 3590, 3595, 3598, 3810, 3814, 3923, and 3924). The species uses ephemeral drainage lines and permanent pools and is likely to utilise other areas with dense vegetation and debris beside ephemeral creeks within the subject site. During construction, soil and sediment erosion controls and barriers will be in place to avoid any direct or indirect impacts to potential habitat for Giant Burrowing Frog. As direct and indirect impacts to individuals and their habitat will be mitigated (i.e., pre-clearing surveys), the Project (proposed activity) is unlikely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.
b) <i>in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:</i>	i) <i>is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or</i> ii) <i>is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,</i>	N/A
c) <i>in relation to the habitat of a threatened species or ecological community:</i>	i) <i>the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and</i> ii) <i>whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and</i> iii) <i>the importance of the habitat to be removed, modified, fragmented or isolated</i>	i) The Project will result in indirect impacts to suitable habitat for these species and direct impacts to 1.27 ha of suitable habitat (PCT 3590, 3595, 3598, 3810, 3814, 3923, 3924). – Ephemeral creeks and associated habitat are important feature for these species. However, the Project largely avoids such habitat through appropriate mitigation (i.e., pre-clearing surveys). Any potential impacts will be mitigated by a suite of measures, which will aid the rapid re-establishment of ephemeral drainages within the subject site. Therefore, the

your environment.



Giant Burrowing Frog (*Heleioporus australiacus*) (Vulnerable), Littlejohn's Tree Frog (*Litoria littlejohnii*) (Vulnerable), and Stuttering Frog (*Mixophyes balbus*) (Vulnerable)

	to the long-term survival of the species or ecological community in the locality,	negligible amount of habitat to be temporarily modified is of low importance to the long-term survival of the species in the locality. ii) The area of habitat is unlikely to become fragmented or isolated from other areas of habitat as a result of the proposed activity. The trails and associated impacts will not act as a barrier to movement, and the removal of vegetation will be temporary in nature and are unlikely to further impede movement for these species in the locality. iii) The ephemeral and permanent creek crossings would temporarily modify the tributary and habitats using a variety of erosion control measures during construction to allow water flow to continue along its natural pathway. Such structures may be removed once vegetation clearance and associated construction works are completed, to avoid impeding the natural flow and features at each site. iv) The area of habitat is unlikely to become fragmented or isolated from other areas of habitat as a result of the proposed activity. The trails and associated impacts will not act as a barrier to movement and are likely to further facilitate movement for these species in the locality. v) Ephemeral creeks and associated habitat are important features for these species; however, the Project largely avoids such habitat, and the very small area of habitat temporarily impacted compared to the amount of habitat in the locality, significantly reduces the overall importance of potentially impacted habitat. Furthermore, any potential impacts would be mitigated by a suite of measures, which would aid the rapid re-establishment of ephemeral drainages within the subject site. Therefore, the negligible amount of habitat to be temporarily modified is of low importance to the long-term survival of the species in the locality.
d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),		No AOBV are present within the areas to be cleared or potentially impacted by the Project.
e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.		Section 4.1.2 provides a full analysis of the potential operation of KTPs within the subject site due to the proposed works. Relevant KTPs will not be exacerbated by the Project. Recommendations for avoidance and mitigation are provided in Section 5.

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Giant Burrowing Frog (*Heleioporus australiacus*) (Vulnerable), Littlejohn's Tree Frog (*Litoria littlejohnii*) (Vulnerable), and Stuttering Frog (*Mixophyes balbus*) (Vulnerable)

Conclusion: Given the that the Project will not remove suitable habitat for these species and direct and indirect impacts to individuals and their habitat will be mitigated, the Project is unlikely to result in a significant impact on the Giant Burrowing Frog, Littlejohn's Tree Frog and Stuttering Frog.



Eastern Pygmy-possum

Eastern Pygmy Possum (*Cercartetus nanus*) (Vulnerable)

Distribution

The Eastern Pygmy-possum is found in south-eastern Australia, from southern Queensland to eastern South Australia and in Tasmania. In NSW it extends from the coast inland as far as the Pilliga, Dubbo, Parkes and Wagga Wagga on the western slopes.

Habitat requirements

Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. They may occupy small patches of vegetation in fragmented landscapes and although the species prefers habitat with a rich shrub understory, they are known to occur in grassy woodlands and the presence of Eucalypts alone is sufficient to support populations in low densities. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable. Also feeds on insects throughout the year; this feed source may be more important in habitats where flowers are less abundant such as wet forests. Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum (*Pseudocheirus peregrinus*) dreys or thickets of vegetation, (e.g. grass-tree skirts); nest-building appears to be restricted to breeding females; tree hollows are favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks. Appear to be mainly solitary, each individual using several nests, with males having non-exclusive home-ranges of about 0.68 hectares and females about 0.35 hectares.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

Criteria	Address of Criteria	Likelihood
In the case of a threatened species: whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of your environment.	The species may be impacted by the proposal through removal of up to 0.16 ha of marginal habitat. However, given small proportion of habitat that would be impacted compared with that in the locality, it is unlikely that the removal of the habitat associated with the proposal would have an adverse effect on the lifecycle of the Eastern Pygmy Possum such that the local population is likely to be placed at risk of extinction.	Unlikely



Eastern Pygmy Possum (*Cercartetus nanus*) (Vulnerable)

the species is likely to be placed at risk of extinction.

- In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

N/A

N/A

- In the case of an endangered ecological community or critically endangered ecological community:

Whether the proposed development or activity is likely to substantially and adversely modify the composition of the ecological community such that its

your environment.

N/A

N/A



Eastern Pygmy Possum (*Cercartetus nanus*) (Vulnerable)

local occurrence is likely to be placed at risk of extinction.		
In relation to the habitat of a threatened species or ecological community: The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity.	The extent of Eastern Pygmy Possum habitat to be modified is up to approximately 0.16 ha of potential habitat as a result of the proposed activity. There is an abundance of similar habitat in the locality, much of which has a relatively high level of protection and therefore the area of habitat impacted by the proposal represents a very small proportion of habitat within the locality.	Unlikely
In relation to the habitat of a threatened species or ecological community: Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity.	The area of habitat is unlikely to become fragmented or isolated from other areas of habitat as a result of the proposed activity. Hollow bearing trees will not be impacted by this project. The tracks would not be sufficiently wide to act as a barrier to movement for the Eastern Pygmy Possum. There is also an abundance of similar habitat within the locality.	Unlikely
In relation to the habitat of a threatened species or ecological community: The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the	The area of habitat is unlikely to become fragmented or isolated from other areas of habitat as a result of the proposed activity. Hollow bearing trees will not be impacted by this project. The tracks would not be sufficiently wide to act as a barrier to movement for the Eastern Pygmy Possum. There is also an abundance of similar habitat within the locality.	Unlikely

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Eastern Pygmy Possum (*Cercartetus nanus*) (Vulnerable)

species, population or ecological community in the locality.		
Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).	Areas of Outstanding Biodiversity Value (AOBV) in NSW include: - Gould's Petrel- critical habitat declaration; - Little penguin population in Sydney's North Harbour; - Mitchell's Rainforest Snail in Stotts Island Nature Reserve; and - Wollemi Pine. None of these areas of AOBV will be affected by the proposal.	Unlikely
Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The only KTP that will be affected as a result of the proposal is the clearing of native vegetation. In this case, the proposed program effectively equates to clearing of native vegetation structure of 1.273 ha, with only 0.16 ha being within the TEC. This is less than 1% of the total community within the 5 km radius and therefore will not significantly impact the population.	Unlikely

Conclusion: Based on the above information, the proposal is unlikely to result in a significant impact of Eastern Pygmy Possum.

Eastern Bristlebird and Eastern Ground Parrot

Eastern Ground Parrot (Vulnerable), and Eastern Bristlebird (Vulnerable)

Eastern Ground Parrot

Distribution: There are three recognised subspecies of the Ground Parrot in Australia, the eastern subspecies (*wallicus*) inhabits south-eastern Australia from southern Queensland through NSW to western Victoria. It formerly occurred in South Australia but was last recorded in 1945. In NSW populations have declined and contracted to islands of coastal or subcoastal heathland and sedgeland habitats. The species is found in relatively large numbers on the north coast (Broadwater, Bundjalung, Yuraygir and Limeburners Creek NPs) and in smaller numbers at Myall Lakes on the central coast. There are also large

your environment.



Eastern Ground Parrot (Vulnerable), and Eastern Bristlebird (Vulnerable)

populations on the NSW south coast, particularly Barren Grounds NR, Budderoo NP, the Jervis Bay area and Nadgee NR. Small numbers are recorded at Morton and Ben Boyd NP and other areas on the south coast. Estimated population size is about 2000 birds.

Habitat: the Eastern Ground Parrot occurs in high rainfall coastal and near coastal low heathlands and sedgelands, generally below one metre in height and very dense (up to 90% projected foliage cover). These habitats provide a high abundance and diversity of food, adequate cover and suitable roosting and nesting opportunities for the Ground Parrot, which spends most of its time on or near the ground. When flushed, birds fly strongly and rapidly for up to several hundred metres, at a metre or less above the ground. Ground Parrots breed from September to December. Breeding is thought to be triggered by increasing seed availability in spring. 2-7 eggs are laid in a shallow bowl of fine sticks and grass, well hidden under overhanging tall, coarse grass, sedge or low, heathy shrubs. The nest is usually screened from above and sides, often with a tunnel in the surrounding dense plants. The female incubates the eggs for 21-24 days and on average a pair successfully fledges two young per season. Suitable habitat within the subject site consists of PCTs 3814, 3923 and 3924.

Eastern Bristlebird

Distribution: The distribution of the Eastern Bristlebird has contracted to three disjunct areas of south-eastern Australia. There are three main populations: Northern - southern Queensland/northern NSW, Central - Barren Ground NR, Budderoo NR, Woronora Plateau, Jervis Bay NP, Booderee NP and Beecroft Peninsula and Southern - Nadgee NR and Croajingalong NP in the vicinity of the NSW/Victorian border. The estimated population size is less than 2000 individuals occupying a total area of about 120 sq km. The central population comprises an estimated 1600 birds, mainly from Barren Grounds Nature Reserve, Budderoo National Park and the Jervis Bay area.

Habitat: Habitat for central and southern populations of the Eastern Bristlebird is characterised by dense, low vegetation including heath and open woodland with a heathy understorey. In northern NSW the habitat occurs in open forest with dense tussocky grass understorey and sparse mid-storey near rainforest ecotone; all these vegetation types are fire prone. Suitable habitat within the subject site consists of 3590, 3595, 3598, 3810, 3814, 3923, and 3924.

Test of significance: An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:

Criteria	Response
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Eastern Ground Parrot (Vulnerable), and Eastern Bristlebird (Vulnerable)

in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

The Project will require the removal of approximately 1.27 ha of understorey shrub species within the subject site. Further, there are two records of Eastern Ground Parrot within the broader area (Swamp 92 and Samp 76), and six records of the Eastern Ground Parrot within in 10-kilometres radius of the subject site and the species is associated with PCTs 3814, 3923 and 3924. Eastern Bristlebird habitat within the subject site consists of 3590, 3595, 3598, 3810, 3814, 3923, and 3924.

The Project has the potential to directly impact 0.36 ha of suitable habitat for Eastern Ground Parrot, and 1.27 ha of suitable habitat for Eastern Bristlebird.

As direct and indirect impacts to individuals and their habitat will be mitigated, the Project is unlikely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

n/a

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Eastern Ground Parrot (Vulnerable), and Eastern Bristlebird (Vulnerable)

<i>in relation to the habitat of a threatened species or ecological community:</i>	<i>the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and</i> <i>whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and</i> <i>the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,</i>	The Project has the potential to directly impact 0.36 ha of suitable habitat for Eastern Ground Parrot, and 1.27 ha of suitable habitat for Eastern Bristlebird. The area of habitat is not likely to increase in fragmentation or isolation from other areas of habitat as a result of the proposed activity. The trails and associated impacts will not be sufficiently wide enough to act as a barrier to movement for Eastern Ground Parrot and Eastern Bristlebird that are currently able to move between pockets of low heathlands, sedgelands and woodland habitats. The habitat to be directly/indirectly impacted represents common foraging habitat that is available within the broader subject site and is unlikely to represent habitat that is important for the long-term survival of the species in the locality.
<i>whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),</i>		No AOBV are present within the areas to be cleared or potentially impacted by the Project.
<i>whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.</i>		Section 4.1.2 provides a full analysis of the potential operation of KTPs within the subject site due to the proposed works. Relevant KTPs will not be exacerbated by the Project. Recommendations for avoidance and mitigation are provided in Section 5.
Conclusion: Given that the habitat for this species will be largely avoided, and any Indirect Impacts to potential habitat will be mitigated, the Project is unlikely to have a significant impact on the Eastern Ground Parrot and Eastern Bristlebird.		



Broad-headed Snake and Rosenberg's Goanna

Broad-headed Snake (*Hoplocephalus bungaroides*) (Endangered) and Rosenberg's Goanna (*Varanus rosenbergi*) (Vulnerable)

Broad-headed Snake

Distribution: The Broad-headed Snake is largely confined to Triassic and Permian sandstones, including the Hawkesbury, Narrabeen and Shoalhaven groups, within the coast and ranges in an area within approximately 250 km of Sydney.

Habitat requirements: The Broad-headed Snake is a nocturnal species. It shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from the sandstone rocks to shelters in crevices or hollows in large trees within 500m of escarpments in summer. Feeds mostly on geckos and small skinks; will also eat frogs and small mammals occasionally. Females produce four to 12 live young from January to March, which is a relatively low level of fecundity. Suitable habitat for Broad-headed Snake exists within suitable PCT 3590, 3598, 3923, 3924, 3925.

Rosenberg's Goanna

Distribution: Rosenberg's Goanna occurs on the Sydney Sandstone in Wollemi National Park to the north-west of Sydney, in the Goulburn and ACT regions and near Cooma in the south. There are records from the South West Slopes near Khancoban and Tooma River. Also occurs in South Australia and Western Australia.

Habitat requirements: Found in heath, open forest and woodland. Associated with termites, the mounds of which this species nests in; termite mounds are a critical habitat component. Individuals require large areas of habitat. Feeds on carrion, birds, eggs, reptiles and small mammals. Shelters in hollow logs, rock crevices and in burrows, which they may dig for themselves, or they may use other species' burrows, such as rabbit warrens. Runs along the ground when pursued (as opposed to the Lace Monitor, which climbs trees). Lays up to 14 eggs in a termite mound; the hatchlings dig themselves out of the mounds. Generally slow moving; on the tablelands likely only to be seen on the hottest days. Suitable habitat for Rosenberg's Goanna exists within suitable PCT 3590, 3595, 3598, 3923, 3924, 3925.

Test of significance: An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:

Criteria		Response
f) <i>in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction</i>		The Project will result in indirect impacts to suitable habitat for this species and direct impacts to 1.07 ha of suitable habitat (PCT 3590, 3595, 3598, 3923, 3924 and 3925). These species use rocky outcrops and are likely to utilise other areas with dense vegetation within the subject site. During construction, rocky outcrop and bush rock disturbance will be avoided where practical. As direct and indirect impacts to individuals and their habitat will be mitigated (i.e., pre-clearing surveys), the Project (proposed activity) is unlikely to have an adverse effect on the life cycle of these species such that a viable local population of the species is likely to be placed at risk of extinction.
g) <i>in the case of an endangered ecological community or critically endangered ecological community, whether the</i>	iii) <i>is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or</i> iv) <i>is likely to substantially and adversely modify the composition of the ecological</i>	N/A



Broad-headed Snake (*Hoplocephalus bungaroides*) (Endangered) and Rosenberg's Goanna (*Varanus rosenbergi*) (Vulnerable)

<i>proposed development or activity:</i>	<i>community such that its local occurrence is likely to be placed at risk of extinction,</i>	
<i>h) in relation to the habitat of a threatened species or ecological community:</i>	<i>iv) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and</i> <i>v) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and</i> <i>vi) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,</i>	vi) The Project will result in indirect impacts to suitable habitat for these species and direct impacts to 1.07 ha of suitable habitat (PCT 3590, 3595, 3598, 3923, 3924, 3925). – Rocky outcrops, bush rock, termite mounds and associated habitat are important feature for these species. However, the Project largely avoids such habitat through appropriate mitigation (i.e., pre-clearing surveys). Any potential impacts will be mitigated by a suite of measures within the subject site. Therefore, the negligible amount of habitat to be temporarily modified is of low importance to the long-term survival of the species in the locality. vii) The area of habitat is unlikely to become fragmented or isolated from other areas of habitat as a result of the proposed activity. The trails and associated impacts will not act as a barrier to movement, and the removal of vegetation will be temporary in nature and are unlikely to further impede movement for these species in the locality. viii) The area of habitat is unlikely to become fragmented or isolated from other areas of habitat as a result of the proposed activity. The trails and associated impacts will not act as a barrier to movement and are likely to further facilitate movement for these species in the locality. ix) – Rocky outcrops, bush rock, termite mounds and associated habitat are important features for these species; however, the Project largely avoids such habitat, and the very small area of habitat temporarily impacted compared to the amount of habitat in the locality, significantly reduces the overall importance of potentially impacted habitat. Furthermore, any potential impacts would be mitigated by a suite of measures. Therefore, the negligible amount of habitat to be temporarily modified is of low importance to the long-term survival of the species in the locality.
<i>i) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),</i>		No AOBV are present within the areas to be cleared or potentially impacted by the Project.

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Broad-headed Snake (*Hoplocephalus bungaroides*) (Endangered) and Rosenberg's Goanna (*Varanus rosenbergi*) (Vulnerable)

j) *whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.*

Section 4.1.2 provides a full analysis of the potential operation of KTPs within the subject site due to the proposed works. Relevant KTPs will not be exacerbated by the Project. Recommendations for avoidance and mitigation are provided in Section 5.

Conclusion: Given the that the Project will not remove suitable habitat for these species and direct and indirect impacts to individuals and their habitat will be mitigated, the Project is unlikely to result in a significant impact on the Broad-headed Snake and Rosenberg's Goanna.



11 Annex 5 Assessment of significance (EPBC Act)

Threatened ecological communities

Coastal Upland Swamp in the Sydney Basin Bioregion TEC (Coastal Upland Swamp)

Distribution: Coastal Upland Swamp is listed as an threatened ecological community (TEC) under Part 2 of Schedule 2 of the BC Act. The following description of Coastal Upland Swamp is from the Final Determination for the TEC (NSW Scientific Committee 2012):

“Coastal Upland Swamp in the Sydney Basin Bioregion is the name given to the ecological community in the Sydney Basin bioregion associated with periodically waterlogged soils on Hawkesbury sandstone plateaus, generally where mean annual rainfall exceeds 950 mm. Coastal Upland Swamp is generally associated with soils that are acidic and vary from yellow or grey mineral sandy loams with a shallow organic horizon to highly organic spongy black peats with pallid subsoils. They vary in depth from a few centimetres to at least 4 metres. The vegetation is dominated by sclerophyll shrubs and/or sedges, with dynamic mosaics of structural forms that may include tall scrub, open heath and/or sedgeland. Although typically treeless, Coastal Upland Swamp may include scattered trees.”

Extent: Extensive areas of Coastal Upland Swamp exist within the locality (498 ha within five km of the proposal according to NPWS 2003).

Impact summary: A maximum of 0.16 ha of Coastal Upland Swamps will be temporarily impacted by the proposed works via clearing. The proposed subject sites are within *PCT 3923 Sydney Coastal Sandstone Creekline Swamp Heath*, *PCT 3924 Sydney Coastal Upland Swamp Heath* and *PCT 3925 Sydney Sandstone Button Grass Sedgeland*. The works will be temporary in nature and will be rehabilitated on completion in accordance with Section 7 of the *Metropolitan Coal Rehabilitation Management Plan*.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

Criteria	Address of Criteria	Likelihood
Lead to a long-term decrease in the size of an important population of a species.	N/A	Unlikely



Coastal Upland Swamp in the Sydney Basin Bioregion TEC (Coastal Upland Swamp)		
Reduce the area of occupancy of an important population.	Approximately 0.16 ha of Coastal Upland swamp would be temporarily modified by the proposal. The proposed subject sites have been designed to avoid needing to clear large areas supporting Coastal Upland Swamp. The local extent of Coastal Upland Swamp will not be significantly reduced by the proposal.	Unlikely
Fragment an existing important population into two or more populations.	The proposal will result in the modification of a negligible amount of habitat (0.16 ha in total across all site), none of which presents a hostile barrier to the movement of pollinators or the dispersal of seed. Habitat for <i>Pultenaea aristata</i> would not be fragmented as a result of the proposal.	Unlikely
Adversely affect habitat critical to the survival of a species.	The following species are listed on the EPBC Act Register of Critical Habitat: Wandering Albatross (<i>Diomedea exulans</i>) - Macquarie Island <i>Lepidium ginninderrense</i> (Ginninderra peppercress) - Northwest corner Belconnen Naval Transmission Station, ACT Black-eared Miner (<i>Manorina melanotis</i>) - Gluepot Reserve, Taylorville Station and Calperum Station. Shy Albatross (<i>Thalassarche cauta</i>) - Albatross Island, The Mewstone, Pedra Branca Grey-headed Albatross (<i>Thalassarche chrysostoma</i>) - Macquarie Island No critical habitat has been declared for Coastal Upland Swamp. Given no areas of Coastal Upland Swamp would be removed by the proposal, the proposal is not likely to adversely affect habitat critical to the survival of Coastal Upland Swamp.	Unlikely
Disrupt the breeding cycle of an important population.	N/A	Unlikely



Coastal Upland Swamp in the Sydney Basin Bioregion TEC (Coastal Upland Swamp)		
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	N/A	Unlikely
Result in invasive species that are harmful to an endangered species becoming established in the vulnerable species' habitat.	The ecological processes required to enable the establishment of invasive species are unlikely to eventuate. Vehicle quarantining procedures will mitigate against this. On-site work will be tightly regulated and controlled by a series of mitigation measures and environmental safeguards to ensure against events such as the mobilisation of pollutants. These measures are described the Metropolitan Coal Construction Management Plan.	Unlikely
Introduce disease that may cause the species to decline.		Unlikely
Interfere substantially with the recovery of the species.	To date, there is no recovery plan or threat abatement plan for Coastal Upland Swamp. Management objectives have been identified for Coastal Upland Swamps under the Saving Our Species program: The extent and condition of this ecological community will be improved or maintained primarily via positive management consistent with Catchment Action Plans, water management plans, and by regulating clearing. Where it occurs on private lands, this ecological community will also benefit from voluntary agreements with landholders to manage the land for conservation purposes. Given the proposal would not result in significant clearing of Coastal Upland Swamp, the proposal is not inconsistent with this management action.	Unlikely
Conclusion: Based on the above information, the proposed action is unlikely to have a significant impact on Coastal Upland Swamp.		

Threatened flora



Pultenaea aristata

Pultenaea aristata (Prickly Bush-pea) (Vulnerable)

Distribution: *Pultenaea aristata* (Fabaceae) is listed as a vulnerable species on the BC Act.

Pultenaea aristata is restricted to the Woronora Plateau, a small area between Helensburgh, south of Sydney, and Mt Kiera above Wollongong. The species occurs in either dry sclerophyll woodland, upland swamp or wet heath on sandstone. Extensive areas of potential habitat occur within and on the margins of Coastal Upland Swamps exist within the subject site.

Extent: Extensive areas of Coastal Upland Swamp exist within the locality (498 ha within five km of the proposal according to NPWS 2003).

Impact summary: Six individuals of *Pultenaea aristata* were recorded in the subject site along 106c link track, 300XL Survey Line and at S92-GW-02.

Overall, it is likely that there are many hundreds of plants of *Pultenaea aristata* within suitable habitat in the subject site. The preferred habitat for the species (Upland Swamps and their margins) is unavoidable by the proposal. Mitigation measures and barrier fencing will be implemented to protect individual plants so impacts to *Pultenaea aristata* would be minimal. However, given the density of the species where it occurs, there is the potential that the proposal would impact on a few individuals during construction through trampling or damage to the root zone. To minimise this impact, an ecologist would be on site during proposed clearing in the vicinity of known locations of the species to ensure the vast majority of plants are not impacted.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

Criteria	Address of Criteria	Likelihood
Lead to a long-term decrease in the size of an important population of a species.	Overall, it is likely that there are many <i>Pultenaea aristata</i> in the locality and probably has a population in the tens of thousands (N. Smith pers. com.) within suitable habitat in the subject site. The preferred habitat for the species (Upland Swamps and their margins) has been avoided by the proposal and so impacts to <i>Pultenaea aristata</i> would be minimal. However, given the density of the species where it occurs, there is the potential that the proposal would impact on a few individuals during construction. <i>Pultenaea aristata</i> individuals at all sites will be made known to project personnel so they can be avoided and protected during works. Within dense areas of threatened plants the vegetation	Unlikely



Pultenaea aristata (Prickly Bush-pea) (Vulnerable)

	clearing will be reduced and completed by hand-held devices, this will ensure the proposed works avoid any individuals of <i>Pultenaea aristata</i> .	
Reduce the area of occupancy of an important population.	The proposal is unlikely to reduce the area of occupancy of an important population of <i>Pultenaea aristata</i> as, immediately prior to construction, areas where the species has been recorded would be made known to personnel to ensure impacts to the species are minimised.	Unlikely
Fragment an existing important population into two or more populations.	The proposal will result in the modification of a negligible amount of habitat (0.16 ha in total across all sites), none of which presents a hostile barrier to the movement of pollinators or the dispersal of seed. Habitat for <i>Pultenaea aristata</i> would not be fragmented as a result of the proposal.	Unlikely
Adversely affect habitat critical to the survival of a species.	The following species are listed on the EPBC Act Register of Critical Habitat: Wandering Albatross (<i>Diomedea exulans</i>) - Macquarie Island <i>Lepidium ginninderrense</i> (Ginninderra peppercress) - Northwest corner Belconnen Naval Transmission Station, ACT Black-eared Miner (<i>Manorina melanotis</i>) - Gluepot Reserve, Taylorville Station and Calperum Station. Shy Albatross (<i>Thalassarche cauta</i>) - Albatross Island, The Mewstone, Pedra Branca Grey-headed Albatross (<i>Thalassarche chrysostoma</i>) - Macquarie Island No critical habitat has been declared for <i>Pultenaea aristata</i>. Habitat critical to the survival of <i>Pultenaea aristata</i> is not likely to be impacted by the proposal known individuals would be avoided as far as practicable during clearing operations, with an ecologist on site to mark exclusion zones.	Unlikely



Pultenaea aristata (Prickly Bush-pea) (Vulnerable)

Disrupt the breeding cycle of an important population.	There is the potential for a few individuals of <i>Pultenaea aristata</i> to be affected by the proposal, but this impact would be minimised by having an ecologist on site prior to clearing works to ensure impacts are minimised. Therefore, the action proposed is unlikely to have an adverse effect on the breeding cycle of an important population of <i>Pultenaea aristata</i> .	Unlikely
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The modification of native vegetation that represents potential habitat for the species is unlikely to have long-term negative consequences for <i>Pultenaea aristata</i> as impacts will be avoided. <i>Pultenaea aristata</i> individuals at all sites will be made known to project personnel and avoided during clearing.	Unlikely
Result in invasive species that are harmful to an endangered species becoming established in the vulnerable species' habitat.	The proposal will introduce tracks into relatively pristine habitat, which generally increases the potential for invasive predators to move into new areas. However, the proposed tracks are minor in nature and the tracks will be rehabilitated. The risk of introducing invasive species would be ameliorated through vehicle quarantining procedures. The proposal is not likely to lead to the introduction of invasive species in <i>Pultenaea aristata</i> habitat. On-site work will be tightly regulated and controlled by a series of mitigation measures and environmental safeguards to ensure against events such as the mobilisation of pollutants. These measures are described in the Metropolitan Coal Construction Management Plan.	Unlikely
Introduce disease that may cause the species to decline.	Whilst there is some potential for works plant and machinery to transport and disperse soil pathogens throughout the subject site, this risk will be managed through the use of vehicle quarantining procedures. It is considered unlikely that the proposed action will introduce disease that may cause the <i>Pultenaea aristata</i> to decline.	Unlikely
Interfere substantially with the recovery of the species.	To date, there is no recovery plan or threat abatement plan for <i>Pultenaea aristata</i> . No recovery programs are known to occur within the subject site. A number of state-wide conservation actions have also been identified for this species under the Saving Our Species program:	Unlikely



Pultenaea aristata (Prickly Bush-pea) (Vulnerable)

	• Confirm location details of existing records. • Review fire management requirements and apply. • Provide map of known occurrences to Rural Fire Service and seek inclusion of mitigative measures on Bush Fire Risk Management Plan(s), risk register and/or operation map(s). • Reserve Fire Management Strategy to include operational guidelines to protect this species from fire. The proposal is not likely to interfere with the recovery of <i>Pultenaea aristata</i>.	
Conclusion: Based on the above information, the proposed action is unlikely to have a significant impact on <i>Pultenaea aristata</i> .		

Leucopogon exolasius

Leucopogon exolasius (Vulnerable)

Distribution: *Leucopogon exolasius* is listed as a vulnerable species on the EPBC Act and BC Act. It is found along the upper Georges River area and in Heathcote National Park. It occurs in woodland on sandstone and flowers in August and September.

Impact summary:

While no individuals were recorded in the subject site during the survey, records have previously been recorded in the vicinity of the subject site and presence has been assumed. *Leucopogon exolasius* is known to occur in PCT 3590, 3595, 3598, 3814. This preferred habitat for the species is unavoidable by the proposal. Mitigation measures and barrier fencing will be implemented to protect individual plants so impacts to *Leucopogon exolasius* would be minimal. There is the potential that the proposal would impact on a few individuals during construction through trampling or damage to the root zone. To minimise this impact, an ecologist would be on site during proposed clearing in the vicinity of known locations of the species to ensure the vast majority of plants are not impacted.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:



Leucopogon exolasius (Vulnerable)

Criteria	Address of Criteria	Likelihood
Lead to a long-term decrease in the size of an important population of a species.	No <i>Leucopogon exolasius</i> were recorder during the survey. It is unlikely that the proposed works would lead to long-term decrease in the size of an important population of a species. An ecologist will be on site prior to clearing works to ensure impacts are minimised.	Unlikely
Reduce the area of occupancy of an important population.	No <i>Leucopogon exolasius</i> were recorder during the survey, the proposal is unlikely to reduce the area of occupancy of an important population of <i>Leucopogon exolasius</i> .	Unlikely
Fragment an existing important population into two or more populations.	The proposal will result in the modification of a negligible amount of habitat (1.11 ha in total across all sites), none of which presents a hostile barrier to the movement of pollinators or the dispersal of seed. Habitat for <i>Leucopogon exolasius</i> would not be fragmented as a result of the proposal.	Unlikely
Adversely affect habitat critical to the survival of a species.	The following species are listed on the EPBC Act Register of Critical Habitat: Wandering Albatross (<i>Diomedea exulans</i>) - Macquarie Island <i>Lepidium ginninderrense</i> (Ginninderra peppercress) - Northwest corner Belconnen Naval Transmission Station, ACT Black-eared Miner (<i>Manorina melanotis</i>) - Gluepot Reserve, Taylorville Station and Calperum Station. Shy Albatross (<i>Thalassarche cauta</i>) - Albatross Island, The Mewstone, Pedra Branca Grey-headed Albatross (<i>Thalassarche chrysostoma</i>) - Macquarie Island No critical habitat has been declared for <i>Pultenaea aristata</i>.	Unlikely



Leucopogon exolasius (Vulnerable)

	Habitat critical to the survival of <i>Pultenaea aristata</i> is not likely to be impacted by the proposal known individuals would be avoided as far as practicable during clearing operations, with an ecologist on site to mark exclusion zones.	
Disrupt the breeding cycle of an important population.	There is the potential for a few individuals of <i>Leucopogon exolasius</i> to be affected by the proposal, but this impact would be minimised by having an ecologist on site prior to clearing works to ensure impacts are minimised. Therefore, the action proposed is unlikely to have an adverse effect on the breeding cycle of an important population of <i>Leucopogon exolasius</i> a.	Unlikely
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	All known individuals of <i>Leucopogon exolasius</i> will be avoided by the Project wherever practical. In the unlikely event an individual is disturbed as a result of the Project, they have the potential to regenerate via seed or reshoot.	Unlikely
Result in invasive species that are harmful to an endangered species becoming established in the vulnerable species' habitat.	The proposal will introduce tracks into relatively pristine habitat, which generally increases the potential for invasive predators to move into new areas. However, the proposed tracks are minor in nature and the tracks will be rehabilitated. The risk of introducing invasive species would be ameliorated through vehicle quarantining procedures. The proposal is not likely to lead to the introduction of invasive species in <i>Leucopogon exolasius</i> habitat. On-site work will be tightly regulated and controlled by a series of mitigation measures and environmental safeguards to ensure against events such as the mobilisation of pollutants. These measures are described the Metropolitan Coal Construction Management Plan.	Unlikely
Introduce disease that may cause the species to decline.	Whilst there is some potential for works plant and machinery to transport and disperse soil pathogens throughout the subject site, this risk will be managed through the use of vehicle quarantining procedures. It is considered unlikely that the proposed action will introduce disease that may cause the <i>Leucopogon exolasius</i> to decline.	Unlikely



Leucopogon exolasius (Vulnerable)

Interfere substantially with the recovery of the species.

To date, there is no recovery plan or threat abatement plan for *Leucopogon exolasius*. No recovery programs are known to occur within the subject site.

A number of state-wide conservation actions have also been identified for this species under the Saving Our Species program:

- Confirm location details of existing records.
- Review fire management requirements and apply.
- Provide map of known occurrences to Rural Fire Service and seek inclusion of mitigative measures on Bush Fire Risk Management Plan(s), risk register and/or operation map(s).
- Reserve Fire Management Strategy to include operational guidelines to protect this species from fire.

The proposal is not likely to interfere with the recovery of *Leucopogon exolasius*.

Unlikely

Conclusion: Based on the above information, the proposed action is unlikely to have a significant impact on *Leucopogon exolasius*.

Astrotricha crassifolia

Astrotricha crassifolia (Vulnerable)

Distribution: *Astrotricha crassifolia* is listed as a vulnerable species on the BC Act. 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). Occurs in dry sclerophyll woodland on sandstone. Flowers in spring. Resprouts from root suckers or basal stem buds after fire. Seed storage and dispersal ecology and germination requirements are unknown. Not enough data to rank sensitivity to either frequent or infrequent fires

Impact summary:

While no individuals were recorded in the subject site during the survey, individuals were recorded close to the Sampler site but outside the subject site and many have previously been recorded in the vicinity of the subject site. *Astrotricha crassifolia* is known to occur in PCT 3590 and 3595. This preferred



Astrotricha crassifolia (Vulnerable)

habitat for the species is unavoidable by the proposal. Mitigation measures and barrier fencing will be implemented to protect individual plants so impacts to *Astrotricha crassifolia* would be minimal. There is the potential that the proposal would impact on a few individuals during construction through trampling or damage to the root zone. To minimise this impact, an ecologist would be on site during proposed clearing in the vicinity of known locations of the species to ensure the vast majority of plants are not impacted.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

Criteria	Address of Criteria	Likelihood
Lead to a long-term decrease in the size of an important population of a species.	No <i>Astrotricha crassifolia</i> were recorder during the survey. It is unlikely that the proposed works would lead to long-term decrease in the size of an important population of a species. An ecologist will be on site prior to clearing works to ensure impacts are minimised.	Unlikely
Reduce the area of occupancy of an important population.	No <i>Astrotricha crassifolia</i> were recorder during the survey, the proposal is unlikely to reduce the area of occupancy of an important population of <i>Astrotricha crassifolia</i> .	Unlikely
Fragment an existing important population into two or more populations.	The proposal will result in the modification of a negligible amount of habitat (0.72 ha in total across all sites), none of which presents a hostile barrier to the movement of pollinators or the dispersal of seed. Habitat for <i>Astrotricha crassifolia</i> would not be fragmented as a result of the proposal.	Unlikely
Adversely affect habitat critical to the survival of a species.	The following species are listed on the EPBC Act Register of Critical Habitat: Wandering Albatross (<i>Diomedea exulans</i>) - Macquarie Island <i>Lepidium ginninderrense</i> (Ginninderra peppercress) - Northwest corner Belconnen Naval Transmission Station, ACT	Unlikely



<i>Astrotricha crassifolia</i> (Vulnerable)		
	Black-eared Miner (<i>Manorina melanotis</i>) - Gluepot Reserve, Taylorville Station and Calperum Station. Shy Albatross (<i>Thalassarche cauta</i>) - Albatross Island, The Mewstone, Pedra Branca Grey-headed Albatross (<i>Thalassarche chrysostoma</i>) - Macquarie Island No critical habitat has been declared for <i>Pultenaea aristata</i>. Habitat critical to the survival of <i>Pultenaea aristata</i> is not likely to be impacted by the proposal known individuals would be avoided as far as practicable during clearing operations, with an ecologist on site to mark exclusion zones.	
Disrupt the breeding cycle of an important population.	There is the potential for a few individuals of <i>Astrotricha crassifolia</i> to be affected by the proposal, but this impact would be minimised by having an ecologist on site prior to clearing works to ensure impacts are minimised. Therefore, the action proposed is unlikely to have an adverse effect on the breeding cycle of an important population of <i>Astrotricha crassifolia</i> .	Unlikely
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	All known individuals of <i>Astrotricha crassifolia</i> will be avoided by the Project wherever practical. In the unlikely event an individual is disturbed as a result of the Project, they have the potential to regenerate via seed or reshoot.	Unlikely
Result in invasive species that are harmful to an endangered species becoming established in the vulnerable species' habitat.	The proposal will introduce tracks into relatively pristine habitat, which generally increases the potential for invasive predators to move into new areas. However, the proposed tracks are minor in nature and the tracks will be rehabilitated. The risk of introducing invasive species would be ameliorated through vehicle quarantining procedures. The proposal is not likely to lead to the introduction of invasive species in <i>Astrotricha crassifolia</i> habitat. On-site work will be tightly regulated and controlled by a series of mitigation measures and environmental safeguards to ensure against events such as the mobilisation of pollutants. These measures are described the Metropolitan Coal Construction Management Plan.	Unlikely



<i>Astrotricha crassifolia</i> (Vulnerable)		
Introduce disease that may cause the species to decline.	Whilst there is some potential for works plant and machinery to transport and disperse soil pathogens throughout the subject site, this risk will be managed through the use of vehicle quarantining procedures. It is considered unlikely that the proposed action will introduce disease that may cause the <i>Astrotricha crassifolia</i> to decline.	Unlikely
Interfere substantially with the recovery of the species.	There is a recovery plan for <i>Astrotricha crassifolia</i>. An area on the western side of Woronora Dam has been allocated by the Save Our Species Program. are known to occur within the subject site. Conservation actions have also been identified for this species under the Saving Our Species program: • Improvement of knowledge in relation to the post-fire response of <i>Astrotricha crassifolia</i>. Review fire management requirements and apply. • Prevent further loss and fragmentation of habitat. • Reduce random natural and human-induced events that may cause extinction. The proposal is not likely to interfere with the recovery of <i>Astrotricha crassifolia</i>.	Unlikely
Conclusion: Based on the above information, the proposed action is unlikely to have a significant impact on <i>Astrotricha crassifolia</i> .		



Threatened fauna

Littlejohn’s Tree Frog and Giant Burrowing Frog

Littlejohn’s Tree Frog (<i>Litoria littlejohnii</i>)(Vulnerable) and Giant Burrowing Frog (Vulnerable)		
Distribution Littlejohn’s Tree Frog is listed as Vulnerable on the BC Act and EPBC Act. Littlejohn’s Tree Frog has a distribution that includes the plateaus and eastern slopes of the Great Dividing Range from Watagan State Forest (90 km north of Sydney) south to Buchan in Victoria. The majority of records are from within the Sydney Basin Bioregion with only scattered records south to the Victorian border, and this species has not been recorded in southern NSW within the last decade; these records are isolated and tend to be at high altitude. The Giant Burrowing Frog is distributed in southeastern NSW and Victoria and appears to exist as two distinct populations: a northern population largely confined to the sandstone geology of the Sydney Basin and extending as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria. These species have been identified by Niche (2024), along Honeysuckle Creek. Habitat requirements Potential habitat for the species occurs within Sandstone Gully Peppermint Forest, Upland Swamp communities and Exposed Sandstone Scribbly Gum Woodland.		
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:		
Criteria	Address of Criteria	Likelihood
Lead to a long-term decrease in the size of an important population of a species.	It is considered unlikely that the proposal would lead to a long-term decrease in the size of the Littlejohn’s Tree Frog or Giant Burrowing Frog populations, since the proposal avoids the majority of key habitat for the species and the proposal involves only limited disturbance to a negligible proportion of habitat for the species within the Subject site. Personnel will implement standard Chytrid fungus protocols to manage this risk.	Unlikely



Littlejohn's Tree Frog (*Litoria littlejohnii*) (Vulnerable) and Giant Burrowing Frog (Vulnerable)

	The proposed works are likely to temporarily modify small areas of vegetation at access tracks that follows ephemeral watercourses resulting in negligible impacts on foraging, sheltering and breeding habitat. There is abundant habitat for the species within the Subject site. Any impact would only be temporary.	
Reduce the area of occupancy of an important population.	The proposal is not likely to reduce the area of occupancy of a population of the species in the long term. Impacts to breeding pools would be temporary in nature.	Unlikely
Fragment an existing important population into two or more populations.	The proposal would not cause fragmentation for the species as there would be no barrier to movement of individuals.	Unlikely
Adversely affect habitat critical to the survival of a species.	The following species are listed on the EPBC Act Register of Critical Habitat: • Wandering Albatross (<i>Diomedea exulans</i>) - Macquarie Island • <i>Lepidium ginninderrense</i> (Ginninderra peppercress) - Northwest corner Belconnen Naval Transmission Station, ACT • Black-eared Miner (<i>Manorina melanotis</i>) - Gluepot Reserve, Taylorville Station and Calperum Station. • Shy Albatross (<i>Thalassarche cauta</i>) - Albatross Island, The Mewstone, Pedra Branca • Grey-headed Albatross (<i>Thalassarche chrysostoma</i>) - Macquarie Island No critical habitat has been declared for Littlejohn's Tree Frog or Giant Burrowing Frog	Unlikely
Disrupt the breeding cycle of an important population.	The proposal is not likely to significantly disrupt the breeding cycle of any Littlejohn's Tree Frog or Giant Burrowing Frog populations as it will only potentially impact a very small area of limiting shelter, breeding or foraging habitat.	Unlikely



Littlejohn's Tree Frog (*Litoria littlejohnii*) (Vulnerable) and Giant Burrowing Frog (Vulnerable)

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The proposal is likely to temporarily modify small areas of vegetation at the access tracks that follows ephemeral watercourses resulting in negligible impacts on foraging, sheltering and breeding habitat. It is therefore considered unlikely that the action will modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	Unlikely
Result in invasive species that are harmful to an endangered species becoming established in the vulnerable species' habitat.	The proposal will introduce personnel (by foot) and equipment into relatively pristine habitat, therefore it is unlikely that invasive predators would become established in new areas (due to the lack of tracks being constructed). It is therefore unlikely that the proposal would lead to the establishment of invasive species harmful to the Littlejohn's Tree Frog or the Giant Burrowing Frog.	Unlikely
Introduce disease that may cause the species to decline.	Whilst there is some potential for personnel and equipment to transport and disperse soil pathogens/disease throughout the subject site, this risk will be managed through the use of chytrid protocols. It is considered unlikely that the proposed action will introduce disease that may cause the Littlejohn's Tree Frog or Giant Burrowing Frog to decline.	Unlikely
Interfere substantially with the recovery of the species.	Giant Burrowing Frog has not been assigned a recovery plan yet. Littlejohn's Tree Frog in NSW has been assigned as a site managed species under the Saving Our Species program. No sites have been identified as management sites for this species. The proposal is not likely to interfere with the recovery of Littlejohn's Tree Frog. Given the proposal would not result in significant clearing of Coastal Upland Swamp, the proposal is not inconsistent with this management action.	Unlikely
Conclusion: The proposal is unlikely to have a significant impact on the Littlejohn's Tree Frog or the Giant Burrowing Frog. The Referral of the proposal to the Federal Minister for the Environment is not required.		





Eastern Bristlebird

Eastern Bristlebird (*Dasyornis brachypterus*) (Endangered)

Distribution

Eastern Bristlebird is listed as Endangered on the BC Act and EPBC Act. The distribution of the Eastern Bristlebird has contracted to three disjunct areas of south-eastern Australia. There are three main populations: Northern - southern Queensland/northern NSW, Central - Barren Ground NR, Budderoo NR, Woronora Plateau, Jervis Bay NP, Booderee NP and Beecroft Peninsula and Southern - Nadgee NR and Croajingalong NP in the vicinity of the NSW/Victorian border. The estimated population size is less than 2000 individuals occupying a total area of about 120 sq km. There are now only four populations in the southern Queensland/northern NSW area with a total of 35 birds, compared to 15 years ago when 14 populations and 154 birds were recorded. This population once extended as far south as at least Dorrigo and has recently been identified as a separate ultrataxon (monoides) but further research is being undertaken to determine the validity of this. The remaining populations are the nominate ultrataxon (brachypterus) and once extended at least to what is now the Sydney urban area. The central population comprises an estimated 1600 birds, mainly from Barren Grounds Nature Reserve, Budderoo National Park and the Jervis Bay area. The southern population in Nadgee Nature Reserve and Howe's Flat is around 200 birds. Further surveys are required in parts of Ben Boyd National Park and Sydney Catchment Authority lands to determine whether further populations of the Eastern Bristlebird occur in these areas.

Habitat requirements

Habitat for central and southern populations of the Eastern Bristlebird is characterised by dense, low vegetation including heath and open woodland with a heathy understorey. In northern NSW the habitat occurs in open forest with dense tussocky grass understorey and sparse mid-storey near rainforest ecotone; all these vegetation types are fire prone. Suitable habitat within the subject site consists of 3590, 3595, 3598, 3810, 3814, 3923, and 3924.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

Criteria	Address of Criteria	Likelihood
Lead to a long-term decrease in the size of an important population of a species.	It is considered unlikely that the proposal would lead to a long-term decrease in the size of the Eastern Bristlebird populations, since there are limited records of the species within the locality.	Unlikely



Eastern Bristlebird (*Dasyornis brachypterus*) (Endangered)

Reduce the area of occupancy of an important population.	The proposal is not likely to reduce the area of occupancy of a population of the species in the long term, due to there being few records of the species within the locality.	Unlikely
Fragment an existing important population into two or more populations.	The proposal would not cause fragmentation for the species as there would be no barrier to movement of individuals.	Unlikely
Adversely affect habitat critical to the survival of a species.	The following species are listed on the EPBC Act Register of Critical Habitat: • Wandering Albatross (<i>Diomedea exulans</i>) - Macquarie Island • <i>Lepidium ginninderrense</i> (Ginninderra peppercress) - Northwest corner Belconnen Naval Transmission Station, ACT • Black-eared Miner (<i>Manorina melanotis</i>) - Gluepot Reserve, Taylorville Station and Calperum Station. • Shy Albatross (<i>Thalassarche cauta</i>) - Albatross Island, The Mewstone, Pedra Branca • Grey-headed Albatross (<i>Thalassarche chrysostoma</i>) - Macquarie Island No critical habitat has been declared for Littlejohn's Tree Frog	Unlikely
Disrupt the breeding cycle of an important population.	The proposal is not likely to significantly disrupt the breeding cycle of any Eastern Bristlebird populations as it will only potentially impact a very small area of limiting shelter, breeding or foraging habitat.	Unlikely
Modify, destroy, remove or isolate or decrease the availability or quality of	The proposal is likely to temporarily modify small areas of vegetation at the access tracks that resulting in negligible impacts on foraging, sheltering and breeding habitat. It is therefore	Unlikely



Eastern Bristlebird (*Dasyornis brachypterus*) (Endangered)

habitat to the extent that the species is likely to decline.	considered unlikely that the action will modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	
Result in invasive species that are harmful to an endangered species becoming established in the vulnerable species' habitat.	The proposal will introduce personnel (by foot) and equipment into relatively pristine habitat, therefore it is unlikely that invasive predators would become established in new areas (due to the lack of tracks being constructed). It is therefore unlikely that the proposal would lead to the establishment of invasive species harmful to the Eastern Bristlebird.	Unlikely
Introduce disease that may cause the species to decline.	Whilst there is some potential for personnel and equipment to transport and disperse soil pathogens/disease throughout the subject site, this risk will be managed through the use of mitigation measures. It is considered unlikely that the proposed action will introduce disease that may cause the Eastern Bristlebird to decline.	Unlikely
Interfere substantially with the recovery of the species.	Eastern Bristlebird has been assigned a recovery plan. This is a national recovery plan. It lists the key threats to the species are: - inappropriate fire regimes - climate change - small population sizes - invasive species - habitat clearing. The proposed works will reduce the clearing footprint to less than a 1 m wide tracks in areas of Coastal Upland Swamp and the works will be temporary in nature, retaining the rootballs of the vegetation to allow for regrowth, when rehabilitation occurs.	Unlikely
Conclusion: The proposal is unlikely to have a significant impact on the Eastern Bristlebird. The Referral of the proposal to the Federal Minister for the Environment is not required.		

Broad Headed Snake



Broad-headed Snake (*Hoplocephalus bungaroides*) (Endangered)

Distribution

The Broad-headed Snake is largely confined to Triassic and Permian sandstones, including the Hawkesbury, Narrabeen and Shoalhaven groups, within the coast and ranges in an area within approximately 250 km of Sydney.

Habitat requirements

The Broad-headed Snake is a nocturnal species. It shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from the sandstone rocks to shelters in crevices or hollows in large trees within 500m of escarpments in summer. Feeds mostly on geckos and small skinks; will also eat frogs and small mammals occasionally. Females produce four to 12 live young from January to March, which is a relatively low level of fecundity. Suitable habitat for Broad-headed Snake exists within suitable PCT 3590, 3598, 3923, 3924, 3925.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

Criteria	Address of Criteria	Likelihood
Lead to a long-term decrease in the size of an important population of a species.	It is considered unlikely that the proposal would lead to a long-term decrease in the size of the Broad-headed Snake populations, since the proposal avoids the majority of key habitat for the species and the proposal involves only limited disturbance to a negligible proportion of habitat for the species within the subject site. The proposed works are likely to temporarily modify small areas of vegetation at access tracks resulting in negligible impacts on foraging, sheltering and breeding habitat. There is abundant habitat for the species within the Subject site. Any impact would only be temporary.	Unlikely
Reduce the area of occupancy of an important population.	The proposal is not likely to reduce the area of occupancy of a population of the species in the long term.	Unlikely



Broad-headed Snake (*Hoplocephalus bungaroides*) (Endangered)

Fragment an existing important population into two or more populations.	The proposal would not cause fragmentation for the species as there would be no barrier to movement of individuals.	Unlikely
Adversely affect habitat critical to the survival of a species.	The following species are listed on the EPBC Act Register of Critical Habitat: • Wandering Albatross (<i>Diomedea exulans</i>) - Macquarie Island • <i>Lepidium ginninderrense</i> (Ginninderra peppercress) - Northwest corner Belconnen Naval Transmission Station, ACT • Black-eared Miner (<i>Manorina melanotis</i>) - Gluepot Reserve, Taylorville Station and Calperum Station. • Shy Albatross (<i>Thalassarche cauta</i>) - Albatross Island, The Mewstone, Pedra Branca • Grey-headed Albatross (<i>Thalassarche chrysostoma</i>) - Macquarie Island No critical habitat has been declared for Broad-headed Snake.	Unlikely
Disrupt the breeding cycle of an important population.	The proposal is not likely to significantly disrupt the breeding cycle of any Broad-headed Snake populations as it will only potentially impact a very small area of limiting shelter, breeding or foraging habitat.	Unlikely
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The proposal is likely to temporarily modify small areas of vegetation at the access tracks resulting in negligible impacts on foraging, sheltering and breeding habitat. It is therefore considered unlikely that the action will modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	Unlikely
Result in invasive species that are harmful to an endangered species becoming established in the vulnerable species' habitat.	The proposal will introduce personnel (by foot) and equipment into relatively pristine habitat, therefore it is unlikely that invasive predators would become established in new areas (due to the lack of tracks being constructed). It is therefore unlikely that the proposal would lead to the establishment of invasive species harmful to the Broad-headed Snake.	Unlikely



Broad-headed Snake (*Hoplocephalus bungaroides*) (Endangered)

Introduce disease that may cause the species to decline.	Whilst there is some potential for personnel and equipment to transport and disperse soil pathogens/disease throughout the subject site, this risk will be managed through the use of mitigation measures. It is considered unlikely that the proposed action will introduce disease that may cause the Broad-headed Snake to decline.	Unlikely
Interfere substantially with the recovery of the species.	Broad-headed Snake has not been assigned a recovery plan yet.	Unlikely
Conclusion: The proposal is unlikely to have a significant impact on the Broad-headed Snake. The Referral of the proposal to the Federal Minister for the Environment is not required.		



Contact us

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02 9630 5658
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Fortitude Valley QLD 4006

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Level 3, 162 Collins Street
Melbourne VIC 3000

Our Expertise



Natural capital
and offsetting



Ecology



Heritage
management



Spatial
Services

Attachment 2

Drilling Mud SDS

SAFETY DATA SHEET

POLY-BORE™

Revision Date: 17-Feb-2016

Revision Number: 20

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name POLY-BORE™

Other means of Identification

Synonyms None
Product Code: HM003740

Recommended use of the chemical and restrictions on use

Recommended Use Stabilizer
Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton/Baroid Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: 61 (08) 9455 8300
Fax Number: 61 (08) 9455 5300

Product Emergency Telephone

Australia: + 61 1 800 686 951
Papua New Guinea: + 61 1 800 686 951
NewZealand: +64 800 451719

Fire, Police & Ambulance - Emergency Telephone

Australia: 000
Papua New Guinea: 000
New Zealand: 111

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements**Hazard pictograms****Signal Word** Not Hazardous**Hazard Statements** Not Classified**Precautionary Statements****Prevention** None**Response** None**Storage** None**Disposal** None**Contains Substances**

Contains no hazardous substances in concentrations above cut-off values according to the competent authority

CAS Number

NA

Other hazards which do not result in classification

Dust can form an explosive mixture in air

This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).

This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

Australia Classification*For the full text of the H-phrases mentioned in this Section, see Section 16***Classification** Not Classified**Risk Phrases** None**3. Composition/information on Ingredients**

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not Applicable

4. First aid measures**Description of necessary first aid measures****Inhalation** If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.**Eyes** In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.**Skin** Wash with soap and water. Get medical attention if irritation persists.**Ingestion** Under normal conditions, first aid procedures are not required.**Symptoms caused by exposure**

No significant hazards expected.

Medical Attention and Special Treatment

Notes to Physician

Treat symptomatically

5. Fire Fighting Measures**Suitable extinguishing equipment****Suitable Extinguishing Media**

All standard fire fighting media

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical**Special exposure hazards in a fire**

Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters**Special protective equipment for firefighters**

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures**6.1. Personal precautions, protective equipment and emergency procedures**

Use appropriate protective equipment. Slippery when wet. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Scoop up and remove.

7. Handling and storage**7.1. Precautions for safe handling****Handling Precautions**

Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Slippery when wet. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities**Storage Information**

Store away from oxidizers. Store in a cool, dry location. Keep container closed when not in use. Keep from excessive heat. Product has a shelf life of 24 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection**Control parameters - exposure standards, biological monitoring****Exposure Limits**

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls**Engineering Controls**

Use in a well ventilated area.

Personal protective equipment (PPE)

Personal Protective Equipment	If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection	Not normally necessary.
Hand Protection	Normal work gloves.
Skin Protection	Normal work coveralls.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.
Environmental Exposure Controls	Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Powder	Color	White to yellow
Odor:	Odorless	Odor Threshold:	No information available

<u>Property</u>	<u>Values</u>
<u>Remarks/ - Method</u>	
pH:	7-9 (5%)
Freezing Point / Range	No data available
Melting Point / Range	No data available
Boiling Point / Range	103 °C / 219 °F
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	0.75 - 0.95
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	8-13%
Bulk Density	48-55 lbs/ft3

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions

Will Not Occur

10.4. Conditions to avoid

None anticipated

10.5. Incompatible materials

Strong oxidizers. Prolonged contact with aluminum. Contact with copper. Contact with iron.

10.6. Hazardous decomposition products

Oxides of nitrogen. Ammonia. Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye and skin contact.

Symptoms related to exposure

Most Important Symptoms/Effects

No significant hazards expected.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation None known.
Eye Contact Non-irritating to rabbit's eye
Skin Contact Not irritating to skin in rabbits.
Ingestion None known.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels

No data available

Interactive effects

None known.

Data limitations

No data available

12. Ecological Information

Ecotoxicity

Product Ecotoxicity Data

No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects**Endocrine Disruptor Information**

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

UN Number	Not restricted
UN proper shipping name	Not restricted
Transport Hazard Class(es)	Not applicable
Packing Group:	Not applicable
Environmental Hazards	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product**International Inventories****Australian AICS Inventory**

All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.

New Zealand Inventory of Chemicals

All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.

EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number

None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stolkhom Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review**Revision Date:** 17-Feb-2016**Revision Note**

SDS sections updated: 2

Full text of R-phrases referred to under Sections 2 and 3

None

Full text of H-Statements referred to under sections 2 and 3

None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abbreviations or acronyms used

bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m³ - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for datawww.ChemADVISOR.com/

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

MATERIAL SAFETY DATA SHEET

Product Trade Name: **AQUAGEL®**

Revision Date: 20-Dec-2011

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: AQUAGEL®
Synonyms: None
Chemical Family: Mineral
Application: Viscosifier

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Bentonite	1302-78-9	92-100	Not applicable	Not applicable
Crystalline silica, cristobalite	14464-46-1	0 - 1%	0.025 mg/m ³	1/2 x 10 mg/m ³ %SiO ₂ + 2
Crystalline silica, tridymite	15468-32-3	0 - 1%	0.05 mg/m ³	1/2 x 10 mg/m ³ %SiO ₂ + 2
Crystalline silica, quartz	14808-60-7	1-6	0.025 mg/m ³	10 mg/m ³ %SiO ₂ + 2

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD

May cause eye and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD

Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

Inhalation

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin

Wash with soap and water. Get medical attention if irritation persists.

Eyes

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion

Under normal conditions, first aid procedures are not required.

Notes to Physician

Treat symptomatically.

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not applicable.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0
HMIS Ratings: Health 0*, Flammability 0, Physical Hazard 0 , PPE: E

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption

Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information

Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 12 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls

Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2.

Personal Protective Equipment

If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection

Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection

Normal work gloves.

Skin Protection

Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.

Eye Protection

Wear safety glasses or goggles to protect against exposure.

Other Precautions

None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Powder
Color:	Tan to Gray
Odor:	Mild earthy
pH:	8-10
Specific Gravity @ 20 C (Water=1):	2.65
Density @ 20 C (lbs./gallon):	Not Determined
Bulk Density @ 20 C (lbs/ft3):	50-73
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	8 - 12
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Disperses

9. PHYSICAL AND CHEMICAL PROPERTIES

Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistrokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None anticipated
Incompatibility (Materials to Avoid)	Hydrofluoric acid.
Hazardous Decomposition Products	Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A). Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).
Skin Contact	May cause mechanical skin irritation.
Eye Contact	May cause eye irritation.
Ingestion	None known
Aggravated Medical Conditions	Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust.

Chronic Effects/Carcinogenicity Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

Other Information For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997).

Toxicity Tests

Oral Toxicity:	Not determined
Dermal Toxicity:	Not determined
Inhalation Toxicity:	Not determined
Primary Irritation Effect:	Not determined
Carcinogenicity	Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997).
Genotoxicity:	Not determined
Reproductive / Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined

Persistence/Degradability Not determined

Bio-accumulation Not determined

Ecotoxicological Information

Acute Fish Toxicity: TLM96: 10000 ppm (*Oncorhynchus mykiss*)

Acute Crustaceans Toxicity: Not determined

Acute Algae Toxicity:	Not determined
Chemical Fate Information	Not determined
Other Information	Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method	If practical, recover and reclaim, recycle, or reuse by the guidelines of an approved local reuse program. Should contaminated product become a waste, dispose of in a licensed industrial landfill according to federal, state, and local regulations.
Contaminated Packaging	Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Transportation Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory or are exempt.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	Acute Health Hazard Chronic Health Hazard
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).

EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	The California Proposition 65 regulations apply to this product.
MA Right-to-Know Law	One or more components listed.
NJ Right-to-Know Law	One or more components listed.
PA Right-to-Know Law	One or more components listed.
Canadian Regulations	
Canadian DSL Inventory	All components listed on inventory or are exempt.
WHMIS Hazard Class	D2A Very Toxic Materials Crystalline silica

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

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*****END OF MSDS*****