



REVIEW OF ENVIRONMENTAL FACTORS

Tahmoor Coal Pty. Ltd. – Tahmoor Colliery

Surface Exploration – 10 Borehole sites

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Cover Plate: View from Borehole R10

ABBREVIATIONS

AHC	Australian Heritage Commission
AMG	Australian Map Grid
ANW	Atlas of NSW Wildlife
ATSIC	Aboriginal and Torres Strait Islander Commission
BP	Before Present
CAMBA	China-Australia Migratory Bird Agreement
DEC	Department of Environment and Conservation
DEH	Department of Environment and Heritage
EES	Environmental Effects Statement
EIS	Environmental Impact Statement
EP & A Act	<i>Environmental Planning and Protection Act</i>
EPBC Act	<i>Environment Protection and Biodiversity Act</i>
EVC	Ecological Vegetation Classes
GIS	Geographic Information System
ICO	Interim Conservation Order
ICOMOS	International Council on Monuments and Sites
IGAE	Intergovernmental Agreement on the Environment
IUCN	International Union for the Conservation of Nature
JAMBA	Japan-Australia Migratory Bird Agreement
LEP	Local Environmental Plan
LGA	Local Government Authority
NPWS	National Parks and Wildlife Service (now part of DEC)
REP	Regional Environmental Plan
RNE	Register of the National Estate
SIS	Species Impact Statement
Spp.	Species
TSC Act	<i>Threatened Species Conservation Act</i>

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1.0 SUMMARY

This Review of Environmental Factors (REF) relates to a proposal to conduct a series of drilling investigations associated with Tahmoor Colliery. The purpose of these investigations is to obtain further information on underground geological features and coal seam quality and conditions to aid mine planning.

This report:

1. Identifies the precise borehole site locations that will be developed within the exploration drilling program (ten boreholes in total)
2. Details the site conditions, development constraints and the natural and cultural heritage assessments for those sites
3. Describes site specific management practices that will be employed for each site

1.1 Conclusion and Declaration

The proposed exploration program is necessary to achieve accurate and safe mine planning.

Tahmoor Coal Pty. Ltd. (Tahmoor Coal) is committed to the long term viability of the areas within which it operates. Tahmoor Coal will utilise all means to minimise the disturbance footprint of the exploration activities and to rehabilitate those areas that may be affected by the proposal to pre-disturbance condition.

On the basis of the information presented in this REF, it is concluded that it is unlikely the proposed works will result in any significant environmental impacts, provided all the environmental safeguards identified in this REF's are adhered to.

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Environmental Coordinator

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Tahmoor Coal – Tahmoor Colliery

2.0 INTRODUCTION

Tahmoor Coal (Tahmoor Colliery) intends to undertake surface exploration activities within their mining tenements ML 1376 and EA 410 (Figure 1). The proposed program will consist of ten exploration boreholes.

The purpose of the proposed exploration activities is to determine resource quality and extent and to aid with future mine planning.

The Department of Primary Industries (DPI) is the determining authority with respect to exploration activities of this nature and will assess the application to undertake the current proposal within the context of a Review of Environmental Factors (REF). The Guidelines for Review of Environmental Factors (DPI 2006) have formed the basis of the current assessment.

2.1 Locality

The Tahmoor Colliery Pit Top is located approximately two kilometres to the west of the Bargo River and east of Remembrance Drive. The ten proposed boreholes have been identified as Boreholes MD05, MD06, R03, R04, R05, R06, R07, R08, R10 and R13. All boreholes occur within private or on managed by Government Authorities Land. In the locality, much of the flat and undulating land has been developed for agriculture.

The proposed exploration activities are not within:

- An area reserved or dedicated under the National Parks and Wildlife Act 1974
- Land reserved or dedicated with the meaning of the Crown Lands Act 1989 for preservation or other environmental protection purposes
- A World Heritage Area
- Environmental Protection Zones within environmental planning instruments
- Lands protected under SEPP 14 – Coastal Wetlands
- Lands protected under SEPP 26 – Littoral Rainforest
- Land identified as wilderness under the Wilderness Act 1987 or declared as wilderness under the National Parks and wildlife Act 1974
- Aquatic Reserves dedicated under the Fisheries Management Act 1994
- Wetland Areas dedicated under the Fisheries Management Act 1974
- Land identified as State Forest under the Forestry Act 1916
- Western Lands Release
- Crown Land

2.2 Description of the Activity

2.2.1 Overview of Proposed Activity

A series of ten borehole sites within Tahmoor Colliery mining lease area are proposed at this time (Figure 2). Eight of the borehole sites occur on land that has been previously cleared and

heavily grazed. Two of the sites (MD05 and R04) are located within areas supporting native vegetation (see Appendix 1).

This report describes the location and activities associated with the following ten boreholes:

- BH-Site MD05, Lot 31 DP 1022462
- BH- Site MD06, Lot 31 DP 1022462
- BH- Site R03, Lot 31 DP 1022462
- BH-Site R04, Lot 1 DP 264150
- BH-Site R05, Lot 7003 DP 92835
- BH-Site R06, Lot 6 DP 751287
- BH-Site R07, Lot 1 DP 705920
- BH-Site R08, Lot 1 DP 975896
- BH-Site R10, Lot 1 DP 975896
- BH-Site R13, Lot 33 DP 1022462

A private drilling company will be engaged by Tahmoor Coal to undertake the exploration activities. Drilling equipment that will be used on site includes a drill rig and associated equipment (drilling rods, core boxes, generators, fencing and fuel tanks). Three main stages have been identified for this proposal. These stages are Site Preparation, Drilling Execution and Site Rehabilitation. A discussion of each of these stages is provided below. A discussion of the location, access issues, constraints and management activities to be employed at each site is provided in Table 1 below.

Stage 1: Site Preparation

An excavator will be used to prepare a level drilling platform and develop two drill water sumps (~4 m x 3m x 2m). An excavator will be used to strip the first 100mm of topsoil (and vegetation cover if required) this surface material will be stockpiled separately to the other excavated fill.

Where an access track departs from an existing farm track, it is anticipated that access across farm paddocks will be possible and the development of access tracks to the proposed drill sites are considered unnecessary at this stage.

Sediment fencing will be installed around appropriate areas of the drill sites to prevent any sediment runoff in the event of rain. Further, site fencing will be employed at all sites to prevent unauthorised access to the site and also to exclude any livestock or native fauna from the site.

Stage 2: Drilling Execution

Drilling at site will be undertaken by modern, joystick operated, fully guarded drilling equipment. The depth of each borehole to be drilled will be an average of 550m, with a maximum of 630m. Each borehole will be 100mm in diameter.

The drilling equipment will be delivered to the site on a small flat bed truck mounted rig. At the site it will be deployed to its own stand.

The site will be fenced and the equipment will remain on site for the duration of the drilling program.

Daily access to the site will typically involve personnel driving to the site using standard 4WD vehicles. Other support vehicles such as water supply and vacuum trucks may be used from time to time as necessary.

Water is required on site for the purposes of drilling. As discussed above two sumps are proposed for each drilling site.

Water will be delivered to the drill site by a water carrying truck or taken from dams located on the property as negotiated with the owner through a property access agreement.

For further information see Section 2.2.4.

Stage 3: Site Rehabilitation

Rehabilitation of drilling sites and access tracks aims to return the site to original state. All sites to be directly disturbed are located in cleared and disturbed areas with limited native shrub and pasture species. The reinstatement of the sites will involve the following:

- use of an excavator to replace soils within the sumps after draining
- Spreading stockpiled topsoil over the surface at the end of the drilling program.

2.2.2 Work Location

The borehole sites are located west of Picton township on the western side of the Nepean River and north of Redbank Creek (Figure 2).

2.2.3 Activity, Duration, Working Times and Personnel

The exploration activity would occur over a period of approximately three to six months and is scheduled to take place five days a week from 7am to 5pm.

It is anticipated that each borehole would be completed within approximately 4 weeks of commencement, weather permitting. Downhole wireline geophysical logging will be performed in all of the boreholes at the completion of drilling and prior to cement sealing. Access to

some of the boreholes may be maintained as ongoing monitoring of underground conditions is proposed.

All disturbed sites will be rehabilitated upon completion (see above, Section 2.2.1).

Personnel on site would be limited to a small drilling team (2-4 people). Additional personnel may be required to assist with site set up and rehabilitation. Tahmoor Coal personnel may periodically visit the drill sites to supervise works and conduct inspections.

2.2.4 Drilling Methods

The drilling methods at each site would involve minimal ground disturbance.

Drilling of the holes would be undertaken with a slim hole (HQT) drilling rig. The type of rig to be used would be typical of rigs used for coal and mineral exploration. It would include equipment to raise and lower rods in the hole, drive gear for rotary drilling, wire line equipment for recovery of core tubes and down-hole devices such as magnets for recovery of broken bits.

The holes would be drilled using water as the circulating fluid. Provision would be made for storage of drilling water for circulation within each hole, primarily to flush cuttings from the hole. This water would be stored in sumps as described above. Sump water would be allowed to settle and then discharged into paddocks (through filter cloth) at the completion of the drilling program at each borehole. No sump water will be discharged into areas supporting native vegetation, or where it may drain into areas supporting native vegetation. This is of particular importance at Boreholes MD05 and R04.

No petroleum based drilling fluids or additives would be used at any stage in the drilling or testing of the holes.

No drilling circulation water would be discharged to waterways, drainage lines or farm dams.

Open Hole Section

This (upper) section of the hole would be drilled using a down hole hammer or PCD bit. Chip samples would be taken representing each drill rod length. Information from the strata overlying the coal seam would be used to model ground water and the effects of subsidence.

Core Section

Coring would commence 50 m above the Bulli Seam and continue to the end of the hole below the Tongarra seam. All cored sections would be photographed and logged for lithology and geotechnical defects.

Rock Strength Testing

Cores would be taken to determine the strength of material in the seam roof and floor. Testing will include:

- Uniaxial and triaxial compressive strengths and determination of Poisson's ratio
- CMRR
- Sonic velocity

Coal Seam Sample for Quality Determination

The Bulli Seam, Balgownie Seam and Wongawilli Seam would be analysed for coal quality. Further determination of ash in coal sections may be required to complement calculation of seam gas contents.

Gas Distribution and Content Testing

All coal seams would be sealed in bombs and gas desorption measured to allow calculation of Q1 and Q2.

Wireline Logging

Once drilling has been completed a suite of wireline logs would be run in each hole. The purpose of running geophysical logs is to allow the analysis of a range of the rock parameters. Lithological boundaries can be accurately determined and synthetic images of the strata generated from acoustic signals. Logs to be run include:

- Density
- Gamma
- Calliper
- Acoustic scanner
- Neutron porosity
- Temperature

Piezometers and Groundwater Studies

It is a requirement of the industry to understand the effect that mining has on groundwater and to predict the impact on areas to be mined. When installed in bores, changes in water table and aquifers pre-mining and post-mining can be monitored. They are to be installed both in rock formations which allow for the retention and transmission of water and in formations which form seals. Piezometers may be installed in the following borehole sites: R05 and R13. It is

proposed that the piezometer would be installed to monitor in the Bulli Seam and may be installed at four additional horizons:

- Hawkesbury Sandstone (15 m from groundwater level and lower)
- Bald Hill Claystone
- Bulgo Sandstone (upper)
- Scarborough Sandstone (top)

Data from the piezometers is stored electronically in a data logger fitted within the bore collar enclosure. This information is downloaded periodically until mining has ceased or the unit is no longer viable.

If a piezometer is to be installed, at the completion of drilling an in-ground Telstra-style PVC frame pit will be sited at the borehole location. The pit and has minimal visual impact and provides housing to the down hole instrumentation. At such a site, the instrumentation will remain on site until the completion of mining in the area (subject to landowner agreement).

To complement piezometer measurements and provide information on pre-mining fluid transmission, straddle packer tests may be conducted as part of the drilling process. Eight horizons have been selected:

- Hawkesbury Sandstone (upper, middle and lower)
- Bald Hill Claystone
- Bulgo Sandstone (upper, middle and lower)
- Stanwell Park Claystone
- Scarborough Sandstone
- Wombarra Claystone
- Coal Cliff Sandstone
- Bulli Seam

2.3 Justification of the Activity

The proposed exploration program has been designed to define the underground and seam conditions for mine planning purposes.

Exploration is an essential precursor for any mining activity as it determines the nature and extent of the resource and therefore confirms the viability of future mining operations in the area.

Publicly listed mining companies comply with a code to calculate the resource which is to be mined, which requires them to calculate the extent and quality of resource to be mined. Although listed overseas, Tahmoor Coal follows this internationally recognised code known as JORC. It stipulates that the coal seam must be sampled at intervals not exceeding 1 km. Ahead of the mine workings this is achieved by drilling surface exploration boreholes. Sampling not only provides information on the coal seam location and quality, but also the stratigraphic sequence, water distribution and gas.



2.4 Evaluation of Alternatives

There are no practical alternatives to the proposed exploration program for determining resource quality and extent.


Proposed boreholes have been placed so as to avoid impacts on sites of natural and cultural heritage value. During the desktop study and site inspection, no significant natural or cultural heritage issues were identified at any of the sites. The proposed boreholes have been located outside areas of intact native vegetation.

Table 1: Site location, access and environmental and cultural heritage constraints for Tahmoor Coal - Tahmoor Colliery Borehole sites

Borehole Site	Location and Access	Environmental and Cultural Heritage Issues	Controls and Safeguards
MD 05	<p>Location</p> <ul style="list-style-type: none"> Co-ordinates of this borehole E277828 N6213285. (MGA) Located within native bushland associated with the riparian Corridor along Redbank Creek, off Bridge Street. See Appendix 2 for sketch plan of location. <p>Access</p> <ul style="list-style-type: none"> Borehole MD05 will be accessed via Bridge Street, Picton. Some minor clearing will be required to access this borehole site off Bridge Street, involving clearing of native shrubs and groundcover species. Trees will be avoided. 	<p>Flora</p> <ul style="list-style-type: none"> Shale Sandstone Transition Forest, an EEC listed on the TSC and EPBC Acts, in good condition occurs at this borehole site. Borehole will result in clearing of small trees (DBH<20cm), shrubs and groundcover species. Large trees of <i>Eucalyptus crebra</i> and <i>E. tereticornis</i> will be avoided and protected, with no works occurring within 2 m of the outer dripline of the canopy. Clearing will be required for access, and will avoid areas with large trees. <p>Fauna</p> <ul style="list-style-type: none"> Fauna habitat impacted at this site is restricted to the removal of some foraging habitat for common fauna, including small birds and reptile species. No significant fauna habitat will be impacted at this site. <p>Archaeological and Cultural Heritage</p> <ul style="list-style-type: none"> There are no archaeological sites recorded at or near this borehole location. However there was a possible scarred tree 	<p>Site Preparation</p> <ul style="list-style-type: none"> This borehole site requires the preparation of an area of ~30m x 40m within native vegetation. Site preparation will be confined to the borehole foot print. In the case that vegetation clearance or other disturbance is required outside the foot print, additional assessments will be conducted. <p>Environmental Controls</p> <ul style="list-style-type: none"> Access to the borehole site will be <i>via</i> existing roads and tracks only. Some clearing will be required to access borehole from nearest adjoining road, with only shrubs and small trees cleared. Sediment fencing will be placed downslope of the borehole site to prevent sediment transport downslope. Topsoil and grass layer will be scraped off and set aside, for use in rehabilitation (see below). Vehicles and machinery will not be driven over or parked underneath the dripline of trees. Regular environmental site inspections will be undertaken at this hole to ensure

		<p>(Plate 2) located 25m south east of the proposed borehole location. The possible scarred tree is a <i>Eucalyptus tereticornis</i>, which is commonly known as a Forrest Red Gum. This tree is classified as possible due to the stub of a fallen branch being located in the middle of the scar; it appears as though the scar was formed from the branch falling down. This is further supported by the scar being slightly askew and not of a straight nature.</p>	<p>compliance and adequacy of other environmental controls.</p> <p>Rehabilitation</p> <ul style="list-style-type: none"> • Sumps will be filled in with stockpiled soil. • Original topsoil (containing seed), set aside during clearing, will be spread over the site. • Sediment and erosion control structures will be maintained on the site and inspected at regular intervals. • Brushmatting with local native seed bearing material will be spread over disturbed areas to expedite regeneration.
			
<p>Plate 1: Proposed Borehole site MD05, supporting SSTF</p>		<p>Plate 2: Possible scarred tree note the branch stub in the northern end of the scar.</p>	

Borehole Site	Location and Access	Environmental and Cultural Heritage Issues	Controls and Safeguards
MD 06	<p>Location</p> <ul style="list-style-type: none"> • Co-ordinates of this borehole E277796. N6213925. (MGA) • Located on a ridge top within a cleared area south of Queen Victoria Hospital. • See Appendix 2 for sketch plan of location. <p>Access</p> <ul style="list-style-type: none"> • Through cleared paddocks off Thirlmere Way, Picton. 	<p>Flora</p> <ul style="list-style-type: none"> • Cleared area adjoining Cumberland Plain Woodland occurs at this borehole site. Borehole will result in removal of some native and pasture grass and herbaceous species only. Some seedlings of <i>Eucalyptus</i> sp. and <i>Bursaria spinosa</i> occurring at this site may also be impacted. • Large trees of <i>Eucalyptus crebra</i> and <i>E. tereticornis</i> occurring nearby will be avoided and protected, with no works occurring within 2 m of the outer dripline of the canopy. • No impacts to threatened flora. <p>Fauna</p> <ul style="list-style-type: none"> • There have been no threatened fauna recorded within this site. • Fauna habitat will not be impacted by the proposal at this site. <p>Archaeological and Cultural Heritage</p> <ul style="list-style-type: none"> • There are no archaeological sites recorded at or near this borehole 	<p>Site Preparation</p> <ul style="list-style-type: none"> • This borehole site requires the preparation of an area of ~30m x 40m within previously disturbed paddocks. • Site preparation will be confined to the borehole foot print. In the case that vegetation clearance or other disturbance is required outside the foot print, additional assessments will be conducted. <p>Environmental Controls</p> <ul style="list-style-type: none"> • Access to the borehole site will be <i>via</i> existing roads and tracks only. • Sediment fencing will be placed downslope of the borehole site to prevent sediment transport downslope. • Topsoil and grass layers will be scraped off and set aside, for use in rehabilitation (see below). • Vehicles and machinery will not be driven over or parked underneath the dripline of trees. • Regular environmental site inspections will be undertaken at this hole to ensure compliance and adequacy of other

		<p>location.</p> <ul style="list-style-type: none"> No further action is required for this borehole site in relation to cultural heritage sites 	<p>environmental controls.</p> <p>Rehabilitation</p> <ul style="list-style-type: none"> Sumps will be filled in with stockpiled soil. Original topsoil (containing seed), set aside during clearing, will be spread over the site. Sediment and erosion control structures will be maintained on the site and inspected at regular intervals.
			
<p>Plate 3: Proposed Borehole MD06</p>			

Borehole Site	Location and Access	Environmental and Cultural Heritage Issues	Controls and Safeguards
R 03	<p>Location</p> <ul style="list-style-type: none"> • Co-ordinates of this borehole E278035. N6214119. (MGA) • Located at the base of a small gully, within a cleared paddock. • See Appendix 2 for sketch plan of location. <p>Access</p> <ul style="list-style-type: none"> • Through cleared paddocks off Thirlmere Way, Picton. 	<p>Flora</p> <ul style="list-style-type: none"> • Cleared paddock supporting exotic pasture and herbaceous species. No impacts to native vegetation. • Large trees occurring nearby will be avoided and protected, with no works occurring within 2 m of the outer dripline of the canopy. • No impacts to threatened flora. <p>Fauna</p> <ul style="list-style-type: none"> • There have been no threatened fauna recorded within this site. • Fauna habitat will not be impacted by the proposal at this site. <p>Archaeological and Cultural Heritage</p> <ul style="list-style-type: none"> • There are no archaeological sites recorded at or near this borehole location. • No further action is required for this borehole site in relation to cultural 	<p>Site Preparation</p> <ul style="list-style-type: none"> • This borehole site requires the preparation of an area of ~30m x 40m within previously disturbed paddocks. • Site preparation will be confined to the borehole foot print. In the case that vegetation clearance or other disturbance is required outside the foot print, additional assessments will be conducted. <p>Environmental Controls</p> <ul style="list-style-type: none"> • Access to the borehole site will be <i>via</i> existing roads and tracks only. • Sediment fencing will be placed downslope of the borehole site to prevent sediment transport downslope. • Topsoil and grass layer will be scraped off and set aside, for use in rehabilitation (see below). • Vehicles and machinery will not be driven over or parked underneath the dripline of trees. • Regular environmental site inspections will be undertaken at this hole to ensure compliance and adequacy of other

		<p>heritage sites</p>	<p>environmental controls.</p> <p>Rehabilitation</p> <ul style="list-style-type: none"> • Sumps will be filled in with stockpiled soil. • Original topsoil (containing seed), set aside during clearing, will be spread over the site. • Sediment and erosion control structures will be maintained on the site and inspected at regular intervals.
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Plate 4: Proposed Borehole R03

Borehole Site	Location and Access	Environmental and Cultural Heritage Issues	Controls and Safeguards
R 04	<p>Location</p> <ul style="list-style-type: none"> • Co-ordinates of this borehole E277421. N6214749. (MGA) • Located within native vegetation of a riparian corridor along Matthews Creek. The borehole is located greater than 100 m from the creek itself. • See Appendix 2 for sketch plan of location. <p>Access</p> <ul style="list-style-type: none"> • Access will be across the Picton Mittagong Railway, off Thirlmere Way. • Clearing will be required for access, through an area supporting native vegetation. Large trees will be avoided. Shrub and groundcover species only will require clearing. 	<p>Flora</p> <ul style="list-style-type: none"> • Shale Sandstone Transition Forest, an EEC listed on the TSC and EPBC Acts, in good to moderate condition occurs at this borehole site. Borehole will result in clearing of groundcover species only. • Large trees occurring nearby and on access route will be avoided and protected, with no works occurring within 2 m of the outer dripline of the canopy. • Minor clearing will be required for access, and will avoid areas with large trees. Shrub and groundcover species only will require clearing. <p>Fauna</p> <ul style="list-style-type: none"> • Fauna habitat impacted at this site is restricted to the removal of some foraging habitat for common fauna, including small birds and reptile species. • No significant fauna habitat will be impacted at this site. 	<p>Site Preparation</p> <ul style="list-style-type: none"> • This borehole site requires the preparation of an area of ~30m x 40m within native vegetation. • Site preparation will be confined to the borehole foot print. In the case that vegetation clearance or other disturbance is required outside the foot print, additional assessments will be conducted. <p>Environmental Controls</p> <ul style="list-style-type: none"> • Access to the borehole site will be <i>via</i> existing roads and tracks only. • Sediment fencing will be placed downslope of the borehole site to prevent sediment transport downslope. • Topsoil and grass layer will be scraped off and set aside, for use in rehabilitation (see below). • Vehicles and machinery will not be driven over or parked underneath the dripline of trees. • Regular environmental site inspections will be undertaken at this hole to ensure compliance and adequacy of other

		<p><i>Archaeological and Cultural Heritage</i></p> <ul style="list-style-type: none"> • There are no archaeological sites recorded at or near this borehole location. • No further action is required for this borehole site in relation to cultural heritage sites 	<p>environmental controls.</p> <p><i>Rehabilitation</i></p> <ul style="list-style-type: none"> • Sumps will be filled in with stockpiled soil. • Original topsoil (containing seed), set aside during clearing, will be spread over the site. • Sediment and erosion control structures will be maintained on the site and inspected at regular intervals. • Brush matting, using locally native seed bearing material, will be undertaken post construction of the borehole to expedite regeneration.
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Plate 5: Proposed Borehole R04, supporting Shale Sandstone Transition Forest

Borehole Site	Location and Access	Environmental and Cultural Heritage Issues	Controls and Safeguards
R 05	<p>Location</p> <p>Location</p> <ul style="list-style-type: none"> • Co-ordinates of this borehole E279027. N6214555. (MGA) • This borehole is located within a cleared paddock on top of a ridge. • See Appendix 2 for sketch plan of location. <p>Access</p> <ul style="list-style-type: none"> • Access to this borehole will be via rest stop off Thirlmere Way, Picton. 	<p>Flora</p> <ul style="list-style-type: none"> • Cleared paddock dominated by exotic pasture grasses. No native species present. • No impacts to threatened flora. <p>Fauna</p> <ul style="list-style-type: none"> • There have been no threatened fauna recorded within this site. • Fauna habitat will not be impacted by the proposal at this site. <p>Archaeological and Cultural Heritage</p> <ul style="list-style-type: none"> • There are no archaeological sites recorded at or near this borehole location. • No further action is required for this borehole site in relation to cultural heritage sites 	<p>Site Preparation</p> <ul style="list-style-type: none"> • This borehole site requires the preparation of an area of ~30m x 40m within previously disturbed paddocks. • Site preparation will be confined to the borehole foot print. In the case that vegetation clearance or other disturbance is required outside the foot print, additional assessments will be conducted <p>Environmental Controls</p> <ul style="list-style-type: none"> • Access to the borehole site will be <i>via</i> existing roads and tracks only. • Sediment fencing will be placed downslope of the borehole site to prevent sediment transport downslope. • Topsoil and grass layer will be scraped off and set aside, for use in rehabilitation (see below). • Regular environmental site inspections will be undertaken at this hole to ensure compliance and adequacy of other environmental controls. <p>Rehabilitation</p> <ul style="list-style-type: none"> • Sumps will be filled in with stockpiled soil. • Original topsoil (containing seed), set aside

			<p>during clearing, will be re-spread over the site.</p> <ul style="list-style-type: none"> • Sediment and erosion control structures will be maintained on the site and inspected at regular intervals.
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Plate 6: Proposed Borehole R05


Borehole Site	Location and Access	Environmental and Cultural Heritage Issues	Controls and Safeguards
R 06	<p>Location</p> <ul style="list-style-type: none"> • Co-ordinates of this borehole E279274. N6215155. (MGA) • Located on top of a ridge, in a cleared area. • See Appendix 2 for sketch plan of location. <p>Access</p> <ul style="list-style-type: none"> • Access to Borehole R06 will be via Star Street, Picton and through cleared paddocks. 	<p>Flora</p> <ul style="list-style-type: none"> • Cleared paddock dominated by exotic pasture grasses. Some native shrubs of <i>Bursaria spinosa</i> and groundcover species of <i>Microlaena stipoides</i> and <i>Geranium homeanum</i> were recorded at this site. • No impacts to threatened flora. <p>Fauna</p> <ul style="list-style-type: none"> • There have been no threatened fauna recorded within this site. • Fauna habitat will not be impacted by the proposal at this site. <p>Archaeological and Cultural Heritage</p> <ul style="list-style-type: none"> • There are no archaeological sites recorded at or near this borehole location. • No further action is required for this borehole site in relation to cultural heritage sites 	<p>Site Preparation</p> <ul style="list-style-type: none"> • This borehole site requires the preparation of an area of ~30m x 40m within previously disturbed paddocks. • Site preparation will be confined to the borehole foot print. In the case that vegetation clearance or other disturbance is required outside the foot print, additional assessments will be conducted. <p>Environmental Controls</p> <ul style="list-style-type: none"> • Access to the borehole site will be <i>via</i> existing roads and tracks only. • Sediment fencing will be placed downslope of the borehole site to prevent sediment transport downslope. • Topsoil and grass layer will be scraped off and set aside, for use in rehabilitation (see below). • Regular environmental site inspections will be undertaken at this hole to ensure compliance and adequacy of other environmental controls. <p>Rehabilitation</p>

			<ul style="list-style-type: none"> • Sumps will be filled in with stockpiled soil. • Original topsoil (containing seed), set aside during clearing, will be spread over the site. • Sediment and erosion control structures will be maintained on the site and inspected at regular intervals.
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Plate 7: Proposed Borehole R06

Borehole Site	Location and Access	Environmental and Cultural Heritage Issues	Controls and Safeguards
R 07	<p>Location</p> <ul style="list-style-type: none"> • Co-ordinates of this borehole E277272. N6215415. (MGA) • Located in a cleared paddock upslope of Matthews Creek. The borehole is located greater than 100 m from the creek itself. • See Appendix 2 for sketch plan of location. <p>Access</p> <ul style="list-style-type: none"> • Borehole will be access via Addison Street, Picton. 	<p>Flora</p> <ul style="list-style-type: none"> • Cleared paddock dominated by exotic pasture grasses and herbaceous weeds. Some large trees of <i>Eucalyptus crebra</i>, <i>E. tereticornis</i> and <i>E. fibrosa</i> occurring nearby will not be impacted. • Scattered large trees occurring nearby will be avoided and protected, with no works occurring within 2 m of the outer dripline of the canopy. • No impacts to threatened flora. <p>Fauna</p> <ul style="list-style-type: none"> • A previous record of Glossy Black-cockatoo occurs at this site (Figure 6). • The proposed borehole will not require clearing of any native vegetation at this site. Fauna habitat will not be impacted by the proposal at this site. <p>Archaeological and Cultural Heritage</p> <ul style="list-style-type: none"> • There are no archaeological sites 	<p>Site Preparation</p> <ul style="list-style-type: none"> • This borehole site requires the preparation of an area of ~30m x 40m within previously disturbed paddocks. • Site preparation will be confined to the borehole foot print. In the case that vegetation clearance or other disturbance is required outside the foot print, additional assessments will be conducted. <p>Environmental Controls</p> <ul style="list-style-type: none"> • Access to the borehole site will be <i>via</i> existing roads and tracks only. • Sediment fencing will be placed downslope of the borehole site to prevent sediment transport downslope. • Topsoil and grass layer will be scraped off and set aside, for use in rehabilitation (see below). • Vehicles and machinery will not be driven over or parked underneath the dripline of trees. • Regular environmental site inspections will be undertaken at this hole to ensure compliance and adequacy of other

		<p>recorded at or near this borehole location.</p> <ul style="list-style-type: none"> No further action is required for this borehole site in relation to cultural heritage sites 	<p>environmental controls.</p> <p>Rehabilitation</p> <ul style="list-style-type: none"> Sumps will be filled in with stockpiled soil. Original topsoil (containing seed), set aside during clearing, will be spread over the site. Sediment and erosion control structures will be maintained on the site and inspected at regular intervals.
			
<p>Plate 8: Proposed Borehole R07</p>			

Borehole Site	Location and Access	Environmental and Cultural Heritage Issues	Controls and Safeguards
R 08	<p>Location</p> <ul style="list-style-type: none"> • Co-ordinates of this borehole E278762. N6215669. (MGA) • Borehole located in a cleared paddock on a gentle slope. • See Appendix 2 for sketch plan of location. <p>Access</p> <ul style="list-style-type: none"> • Accessed through cleared paddocks via Star Street, Picton. 	<p>Flora</p> <ul style="list-style-type: none"> • Cleared paddock dominated by exotic pasture grasses and herbaceous weeds. • Scattered large trees occurring nearby will be avoided and protected, with no works occurring within 2 m of the outer dripline of the canopy. • No impacts to threatened flora. <p>Fauna</p> <ul style="list-style-type: none"> • There have been no threatened fauna recorded within this site. • Fauna habitat will not be impacted by the proposal at this site. <p>Archaeological and Cultural Heritage</p> <ul style="list-style-type: none"> • There are no archaeological sites recorded at or near this borehole location. • No further action is required for this borehole site in relation to cultural 	<p>Site Preparation</p> <ul style="list-style-type: none"> • This borehole site requires the preparation of an area of ~30m x 40m within previously disturbed paddocks. • Site preparation will be confined to the borehole foot print. In the case that vegetation clearance or other disturbance is required outside the foot print, additional assessments will be conducted. <p>Environmental Controls</p> <ul style="list-style-type: none"> • Access to the borehole site will be <i>via</i> existing roads and tracks only. • Sediment fencing will be placed downslope of the borehole site to prevent sediment transport downslope. • Topsoil and grass layer will be scraped off and set aside, for use in rehabilitation (see below). • Vehicles and machinery will not be driven over or parked underneath the dripline of trees. • Regular environmental site inspections will be undertaken at this hole to ensure compliance and adequacy of other

		<p>heritage sites</p>	<p>environmental controls.</p> <p>Rehabilitation</p> <ul style="list-style-type: none"> • Sumps will be filled in with stockpiled soil. • Original topsoil (containing seed), set aside during clearing, will be spread over the site. • Sediment and erosion control structures will be maintained on the site and inspected at regular intervals.
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Plate 9: Proposed Borehole R08

Borehole Site	Location and Access	Environmental and Cultural Heritage Issues	Controls and Safeguards
R 10	<p>Location</p> <ul style="list-style-type: none"> • Co-ordinates of this borehole E279019. N6215997. (MGA) • Located at the top of a ridge in a cleared paddock. • See Appendix 2 for sketch plan of location. <p>Access</p> <ul style="list-style-type: none"> • Accessed through cleared paddocks via Star Street, Picton. 	<p>Flora</p> <ul style="list-style-type: none"> • Cleared paddock dominated by exotic pasture grasses and herbaceous weeds. • Scattered large trees occurring nearby will be avoided and protected, with no works occurring within 2 m of the outer dripline of the canopy. • No impacts to threatened flora. <p>Fauna</p> <ul style="list-style-type: none"> • There have been no threatened fauna recorded within this site. • Fauna habitat will not be impacted by the proposal at this site. <p>Archaeological and Cultural Heritage</p> <ul style="list-style-type: none"> • There are no archaeological sites recorded at or near this borehole location. • Due to the aspect of the site it has been recommended by the Aboriginal 	<p>Site Preparation</p> <ul style="list-style-type: none"> • This borehole site requires the preparation of an area of ~30m x 40m within previously disturbed paddocks. • Site preparation will be confined to the borehole foot print. In the case that vegetation clearance or other disturbance is required outside the foot print, additional assessments will be conducted. <p>Environmental Controls</p> <ul style="list-style-type: none"> • Access to the borehole site will be <i>via</i> existing roads and tracks only. • Sediment fencing will be placed downslope of the borehole site to prevent sediment transport downslope. • Topsoil and grass layer will be scraped off and set aside, for use in rehabilitation (see below). • Vehicles and machinery will not be driven over or parked underneath the dripline of trees. • Regular environmental site inspections will be undertaken at this hole to ensure compliance and adequacy of other

		<p>stakeholders from both groups that the borehole site be monitored whilst any clearance or excavation of the sumps is carried out. This would involve excavating at a slower than normal rate (in approximately 150 mm splits, until either natural clay or rock is uncovered). If any aboriginal artefacts are uncovered work would have to stop and a new borehole location would have to be determined.</p>	<p>environmental controls.</p> <p>Rehabilitation</p> <ul style="list-style-type: none"> • Sumps will be filled in with stockpiled soil. • Original topsoil (containing seed), set aside during clearing, will be spread over the site. • Sediment and erosion control structures will be maintained on the site and inspected at regular intervals.
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Plate 10: Proposed Borehole R10

Borehole Site	Location and Access	Environmental and Cultural Heritage Issues	Controls and Safeguards
R 13	<p>Location</p> <ul style="list-style-type: none"> • Co-ordinates of this borehole E277338. N6213974. (MGA) • Located on a gentle slope in a cleared paddock, upslope of a tributary of Matthews Creek. • See Appendix 2 for sketch plan of location. <p>Access</p> <ul style="list-style-type: none"> • Accessed via Innes Street, Picton, over cleared paddocks. 	<p>Flora</p> <ul style="list-style-type: none"> • Cleared paddock dominated by exotic pasture grasses. Some native shrubs of <i>Bursaria spinosa</i> and groundcover species of <i>Microlaena stipoides</i> were recorded at this site. • No impacts to threatened flora. <p>Fauna</p> <ul style="list-style-type: none"> • There have been no threatened fauna recorded within this site. • Fauna habitat will not be impacted by the proposal at this site. <p>Archaeological and Cultural Heritage</p> <ul style="list-style-type: none"> • There are no archaeological sites recorded at or near this borehole location. • No further action is required for this borehole site in relation to cultural heritage sites 	<p>Site Preparation</p> <ul style="list-style-type: none"> • This borehole site requires the preparation of an area of ~30m x 40m within previously disturbed paddocks. • Site preparation will be confined to the borehole foot print. In the case that vegetation clearance or other disturbance is required outside the foot print, additional assessments will be conducted. <p>Environmental Controls</p> <ul style="list-style-type: none"> • Access to the borehole site will be <i>via</i> existing roads and tracks only. • Sediment fencing will be placed downslope of the borehole site to prevent sediment transport downslope. • Topsoil and grass layer will be scraped off and set aside, for use in rehabilitation (see below). • Regular environmental site inspections will be undertaken at this hole to ensure compliance and adequacy of other environmental controls. <p>Rehabilitation</p>

			<ul style="list-style-type: none"> • Sumps will be filled in with stockpiled soil. • Original topsoil (containing seed), set aside during clearing, will be spread over the site. • Sediment and erosion control structures will be maintained on the site and inspected at regular intervals.
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Plate 11: Proposed Borehole R13

Diagram 1: Typical Site Layout for Exploration Core Rig (Diagram developed by McDermott's Drilling).

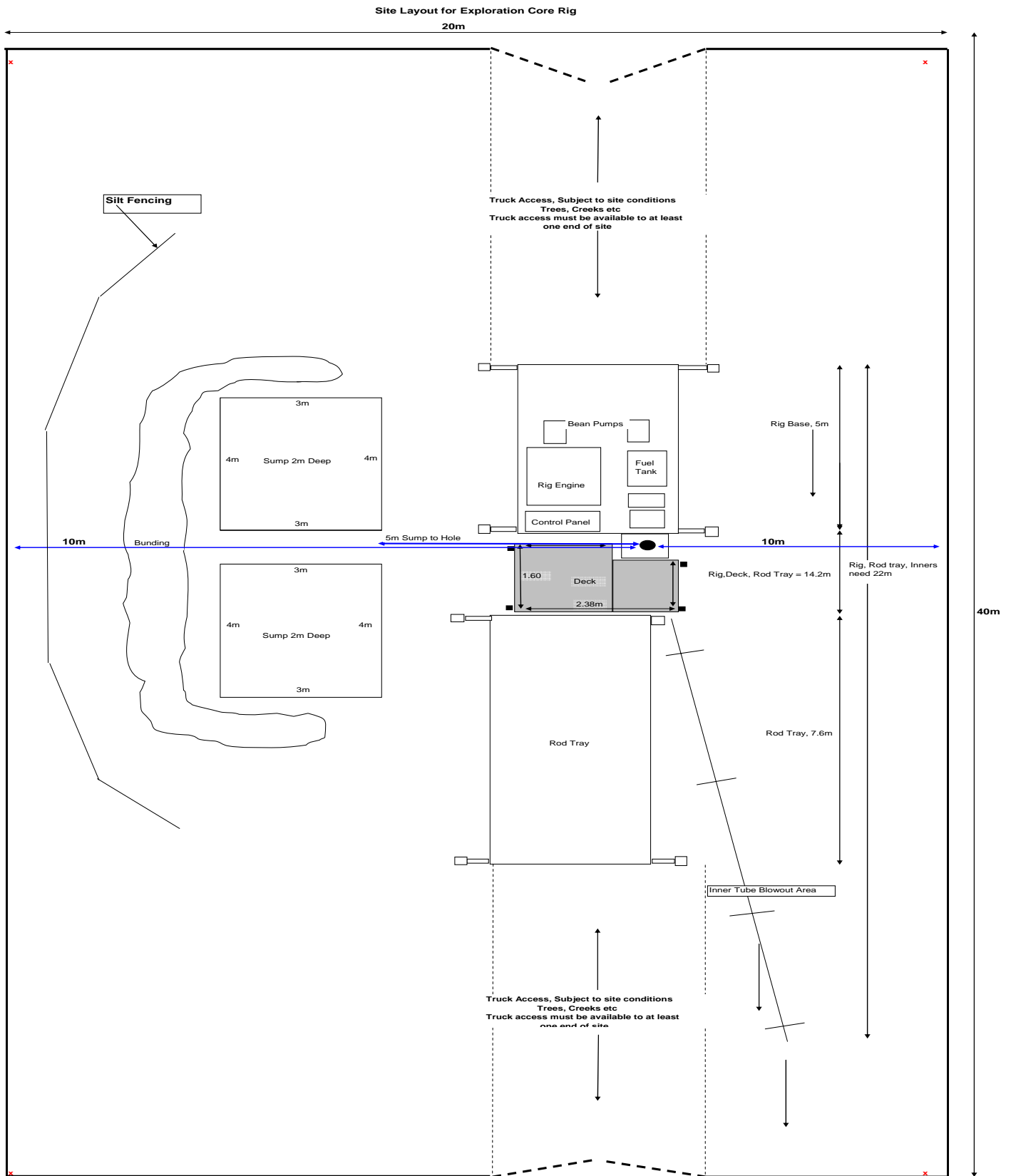
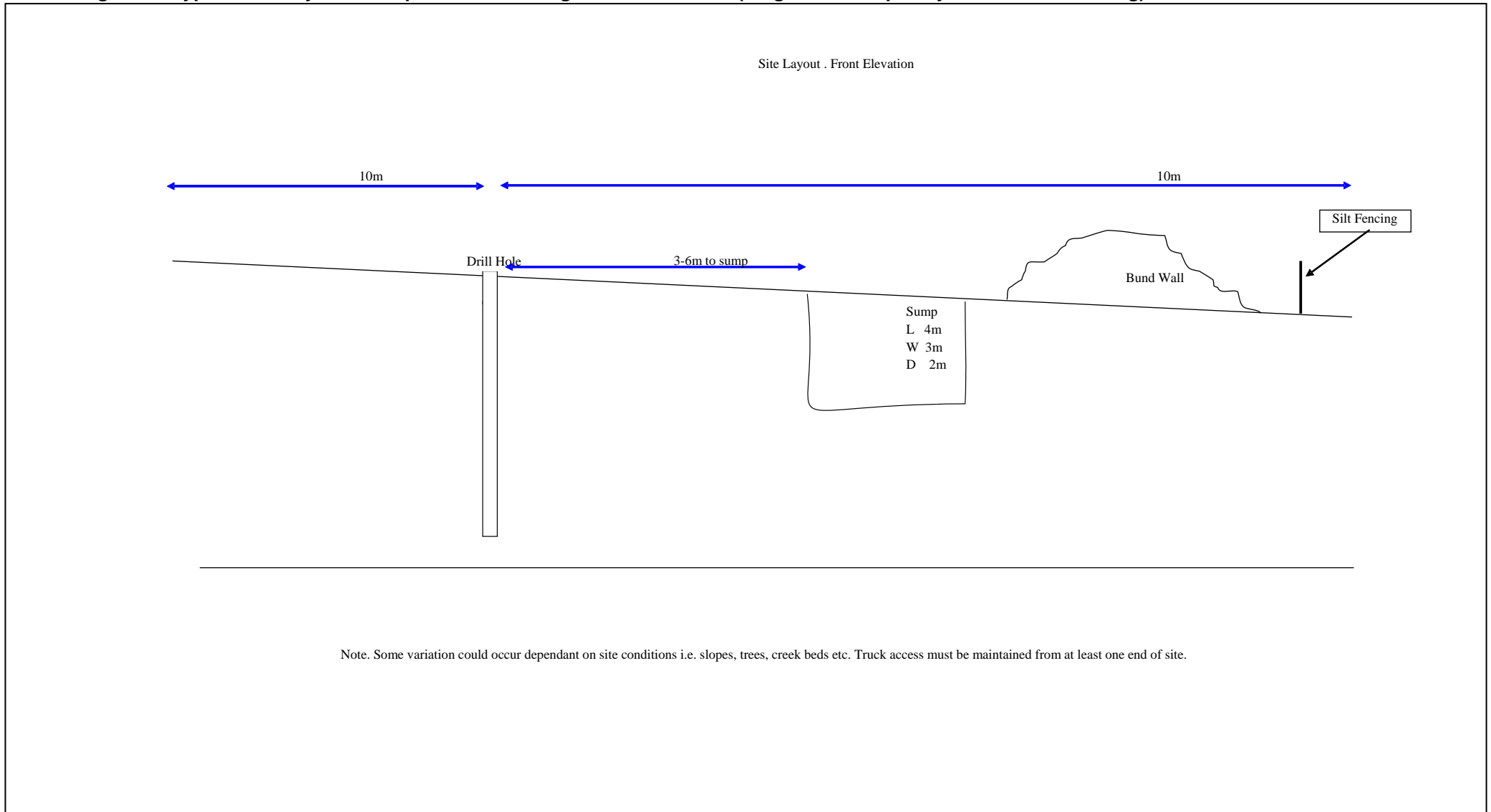


Diagram 2: Typical Site Layout for Exploration Core Rig – Front Elevation (Diagram developed by McDermott’s Drilling)



3.0 PLANNING CONTEXT

Tahmoor Coal is proposing to carry out mining exploration activities to determine the quality of coal within one of their Mineral Exploration Licence areas. Previously the only approval required for such work was under the Mining Act 1992 via a Surface Disturbance Notice (Appendix 3).

A Review of Environmental Factors (REF) under Part 5 of the Environmental Planning & Assessment (EP&A) Act 1979 is required in addition to permission under the Mining Act 1992. The Department of Primary Industries (DPI) will be the consent authority under Part 5 for Tahmoor Coal's proposed exploration works.

Other legislation, guidance and policies are applicable to Tahmoor Coal's proposed exploration activities based on the nature of the work, environmental factors and geographical location. The relevant regulatory framework is discussed below.

3.1 Federal Legislation

3.1.1 Environmental Protection & Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is environment and heritage legislation which applies across Australia. This Act requires approval from the Department of the Environment, Water, Heritage and the Arts for any action that has, will have, or is likely to have, a significant impact on the seven listed 'controlled matters' of National Environmental Significance.

These matters are:

1. World Heritage properties
2. National Heritage places
3. Wetlands of international importance
4. Threatened species and ecological communities
5. Migratory species
6. Commonwealth marine or land areas
7. Nuclear actions (including uranium mining)

The proposed exploration surveys are not within a World Heritage site, a National Heritage place, a wetland or a Commonwealth marine or land area.

Appendix 1 of this REF considers potential impacts of the proposed program on habitat for threatened species and ecological communities and confirms that the proposed development will

not have any impact on such values. The proposal will not affect migratory species due to the drilling equipment only being in place for a short time.

Tahmoor Coal's proposed development does not have any relationship to nuclear actions. As the exploration activity will not have any impact on controlled matters Tahmoor Coal do not believe the proposed development requires referral or assessment in relation to the EPBC Act 1999.

3.2 NSW Legislation

Relevant state planning controls and strategic planning guidance is assessed below.

3.2.1 Environmental Planning & Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* legislates the Town Planning process for consideration of all developments within New South Wales. This Act is administered by the Department of Planning (DoP) and defines the relevant consent authority for proposed developments.

The EP&A Act defines numerous objectives. The objectives relevant to the proposed exploration survey program are to encourage:

- The proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment
- The protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats
- The sharing of the responsibility for environmental planning between the different levels of government in the State

The proposed exploration survey program will permit Tahmoor Coal to determine resource quality and ensure mining activities are co-ordinated and located correctly. This preliminary work will ensure Tahmoor Coal's future developments are properly managed to conserve resources and minimise impacts on communities and the environment.

As detailed above, approval for these works are sort under Part 5 of the EP&A Act and DPI are the nominated consent authority under Clause 110A. An assessment of the potential impacts of the proposal to impact threatened species, populations or ecological communities in accordance with Part 5 of the EP&A Act is provided in Appendix 1.

Clause 111 of the EP&A Act dictates the consent authority must take specified matters into account prior to determining an application under Part 5. These matters and Tahmoor Coal's compliance are assessed in Table 2.

Table 2: Compliance with Clause 111 of the EP&A Act.

Requirement of EP&A Act	Tahmoor Coal Compliance
To the fullest extent possible, all matters affecting or likely to affect the environment due to the proposed activity.	This REF identifies and assesses all matters affecting or likely to affect the environment due to the proposed exploration. No unacceptable impact to the environment have been identified.
Any conservation agreement entered into, or any plan of management under the National Parks and Wildlife Act 1974 applying to any part of the land to which the activity relates.	The land (s) on which the activities are proposed are not subject to an agreement or plan of management under the NP&W Act.
Any joint management agreement entered into under the Threatened Species Conservation Act 1995 .	The proposed activity will have no impact on any agreement under the TSC Act.
Any biobanking agreement entered into under Part 7A of the Threatened Species Conservation Act 1995 that applies to any part of the land to which the activity relates.	The proposed activity will have no impact on biobanking agreements.
The effect of an activity on any wilderness area in the locality in which the activity is intended to be carried on.	The activity will not affect any Wilderness area.
Critical habitat, threatened species or populations and ecological communities and any other protected fauna or protected native plants within the meaning of the National Parks and Wildlife Act 1974 .	<p>No critical habitat, or threatened species or populations will be impacted by the proposed exploration activities. Some native vegetation to be cleared comprises a degraded form of the EEC, Shale Sandstone Transition Forest, listed under the TSC and EPBC Acts. Assessments of significance of the impacts of this proposed clearing were conducted. It is considered that there will be no significant impact on this EEC. Measures will be taken (as discussed in sections 2.2.1, 5.3 and 5.4) to prevent indirect impacts on habitat for threatened species.</p> <p>The activity has no impact on the other listed matters.</p>

This REF demonstrates that the proposed drilling activity is in accordance with Part 5 and particularly Clause 111 of the EP&A Act.

3.2.2 Environmental Planning & Assessment Regulations 2000

The Environmental Planning & Assessment Regulations 2000 (the Regulations) support the EP&A Act by providing further information on related matters. Part 14 of the Regulations relates to development applications under Part 5 of the EP&A Act and is thus relevant to this Tahmoor Coal Proposal.

Tahmoor Coal will progress this project in accordance with relevant clauses from the Regulations. Clause 228 lists matters to be taken into account concerning the impact of a facility on the environment. This REF ensures all matters in this clause relevant to the proposed development are considered and assessed. This REF does not find any significant impact in relation to these matters.

3.2.3 Mining Act 1992

As Tahmoor Coal is a mining company their activities are regulated by the Mining Act 1992. The Mining Act requires individuals or companies to obtain approval for exploration and leases relating to mining activities. This Act also directs matters which the Minister must take into account prior to granting an authority to carry out mining activities; it also controls exploration and mining activities through consent conditions.

Part 11 of the Mining Act relates to protection of the environment. Clause 238 empowers the Minister or delegated consent authority to include conditions on any exploration or mining authority to ensure the protection of flora, fauna, fish, fisheries, scenic attractions and features of Aboriginal, architectural, archaeological, historical or geological interest.

Clause 239 of the Mining Act permits conditions relating to the rehabilitation of land affected by exploration or mining to be included on any authority.

Approval for the proposed drilling work for exploration purposes is required under the Mining Act in addition to permission required under Part 5 of the EP&A Act. Tahmoor Coal currently holds Exploration Authorisation No. 206 and 410. The proposed activities will be undertaken within Mining Leases ML1376 and EA410. Tahmoor Coal will meet the requirements of the Mining Act by complying with all conditions of their Exploration Authorisation(s).

3.2.4 Protection of Environment Operation Act 1997

The *Protection of Environment Operation Act 1997* (POEO Act) 1997 is a major aspect of the NSW Government's legislation to protect the environment. This Act is administered by the Environmental Protection Authority which is part of the Department of Environment and Climate Change. The POEO Act permits Environmental Protection Licences (EPL) to be granted for air pollution, water pollution, noise pollution and waste management.

In relation to the proposed exploration works an EPL is not required as the works are not a scheduled activity for which an EPL is required under Schedule 1 of the POEO Act. Additionally, there will be no pollution requiring control. This is because:

- The only air pollution will be from petrol or diesel engines used to power vehicles or the drilling rig
- The location of work is away from natural water courses and bodies
- The location of work is away from sensitive noise receivers or if in close proximity to residences will only be undertaken with land owner consent
- Any waste generated will be taken away from site and disposed of in accordance with procedures relating to the type of waste.

3.2.5 National Parks & Wildlife Act 1974

The *National Parks & Wildlife Act 1974* (NP&W Act; NSW) is administered by the National Park and Wildlife Service and manages:

- Conservation of nature
- Conservation of objects, places and features of cultural value
- Public appreciation, understanding and enjoyment of nature and cultural heritage
- Land reserved under this Act

When determining applications under this Act consideration must be given to the objectives listed above, the public interest and appropriate management of the subject land of the application. This Act stringently controls activities which are carried out in designated Parks, Reserves and Aboriginal areas.

The proposed exploration works are in accordance with the NP&W Act where relevant. This is for the following reasons.

Tahmoor Coal's proposed exploration works will not be within a Park, Reserve or Area designated under Part 4 of the NP&W Act. The specific locations of the boreholes have been assessed by an appropriately qualified ecologist and archaeologist, and where necessary, were relocated to ensure minimal impact on protected flora, fauna or habitat or items of cultural significance. This will ensure the proposed activities are in compliance with Parts 7, 8, and 8A of the NP&W Act.

The proposed works have been assessed by a qualified archaeologist who is experienced in Aboriginal Cultural Heritage assessment work. Relevant Aboriginal representatives from the Tharawal Local Aboriginal Land Council and Cubbitch Barta Native Title Claimants Aboriginal Corporation were consulted and participated during the field survey. Appropriate cultural heritage registers have been checked and the proposed borehole sites have not been located near any known places or items of value listed under the NSW NP&W Act.

The proposal will not impact on matters subject to this Act. Further assessments or applications

permitting the activity are not required under the NP&W Act.

3.2.6 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act* (TSC Act; NSW) protects threatened species, populations, communities and critical habitat in New South Wales. Protection is provided under the Act for species, populations and ecological communities which are considered to be endangered, vulnerable or extinct. Any activity which may have an impact on protected animals, plants or locations is rigorously assessed to ensure the justification is strong enough to permit the impact to progress.

Appropriately qualified ecologists have assessed the proposed boreholes. The area to be disturbed will be small and the specific locations for drilling activities will not have a significant impact upon any:

- Endangered species or populations listed in Schedule 1 of the TSC Act
- Critically endangered species or ecological communities listed in Schedule 2 of the TSC Act
- Vulnerable species or ecological communities listed in Schedule 3 of the TSC Act

During survey, native plant species identified within the disturbance footprint for two of the borehole sites (MD05 and R04) were considered to constitute part of the EEC, Shale Sandstone Transition Forest. Assessments of Significance (EPBC and TSC Acts) have been completed for this EEC (Appendix 1) and found that the proposal is considered unlikely to significantly impact that community. Additionally, it is considered highly unlikely that the proposal would have a significant impact on potential habitat for any threatened biota which occurs within 10 km of the site (Tables 7 and 8).

Access routes which do not impact on any flora, fauna or habitat listed on the TSC Act have been identified and will be utilised by the proposal. Employees will be instructed not to take equipment in to areas which have not been selected for exploration activities or transportation routes.

3.2.7 Native Vegetation Conservation Act 2003

The *Native Vegetation Conservation Act 2003* (NSW) protects trees, plants and understorey growth which are identified as being indigenous to Australia. The main aims of this Act are to manage and improve all native vegetation and protect areas of high quality. The Act specifically controls clearance of native vegetation. Part 2 of this Act defines clearing of native vegetation to include cutting down, felling, thinning, logging or removing.

Tahmoor Coal's proposed bore holes have been located with care to ensure that native vegetation is not unnecessarily disturbed or removed due to the exploration activities. This will ensure that approval under Part 3 of this Act is not required for the proposed works.

3.2.8 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FMA Act; NSW) applies to all waters in NSW. The objectives are to conserve, develop and share the fishery resources of the State for the benefit of present and future generations. In particular the Act seeks to protect fish stocks, habitat and threatened communities whilst permitting fishing activities and promoting ecologically sustainable development and conservation of biodiversity. Only the following sections of this Act have any relation to the proposed exploration activities:

- Part 7A - legislates for the protection of fish and marine environments
- Schedule 6 - lists key threatening processes which detrimentally impact fish and aquatic environments.

Tahmoor Coal's proposal will not impact on the objectives of this Act as all drilling sites are not within, or on the banks of a water course or have any impact on aquatic life or environments. Additionally, the drilling works do not constitute a key threatening process. Therefore no further assessment of Tahmoor Coal's exploration works under this Act is required.

3.2.9 Water Management Act 2000

The *Water Management Act 2000* (WM Act; NSW) came into force on 8 February 2000. On 4 February 2008 the *Rivers and Foreshore Improvement Act 1948* was repealed as the *Water Management Act 2000* provides the necessary and up to date controls.

The Water Management Act applies to designated water management areas within NSW. The majority of this Act provides legislation for the conservation of, and regulation of access to, water resources. The Act also promotes the protection of aquatic environments and adjacent land and encourages ecologically sustainable development.

There are six water management areas in which this Act applies; these are within the regions of:

1. Barwon
2. Central West
3. Hunter
4. Murray Murrumbidgee
5. North Coast
6. South Coast

The closest water management area to the proposed exploration activities is in the South Coast region. Figure 3 depicts the borehole sites within the South Coast region in which the Water Management Act is applicable. Tahmoor Coal's proposed activities are just south of Picton which is clearly shown outside the area bounded by the red line (Figure 3) and as such do not have any water resources which are controlled by this Act.

As the proposed exploration activities are not within an area which is controlled by the Water Management Act 2000 no further assessment is required.

3.3 State Environmental Planning Policies

3.3.1 State Environmental Planning Policy (Mining, Petroleum, Production & Extractive Industries) 2007

This SEPP is in place due to the importance of mining to NSW, it sets out aims and objectives to support the mining industry. The aims of the SEPP are:

- a) To provide for the proper management and development of mineral, petroleum and extractive material resources for the purpose of promoting the social and economic welfare of the State
- b) To facilitate the orderly and economic use and development of land containing mineral, petroleum and extractive material resources
- c) To establish appropriate planning controls to encourage ecologically sustainable development through the environmental assessment, and sustainable management, of development of mineral, petroleum and extractive material resources

This SEPP also provides conditional approval for certain types of related activities to be undertaken without requiring approval under the EP&A Act. Guidance is also provided to consent authorities on relevant matters to be considered during the determination of a related application.

The proposed exploration activities are not exempt, complying or prohibited development as defined by this SEPP. This confirms consent is required under the EP&A Act (as detailed above). Clauses relevant to Tahmoor Coal's proposed exploration activity from this SEPP are discussed below and assessment provided to confirm that the proposed development is compliant.

Clause 12 of the Mining, Petroleum and Extractive Industries SEPP details matters which the consent authority must consider prior to issuing a decision regarding an application under the EP&A Act. These matters are listed and considered against the proposed development in Table 3.

Table 3: Consideration of Mining, Petroleum, Production & Extractive Industries SEPP

Requirements of SEPP	Tahmoor Coal Compliance
Consideration of existing and approved uses of land in the vicinity of the development.	The existing land use is rural open space. The exploration activities will not affect this use or constitute a development which prevents this use from continuation. Further, the proposed works will only be undertaken in consultation with existing land users so as not to compromise existing lands use.
Consideration of significant impact on uses that is likely to be the preferred use of land in the vicinity of the development.	The exploration activities will not have a significant impact on the use of the land as they are temporary in nature thus not altering existing or future land uses.
Any ways in which the development may be incompatible with any of those existing, approved or likely preferred uses.	The development will not be incompatible with existing land uses as the specific location for drilling will be rehabilitated following works.
Evaluate and compare the respective public benefits of the development and the land uses referred to above.	Not applicable as the land use will not alter due to the proposed temporary development.
Evaluate any measures to avoid or minimise incompatibility between proposed activity and existing use.	The specific drilling locations have been selected with care to minimise impacts on the environment. Backfilling of holes and rehabilitation of disturbed areas will ensure vegetation will regrow to remove any damage caused and permit the existing use of the land to continue unaffected.

Clause 14 of this SEPP directs consent authorities that the following matters in relation to the protection of the environment must be considered prior to determining a development application under the EP&A Act:

- Impacts on significant water resources, including surface and groundwater resources, are avoided, or are minimised to the greatest extent practicable
- Impacts on threatened species and biodiversity, are avoided, or are minimised to the greatest extent practicable
- Greenhouse gas (GHG) emissions are minimised to the greatest extent practicable

- An assessment of greenhouse gas emissions

Tahmoor Coal's proposed development will not have any impact on water resources due to the nature of the activity. As detailed above there will be no significant impacts on threatened species or biodiversity.

The only greenhouse gas emissions directly related to the exploration works is from petrol or diesel engines powering vehicles and the drilling rig. It is not possible to avoid the requirement for these engines. To ensure emissions are minimised engines will be turned off when not required. The addition to GHG emissions from the exploration activities in this REF will be an insignificant percent of GHG emissions from NSW mining related activities.

Clause 17 dictates a consent authority must have regard to a potential requirement for the rehabilitation of land following conclusion of mining related activities. Tahmoor Coal will backfill and securely cap bore holes and reinstate topsoil prior to leaving site. Due to the minor nature of the works no additional rehabilitation works are required.

Tahmoor Coal believes that this REF demonstrates the proposed exploration activities fully comply with relevant sections of SEPP (Mining, Petroleum and Extractive Industries) 2007. Upon the acceptance of this REF, DPI will have considered matters relevant to allow the application to be determined.

3.4 Regional Environmental plans

The Greater Metropolitan Regional Environmental Plan No., 2 – Georges River Catchment protects the catchment area of the Georges River that flows from near Appin to Botany Bay via the Western Sydney suburbs. The proposal is not within or near to the Georges River Catchment and therefore does not require further consideration under this instrument.

3.5 Local Planning Controls

3.5.1 Local Environmental Plan and Zoning

The proposed exploration works are within Wollondilly Shire Council's administrative boundaries, where the Wollondilly Local Environmental Plan 1991 zones the administrative area and provides planning controls. The boreholes are in several different land use zones. These are 1(a) Agricultural Zone, 1(a2) Rural "A2" Zone, 1(a3) Rural "A3" Zone and 6(a) Open Spaces Recreation. The objectives of each zone are detailed in Table 4.

Table 4: Zoning of the Study Area

Zone	Primary Objectives
Wollondilly Local Environmental Plan 1991	
1(a) Agricultural Zone	<p>(a) to promote and maintain sustainable agricultural uses, and</p> <p>(b) to recognise the importance of the preservation of high-class agricultural land for agricultural purposes, and</p> <p>(c) to minimise the incidence of existing and potential rural land use conflict, and</p> <p>(c1) to maintain existing significant stands of indigenous vegetation, and</p> <p>(c2) to allow for the development of non-agricultural land uses which are compatible with the character of the zone, and</p> <p>(c3) to minimise the impact of noxious weeds on agricultural production, and</p> <p>(d) to protect the water quality of receiving streams and to reduce land degradation, and</p> <p>(e) to minimise the impact of development on the existing agricultural landscape character.</p>
1(a2) Rural A2 Zone	<p>(a) to protect the agricultural potential of rural land and to prevent fragmentation of viable rural holdings, and</p> <p>(b) to prevent inappropriate, premature and sporadic subdivisions and to ensure consolidation of urban areas so as to enhance the prospect of economic provision of services, and</p> <p>(c) to prevent, on the fringe of urban areas, the subdivision of land into small lots which would prejudice the proper layout of additional urban areas as a result of natural growth, and</p> <p>(d) to retain the scenic quality and overall character of the land,</p> <p>(e) to encourage agricultural activities that are within the rural capability of the land.</p>
1(a3) Rural A3 Zone	<p>(a) to protect the agricultural potential of rural land and to prevent fragmentation of viable rural holdings, and</p> <p>(b) to prevent inappropriate, premature and sporadic subdivisions and to ensure consolidation of urban areas so as to enhance the prospect of economic provision of services, and</p> <p>(c) to prevent, on the fringe of urban areas, the subdivision of land into small lots which would prejudice the proper layout of additional urban areas as a result of natural growth, and</p> <p>(d) to retain the scenic quality and overall character of the land,</p> <p>(e) to encourage agricultural activities that are within the rural capability of the land.</p>
6(a) Open Space A Recreation Zone	<p>(a) the objectives of this zone are to recognise and ensure that publicly owned land is developed for open space recreation, to encourage the development of open space which best satisfies community needs and to permit development associated with or complementary to open space</p> <p>(b) works for the purposes of gardening, landscaping or bushfire hazard control.</p> <p>(c) Agriculture; community centres; drainage; forestry; land filling operations; parking; racecourses; recreation areas; recreation facilities; roads; showgrounds; sportsgrounds; telecommunications facilities; utility installations (other than generating works).</p> <p>(d) Any purpose other than a purpose included in Item 2 or 3.</p>

The proposal is to be determined under Part 5 of the EP&A Act, as such, an approval from Wollondilly Shire Council (in accordance with the LEP) is not necessary. However, these works are not prohibited or exempt development under either zoning, resulting in the development being permissible with consent. Further, the proposal is not at odds with the objective of each of the zones identified in Table 4.

As the proposed exploration activities are required in relation to mining and as the proposal is such a minor development with no significant environmental harm it is likely that Wollondilly Shire Council would have no objections to the proposal.

3.5.2 Wollondilly Draft Local Environmental Plan 2009

Wollondilly Shire Council's website advises the following:

"The amended Draft Wollondilly Local Environmental Plan 2009 was reported to Council in August this year, where Council resolved to endorse the changes and resolved to place the amended draft plan on public exhibition once the Department of Planning enables Council to do so. Council is also in the process of preparing a new Draft Development Control Plan to accompany the Draft LEP.

Council anticipates that the Draft LEP and Draft DCP will be placed on exhibition in late 2008, early 2009".

(Source: <http://www.wollondilly.nsw.gov.au/planning/1328/12638.html>)

Discussions with Council on 11 March 2009 indicate Council is unwilling to issue copies of the Draft LEP. It is likely the activity will continue to be a permissible use under the new LEP.

3.5.3 Development Control Plans

Wollondilly Shire Council only has one Development Control Plan (DCP) which has any association with the proposed development:

DCP 36 – Development in Rural Areas

The purpose of this DCP is to ensure that development carried out in rural zoned areas does not detract from rural amenity. To help achieve this, the plan provides controls and guidelines in relation to subdivision, agriculture, residential, non residential and services.

The DCP has controls relating to protection of the natural environment. It seeks to ensure that development takes account of the physical constraints of the land and promotes development in harmony, rather than in conflict, with the environment. Such controls relate to:

- Erosion and sediment control
- Tree preservation

- Heritage

The proposed exploration works are in accordance with this DCP as, if required, relevant erosion and sediment control measures will be implemented during drilling works. No mature trees will be damaged or removed due to this development and there are no heritage items impacted.

3.6 Licenses and Approval Required

Section 3.0 describes the relevant process for the approval of the proposed exploration activities.

Relevant licences that apply to the proposed drilling operation include:

- Exploration Authorisation No.410, expiry 5 December 2010

3.7 Stakeholder Consultation

Consultation undertaken during the preparation of this REF involved:

- Consultation with landholders to agree upon access and compensation requirements
- Consultation with Donna Whillock from Tharawal Local Aboriginal Land Council and with Glenda Chalker from Cubbitch Barta Native Title Claimants Aboriginal Corporation.

No other stakeholder consultation is considered necessary.

4.0 EXISTING ENVIRONMENT

4.1 Landform and Geology

The exploration area is located on undulating hills and plains that are incised by tributaries of the Nepean and Bargo Rivers. The Study Area is situated in the southern section of the Cumberland Plain, on what Hazelton and Tille (1990) define as the Cumberland Lowlands. This area is on the edge of the Cumberland Plain where it meets the Woronora Plateau. The Cumberland Lowlands and Woronora Plateau have very similar physiographic features in the region where the lowlands are steeply incised by the Nepean and Bargo Rivers and their larger tributaries; essentially the Study Area is a transitional zone between the two physiographic regions. The geology of the region consists of sandstones and shales from the mid-Triassic. The majority of the Study Area is situated on Wianamatta Shale. The shale overlies Hawkesbury Sandstone, and the sandstone is present at the surface where it has been exposed by the Bargo River and larger tributaries, usually as steep, blocky scarps flanking the drainage lines.

The soils of the exploration area are derived from the Wianamatta Shales. Drilling will be targeting the Illawarra Coal Measures.

4.2 Climate

The climate is warm temperate (warm to hot summers and mild to cool winters).

5.0 ENVIRONMENTAL IMPACTS AND MANAGEMENT

5.1 Air Quality

Vehicle exhaust will be from the drill rig and personnel vehicles. The vehicle exhaust emissions will meet acceptable standards for registered vehicles.

The proposed works will not result in any significant impacts on air quality.

5.2 Green House Gas Emissions

Greenhouse gas emissions were assessed by examining the expected diesel consumption while under taking the drilling operation. It was determined that the following quantities of diesel would be consumed:

Excavators:

- Excavators consume approximately 80 L of diesel fuel/day
- 10 boreholes x 1 days/hole set up and pack up = 10 x 80 L/day = 800 L
- Total diesel usage for excavators: 800 L

Drilling Rigs

- Drilling rigs consume approximately 150 L of diesel fuel/day
- 10 borehole @ 25 days/hole = 10 holes x 25 days/hole x 150 L/day = 37,500L
- Total diesel usage for drilling rigs: 37,500L

Personnel Transports to Drill Sites

- One 4wd vehicle has been estimated to use 20 L of diesel/day
- A total of 27 days of drilling and site set up/pack up are anticipated per hole
- Total diesel usage for the personnel transport: 5,400 L

Total Diesel Usage (estimate) = 43,700L

The total full fuel cycle emissions generated from the consumption of the quoted figure of 43,700 L of diesel are calculated using the Australian Greenhouse Office Factors and Methods Workbook (Dec 2006). Table 1 from this workbook states an energy content (conversion factor) of 38.6GJ/kl of automotive diesel oil. From this, we get $43.7 \text{ kl} * 38.6\text{GJ/kl} = 1686.82 \text{ GJ}$ of energy. This table also makes note of Scope 1, Scope 3 and full fuel cycle (FFC) emission factors. The FFC emission factor for diesel is stated as being 77.2 kg CO₂-e/GJ. As such, the emissions then can be calculated

as: $1686.82 \text{ GJ} * 77.2 \text{ kg CO}_2\text{-e/GJ} = 130,222.50 \text{ kg CO}_2\text{-e}$ or 130.2 tonnes CO₂-e.

In terms of options for mitigation of these emissions, all diesel equipment utilised is fit for the task, with the machinery maintained for efficient operation. Given the small quantity of emissions generated, further mitigation efforts are not considered necessary.

5.3 Water

The proposed activity does not involve any significant soil excavation or disturbance. Furthermore, measures are proposed that will minimise any surface soil disturbance. Vehicles will be kept on existing farm roads or within cleared areas.

All vehicles will be parked in a way so as not to damage any vegetation (see Table 1) and will not impede the movements of other vehicles along tracks.

Water courses and drains in the vicinity of the sites will remain unaltered and there will be no dirty water runoff generated as a result of the activity during or after the works. Furthermore, appropriate run off and sediment control will be placed around the drill sites to prevent any dirty water run off in the event of rain.

There will be no use of chemicals or hazardous materials during the proposed works. The only consumables of concern involve fluids used by the vehicles necessary for the site works, such as diesel, petrol, oil and grease. All of these fluids are contained within the vehicle compartments fit for the purpose and will be inspected to ensure that there are no leaks prior to entry into the area.

As a further precaution bunding with sufficient capacity to completely contain any potential fuel spills will be located on site.

5.3.1 Surface water

The Study Area is located within the catchment of Redbank and Matthews Creeks. Redbank Creek and Matthews Creek are tributaries of Stonequarry Creek, which flows into the Nepean River.

None of the ten proposed boreholes will impact creeks, drainage lines, rivers or dams. Sufficient water management activities will be in place to ensure that the exploration activities do not interfere with or degrade the surface water of the local area.

5.3.2 Ground water

The proposed borehole will not be utilised for groundwater extraction. There will be no impact on local groundwater.

5.4 Soils

The soils of the exploration area are predominantly shale derived soils overlying sandstone. These

soils are generally suitable for grazing and cultivation.

Site preparation will involve earthworks for the construction of drill pads, in-ground water management sumps and the preparation of bunds around the drill sites. This disturbance provides the potential for localised increased erosion and sedimentation.

Appropriate sedimentation and erosion controls will be employed at each site (see Table 1), along temporary access tracks and around soil bunds. Appropriate control measures include:

- Minimal ground disturbance
- Topsoil from excavations or sumps to be stockpiled for use in rehabilitation
- Upslope drains will divert upslope runoff water around disturbance areas although it should be noted that in general the drill sites will attempt to be located on flat areas rather than on hill sides
- Sediment fences to be erected around the down slope sides of topsoil stockpiles and disturbance areas
- The sites will be rehabilitated immediately after drilling activities have been completed

5.5 Noise and Vibration

Potential noise and vibrations associated with the proposed activities may derive from drilling and excavation equipment. These impacts are extremely localised and the implications of these impacts have been fully discussed within residents and landholders who may be affected.

All boreholes have been located at distances greater than 200m from any primary residence.

In the event that any complaints are received in respect to noise, consultation and investigation would be undertaken to assess the nature of the concerns and identify options to mitigate the noise.

5.6 Flora and Fauna

The Study Area was inspected by Sian Wilkins on 15 April 2009. Appendix 1 contains the Flora and Fauna Assessment of the ten borehole sites.

The majority of the borehole sites occur on land that has been previously cleared and heavily grazed. Two of the sites (MD05 and R04) are located within small cleared areas which support limited cover of native shrub and groundcover species that are typically represented in the nearby intact portions of native vegetation. Sediment fencing will be adequate to prevent sediment from being transported to adjacent and nearby patches of intact native vegetation. Native trees occur in proximity to six borehole sites (MD05, MD06, R03, R04, R07 and R08) in these cases trees will be retained and vehicles/machinery will not be driven or parked within 2 m of the drip line of these tree canopies.

Native plant species identified within the disturbance footprint for two of the borehole sites (MD05 and R04) were considered to constitute part of the EEC, Shale Sandstone Transition Forest listed on both the TSC and EPBC Acts (Figure 4). These native plant species occur on or near the edge of remnants in good to moderate condition. Assessments of Significance (EPBC and TSC Acts) have been completed for this EEC (Appendix 1) and found that the proposal is considered unlikely to significantly impact that community. A Species Impact Statement (NSW) and/or a Referral to the Federal Environment Minister (Commonwealth) are not recommended for this EEC.

No threatened flora listed on the TSC or EPBC Acts have previously been recorded at or in close proximity to the ten proposed borehole sites (Figure 5). Native vegetation at Boreholes MD05 and R04 provides potential habitat for a number of threatened flora and fauna species, none of which were recorded at this site during surveys. Previous records of threatened fauna occur in areas adjacent to borehole R07 (Figure 6): Glossy Black Cockatoo. Potential habitat for threatened biota will not be impacted by the proposal, and on this basis, impact assessments under the TSC and EPBC Acts have not been completed for any of these species. A Species Impact Statement (NSW) and/or a Referral to the Federal Environment Minister (Commonwealth) are not recommended for any threatened biota.

5.7 Chemical and Hazardous Substance Management

Only limited quantities of hazardous substances will be utilised during the exploration activities. These substances include petrol and diesel fuels. All fuels will be contained.

Drilling activities will be subject to a health and safety plan and Material Safety Data Sheets will be available for any potential hazardous materials used.

Water will normally be used as the drilling fluid. However, the use of polymer additives may be required from time to time. The polymer additives are not petroleum based and are fully biodegradable.

5.8 Contaminated Land

Past land use at the ten borehole locations has been confined to agricultural activities. None of the boreholes sites occur on land known to be contaminated. Due to the past land use of the area it is considered highly unlikely that contaminated lands would exist within the vicinity of the ten boreholes.

Only an unexpected escape of fuels or oils could have potential to cause land contamination. Any such escape would be quickly contained and recovered.

5.9 Waste Minimisation and Management

There will be some vegetation removal for the proposed borehole development activities, with small trees, shrubs and native groundcover species removed at boreholes MD05 and R04 and the removal of exotic pasture grasses at sites MD06, R03, R05, R06, R07, R08, R10 and R13. Any native vegetation removed will be retained on site and raked back over the disturbed area

once the works are completed to assist with natural regeneration. Minimal waste is expected to be produced as a result of the drilling program. Any wastes such as paper products, drums etc. if produced would be removed from the work site for proper disposal or recycling.

5.10 Natural Resource Use

Natural resources that will be utilised in the proposed drilling program include petroleum based products as fuel and mechanical lubricants. The proposal will utilise an insignificant volume of such resources. Supplies of these resources are unlikely to be placed at risk by the proposal.

Fishery, agricultural, forestry and mining resources will not be placed at risk by the proposal.

5.11 Impact on the Community

5.11.1 Traffic

The project will span approximately a 3-6 month period and will include the arrival and departure of drilling contractors to the drill sites each day and the delivery of materials. The drilling contractor will have several heavy vehicles including the drilling rig, ancillary vehicles and equipment. These vehicles will mostly remain located at the site until the completion of each hole. The drilling contractor will be required to maintain the vehicles in a roadworthy condition and obtain all necessary approvals and licences for them.

Further, given the rural nature of the survey area, traffic activity in the region is generally low. The proposed activities will not add considerably to the traffic of the survey area.

5.11.2 Socio-economic and Community Aspects

Due to the limited nature of the proposal, no significant socio-economic or community impacts would result from the proposal. In order to explain the proposal meetings, correspondence and discussions took place between Tahmoor Coal and all of the affected land holders. Subsequently access agreements have been obtained from these affected landholders.

Notwithstanding this there would be a positive short term economic effect associated with the short term employment of drilling employees associated with the proposal and expenditure for drilling consumables, accommodation, food and entertainment in the local area.

5.12 Visual Assessment

Due to the short term nature of the proposal, potential visual impacts due to the operation of drill rigs would be limited. Further, given the proposed hours of operation, lighting will not be required at the drill sites.

5.13 Heritage

5.13.1 Aboriginal Heritage

The proposed boreholes have been sited within cleared agricultural lands. These areas have been extensively disturbed by past and continuing agricultural practices.

Background

The Study Area is located on Wianamatta Shales and Hawkesbury Sandstone of the Woronora Plateau. This landscape is predominantly characterised by gently undulating rises that have been cleared and used for agricultural purposes within the region. Hawkesbury Sandstone also outcrops horizontally, as isolated blocks and cliff lines with overhang formations along the Bargo River and interlinking tributaries, such as Redbank Creek within the Study Area. Typically along creek gullies and gorges, the land has been undeveloped and vegetation corridors remain. The principle soil type of the Study Area is the Blacktown Landscape (bt) (Hazelton & Tille 1990).

A number of previous archaeological assessments have taken place within the general area (Sefton 1988, 1994; Comber 2005; Biosis Research 2006, 2007a, 2007b, 2008, 2009a and 2009b).

Sefton (1988) undertook an assessment encompassing the current Study Area, though fieldwork targeted creeks and steep gullies as the main aim of the investigation was to identify Aboriginal art and grinding groove sites typically located on these landforms.

Sefton (1994) was commissioned to undertake an aboriginal cultural heritage assessment for Kembla Coal and Coke Pty Limited for longwalls 14 to 18. Prior to this survey very little archaeological survey had been done in this area. During this work three shelters with art were located as well as thirteen overhangs that were to be considered to have potential for archaeological deposit.

Comber (2005) undertook a cultural heritage assessment and archaeological survey for the Maldon to Tahmoor electricity line upgrade. The works were to involve the removal of old poles and installing new conductors (Comber, 2005; 1). During this survey there were no previously unregistered sites identified and no previously registered sites would be disturbed by these works.

Biosis Research (2006) completed an Aboriginal archaeological assessment for the proposed extension to longwall mining in Tahmoor Colliery. During previous assessment of the area surveys targeted major creek lines in order to identify and record Aboriginal archaeological sites, as was the case with this study. No previously unrecorded sites were located during this study.

Biosis Research (2007a) was commissioned by Centennial Coal to undertake a brief Aboriginal and historical cultural heritage assessment of the proposed Tahmoor Colliery Transmission Line Upgrade, Tahmoor NSW. There were no previously registered sites within the Study Area, however two new sites of Potential Archaeological Deposit (PAD) were identified.

Biosis Research (2007b) undertook an archaeological survey of the Bargo Gorge to inform future underground mining activities near Tahmoor NSW. The Study Area begins at Mermaid's Pools and stretches north along the Bargo River for approximately 2 kilometres into the steepest section of the Gorge, east of the township of Tahmoor. During this survey one previously registered archaeological site (52-2-2355) was relocated, although it was difficult to identify original art work due to more recent graffiti that covers almost the entire sandstone cliff line. No previously unregistered sites were identified.

Biosis Research (2008) completed a cultural heritage assessment of three borehole locations for Tahmoor Coal's Tahmoor Colliery. Seven previously registered sites were located within this Study Area consisting of shelters with art, shelters with art and deposit and a single grinding groove site. None of these sites were affected by the proposed works and no new archaeological sites were identified during this field survey.

Biosis Research (2009a) undertook an archaeological assessment within the same Study Area of four borehole locations for Tahmoor Colliery. No new archaeological sites were identified during this survey and none of the borehole locations were close to any previously registered sites.

Biosis Research (2009b) completed a cultural heritage assessment of seven proposed borehole locations for Tahmoor Colliery. During this survey no new archaeological sites were identified. None of these proposed borehole sites were within 200 metres of any previously registered aboriginal sites.

A review of the NSW Department of Environment and Climate Change (DECC) AHIMS register identified sixty seven previously recorded Aboriginal archaeological sites within a 6 x 6 km area surrounding the ten boreholes (Figure 7, Table 5).

Table 5: Cultural Heritage Sites Previously Recorded in the Vicinity of the Study Area

AHIMS Site No.	Site Name	Site Type
48-2-0057	NG/SH1-Stonequarry (See 52-2-2088 as it's a duplication)	Grinding Grooves
52-2-006	Thirilmere	Shelter with Art
52-2-0007	Bakers Lodge	Burials; Carved Tree
52-2-0008	Barkers Lodge	Axe Grinding Grooves
52-2-0461	Courijah	Shelter with Art
52-2-0575	Courijah; Picton Lakes	Shelter with Art

52-2-0909	Thirlmere; Bonds Road	Shelter with Art
52-2-0967	Nepean River Gully; Maldon	Shelter with Art
52-2-1362	Moven Gully	Burial
52-2-1377	Crocodile Creek	Axe Grinding Grooves
52-2-1378	Carbundl	Aboriginal Ceremony and Dreaming
52-2-1379	Shingle Hill	Shelter with Art
52-2-1518	Jame's Find	Shelter with Art
52-2-1519	Julian's Find	Shelter with Art
52-2-1541	Carlers Creek	Shelter with Art
52-2-1545	Dry Creek	Shelter with Art
52-2-1546	Dry Creek	Shelter with Art
52-2-1547	Carters Creek	Shelter with Art
52-2-1599	Bandibong	Open Camp Site
52-2-1722	Couridjah 1	Shelter with Art
52-2-1723	Couridjah 1	Shelter with Art
52-2-1724	Couridjah 3	Shelter with Art; Shelter with Deposit
52-2-1727	Thirlmere Lakes Ramp	Scarred Tree
52-2-2042	Couridjah 4 Tahmoor	Shelter with Art
52-2-2049	Couridjah 6 (Tahmoor)	Shelter with Art
52-2-2068	Stonequarry Creek-1 (SC-1)	Axe Grinding Grooves
52-2-2069	ISOLATED FINDS 5	Isolated Find
52-2-2070	ISOLATED FIND 9	Isolated Find
52-2-2071	ISOLATED FINDS 2	Isolated Find
52-2-2072	ISOLATED FIND 1	Isolated Find
52-2-2073	ISOLATED FIND 3	Isolated Find
52-2-2078	Tahmoor 1	Shelter with Art; Shelter with Deposit
52-2-2079	Tahmoor 2	Shelter with Deposit

52-2-2080	Redbank Creek 2	Shelter with Art
52-2-2081	Redbank Creek 3	Shelter with Art
52-2-2082	Redbank Creek 4	Axe Grinding Groove
52-2-2083	Matthews Creek 1	Scarred Tree
52-2-2084	Thirlmere 2	Shelter with Deposit
52-2-2085	NG/F1 Long Gully Creek 1	Isolated Find
52-2-2086	NG/OC1 Stonequarry Creek 2	Open Camp Site
52-2-2087	NG/OC2 Stonequarry Creek 3	Open Camp Site
52-2-2088	NG/SHD 1 Stonequarry Creek 4	Shelter with Deposit
52-2-2089	NG/F2 Long Gully Creek 2	Isolated Find
52-2-2090	NG/F3 Long Gully Creek	Isolated Find
52-2-2100	Clearveiw	Scarred Tree
52-2-2118	Cedar Creek 1	Open Camp Site
52-2-2119	Stone quarry Creek 8	Open Camp Site
52-2-2120	Cedar Creek 2	Open Camp Site
52-2-2226	NG/OC3- "STONEQUARRY CREEK 7"	Open Camp Site
52-2-2355	MIGADAN SPIRIT SITE	Shelter with Art
52-2-3212	AMP IF 1	Open Camp Site
52-2-3213	AMP IF 2	Open Camp Site
52-2-3214	AMP IF 3	Open Camp Site
52-2-3215	AMP IF 4	Open Camp Site
52-2-3216	AMP IF 5	Open Camp Site
52-2-3217	AMP OCS 1	Open Camp Site
52-2-3218	AMP OS 2	Open Camp Site
52-2-3219	AMP St 1	Scarred Tree
52-2-3220	AMP PAD 1	Potential Archaeological Deposit
52-2-3225	EMAI Site 2	Open Camp Site
52-2-3254	Redbank Creek 1	Shelter with Deposit

52-2-3572	Maldon 01	Scarred Tree
52-2-3573	Maldon 02	Shelter with Art
52-2-3574	Maldon 03	Open Camp Site
52-2-3633	Couridjah 2	Shelter with Art

A search of the following registers identified no historical items listed within the vicinity of the proposed borehole locations:

- Commonwealth Heritage List
- National Heritage List
- Register of the National State
- NSW State Heritage Register and Inventory
- Wollondilly Shire Council LEP 1991

The following archaeological predictive model has been formulated based on the results of the location and type of sites that were recorded within the regional area (based on the relevant registry searches) and information obtained from previous archaeological work. This information has been broken down into patterns and compared to the environmental character of the Study Area to allow for an understanding of archaeological potential.

The following predictive model has been formulated for the Study Area:

Aboriginal

- Axe grinding grooves may be present where suitable open, fine grained sandstone outcrops occur, close to water sources
- Stone artefact occurrences can occur anywhere within the landscape, but are more likely to be identified on prominent plateau or ridge lines, or in close proximity to water sources, although these are almost impossible to detect in heavily vegetated areas
- Rock shelters with art and / or deposit are likely to be present where suitable sandstone overhangs occur
- Scarred trees are unlikely to occur due to the extensive land clearing for agricultural practices.

5.13.2 Other Cultural Heritage

Given the lack of early historical use and later development specific to the Study Area there is a low potential for historical archaeological sites to be present at the borehole sites.

Field Survey

An archaeological field assessment of the proposed boreholes was undertaken on 15 April 2009 by Renée Regal (Biosis Research), Donna Whillock (Tharawal Land Council) and Glenda Chalker (Cubbitch Barta). No Aboriginal or historical archaeological sites were located within a 30 x 40 m Study Area surrounding each of the proposed borehole locations (Table 6).

There was however one possible scarred tree identified by the aboriginal stakeholders within the vicinity of borehole MD05 (Figure 7). The possible scarred tree is a *Eucalyptus tereticornis*, which is commonly known as a Forrest Red Gum. Although considered to be Aboriginal in origin by the Aboriginal stakeholders, the tree does not exhibit the principal features used by archaeologists to classify scarred trees. These features typically include:

- regular shape to scar, often with parallel sides and slightly pointed or rounded ends
- tools marks on the dry face at the top, centre of bottom of the scar;
- significant regrowth or ‘overgrowth’ on the margin of the scar
- scarring terminates above ground level
- tree must be of reasonable age from which a suitably sized piece of bark could be utilised
- tree species would be indigenous to that area
- scar free from tree knots and branches, or evidence of a branch having been at the top of the scar

This tree has been classified as a ‘possible’ scarred tree by the archaeologist due to the lack of axe marks, a small knot growing in the centre of the scar, the remnants of a fallen branch at the top of the scar and the uneven shape of the scar that does not indicate what the removed piece of bark would have been used for. It appears that this scar has been formed by a fallen branch tearing away the bark on this side (Long 2005; 40-41).

There is also an area of Potential Archaeological Deposit at the site of borehole R10. Due to the aspect of the site it has been recommended by the Aboriginal stakeholders from both groups that the borehole site be monitored whilst any clearance or excavation of the sumps is carried out; as there was very little visibility at the site due to the length of the grass in this area. This would involve excavating at a slower than normal rate (in approximately 150 mm splits, until either natural clay or rock is uncovered). If any aboriginal artefacts are uncovered work would have to stop and a new borehole location would have to be determined.

Information recorded during this survey included geology of the area, exploitable resources, identifiable land-use impacts, landform and topography, surface visibility and exposure, and any archaeological sites or archaeological potential present in the Study Area (Table 6).

Table 6: Cultural Heritage Survey Details

Borehole	Landform Context	Disturbance	Exposure %	Visibility %	Archaeology
MD05	Undulating paddocks.	The majority of the area has been cleared for both the emplacement of bridge street and the use of the area for farming practices. There were however a number of remnant trees in this location.	0	0	There were no previously registered sites at this borehole location. However there was one possible scarred tree located at the site.
MD06	Undulating paddocks	The majority of the area has been cleared for the purpose of cattle farming. There is also an area to the south west of the borehole site that appears to have been used as a picnic area that was formerly associated with the Queen Victoria hospital.	0	0	No registered sites occur at this borehole location. No new sites were recorded at this borehole location.
R03	Undulating paddocks. The proposed borehole location is in a small drainage.	The area has been cleared for the purpose of cattle farming. There are also a number of areas where blackberries are growing.	0	0	No registered sites occur at this borehole location. No new sites were recorded at this borehole location.
R04	Cleared plain. Borehole area is surrounded by regrowth Shale Sandstone Transitional Forrest.	The area has been cleared previously for the grazing of cattle and the emplacement of the Picton Mittagong Railway line.	0	0	No registered sites occur at this borehole location. No new sites were recorded at this borehole location.

Borehole	Landform Context	Disturbance	Exposure %	Visibility %	Archaeology
R05	Undulating paddocks	The area has been previously cleared for the purpose of cattle grazing.	0	0	No registered sites occur at this borehole location. No new sites were recorded at this borehole location.
R06	Undulating paddocks	The area has been previously cleared for cattle grazing.	0	0	No registered sites occur at this borehole location. No new sites were recorded at this borehole location.
R07	Cleared plain	The area has been previously cleared for horse agistment. There also appears to have been a chicken shed in the area of the proposed borehole location at some stage.	70	90	No registered sites occur at this borehole location. No new sites were recorded at this borehole location.
R08	Cleared undulating paddock, just north west of a small drainage that runs into a dam.	The area has been previously cleared for cattle grazing.	0	0	No registered sites occur at this borehole location. No new sites were recorded at this borehole location.

Borehole	Landform Context	Disturbance	Exposure %	Visibility %	Archaeology
R10	Undulating paddocks, at the top of the slope.	The area has been previously cleared for cattle grazing.	0	0	No registered sites occur at this borehole location. No new sites were recorded at this borehole location. Due to the aspect of the site it has been recommended by the Aboriginal stakeholders from both groups that the borehole site be monitored whilst any clearance or excavation of the sumps is carried out; as there was very little visibility at the site due to the length of the grass in this area.
R13	Undulating paddocks, moved the borehole location to the left of a small drainage that runs into an unnamed tributary to Matthews Creek	Paddocks cleared for cattle grazing.	0	0	No registered sites occur at this borehole location. No new sites were recorded at this borehole location.

Eight of the boreholes were sited within cleared agricultural lands, which have been extensively disturbed by past and continuing agricultural practices. All sites are located on slightly sloping ground within the wider undulating plain landscape. Ground surface visibility was very poor as paddock grasses obscured a number of borehole site locations. Boreholes MD05 and R04 were located within a flat area of Shale Sandstone Transitional Forest (SSTF). No archaeological sites were identified at any of the borehole impact zones. However at MD05 there was a possible scarred tree identified by both Glenda Chalker (Cubbitch Barta Native Title Claimants Aboriginal Corporation) and Donna Whillock (Tharawal Local Aboriginal Land Council) approximately 25 metres from the proposed borehole site. This tree is classified as possible by the

archaeologist due to the stub of a fallen branch being located in the middle of the scar, it appears as though the scar was formed from the branch falling down (Long 2005; 40-41). This is further supported by the scar being slightly askew and not of a straight nature. No known sites are located within 200 m of either borehole location. The boreholes have been sited within areas of low archaeological potential and have no cultural constraints associated with the proposed works.

The Aboriginal Community Representatives that were on the field survey had no issues with the proposed locations, but have recommended that someone be present for the monitoring of any earthwork operations at Borehole location R10, due to its high elevation and clear view of the surrounding area. Community members have also requested that the possible scarred tree site be avoided, and silt fencing be placed around this site to avoid any impacts of water run off. Also that the movement of any vehicles or heavily equipment to and from boreholes be confined to using consistent tracks and roads when coming to each borehole location.

Results

No new Aboriginal archaeological sites were located during the survey.

No historical archaeological sites were identified during the survey.

The only borehole which will require any further Aboriginal archaeological work is borehole R10. This will require monitoring of any earthworks. The Aboriginal representatives have recommended that silt fencing be put into place to protect the possible scarred tree at borehole M06 to protect it from any run off that may occur at the site.

5.14 Stock Injury and Loss

Land use in the survey area includes but is not limited to grazing activities. As such the use of appropriate site fencing will exclude all domestic, agricultural and native fauna from accessing the drill sites and therefore prevent injury to these animals.

Consultation with the landholder how to best minimise disturbance to grazing stock will be undertaken prior to the commencement of any works and consultation will continue at regular intervals throughout the survey program as required by the landholder.

5.15 Cumulative Environmental Impacts

Given the land use history of the proposed borehole sites, cumulative impacts are not considered to be of consequence for the proposed drilling works.

5.16 Summary of Mitigating Measures

Development of the proposed boreholes is considered unlikely to have significant environmental impact. However, the proposed activities have the potential to result in minor, short term and localised impacts including noise and sediment and erosion. Mitigation of such minor impacts is

simple and has been described in Table 1.

6.0 REHABILITATION WORKS

On completion of the proposed exploration activities, all surface infrastructure and waste (such as litter, used materials and any contaminated soil) would be removed from the site. Where earthworks have been conducted, the stockpiled soil would be returned (topsoil and subsoil) and the areas re-contoured to its original or near-original landform (see Table 1).

Sediment and erosion control structures would be left in place until the potential for erosion and sedimentation is sufficiently reduced by site rehabilitation.

In consultation with the landowners, suitable sterile cover crops may be introduced to each of the drill sites in order to facilitate the rapid development of soil binding vegetation (grasses etc) in order to prevent post development soil erosion.

7.0 SUMMARY OF IMPACTS AND CONCLUSIONS

The proposed drilling program will involve minor disturbance to areas of cleared grazing lands for eight of the ten proposed boreholes. Boreholes MD05 and R04 are situated within an area supporting a small number of native saplings, shrubs and groundcover species. The areas of impact at Boreholes MD05 and R04 are considered to include part of the EEC, Shale Sandstone Transition Forest. Impacts on this EEC are considered unlikely to be significant. The boreholes will be developed over three to six months. Following completion, production water will be disposed of in accordance with regulatory requirements and all disturbance areas would be rehabilitated to the satisfaction of the landowners and the DPI. The exploration activities will be conducted in accordance with suitable environmental management procedures and take into account the potential impacts associated with the activity. Accordingly, the proposed drilling activities can be undertaken with minimal impact to the environment.

APPENDICES

APPENDIX 1

FLORA AND FAUNA ASSESSMENT

Introduction

Tahmoor Coal (Tahmoor Colliery) intends to undertake surface exploration activities within their mining lease area. The program will consist of ten exploration boreholes (Figure 2).

Biosis Research Pty. Ltd. was commissioned by Tahmoor Coal to undertake a terrestrial flora and fauna assessment of the proposed exploration boreholes (Figures 1 and 2). This report assesses the conservation significance of the ten borehole sites in terms of threatened species, populations (and/or their habitats) and ecological communities that occur, or have the potential to occur in the Study Area in accordance with the requirements of the *Environmental Planning and Assessment Act 1979* (EP&A Act), *Threatened Species Conservation Act 1995* (TSC Act) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Methods

The information within this flora and fauna assessment is based on a desktop assessment (including literature and database searches) as well as a field survey conducted on 15 April 2009.

Records of threatened species, populations and communities were obtained from the Department of Environment and Climate Change (DECC) Atlas of NSW Wildlife within a 10 km radius of the Study Area, using the Wollongong 1:100 000 map sheet. Records for threatened species, populations and communities listed on the EPBC Act were obtained from the DEWHA EPBC Online Database within a 10 km radius of the borehole sites. Database searches were conducted in April 2009.

In the field, the area of direct disturbance for each borehole site was inspected in detail. The surrounding area (area of indirect impact and beyond this zone) was inspected more broadly, noting nearby landscape features such as native vegetation or farm dams, their landscape relationship to the borehole sites and the likelihood of impact to these features. Flora species observed were recorded, and flora and fauna habitat values were assessed.

The plant taxonomy (method of classification) used in this report follows Harden (1990, 1992, 1993, 2002) and subsequent advice from the National Herbarium of NSW. In the body of this report plants are referred to by their scientific names only. Common names where available have been included in the Appendices.

Names of vertebrates follow the Census of Australian Vertebrates maintained by Department of Environment, Water, Heritage and the Arts (DEWHA). In the body of this report Vertebrates are referred to by both their common and scientific names when first mentioned. Subsequent references to these species cite the common name only.

Results

Soils

The Study Area is located on Wianamatta Shale of the Woronora Plateau. This landscape is predominantly characterised by gently undulating rises that have been cleared and used for agricultural purposes within the region. Hawkesbury Sandstone also outcrops horizontally, as isolated blocks and cliff lines with overhang formations along the Bargo River and Nepean Rivers and along associated tributaries. Typically along creek gullies and gorges, the land has not been cleared and vegetation corridors remain. The principle soil type of the Study Area is the Blacktown Landscape (bt), with Picton Landscape (pn) and Luddenham Landscape (lu) also occurring (Hazelton *et al.* 1990; Hazelton and Tille 1990).

Plant communities

The vegetation of the Study Area has been mapped by DECC (NPWS 2002b) as part of the mapping of native vegetation of the Cumberland Plain (Figure 3). Vegetation within the Study Area broadly corresponds to the DECC mapping and occurs within cleared paddocks dominated by exotic pasture. Areas of intact native vegetation mapped and observed nearby to the borehole locations includes the plant communities, Shale Plains Woodland and Shale Hills Woodland (both of which correspond to the EEC, Cumberland Plain Woodland, as listed on both the TSC Act and EPBC Acts) and Shale Sandstone Transition Forest (as listed on the TSC and EPBC Acts). An area of disturbed native vegetation impacted by Boreholes MD05 and R04 also corresponds to the EEC, Shale Sandstone Transition Forest.

Exotic pasture

Eight of the ten boreholes occur within cleared and disturbed pasture. Seven of these eight boreholes (R03, R05, R06, R07, R08, R10 and R13) have been subject to historic and ongoing disturbances including heavy grazing to the extent that few if any native plant species were present. These boreholes were no longer representative of a native plant community. Dominant exotic pasture and herb species included *Paspalum dilatatum*, *Cynodon dactylon*, *Pennisetum clandestinum*, *Senecio madagascariensis*, *Conyza albida* and *Plantago lanceolata*. The Study Area in proximity of these boreholes is considered to be a disturbed landscape, with no resilience. That is, it is considered unlikely that these sites retain any natural vegetation components, even within the soil stored seed bank, and therefore have little or no chance of regenerating naturally to a native vegetation community. Impacts resulting from the boreholes on these areas are unlikely to affect any threatened biota.

Shale Sandstone Transition Forest

Boreholes MD05 and R04 supported native plant species that are representative of the EEC, Shale Sandstone Transition Forest.

Borehole MD05

Based on the field survey, borehole MD05 is located within a patch of Shale Sandstone Transition Forest. This area was considered to be in good condition, with a native canopy present supporting *Eucalyptus tereticornis* and *E. crebra*, over a native midstorey of *Allocasuarina littoralis*, *Acacia parramattensis* and juvenile Eucalypts. The shrub layer was relatively dense, supporting *Bursaria spinosa* and *Leucopogon juniperinus*. The ground layer supported native species such as *Themeda australis*, *Aristida vagans*, *Microlaena stipoides* and *Dichondra repens*. On this basis, the area around borehole MD05 has been assessed as the EEC, Shale Sandstone Transition Forest.

Impacts at borehole MD05 will be restricted to small areas of re-growing saplings (average trunk diameter at breast height = 10 – 20 cm), and some native shrubs and groundcover species. Large remnant trees will be avoided, with no works undertaken within 2 m of the outer drip line of the canopy to protect the root zone.

Borehole R04

Vegetation mapping indicates that borehole R04 is within the EEC, Shale Sandstone Transition Forest (Figure 4). Based on the field survey, borehole R04 is located within a small clearing on the edge of a regrowth stand of Shale Sandstone Transition Forest, supporting native grasses and herbs such as *Themeda australis*, *Microlaena stipoides* and *Calotus dentex*. Adjoining the proposed borehole site are stands of small regrowth trees *Eucalyptus tereticornis* and the native shrub, *Bursaria spinosa*. Impact to the trees would be avoided by the proposed borehole. Impacts would occur to the native groundcover species only.

Threatened Flora

A total of 21 plant species listed on the TSC (Figure 5) and/or EPBC Act, or their habitat have been previously recorded within a 10 km radius of the Study Area (Table 1). No significant plant species were recorded during the surveys. The Study Area is considered to provide potential habitat for one threatened plant species *Persoonia bargoensis*, however this species was not recorded at any of the borehole sites in the Study Area. Given that *Persoonia bargoensis* is relatively conspicuous and would most likely have been detected if present, it is not considered that the proposal will result in any impacts to this threatened plant species. On this basis, it is considered highly unlikely that the proposed exploration program would have a significant impact on any threatened plant species. Assessments of significance are not considered necessary for these species.

Table 7: Threatened plant species (on EPBC and TSC Acts) previously recorded or with potential habitat within a 10 km radius of the borehole sites.

Latin Name	EPBC Act	TSC Act (NSW)	Habitat	Potential habitat in area to be impacted?
<i>Acacia bynoeana</i>	V	E1	<i>Acacia bynoeana</i> is found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. It has recently been found in the Colymea and Parma Creek areas west of Nowra. Occurs in heath or dry sclerophyll forest on sandy soils. Seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches (DEC 2005b). Associated overstorey species include Red Bloodwood, Scribbly Gum, Parramatta Red Gum, Saw Banksia and Narrow-leafed Apple (DEC 2005a).	No
<i>Acacia flocktoniae</i>	V	V	<i>Acacia flocktoniae</i> is found only in the Southern Blue Mountains (at Mt Victoria, Megalong Valley and Yerranderie). It grows in dry sclerophyll forest on sandstone. It flowers between June and August (DECC 2005a).	No
<i>Caladenia tessellata</i>	V	E1	Low open forest with heath or sometimes grass understorey this species only grows in very dense shrubbery in coastal areas (Bishop 1996). Generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil (DEC 2005c). Currently known from three disjunct areas: Braidwood on southern tablelands, Ulladulla on the south coast and three populations in Wyong area on the Central Coast (DEC 2005c). ROTAP; 3V.	No
<i>Callistemon linearifolius</i>	-	V	Occurs chiefly from Georges River to the Hawkesbury River where it grows in dry sclerophyll forest (Harden 2002), open forest, scrubland (Fairley and Moore 2000) or woodland on sandstone. Found in damp places, usually in gullies (Robinson 1994). Flowers in Spring.	No
<i>Cynanchum elegans</i>	E	E1	Rainforest gullies scrub and scree slopes in Gloucester and Wollongong districts (Harden 1992). Occurs mainly at the ecotone between dry subtropical rainforest and sclerophyll forest/woodland communities (DEC 2005l). Has been recorded in dry subtropical rainforest, littoral rainforest, <i>Leptospermum laevigatum</i> - <i>Banksia integrifolia</i> Coastal scrub, <i>Eucalyptus tereticornis</i> forest and woodland, <i>Corymbia maculata</i> forest and woodland and <i>Melaleuca armillaris</i> scrub to open scrub (DEC 2005l).	No
<i>Darwinia peduncularis</i>	-	V	Occurs from Hornsby to Hawkesbury River and west to near Glen Davis where it grows in dry sclerophyll forest on sandstone hillsides and ridges [Harden, 2002 #833]. Usually grows on or near rocky outcrops on sandy, well drained, low nutrient soil over sandstone. Flowers in winter to early spring [DEC, 2005 #1087].	No
<i>Diuris lanceolata</i>	E	-	Grows in moist grassy areas, among shrubs in sclerophyll forest and heath; coast and tablelands (Harden 1993).	No
<i>Epacris purpurascens</i> var. <i>purpurascens</i>		V	Sclerophyll forest, scrub and swamps from Gosford and Sydney districts (Harden 1992) specifically this species is thought to require wet heath vegetation (T. James pers. comm.). Characteristically found in a range of habitat types, most of which have a strong shale soil influence. These include ridgetop drainage depressions supporting wet heath within or adjoining shale cap communities (including Shale Sandstone Transition Forest). Also occurs in riparian zones draining into Sydney Sandstone Gully Forest, shale lenses within sandstone habitats and colluvial areas overlying or adjoining sandstone or tertiary alluvium. Has been recorded from Gosford, Narrabeen, Silverdale and Avon Dam vicinity (DEC 2005d).	No

Latin Name	EPBC Act	TSC Act (NSW)	Habitat	Potential habitat in area to be impacted?
<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	V	V	Sporadically distributed throughout the Sydney Basin with the main occurrence centred in Picton, Appin, Wedderburn and Bargo districts associated with the Nepean and Georges Rivers. Northern populations are found in the Lower Hunter Valley at Kurri Kurri and Heddon Greta, and on the western shores of Lake Macquarie at Dooralong, Cooranbong and Awaba. To the west of Sydney, small populations occur at Kemps Creek & Voyager Point. It occurs on sandy clay loam soils, often with lateritic ironstone gravels. Soils are mostly derived from Tertiary sands or alluvium and from the Mittagong Formation with alternating bands of shale and fine-grained sandstones. <i>G. parviflora</i> subsp. <i>parviflora</i> has been recorded from a range of communities including two endangered communities; Shale Sandstone Transition Forest (south of Sydney) and Kurri Sand Swamp Woodland (Lower Hunter). It is also found in open-forest of <i>Corymbia maculata</i> - <i>Angophora costata</i> on Narrabeen Group and Permian Sandstones (Dooralong), Sydney Sandstone Ridgtop Woodland (Wedderburn) and Castlereagh Ironbark Woodland (Kemps Creek). Flowering occurs from July to December, as well as April to May. (NPWS 2002a)	No
<i>Leucopogon exolasius</i>	V	V	Woodland on sandstone, restricted to the Woronora and Grose Rivers (Harden 1991). The plant occurs in woodland on sandstone and prefers rocky hillsides along creek banks (NPWS 2005). Flowering occurs in August and September (Harden 1991). Germination of dormant seeds is prompted by seasonal changes rather than fire, although fire may enhance germination once it has begun. Associated species include <i>Eucalyptus piperita</i> and <i>E. sieberi</i> and the shrubs <i>Pultenaea flexilis</i> , <i>Leptospermum trinervium</i> and <i>Dillwynia retorta</i> (Powell J.M 2007).	No
<i>Melaleuca deanei</i>	V	V	The species grows in wet heath on sandstone (Harden 1991). Occurs in two distinct areas of Sydney (Ku-Ring-Gai/Berowra and Holsworthy/Wedderburn) and has isolated occurrences in the Blue Mountains, Nowra and Central Coast areas (DEC 2005e). Flowers appear in summer but seed production appears to be small and consequently the species exhibits a limited capacity to regenerate. ROTAP; 3R	No
<i>Persicaria elatior</i>	V	V	Tall Knotweed has been recorded in south-eastern NSW (Mt Dromedary (an old record), Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes. In northern NSW it is known from Raymond Terrace and the Grafton area (Cherry Tree and Gibberagee State Forests). The species also occurs in Queensland. This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance (DEC 2005f).	No
<i>Persoonia acerosa</i>	V	V	The Needle Geebung has been recorded only on the central coast and in the Blue Mountains, from Mt Tomah in the north to as far south as Hill Top where it is now believed to be extinct. Mainly in the Katoomba, Wentworth Falls, Springwood area. The Needle Geebung occurs in dry sclerophyll forest, scrubby low-woodland and heath on low fertility soils (DEC 2005g).	No
<i>Persoonia bargoensis</i>	V	E1	Restricted to a small area south-west of Sydney on the western edge of the Woronora Plateau. Its entire range falls between Picton, Douglas Park, Yanderra, Cataract River and Thirlmere. Occurs in woodland or dry sclerophyll forest on sandstone. Prefers interfaces between shale and sandstone derived soils; that is, soils typical of Shale Sandstone Transition Forest (NPWS 2000). Like most Geebungs this species seems to benefit from the reduced competition and increased light available on disturbance margins including roadsides (DEC 2005h).	Yes. May have potential habitat in SSTF but not found in subject site.
<i>Persoonia glaucescens</i>	V	E1	Woodland to dry sclerophyll forest on sandstone from Picton to Bargo [Harden, 1991 #219]. More specifically this species prefers clayey and gravelly laterites with ridgetops, plateaus and upper slopes being preferred topography [NPWS, 2000 #477]	No

Latin Name	EPBC Act	TSC Act (NSW)	Habitat	Potential habitat in area to be impacted?
<i>Persoonia hirsuta</i>	E	E1	Occurs from Gosford to Royal NP and in the Putty district from Hill Top to Glen Davis where it grows in woodland to dry sclerophyll forest on sandstone (Harden 2002) or rarely on shale (NSW Scientific Committee 1998). Two subspecies are recognised, <i>P. hirsuta</i> ssp. <i>hirsuta</i> (Gosford to Berowra and Manly to Royal NP) and <i>P. hirsuta</i> ssp. <i>evoluta</i> (Blue Mountains, Woronora Plateau and Southern Highlands). Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone and shale-sandstone transition areas (DEC 2005i).	No
<i>Pomaderris brunnea</i>	V	V	Open forest confined to the Colo River & upper Nepean River (Harden 1990), on clay & alluvial soils (Fairley and Moore 1995). Grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines (DEC 2005j). In the Hawkesbury/Nepean region, the species is known to be associated with Dry sclerophyll forests (Cumberland, Upper Riverina, Sydney Coastal, Sydney Hinterland, Sydney Sand Flats), Coastal Floodplain Wetlands and Coastal Valley Grassy Woodlands (DEC 2005j).	No
<i>Pterostylis saxicola</i>	E	E1	Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines (NSW Scientific Committee 1997a). The vegetation communities that occur above the shelves are either shale/sandstone transition or shale communities. Often occurs near streams. Picnic Point to Picton (Harden 1993). Currently known from only 5 localities (NSW Scientific Committee 1997b).	No
<i>Pultenaea glabra</i>	V	V	Found in dry sclerophyll forest on sandstone in the higher Blue Mountains and Glen Davis area (Harden 1991). Grows above south facing escarpments of the main plateau and sometimes in forest with an open canopy and moist soil (Baker and Corringham 1995). Flowers September to November, fruit matures October to December.	No
<i>Rulingia prostrata</i>	E	E1	Dwarf Kerrawang occurs on the Southern Tablelands (one plant at Penrose State Forest, one plant at Rowes Lagoon and one plant at Tallong) and on the North Coast (less than 100 plants at the Tomago sandbeds north of Newcastle). It is also found in Victoria. Occurs on sandy, sometimes peaty soils in a wide variety of habitats: Snow Gum (<i>Eucalyptus pauciflora</i>) Woodland at Rose Lagoon; Blue leaved Stringybark (<i>E. agglomerata</i>) Open Forest at Tallong; and in Brittle Gum (<i>E. mannifera</i>) Low Open Woodland at Penrose; Scribbly Gum (<i>Eucalyptus haemastoma</i>). Swamp Mahogany (<i>E. robusta</i>) Ecotonal Forest at Tomago. Associated native species may include <i>Imperata cylindrica</i> , <i>Empodisma minus</i> and <i>Leptospermum continentale</i> . Appears to respond positively to some forms of disturbance (DEC 2005k).	No.
<i>Thelymitra</i> sp. Kangaloon	CE	-	<i>Thelymitra</i> sp. Kangaloon is a terrestrial orchid endemic to New South Wales, and is known from three locations near Robertson in the Southern Highlands. The swamp habitat in which the species occurs has an extent of occurrence of 300 km ² and an area of occupancy of 10 km ² . The three swamps are Butlers Swamp, Stockyard Swamp and Wildes Meadow Swamp, and are all located above what is known as the Kangaloon aquifer. It flowers in late October and early November. The species grows amongst tall sedges and rushes in seasonally swampy sedgeland on grey silty clay loam at 600-700 m above sea level (Threatened Species Listing Advice 2008).	No

Key: Listed as X – Extinct, E- Endangered or V- Vulnerable on the EPBC Act.

Listed as E1 – Endangered, E4 – Presumed Extinct, or V – Vulnerable on the TSC Act

Fauna Habitat

The habitat features within the Study Area (as described under Plant Communities) have been substantially altered since the introduction of European agricultural practices, particularly through clearing for grazing and cropping.

Exotic pasture

Exotic pasture may provide foraging habitat for common birds such as Australian Magpie (*Cracticus tibicen*), Magpie-lark (*Grallina cyanoleuca*), parrots and cockatoos, as well as common frogs such as Common Eastern Froglet (*Crinia signifera*), Dusky Toadlet (*Uperoleia fusca*) and Spotted Grass Frog (*Limnodynastes tasmaniensis*). Macropods and wombats may also forage in these areas. Exotic pasture will be directly removed as a result of the proposal. However considering the small area of habitat to be impacted, and that there are extensive areas of exotic pasture in the locality, the proposal is unlikely to significantly reduce fauna habitat.

Open Forest

Borehole sites MD05 and R04, include patches of the native shrubs, *Bursaria spinosa* and *Kunzea ambigua*, as well as small trees of *Eucalyptus tereticornis* which is likely to provide shelter and foraging resources for small birds such as the Eastern Yellow Robin (*Eopsaltria australis*), Fairy Wrens (*Malarus* spp.) and Thornbills (*Acanthiza* spp.).

Nearby intact or semi intact native vegetation, leaf litter and bark, and scattered paddock trees provide good habitat value for a wide range of fauna (including frogs, reptiles, ground- and tree-dwelling mammals, forest birds and invertebrates etc). Large Eucalypt species located nearby but outside of the Study Area contain tree hollows of sufficient size to provide habitat for owls. Other surrounding smaller trees may contain smaller hollows which could provide habitat for possums (including gliders). Locally-recorded threatened species which may utilise the tree hollows within the Open Forest include the Gang-gang Cockatoo (*Callocephalon fimbriatum*), Brown Treecreeper (*Climacteris picumnus victoriae*), Turquoise Parrot (*Neophema pulchella*), Barking Owl, Eastern False Pipistrelle (*Falsistrellus tasmaniensis*), Eastern Freetail Bat (*Mormopterus norfolkensis*) and Greater Broad-nosed Bat (*Scoteanax rueppellii*). These nearby fauna habitats would not be impacted by the proposal.

Threatened Fauna

A total of 43 threatened and/or migratory animal species listed on the EPBC Act and/or the TSC Act or their habitats have been previously recorded within a 10 km radius of the borehole locations (Figure 6, Table 8). The habitat potentially used by fauna in the Study Area includes exotic pasture, and open forest.

The cleared land dominated by exotic pasture grasses and open forest on which the boreholes are sited are considered to provide limited potential foraging habitat for threatened fauna (Table 8). It is highly unlikely that any threatened animal species would be impacted by the proposed

exploration program because:

- The areas to be cleared are small (30 x 40 m), and there are large areas of surrounding habitat that would not be impacted by the proposal.
- As the borehole site and machinery will take up a relatively small area, fauna are likely to easily move away, and fauna movement would not be impacted.
- Habitat use by all threatened and/or migratory species considered is restricted to opportunistic foraging. The small area to be impacted would not provide a significant or limiting food resource for any of these species, and there are extensive areas of land within the locality which provide similar foraging opportunities.
- Significant habitat features, such as tree hollows, will be avoided and protected during the construction and operation of the proposed boreholes.

In summary, the habitat to be impacted by the proposal does not comprise limiting habitat for any of the threatened species that may occur in the area. Based on these reasons, it is considered highly unlikely that the proposed exploration program would have a significant impact on any threatened animal species. Assessments of Significance are not considered necessary for any of these species.

Table 8: Threatened and migratory fauna listed on the TSC Act and/or EPBC Act that occur in the local area

Latin Name	Common Name	TSC Act	EPBC Act	Habitat	Potential habitat in area to be impacted
Amphibians					
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	V	Prefers hanging swamps on sandstone shelves adjacent to perennial non-flooding creeks (Daly 1996, Recsei 1996). Can also occur within shale outcrops within sandstone formations. In the southern part of its range can occur in wet and dry forests, montane sclerophyll woodland and montane riparian woodland (Daly 1996). Individuals can be found around sandy creek banks or foraging along ridge-tops during or directly after heavy rain. Males often call from burrows located in sandy banks next to water (Barker <i>et al.</i> 1995).	No
<i>Litoria aurea</i>	Green and Golden Bell Frog	E1	V	Found in marshes, dams and stream sides, particularly those containing bullrushes or spikerushes (NPWS 1999b). Preferred habitat contains water bodies that are unshaded, are free of predatory fish, have a grassy area nearby and have diurnal sheltering sites nearby such as vegetation or rocks (White and Pyke 1996, NPWS 1999b).	No

Latin Name	Common Name	TSC Act	EPBC Act	Habitat	Potential habitat in area to be impacted
<i>Litoria littlejohni</i>	Littlejohn's Tree Frog	V	V	Occurs in wet and dry sclerophyll forests associated with sandstone outcrops between 280 and 1000 m on the eastern slopes of the Great Dividing Range (Barker <i>et al.</i> 1995). Prefers rock flowing streams, but individuals have also been collected from semi-permanent dams with some emergent vegetation (Barker <i>et al.</i> 1995). Forages both in the tree canopy and on the ground, and has been observed sheltering under rocks on high exposed ridges during summer. It is not known from coastal habitats.	No
Invertebrates					
<i>Meridolum corneovirens</i>	Cumberland Plain Land Snail	E1	-	Most likely restricted to Cumberland Plain, Castlereagh Woodlands and boundaries between River-flat Forest and Cumberland Plain Woodland. It is normally found beneath logs, debris and amongst accumulated leaf and bark particularly at the base of trees. May also use soil cracks for refuge (NPWS 2000a).	Unlikely, no areas of built up leaf litter recorded in Study Area.
Birds					
<i>Burhinus grallarius</i>	Bush Stone-curlew	E1	-	Lightly timbered open forest and woodland, or partly cleared farmland with remnants of woodland, with a ground cover of short sparse grass and few or no shrubs where fallen branches and leaf litter are present (Marchant and Higgins 1993).	No Limited foraging habitat only
<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 (Higgins 1999). Also occur in subalpine Snow Gum woodland and occasionally in temperate or regenerating forest (Forshaw and Cooper 1981). 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 (Shields and Crome 1992). It requires tree hollows in which to breed (Gibbons and Lindenmayer 1997).	No.
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V	-	Inhabits forest with low nutrients, characteristically with key Allocasuarina species. Tends to prefer drier forest types (NPWS 1999a) with a middle stratum of Allocasuarina below Eucalyptus or Angophora. Often confined to remnant patches in hills and gullies (Higgins 1999). Breed in hollows stumps or limbs, either living or dead (Higgins 1999).	Possibly, within Shale Sandstone Transition Forest.
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper	V	-	Live in eucalypt woodlands, especially areas of relatively flat open woodland typically lacking a dense shrub layer, with short grass or bare ground and with fallen logs or dead trees present (Traill and Duncan 2000).	No
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	-	M	A migratory species that is resident to Australia. Found in terrestrial and coastal wetlands; favouring deep freshwater swamps, lakes and reservoirs; shallow coastal lagoons and saltmarshes (English and Predavec 2001).	No

Latin Name	Common Name	TSC Act	EPBC Act	Habitat	Potential habitat in area to be impacted
<i>Hirundapus caudacutus</i>	White-throated Needletail	-	M	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges (Pizzey 1983).	No
<i>Apus pacificus</i>	Fork-tailed Swift	-	M	Almost exclusively aerial. Breeds in Asia (Higgins 1999).	No
<i>Ardea alba</i>	Great Egret	-	M	Terrestrial wetlands, estuarine and littoral habitats and moist grasslands. Inland, prefer permanent waterbodies on floodplains; shallows of deep permanent lakes (either open or vegetated), semi-permanent swamps with tall emergent vegetation and herb dominated seasonal swamps with abundant aquatic flora. Also regularly use saline habitats including mangrove forests, estuarine mudflats, saltmarshes, bare salt pans, shallows of salt lakes, salt fields and offshore reefs. Breeding requires wetlands with fringing trees in which to build nests including mangrove forest, freshwater lakes or swamps and rivers (Marchant and Higgins 1990).	No
<i>Ardea ibis</i>	Cattle Egret	-	M	Occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands (Marchant and Higgins 1990).	Yes-boreholes locations provide potential foraging habitat
<i>Melanodryas cucullata</i>	Hooded Robin	V	-	This species lives in a wide range of temperate woodland habitats, and a range of woodlands and shrublands in semi-arid areas (Traill and Duncan 2000).	No
<i>Lathamus discolor</i>	Swift Parrot	E1	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 (Forshaw and Cooper 1981). The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW (Shields and Crome 1992). This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability (Pizzey and Knight 1997).	Possibly within Shale Sandstone Transition Forest.
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater	V	-	Found mostly in open forests and woodlands dominated by box and ironbark eucalypts (Higgins <i>et al.</i> 2001). It is rarely recorded east of the Great Dividing Range (Higgins <i>et al.</i> 2001).	Possibly within Shale Sandstone Transition Forest.
<i>Monarcha melanopsis</i>	Black-faced Monarch	-	M	A migratory species found during the breeding season in damp gullies in temperate rainforests. Disperses after breeding into more open woodland (Pizzey 1983).	No
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	-	M	Migratory species that occurs in coastal forests, woodlands and scrubs during migration. Breeds in heavily vegetated gullies (Pizzey 1983).	No

Latin Name	Common Name	TSC Act	EPBC Act	Habitat	Potential habitat in area to be impacted
<i>Merops ornatus</i>	Rainbow Bee-eater	-	M	Usually occurs in open or lightly timbered areas, often near water. Nest in embankments, including banks of creeks and rivers, in sand dunes, in quarries and in roadside cuttings. Breeding occurs from November to January. It has complex migratory movements in Australia. NSW populations migrate north for winter (Higgins 1999).	No
<i>Ninox connivens</i>	Barking Owl	V	-	Generally found in open forests, woodlands, swamp woodlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country (Pizzey 1983).	Possibly within Shale Sandstone Transition Forest.
<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 (Debus and Chafer 1994). Large mature trees with hollows at least 0.5 m deep are required for nesting (Garnett 1992). Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials (Gibbons and Lindenmayer 1997). Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm (Gibbons and Lindenmayer 1997).	Possibly within Shale Sandstone Transition Forest.
<i>Rhipidura rufifrons</i>	Rufous Fantail	-	M	Migratory species that prefers dense, moist undergrowth of tropical rainforests and scrubs. During migration it can stray into gardens and more open areas (Pizzey 1983).	No
<i>Rostratula australis</i>	Australian Painted Snipe	E1	VM	Usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps and waterlogged grassland. They prefer freshwater wetlands, ephemeral or permanent, although they have been recorded in brackish waters (Marchant & Higgins 1993).	No
<i>Gallinago hardwickii</i>	Latham's Snipe	-	M	Typically found on wet soft ground or shallow water with good cover of tussocks. Often found in wet paddocks, seepage areas below dams (Pizzey and Knight 1997).	No
<i>Pyrrholaemus sagittatus</i>	Speckled Warbler	V	-	This species occurs in eucalypt and cypress woodlands on the hills and tablelands of the Great Dividing Range. They prefer woodlands with a grassy understorey, often on ridges or gullies (Blakers et al. 1984; NSW Scientific Committee 2008b). The species is sedentary, living in pairs or trios and nests on the ground in grass tussocks, dense litter and fallen branches. They forage on the ground and in the understorey for arthropods and seeds (Blakers et al. 1984; NSW Scientific Committee 2008b). Home ranges vary from 6-12 hectares (NSW Scientific Committee 2008b).	Possibly within Shale Sandstone Transition Forest.

Latin Name	Common Name	TSC Act	EPBC Act	Habitat	Potential habitat in area to be impacted
<i>Stagonopleura guttata</i>	Diamond Firetail	V	-	Found in a range of habitat types including open eucalypt forest, mallee and acacia scrubs (Pizzey and Knight 1997).	Possibly within Shale Sandstone Transition Forest.
<i>Tyto novaehollandiae</i>	Masked Owl	V	-	Inhabits a diverse range of wooded habitat that provide tall or dense mature trees with hollows suitable for nesting and roosting (Higgins 1999). Mostly recorded in open forest and woodlands adjacent to cleared lands. Nest in hollows, in trunks and in near vertical spouts or large trees, usually living but sometime dead (Higgins 1999). Nest hollows are usually located within dense forests or woodlands (Gibbons and Lindenmayer 1997). Masked owls do prey upon hollow-dependent arboreal marsupials, but terrestrial mammals make up the largest proportion of the diet (Gibbons and Lindenmayer 1997, Higgins 1999).	Possibly within Shale Sandstone Transition Forest.
<i>Tyto tenebricosa</i>	Sooty Owl	V	-	Often found in tall old-growth forests, including temperate and subtropical rainforests. In NSW mostly found on escarpments with a mean altitude <500 m. Nests and roosts in hollows of tall emergent trees, mainly eucalypts (Higgins 1999) often located in gullies (Gibbons and Lindenmayer 1997). Nests have been located in trees 125 to 161 cm in diameter (Gibbons and Lindenmayer 1997).	No
<i>Xanthomyza phrygia</i>	Regent Honeyeater	E1	E	A semi-nomadic species occurring in temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forests associations and wet lowland coastal forests (Pizzey 1983, NPWS 1999c).	Possibly within Shale Sandstone Transition Forest.
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 (Turner and Ward 1995). Because of its small size it is able to utilise a range of hollow sizes including very small hollows (Gibbons and Lindenmayer 1997). Individuals will use a number of different hollows and an individual has been recorded using up to 9 nest sites within a 0.5ha area over a 5 month period (Ward 1990).	No
<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 (Hoye and Dwyer 1995). Can also be found on the edges of rainforests and in wet sclerophyll forests (Churchill 1998). This species roosts in caves and mines in groups of between 3 and 37 individuals (Churchill 1998).	Possibly within Shale Sandstone Transition Forest.

Latin Name	Common Name	TSC Act	EPBC Act	Habitat	Potential habitat in area to be impacted
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	Uses a range of habitats including sclerophyll forests and woodlands, coastal heathlands and rainforests (Dickman and Read 1992). Habitat requirements include suitable den sites, including hollow logs, rock crevices and caves, an abundance of food and an area of intact vegetation in which to forage (Edgar and Belcher 1995).	No
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V	-	Broad range of habitats including rainforest, wet and dry sclerophyll forest, paperbark forest and open grasslands. Roost in caves and man made habitats and under road culverts (Strahan 1995).	All boreholes considered potential foraging habitat only
<i>Isodon obesulus</i>	Southern Brown Bandicoot	E1	E	Prefers sandy soils with scrubby vegetation and/or areas with low ground cover that are burnt from time to time (Braithwaite 1995). A mosaic of post fire vegetation is important for this species (Maxwell <i>et al.</i> 1996).	No
<i>Mormopterus norfolkensis</i>	Eastern Freetail Bat	V	-	Most records are from dry eucalypt forests and woodlands to the east of the Great Dividing Range. Appears to roost in trees, but little is known of this species habits (Allison and Hoye 1995, Churchill 1998).	No
<i>Myotis macropus</i>	Large-footed Myotis	V	-	Occurs in most habitat types as long as they are near permanent water bodies, including streams, lakes and reservoirs. Commonly roost in caves, but can also roost in tree hollows, under bridges and in mines (Richards 1995, Churchill 1998).	No
<i>Petaurus australis</i>	Yellow-bellied Glider	V	-	Restricted to tall native forests in regions of high rainfall. Preferred habitats are productive, tall open sclerophyll forests where mature trees provide shelter and nesting hollows. Critical elements of habitat include sap-site trees, winter flowering eucalypts, mature trees suitable for den sites and a mosaic of different forest types (NPWS 1999d).	No
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E1	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 (Eldridge and Close 1995).	No
<i>Phascolarctos cinereus</i>	Koala	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 (Reed and Lunney 1990, Reed <i>et al.</i> 1990).	Possibly within Shale Sandstone Transition Forest.
<i>Potorous tridactylus</i>	Long-nosed Potoroo	V	V	Inhabits coastal heath and wet and dry sclerophyll forests. Generally found in areas with rainfall greater than 760 mm. Requires relatively thick ground cover where the soil is light and sandy (Johnston 1995).	No

Latin Name	Common Name	TSC Act	EPBC Act	Habitat	Potential habitat in area to be impacted
<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 (Tidemann 1995) although some individuals may travel up to 70 km (Augee and Ford 1999).	Possibly within Shale Sandstone Transition Forest.
<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 (Churchill 1998). In dense environments they utilise natural and human-made opening in the forest for flight paths. Creeks and small rivers are favoured foraging habitat (Hoye and Richards 1995). This species roosts in hollow tree trunks and branches (Churchill 1998).	No
Reptiles					
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E1	V	Mainly occurs 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 habitat they generally use rock crevices and exfoliating rock during the cooler months and tree hollows during summer (Webb 1996, Webb and Shine 1998).	No

Assessments of Significance:

Shale/Sandstone Transition Forest

Shale Sandstone Transition Forest (SSTF) is listed as an Endangered Ecological Community in Part 3 of Schedule 1 of the TSC Act.

Shale Sandstone Transition Forest was recorded at Boreholes MD05 and R04. The area to be directly impacted at borehole R04 is devoid of trees and comprises a patch of the native shrub *Kunzea ambigua* and scattered native grasses and herbaceous species. The area to be directly impacted by borehole MD05 consists of small saplings and trees (DBH <20 cm), shrubs and native groundcover species. At both boreholes, all large trees will be avoided and disturbed areas will be regenerated posted works.

The proposed development would temporarily disturb a small area of Shale Sandstone Transition Forest. On this basis, an Assessment of Significance under the TSC Act and a Significant Impact Criteria Assessment under the EPBC Act for this community are provided below.

Impacts of the proposed boreholes R04 and MD05 will involve clearance and soil disturbance of an area no greater than 30 x 40 m, or 0.12 ha at each borehole. Both boreholes will also require clearing of an access track, involving disturbance to the shrub and ground layer.

Intact SSTF and large trees located nearby to the boreholes will be protected. Sediment fencing and containment of water associated with the drilling will prevent potential indirect impacts on the down slope areas of SSTF.

TSC Act: Seven-part test

(a) 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.

N/A.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

N/A.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(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

(ii) 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.

The vegetation in the Study Area occurs within a largely cleared rural area. Vegetation mapping (NPWS 2002c) indicates that approximately 1,681 ha of SSTF occurs within a 5 km radius of the Study Area. This mapping also shows the plant community generally occurs as small disturbed remnants within agricultural land and developed land. The proposal will result in the direct impacts to approximately 0.24 ha of SSTF. The local occurrence of SSTF will not be placed at risk of extinction by the proposal.

Topsoil and stockpiled grasses will be returned to the site, which will hasten the regeneration of this patch of groundcover to its pre-drilling condition. Brush matting using local seed bearing material will also be undertaken to expedite natural regeneration of the areas disturbed by the proposal. The proposal will not result in the modification of the composition of this community such that it would be placed at risk of extinction.

(d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which the habitat is likely to be removed or modified as a result of the action proposed, and

(ii) 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

(iii) 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.

DECC (NPWS 2002c) have mapped over 1,681 ha of SSTF within a 5 km radius of the Study Area. The SSTF to be impacted within the Study Area is in good to moderate condition and covers a small area of approximately 0.24 ha. The area that would be impacted as part of the proposal equates to 0.014% of the extent of the community in the locality (5 km radius of the Study Area).

The proposal would not result in the fragmentation or isolation of any SSTF. All large trees will be protected, with only small trees, shrubs and groundcover species being cleared. Given the small area and temporary nature of the impacts, this vegetation is not considered to be important for the long term survival of SSTF in the locality.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a Register of Critical Habitat. To date, no critical habitat has been declared for SSTF.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

A recovery plan for SSTF is currently being prepared, as part of the recovery planning for the endangered ecological communities of the Cumberland Plain. The endangered ecological community information for SSTF (DECC 2005b) lists the following priority actions to recover the ecological community:

- Promote public involvement in restoration activities.
- Apply necessary fire regimes to maintain appropriate floristic and structural diversity.
- Protect habitat by minimising further clearing. This requires recognition of the values of all remnants in the land use planning process, particularly development consents, rezonings and regional planning.
- Protect habitat by controlling run-off entering the site if it would change water, nutrient or sediment levels or cause erosion.
- Weed control.
- Undertake restoration including bush regeneration and revegetation.

The proposed development will result in the disturbance of SSTF which will include clearing some vegetation within the borehole site. Large trees are absent from the borehole site and will not be removed. Revegetation of the site following site closure will assist with the regeneration of the community in the locality.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

‘Clearing of Vegetation’ is listed as a KTP on Schedule 3 of the TSC Act. The proposal will result in the clearing of a very small area of SSTF.

Conclusion

The proposed development of boreholes MD05 and R04 are not likely to have a significant impact on the community given the regional extent of the community and the small area of SSTF to be impacted. A Species Impact Statement is not considered to be required.

EPBC Act: Assessment of Significance

Is the action likely to reduce the extent of a community?

The proposed development of Boreholes MD05 and R04 will involve the disturbance of an area of SSTF of approximately 0.24 ha. Both borehole sites occur at the edge of a much larger area of SSTF that is associated with the Redbank and Matthews creek system. Therefore the proposal is not likely to reduce the extent of the ecological community.

Is the action likely to fragment or increase fragmentation an occurrence of the community, for example by clearing vegetation for roads or transmission lines?

The proposal will not result in the fragmentation of any areas of SSTF. All large trees will be protected, with only small trees, shrubs and groundcover species being cleared.

Is the action likely to adversely affect habitat critical to the survival of an ecological community?

DEWHA (DEH 2006) defines Habitat critical to the survival of a species or ecological community as areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal;
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
- to maintain genetic diversity and long term evolutionary development; or
- for the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act (DEH 2006).

To date, there is no critical habitat listed for SSTF on the Register of Critical Habitat and there is no recovery plan for the ecological community.

Given the small area of SSTF that will be cleared, the proposed development is unlikely to adversely affect habitat critical to the survival of the ecological community.

Is the action likely to modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for the community's survival, including the reduction of groundwater levels, or substantial alteration of surface water drainage patterns?

All water used in the drilling process will be contained on the borehole site, and not discharged to the surrounding vegetation. Sediment fencing will be established to prevent sedimentation effects on down slope areas. There will be no release of any chemicals associated with drilling or transport machinery to the surrounding environment. For these reasons, it is considered highly unlikely that the proposal would have any effects on abiotic factors necessary for the EEC's survival.

Is the action likely to cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting?

The area impacted by the development of Boreholes MD05 and R04 will involve the disturbance of an area of SSTF of approximately 0.24 ha. No large trees will be removed as part of the proposed works and clearing will be restricted to small trees, shrubs and groundcover species. Further, the disturbed area will be actively regenerated post works. The proposal is therefore not likely to lead to a substantial change in the species composition of the ecological community.

Is the action likely to cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:

- assisting invasive species, that are harmful to the listed ecological community, to become established; or
- causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community; or

The proposed development may result in an increase in invasive species in the SSTF in the Study Area. If additional weed species are found to be invading the SSTF in the vicinity of the boreholes as a result of the proposed development, bush regeneration techniques should be employed to remove problem weed species.

The boreholes would be drilled utilising water as the circulating fluid. There will be no use of chemicals or hazardous materials during the proposed works. No petroleum based drilling fluids or additives would be used at any stage in the drilling or testing of the wells and no drilling circulation water would be discharged to waterways, drainage lines or farm dams. It is recommended that drilling circulation water is not discharged into areas supporting SSTF or adjoining areas that might drain to the SSTF.

Is the action likely to interfere with the recovery of an ecological community?

To date, a Recovery Plan has not been prepared under the EPBC Act for this ecological community. Under the TSC Act a recovery plan is currently being prepared, as part of the recovery planning for the endangered ecological communities of the Cumberland Plain. The Endangered Ecological Community Information for SSTF (DECC 2005c) lists the following priority actions to recover the ecological community:

- Promote public involvement in restoration activities.
- Apply necessary fire regimes to maintain appropriate floristic and structural diversity.
- Protect habitat by minimising further clearing. This requires recognition of the values of all remnants in the land use planning process, particularly development consents, rezonings and regional planning.
- Protect habitat by controlling run-off entering the site if it would change water, nutrient or sediment levels or cause erosion.
- Weed control.
- Undertake restoration including bush regeneration and revegetation.

The proposed development will result in the disturbance of SSTF which will include clearing some small trees, shrubs and groundcover species within the borehole sites. Large trees are absent from the borehole site and will not be removed. Revegetation of the site following site closure will assist with the regeneration of the community in the locality.

Conclusion

Based on the above assessment, SSTF is unlikely to be significantly impacted by the proposal and, as such, a Referral under the provisions of the EPBC Act is not recommended for this ecological community.

Species lists: Flora

Note – species list only includes those species within 30 m of the proposed boreholes

Family	Scientific Name	Common Name
Monocotyledons		
Cyperaceae		
	<i>Fimbristylis dichotoma</i>	Common Fringe-sedge
Poaceae		
	<i>Aristida ramosa</i> var. <i>ramosa</i>	
	<i>Aristida vagans</i>	Threeawn Speargrass
	* <i>Axonopus affinis</i>	Narrow-leaved Carpet Grass
	<i>Bothriochloa</i> spp.	
	* <i>Chloris gayana</i>	Rhodes Grass
	<i>Cymbopogon refractus</i>	Barbed Wire Grass
	<i>Cynodon dactylon</i>	Common Couch
	<i>Entolasia marginata</i>	Bordered Panic
	<i>Eragrostis leptostachya</i>	Paddock Lovegrass
	<i>Eragrostis</i> spp.	
	<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Grass
	* <i>Paspalum dilatatum</i>	Paspalum
	* <i>Pennisetum clandestinum</i>	Kikuyu Grass
	* <i>Setaria gracilis</i>	Slender Pigeon Grass
	<i>Sporobolus creber</i>	Slender Rat's Tail Grass
	* <i>Sporobolus indicus</i> var. <i>capensis</i>	Parramatta Grass
	<i>Themeda australis</i>	Kangaroo Grass
Dicotyledons		
Apiaceae		
	<i>Centella asiatica</i>	Pennywort
	* <i>Foeniculum vulgare</i>	Fennel
Asclepiadaceae		
	* <i>Araujia hortorum</i>	
	* <i>Gomphocarpus fruticosus</i>	Narrow-leaved Cotton Bush
Asteraceae		
	<i>Calotis dentex</i>	
	* <i>Cirsium vulgare</i>	Spear Thistle
	<i>Conyza</i> spp.	
	* <i>Hypochaeris radicata</i>	Catsear
	* <i>Senecio madagascariensis</i>	Fireweed
	* <i>Tagetes minuta</i>	Stinking Roger
Cactaceae		
	<i>Opuntia</i> spp.	
Casuarinaceae		
	<i>Allocasuarina littoralis</i>	Black Sheoak
Chenopodiaceae		
	<i>Einadia hastata</i>	Berry Saltbush
Convolvulaceae		
	<i>Dichondra repens</i>	Kidney Weed
Epacridaceae		

Family	Scientific Name	Common Name
	<i>Leucopogon juniperinus</i>	Long-flower Beard-heath
Fabaceae (Mimosoideae)		
	<i>Acacia parramattensis</i>	Parramatta Wattle
	<i>Acacia spp.</i>	
Fabaceae (Faboideae)		
	<i>Glycine clandestina</i>	Twining Glycine
	<i>Hardenbergia violacea</i>	False Sarsaparilla
Geraniaceae		
	<i>Geranium homeanum</i>	Northern Cranesbill
Lauraceae		
	<i>Cassytha pubescens</i>	
Malvaceae		
	* <i>Modiola caroliniana</i>	Red-flowered Mallow
	* <i>Sida rhombifolia</i>	Paddy's Lucerne
Myrtaceae		
	<i>Angophora floribunda</i>	Rough-barked Apple
	<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark
	<i>Eucalyptus fibrosa</i>	Red Ironbark
	<i>Eucalyptus tereticornis</i>	Forest Red Gum
	<i>Kunzea ambigua</i>	Tick Bush
Oleaceae		
	* <i>Ligustrum lucidum</i>	Large-leaved Privet
	* <i>Ligustrum sinense</i>	Small-leaved Privet
	<i>Notelaea longifolia</i>	Large Mock-olive
	* <i>Olea europaea ssp. africana</i>	
Oxalidaceae		
	<i>Oxalis spp.</i>	
Phytolaccaceae		
	* <i>Phytolacca octandra</i>	Inkweed
Pittosporaceae		
	<i>Bursaria spinosa ssp. spinosa</i>	Sweet Bursaria
Plantaginaceae		
	* <i>Plantago lanceolata</i>	Lamb's Tongues
Polygonaceae		
	* <i>Rumex spp.</i>	
Rosaceae		
	* <i>Rubus fruticosus</i>	Blackberry complex
Solanaceae		
	* <i>Lycium ferocissimum</i>	African Boxthorn
	<i>Solanum prinophyllum</i>	Forest Nightshade
Sterculiaceae		
	<i>Brachychiton populneus ssp. populneus</i>	Kurrajong
Verbenaceae		
	* <i>Verbena bonariensis</i>	Purpletop
	* <i>Verbena rigida</i>	Veined Verbena

Note: * signifies exotic species

APPENDIX 2

BOREHOLE SITE PLANS

APPENDIX 3

SURFACE DISTURBANCE NOTICE

FIGURES

Figure 1: Location of the Study Area in a Regional Context.

Figure 2: Location of 10 Borehole Sites within the Tahmoor Colliery Mining Lease Area.



Figure 3: South Coast Region Water Management Act 2000

Figure 4: Vegetation Mapping of the Study Area and Surrounds

Figure 5: Threatened Flora Previously Recorded Within 10km of the Study Area

Figure 6: Threatened and Migratory Fauna Previously Recorded Within 10km of the Study Area.

Figure 7: Cultural Heritage Sites Previously Recorded in the Vicinity of the Study Area.

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