






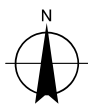
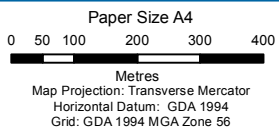


LEGEND

-  Study area
-  Cadastre
-  Watercourse
-  Waterbody
-  Existing access
-  Site access
-  Dead stag (vertical fissures)
-  Disturbance area



Glen Innes Severn Council
Wattle Vale Quarry
Flora and Fauna Impact Assessment

Job Number | 22-18380
Revision | A
Date | 08 Nov 2016

Threatened biota and habitat

Figure 5-2

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E ntmal@ghd.com W www.ghd.com.au
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Data source: LPI: DCDB & DTDB, 2012, Aerial Imagery, 2016; GISSC: Quarry data, 2016. Created by: fmackay, tmorton

6. Potential impacts

6.1 Direct impacts

6.1.1 Vegetation clearing

The proposal would result in the permanent removal of 7.76 hectares of low condition EEC vegetation consisting of 2.29 ha of woodland EEC vegetation and 5.46 hectares of derived grassland EEC vegetation. Removal of vegetation within the indicative footprint is shown on Figure 3 and summarised in Table 6-1. This estimate assumes that all clearing and works associated with the proposal would be contained within the indicative footprint as shown, and that access would be limited to the existing access roads where no vegetation clearing will be required.

The proposal will result in the removal of few mature trees (<10 trees); however, due to the extent of vegetation clearing which has already occurred within the locality, the proposal will not affect the connectivity of the EEC in surrounding areas.

A number of mitigation measures are provided in Section 7 to minimise the potential for impacts on retained native vegetation as a result of the proposal.

Table 6-1 Vegetation clearing within the proposal disturbance footprint

Vegetation Community (OEH, 2013)	TSC Act Status	EPBC Act Status	Area of removal in disturbance footprint (ha)	Total area within study area (ha)
Ribbon Gum Mountain Gum Grassy Woodland EEC	EEC	-	2.29	71.35
Ribbon Gum – Mountain Gum Derived Grassland EEC	-	-	5.46	141.09
Total Native Vegetation			7.76	212.46

6.1.2 Loss of flora habitat

The proposal would result in the removal of up to 7.76 hectares of low condition EEC vegetation. Vegetation within the study area exists in a highly modified state, as a result of past land uses and land management practices. The majority of species recorded within the study area are common and widespread, and capable of withstanding repeated and ongoing disturbance such as intense grazing pressure. Extensive areas of comparable vegetation also occur adjacent to the study area and within the wider locality.

The removal of flora habitat as a result of the proposal is unlikely to result in a loss of genetic or floristic diversity to retained vegetation within the study area and surrounding areas.

6.1.3 Loss of fauna habitat

The vegetation that would be removed provides habitat for a limited number of fauna species due to the large distances between isolated mature trees and other remnant vegetation outside of the proposal footprint. Fauna habitat resources that would be removed include the following:

- Myrtaceous species, including suitable feed trees for threatened woodland bird species.
- A low density of fallen logs and woody debris, which would provide limited shelter and foraging habitat for native insects, common reptiles and amphibians.

6.1.4 Injury and mortality

Vegetation clearing

The proposal may cause displacement or in some cases possible mortality of fauna that are present at the time of vegetation clearing and quarry establishment activities. Less mobile terrestrial fauna, such as common species of frogs and reptiles are at most risk of mortality as a result of vegetation clearing.

The majority of native bird species and non-arboreal mammal species occurring within the proposal footprint (i.e. such as those utilising mature trees) are likely to use these habitats as part of a wider network of habitat across the landscape. These species would likely disperse to avoid quarry establishment activities given their more mobile nature, and most individuals directly affected by the proposal are likely to be displaced into surrounding habitat rather than killed.

Mortality of fauna species which are less able to avoid the disturbance may include the following:

- Less mobile individuals, such as nestlings, old or sick individuals.
- Frogs and reptiles which may be sheltering in burrows, woody debris, soil crevices or under bark.

Displaced individuals would be vulnerable to predation since they would be disturbed in daylight hours and would experience energy costs, increased risk of predation and increased competition for resources. This may result in impacts beyond the disturbance area by favouring aggressive or generalist species. Birds breeding in, or in the vicinity of, the proposal footprint may have breeding disrupted for one season.

These direct impacts would affect limited numbers of individuals and so would be unlikely to threaten the survival of any local populations.

Vehicle strike

The proposal would result in an increase of vehicle traffic through the site, thus increasing the risk of vehicle strike for terrestrial fauna. Vehicle movements would be restricted to the access road and quarry site, and would not pass through retained areas of vegetation, reducing the risk of encountering fauna. Works and vehicle movements would be restricted to daylight operating hours, meaning that this risk would affect diurnal species only. Mitigation measures to reduce the risk of vehicle strike, including the enforcement of speed limits are discussed in Section 7.

6.2 Indirect impacts

Potential indirect impacts that may occur as a result of the proposal are discussed below.

6.2.1 Edge effects

Edge effects are described as an ecological impact at two or more interfacing habitat types. Edge effects are inherent or natural in nature (i.e. wherever changes in vegetation or landscape cause sudden changes in vegetation structure) but can have negative impacts if their creation alters ecological processes. They also change habitat conditions (such as degree of humidity and exposure to light or wind) created at or near the boundary between areas. In general, edge effects increase in relation to the dissimilarity between adjoining habitats.

Removal of vegetation causes a number of new environmental conditions to develop along the edges of the cleared environments, in particular in environments that originally contain the upper strata levels (canopy and/ or shrub layer) of vegetation. The removal of vegetation generally promotes the invasion of exotic species and/or disturbance tolerant native plants. With the invasion of these new species it often becomes difficult for the original plant species to recolonise once disturbed.

The proposed quarry area and immediate surroundings are already largely disturbed, with evidence of minor weed infestations throughout the proposal footprint. The proposal would increase edge effects due to potential detrimental impacts resulting from quarry establishment. Impacts may include the introduction or spread of weed species, light and dust to new areas of vegetation, which are currently less affected by these impacts, reducing flora and fauna habitat values in the newly exposed edge areas.

6.2.2 Introduction or spread of weeds

The proposal may cause the dispersal of weed propagules (seeds, stems and flowers) into adjacent areas of native vegetation via plant and machinery, erosion (wind and water) and via worker's shoes and clothing. Some sections of the study area already support infestations of Blackberry (*Rubus fruticosus*), as well as various other exotic species; however, there is a possibility that additional, more invasive or otherwise damaging environmental weeds may be introduced to the retained vegetation, or that existing Blackberry infestations may be further spread into areas that are currently free from infestations. Depending upon the weeds introduced to the site, this could result in a decline in the condition of adjacent native vegetation and associated native fauna habitats.

6.2.3 Introduction of pathogens

The proposal has the potential to introduce or spread pathogens such as *Phytophthora cinnamomi* (Phytophthora). Rainfall is one key factor influencing the distribution of *Phytophthora cinnamomi*; consequently, disease caused by the pathogen is generally restricted to moister regions (Summerell et al.2005). It occurs in gullies, depressions, along drainage lines, and in areas of surface seepage on ridge tops (Laidlaw & Wilson 2003). Mitigation measures as outlined in Section 7 should be implemented as a precaution.

Spread of *Batrachochytrium dendrobatidis* (Chytrid fungus) is also possible, given the presence of drainage lines in the study area and dams immediately outside of the study area, but is unlikely given no works would be undertaken within the drainage lines or near the off-site dams. As previously described, there is little available information about the distribution of these pathogens within the locality, and no evidence of these pathogens was observed during surveys. Where present, Phytophthora may result in the dieback or modification of native vegetation and damage to fauna habitats. Chytrid fungus affects both tadpoles and adult frogs and can wipe out entire populations once introduced into an area. Mitigation measures are included in Section 7 to minimise the potential for any impacts such as pathogen introduction as a result of the proposal.

6.2.4 Soil and water pollution

The proposal has the potential to result in pollution and contaminated runoff within the proposal footprint and adjoining areas through soil disturbance and quarry establishment activities. Potential sources of soil and water pollution include:

- Soil disturbance during quarry establishment and vegetation clearing activities.
- Inappropriate management of soil and material stockpiles.
- Hydrocarbon leaks or spills from vehicles or equipment used in quarrying or vegetation clearance activities, as well as during works on the access road.
- Increased runoff from hardstand areas.
- Increased sediment transfer and erosion potential in areas cleared of vegetation.

The topography of the study area and nature of the proposal means that there is potential for soil and water pollution as a result of the proposal if appropriate controls are not adopted during quarry establishment and vegetation clearing and soil disturbance activities.

It is anticipated that any water released into the environment as a result of the proposal would be of a similar quality to present conditions. Mitigation measures to reduce the potential for such matters are described in Section 7, and include minimising the disturbance area, the use of erosion and sediment control devices and pollution control methods.

6.2.5 Noise and vibration

There would be noise and vibration impacts during the various stages of quarry operation as a result of vegetation clearing, vehicle movement, operation of plant and blasting for establishment of the quarry itself. Due to the topography of the site and staging of the proposed works, noise and vibration impacts would likely be limited to the areas immediately around the study area.

Raised levels of noise and vibration may deter native fauna from using the area surrounding the source of any noise or vibration. This may potentially interrupt dispersal within the locality if an individual is unwilling to travel through an area where increased levels of noise or vibration is detectable, or may cause some species to abandon an area in search of areas where it is not detectable.

The establishment of the quarry will expose new areas to increased noise and vibration levels, due to quarry establishment activities, resulting in regular blasting activities and the presence of heavy vehicle traffic in and around the quarry. Given the current noise and vibration levels in the vicinity of the proposal, the proposal has the potential to result in additional short-term impacts on native biota.

Mitigation measures to reduce noise and vibration generated by the proposal and to shield sensitive residential receptors have been proposed in the Noise Impact Assessment (GHD, 2016; refer to Chapter 5 of the main EIS document). Measures relevant to reducing impacts on native fauna have been summarised in Section 7.

6.2.6 Artificial lighting

Night time lighting can potentially discourage native species from using habitat where diffuse light penetrates into adjoining areas of vegetation. The foraging and nesting regimes of some nocturnal native mammals and birds can therefore be disrupted by lighting. In addition, the eyesight of nocturnal species (such as owls and possums) is hindered by bright lights, and where they are affected by this, they can become more susceptible to predation.

6.2.7 Alterations to surface water flows

The proposed works would alter the local topography at the site, which would affect the drainage of surface water. It is likely that surface water from beyond the works area would be diverted around the works, which could lead to a concentration and discharge of flows rather than distributed discharges. The impact of this could be increased risk of erosion and sedimentation if not adequately managed.

The proposed operation would expose a larger proportion of rock areas and other impervious areas compared with the existing site, leading to increased runoff volumes during rain events and larger runoff peaks during storm events.

These potential impacts would be managed as described in the Surface and Groundwater Assessment. Mitigation measures would include the installation of a settlement basin to collect and treat excess surface flows from the quarry. This would allow for management of the quality, volume and timing of water discharge to adjoining areas.

6.3 Key threatening processes

A key threatening process (KTP) is defined in the TSC Act as an action, activity or proposal that:

- Adversely affects two or more threatened species, populations or ecological communities.
- Could cause species, populations or ecological communities that are not currently threatened to become threatened.

There are currently 38 KTPs listed under the TSC Act, eight listed under the FM Act and 20 listed under the EPBC Act. A number of KTPs are listed under more than one Act. Those potentially relevant to this proposal are discussed in Table 6-2. Mitigation measures to limit the impacts of these KTPs are discussed in Section 7.

Table 6-2 Key threatening processes

KTP	Status	Comment
Clearing of native vegetation	TSC Act; EPBC Act	Clearing of native vegetation has occurred historically around and throughout the study area. The proposal would result in the clearing of approximately 7.76 hectares of low condition native vegetation from the study area. Mitigation measures are provided in Section 7 to limit the potential for impacts to retained native vegetation elsewhere within the study area.
Removal of dead wood and dead trees	TSC Act	Only one dead stag was identified within the study area which would require removal. The proposal would involve the removal of 7.76 hectares of low condition native vegetation. Mitigation measures are provided in Section 7 to limit the potential for impacts to native biota as a result of removal of dead wood and dead trees.
Invasion of plant communities by perennial exotic grasses	TSC Act	Parts of the study area have been subject to historical disturbance activities, and as a result, there are exotic weed species in some areas of the study area. Weeds have also been introduced in edge areas associated with the existing cleared area. Vehicles and plant could further spread exotic grass species, as could soil disturbance during quarry activities and vegetation clearing. There is the potential for perennial exotic grasses to invade retained and adjacent native vegetation through disturbance during quarry establishment activities.
Infection of native plants by <i>Phytophthora cinnamomi</i>	TSC Act;	Quarry establishment activities have the potential to introduce the root-rot fungus <i>Phytophthora cinnamomi</i> to the study area, which could lead to dieback of

KTP	Status	Comment
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	EPBC Act	vegetation. Mitigation measures to reduce the potential for the introduction of <i>Phytophthora</i> are recommended in Section 7 to limit impacts on native vegetation.
	TSC Act; EPBC Act	Quarry establishment activities have the potential to introduce amphibian chytrid to the proposal footprint, which could lead to death of local frogs. This is unlikely, however, given no works would be undertaken within the drainage line or major dams. The implementation of a Flora and Fauna Management Plan with specific measures to reduce the potential for the introduction chytrid fungus is recommended to limit impacts on fauna and their habitats.
Predation by the European Red Fox	TSC Act; EPBC Act	Foxes were observed in the study area. The proposal is unlikely to increase the incidence of this species.
Competition and grazing by the feral European rabbit (<i>Oryctolagus cuniculus</i>)	TSC Act	Rabbits were recorded in the study area. The proposal is unlikely to increase the incidence of this species.

6.4 Impacts on state-listed biota

6.4.1 Threatened ecological communities

The Mountain Gum – Ribbon Gum Open Forest TEC occurring within the proposal footprint is of low, degraded quality. The proposal will result in the clearing 7.76 hectares of this EEC vegetation, while indirect impacts could increase edge effects, sedimentation and increased disturbance of remnant vegetation within the locality as described in Section 6.2.

An assessment of significance in accordance with Section 5A of the EP&A Act has been undertaken for potential indirect impacts on Mountain Gum – Ribbon Gum Open Forest and is presented in Appendix C. The conclusion of this assessment is that the proposal is unlikely to have a significant effect on Mountain Gum – Ribbon Gum Open Forest, as:

- A small area (7.76 ha) of the EEC may be exposed to direct impacts which may result in further modifications to the already modified community within the proposal footprint.
- The relatively large areas of better quality vegetation that exist elsewhere within the locality that would not be impacted by the proposal.
- The modified nature of the vegetation that may be impacted.
- The proposal will not result in the isolation or fragmentation of this vegetation from other areas of vegetation or habitat.

The proposal is unlikely to interfere with the recovery of this community as it occurs elsewhere within the locality.

6.4.2 Threatened flora species

To date, no threatened flora species have been recorded within the study area.

Notwithstanding, suitable habitat exists for one threatened flora species listed under the TSC Act, as described in Section 5.2.3. The potential for impacts on these species is summarised in Table 6-3. An assessments of significance in accordance with Section 5A of the EP&A Act has also been undertaken for this species and is presented in Appendix C.

The conclusion of these assessments is that the proposal is unlikely to have a significant effect on threatened flora species for the following reasons:

- No individuals have been recorded in the locality of the proposal footprint.
- Only marginal potential habitat would be removed that is likely to be of poor quality for the species due to habitat degradation.
- The potential habitat to be removed is unlikely to be necessary for the long-term survival of these species within the locality given no known individuals would be impacted.
- Clearing would not fragment habitat such that potential habitat in retained areas of vegetation would be impacted and no barriers to dispersal would be created outside of the proposal footprint.
- Only a small area of habitat would be impacted compared to the large areas that exist elsewhere in the locality, including within the various conservation reserves in the area.

Table 6-3 Potential impacts on threatened flora species listed under the TSC Act

Species name	TSC/ FM Act	EPBC Act	Likelihood of occurrence	Potential impacts
Austral Toadflax (<i>Thesium australe</i>)	V	V	Possible. Suitable habitat present.	Loss of up to 7.76 hectares of potential habitat. No impacts to any known individual plants.

6.4.3 Threatened fauna species

The site contains potential habitat for two species of threatened woodland birds (Swift Parrot and the Regent Honeyeater) as described in Section 5.5.3. Assessments of significance in accordance with Section 5A of the EP&A Act have been undertaken for these species and are presented in Appendix C. The conclusion of these assessments is that the proposal is unlikely to have a significant effect on these species for the following reasons:

- The Regent Honeyeater and Swift Parrot would be unlikely to breed within habitats to be removed.
- Vegetation to be removed comprises a negligible proportion of native vegetation present and conserved in surrounding areas and the broader locality.
- Habitat connectivity would be retained for these highly mobile species.

Table 6-4 Threatened fauna species likely to be impacted by the proposal

Common Name	TSC/FM Act	EPBC Act	Likelihood of occurrence	Potential impacts
Woodland Birds				
Regent Honeyeater	CE	E	Possible. Outside breeding range. May forage within study area on an opportunistic basis.	Removal of up to 7.76 hectares of potential foraging refuge habitat which does not contain known feed trees. This species does not breed in the locality.
Swift Parrot	E	E	Possible. Non-breeding visitor to NSW. May forage in locality on occasion.	Removal of up to 7.76 hectares of potential foraging habitat, which does not contain known feed trees. This species does not breed in the locality.

6.5 Impacts on MNES

6.5.1 Threatened ecological communities

No nationally threatened ecological communities are present in the study area. The proposal would not impact any nationally threatened ecological communities in the locality.

6.5.2 Threatened flora species

No threatened flora species as listed under the EPBC Act have been recorded within the study area; however potential habitat for one threatened flora species listed under the Act exists within the study area. Potential habitat for *Thesium australe* (Austral Toadflax) may be impacted by the proposal. This species is also listed under the NSW TSC Act, and the potential for impacts has been discussed in Section 6.4.2.

The factors listed in the EPBC Act significant impact guidelines (DotE 2013c) were considered in conjunction with the assessments of significance included in Appendix C. It was concluded that the proposal would not lead to a significant impact on *Thesium australe* (Austral Toadflax).

6.5.3 Threatened fauna species

Potential habitat for a total of two threatened fauna species listed under the Act exists within the study area, and may be impacted by the proposal:

- Regent Honeyeater, listed as an endangered species under the EPBC Act.
- Swift Parrot, listed as an endangered species under the EPBC Act.

These species are also listed under the NSW TSC Act, and potential impacts have been discussed in Section 6.4.3. For the Regent Honeyeater and Swift Parrot, the factors listed in the EPBC Act significant impact guidelines (DotE 2013c) were considered in conjunction with the assessments of significance included in Appendix C. It was concluded that the proposal would not lead to a significant impact on these species.

6.5.4 Migratory species

The Significant Impact Guidelines (DotE 2013c) for migratory species listed under the EPBC Act define important habitat as follows:

'An area of 'important habitat' for a migratory species is:

- Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or
- Habitat that is of critical importance to the species at particular life-cycle stages, and/or
- Habitat utilised by a migratory species which is at the limit of the species range, and/or
- Habitat within an area where the species is declining'

Seven migratory species were modelled to occur within the study area, however, habitat for only five of these species was identified within aquatic habitat adjacent to the study area (Section 5.5.4). The study area is not considered important habitat for any of these species, according to the Significant Impact Guidelines (DotE 2013c). This is due to the fact that potential habitat in the study area would not support an ecologically significant proportion of the population of these species, is not of critical importance to these species at particular life-cycle stages, is not at the limit of these species ranges, and is not within an area where these species are declining. No assessments of significance have been prepared for these species.

Based on the above considerations the proposal is unlikely to impose “a significant effect” on any of the listed migratory fauna species predicted to occur within the locality.

Table 6-5 Migratory fauna with the potential to occur within the study area

Common Name	TSC/FM Act	EPBC Act	Potential impacts
Aerial species			
Fork-tailed Swift		C,J,K	Unlikely to be impacted: aerial habitat largely unaffected. Quarrying activities may reduce foraging activity directly above and adjacent the study area. The proposal would affect a negligible proportion of habitat available to these highly mobile species.
White-throated Needletail		C,J,K	
Wetland species			
Latham's Snipe		C,J,K	Minimal potential for impacts: no direct impacts on dams with potential habitat value for these species.
Woodland species			
Black-faced Monarch		M	Removal of 7.76 hectares of potential foraging habitat.
Yellow Wagtail		M	

6.5.5 Additional MNES

There are no additional MNES (such as Ramsar Wetlands, World or National Heritage Areas or Commonwealth Marine Areas) that are predicted to occur within the locality of the study area that are relevant to or are likely to be impacted by the proposal.

7. Mitigation

The mitigation of adverse effects arising from the proposal has been presented according to the hierarchy of avoidance, mitigation and offsetting of impacts.

The proposal would result in direct impacts on native biota and their habitats within the proposed quarry establishment area. There is also the potential for impacts on habitats outside the disturbance area through indirect impacts such as noise, sedimentation, runoff or edge effects. Specific mitigation measures are recommended to minimise such impacts on the natural environment.

The proposal would result in some unavoidable residual adverse impacts imposed upon some elements of the natural environment, including removal of low condition EEC vegetation and imposition of edge effects on adjoining areas of retained native vegetation. These residual impacts are not expected to impose a significant negative effect on any local populations of native biota, including threatened species, TECs and their habitats, which occur in the study area or in adjoining habitats.

The following sections detail the avoidance of impacts and mitigation measures recommended for the proposal.

7.1 Avoidance of impacts

The proposal is the establishment of a quarry. The majority of the proposed quarry establishment area has avoided areas of ecological significance and falls within land that has been cleared in association with historical land uses, including logging and agriculture (grazing and pasture improvement). As a result, impacts on native flora and fauna are somewhat less than would be associated with a less disturbed site.

7.2 Mitigation of impacts

The proposal will impact native vegetation communities and habitat for threatened flora and fauna. In order to minimise the potential impacts of the proposal on biodiversity, the mitigation measures detailed below are recommended.

7.2.1 Detailed Design Phase

During the detailed design process, the impact of the proposal on areas with higher biodiversity values should be minimised wherever possible by:

- Minimising the area of native vegetation to be cleared wherever possible.
- Avoidance of identified hollow-bearing trees wherever possible.
- Minimising disturbance to adjacent retained vegetation, aquatic and riparian areas.

These measures aim to guide the vegetation clearing process by encouraging the contractor to avoid unnecessary clearing of vegetation, and limiting vegetation clearing to that which is required for the proposal only. Any establishment of laydown areas, site compounds or similar should be located within existing cleared areas or within the proposal footprint (as per Figure 1-1), so as to avoid any additional impacts outside the proposal footprint.

7.2.2 Environment Management Plan

An Environment Management Plan (EMP) will be prepared for the proposal which will include, as a minimum, industry-standard measures for the management of soil, surface water, weeds and pollutants, as well as site-specific measures including the environmental impact mitigation measures outlined below. While some of these mitigation measures are relevant to other assessments completed as part of this EMP (e.g. Surface and Groundwater Assessment), they are included here as they are relevant to maintaining existing levels of habitat and biodiversity values associated with the study area and adjacent areas.

Worker induction

Ensure all workers are provided with an environmental induction prior to starting work on site. This would include information on the ecological values of the study area and measures to be implemented to protect biodiversity.

Water quality management

A Water Management Plan would be incorporated into the EMP and designed to minimise the impact of altered groundwater and surface water flows at the site. This would include measures to ensure the impact of water releases from the settlement ponds would have minimal impact on adjacent areas of EEC vegetation and aquatic habitats. Mitigation measures would include, but not be limited to:

- Monitoring of all water to be pumped into the environment prior to pumping, targeting turbidity levels.
- Use of results of monitoring to determine the need to treat water to be discharged (e.g. flocculation).
- Appropriate management of surface flows from the quarry area, including sufficient settlement time within overflow ponds to allow sediment load to be deposited.
- Treatment (if necessary) of excess surface water in accordance with relevant licensing standards to ensure water quality in adjacent aquatic habitats is not impacted.
- Staged release of excess water where necessary to reduce erosion potential of additional surface flows into adjacent vegetation and aquatic areas.
- Ongoing contamination, sediment and erosion control measures as per the EMP.
- Use of an oil sock to remove any hydrocarbons in water to be pumped into the environment.
- Ongoing monitoring of surface and groundwater quality and development of contingency measures to address any decrease in quality due to quarrying activities.

Erosion control

A Sediment and Erosion Control Plan will be incorporated in the EMP and should contain detailed mitigation measures to reduce soil erosion and pollutant run-off during all quarry establishment works as well as during all works on the access road. These should include:

- Installation of erosion and sediment control measures prior to any works.
- Regular inspection of erosion and sediment control measures, particularly following rainfall events, to ensure their ongoing functionality.
- Stockpile management measures which minimise the potential for erosion and surface water runoff.

- Construction and maintenance of silt fences to capture and isolate any surface water runoff.
- Immediate removal offsite of excavated materials.

Dust

Specific measures will be incorporated into the EMP to minimise the generation of dust and associated impacts on adjacent natural environments. These should include:

- Setting maximum speed limits for all traffic within the proposal area to limit dust generation.
- Use of a water tanker or similar to spray unpaved roads during all quarry establishment and operational phases where required.
- Application of dust suppressants or covers on soil stockpiles.
- Stockpile management to limit the potential for dust generation.

Chemical spills

Specific measures will be incorporated into the EMP to minimise the potential for chemical spills and associated impacts on adjacent natural environments. These should include:

- All chemicals must be kept in clearly marked bunded areas.
- Regularly inspect vehicles and mechanical plant for leakage of fuel or oil.
- No re-fuelling of vehicles, washing of vehicles or maintenance of vehicles and plant to be undertaken within 20 m of creeks.

7.2.3 Flora and fauna management plan

A Flora and Fauna Management Plan (FFMP) should be prepared as a sub-plan to the EMP for the proposal. The FFMP would identify environmental management measures to protect the natural environment (e.g. weed and pathogen controls) and detailed site-specific and species-specific mitigation measures and management protocols to be implemented before, during and after all quarry establishment works and quarry activities to further avoid or reduce impacts on threatened biodiversity.

The FFMP would include but not be restricted to key protocols for the protection of threatened flora, fauna and their habitats as outlined below. As noted above, these specific protocols will be important to address remaining uncertainties with respect to potential impacts.

Pre-quarry establishment

Minimising vegetation clearance and habitat loss

Disturbance and removal of some areas of Low condition EEC vegetation and habitat will be unavoidable during the establishment of the quarry. To reduce the potential for adverse impacts on ecologically sensitive areas the following measures would be implemented:

- Locating any site offices and stockpiles in already cleared and disturbed areas to avoid further removal of native vegetation and/or hollow-bearing trees.
- Delineation and protection of any exclusion zones around native vegetation to be retained.

Pre-clearance surveys

Pre-clearing surveys of fauna and flora habitat would be carried out by a qualified ecologist. Pre-clearing surveys would largely focus on:

- Inspections of mature trees and stags for resident fauna, including inspections of nests and under exfoliating bark.
- Active searches for reptiles, including checking of exfoliating rock, rock crevices, and woody debris within the quarry footprint.
- Pre-clearing surveys for Austral Toadflax (*Thesium australe*) in areas of potentially suitable habitat.

Phytophthora management

Phytophthora may occur in the proposed development area given annual rainfall for the area is greater than 600 mm (McDougall and Summerell, 2003).

Hygiene measures in accordance with national best practice guidelines for *Phytophthora* (DEH 2006) to prevent the introduction or spread of the pathogen during the vegetation clearing phases of the proposal should be incorporated into the FFMP and include decontamination of personnel and plant equipment prior to entering the proposal site and when traversing between areas of vegetation within the proposal site.

These measures relate to the vegetation clearing and access road construction/upgrade stages of the proposal only, and should accompany measures that ensure plant and machinery does not enter any areas of retained vegetation within the study area. It is envisaged that once the quarry is operational, and machinery movement is restricted to established roads and tracks, that these measures would not be required.

Chytrid fungus management

Vegetation clearing and quarrying activities have the potential to introduce amphibian chytrid fungus to the study area, which could lead to death of local frogs. This potential is limited, however, as there would be no works in aquatic areas. Hygiene measures to prevent the introduction or spread of the pathogen during the vegetation clearing should be incorporated into the FFMP and include decontamination of plant equipment working within 40m of waterways and dams.

These measures relate to the vegetation clearing and access road construction stages of the proposal only, and should accompany measures that ensure plant and machinery does not enter any areas of retained vegetation within the study area. It is envisaged that once the quarry is operational, and machinery movement is restricted to established roads and tracks, that these measures would not be required.

During quarry establishment

Management of weeds and edge effects

A weed management plan would be included within the FFMP, and would include a description of the following:

- Type and location of weeds of concern (including noxious weeds) within the proposal disturbance footprint.
- Sensitive receivers (such as native vegetation and waterways) within or adjacent to the proposal disturbance footprint.

- Measures to prevent the spread of weeds, including hygiene procedures for equipment, footwear and clothing.
- Proposed weed control methods and targeted areas.
- Weed disposal protocols.

The weed management plan would include measures designed to mitigate edge effects that reduce impacts outside the footprint of the proposal (namely within surrounding retained vegetation). The aim of these measures would be to control the possible impacts at their source within existing weed infested areas and soften the edge between the earthworks and the retained native vegetation. Measures that would be adopted include:

- Avoid stockpiling of materials adjacent to native vegetation wherever possible.
- Avoid stockpiling of fill in areas of remnant vegetation but instead in adjacent already cleared areas.
- Implementing soil erosion and sediment control measures.
- During quarry establishment areas of vegetation to be retained should be demarcated to restrict access by site staff and machinery to remnant vegetation.
- During quarry establishment undertake maintenance of silt fences and other mitigation measures to isolate runoff; and immediately rehabilitate disturbed vegetation to limit the potential for colonisation by weeds.

Managing vehicle movements

The proposal would increase the risk of injury or mortality of native fauna due to vehicle strike by increasing the rate of vehicle visitation to the site. This risk would be reduced by:

- Restricting vehicle movements to operational (daylight) hours.
- Implementing and enforcing appropriate speed limits for vehicles traversing the site.

7.2.4 Remediation

Following completion of extraction works in the future, the quarry would be rehabilitated in an ecologically appropriate manner using local and endemic species characteristic of the vegetation types in the area.

8. Conclusion

8.1 Overview

The proposal involves the establishment of a quarry in a property that has been previously cleared for cattle grazing. The proposal will require the removal of up to 7.76 hectares of low condition EEC vegetation. There are minor infestations of Blackberry (*Rubus fruticosus*) across parts of the study area. Where possible, the proposal has been situated so as to avoid native vegetation and other sensitive ecological receptors such as riparian areas around ephemeral drainage lines within the study area.

Areas north of the study area are predominately cleared agricultural grazing land and rural residential properties which support small stands of native vegetation. As such, they represent a significant movement barrier for many native fauna species apart from highly mobile, disturbance tolerant species such as birds, bats and macropods.

8.2 Impacts on State-listed Biota

No threatened flora species were identified within the study area; however, potential habitat for one threatened flora species listed under the TSC Act will be impacted by the proposal. A total of 7.76 hectares of low condition EEC vegetation which constitutes potential habitat for Austral Toadflax (*Thesium australe*) would be impacted by the proposal. An assessment of significance for this removal determined that the proposal is unlikely to result in a significant impact to this species.

One threatened ecological community listed under the TSC Act was identified within the study area; Mountain Gum – Ribbon Gum Open Forest of Drainage Lines of the Southern New England Tablelands Region. An assessment of significance has been completed for direct impacts to 7.76 hectares of the community which determined that the proposal is unlikely to result in a significant impact within the locality.

No threatened fauna species were identified within or directly adjacent to the study area during field surveys. Habitat was identified for the Regent Honeyeater and the Swift Parrot. Assessments of significance were conducted for these species which determined that the proposal is unlikely to result in a significant impact to these species within the locality.

No threatened biota listed under the FM Act are likely to occur in the study area, or downstream of the study area. No assessments of significance were considered warranted for any threatened species, populations or communities listed under the FM Act.

The proposal is not likely to have a significant effect on threatened species, populations or ecological communities listed under the TSC Act or FM Act, pursuant to s.5A of the EP&A Act. As such, a SIS is not required.

8.3 EPBC Act MNES

The proposal contains potential habitat for two threatened fauna species and five migratory bird species listed under the EPBC Act. There are no other MNES within the locality which would be affected by the proposal. It is considered unlikely that the proposal would result in a significant impact on any MNES (see below).

Threatened species

Assessments to determine the likely significance of impacts pursuant to the EPBC Act significant impact guidelines (DotE 2013c) have been prepared for any flora and fauna species listed under the EPBC Act, as all species are also listed under the TSC Act and have been considered as part of the assessments of significance completed as per the EP&A Act in conjunction with the considerations outlined in the DotE (2013c) guidelines. On the basis of the assessments undertaken, the proposal is unlikely to impose a significant impact on any MNES and is therefore unlikely to be a controlled action.

Migratory birds

Habitat was identified within the study area for five migratory species listed under the EPBC Act. These species have the potential to occur within the study area on an occasional or transient basis. The study area is not considered important habitat for any of these migratory species, according to the significant impact criteria for migratory species (DotE 2013c), and the proposal is therefore unlikely to impose “a significant effect” on any of the listed migratory fauna species predicted to occur within the locality.

8.4 Avoidance and mitigation of impacts

The proposal has been positioned during the detailed design phase in order to avoid sensitive ecological receptors such as threatened ecological communities and high value aquatic habitats.

Recommended mitigation measures are included in this report in order to minimise the impact of the proposal on native flora, fauna and ecological processes within the study area and adjacent land. These measures would be incorporated into an Environmental Management Plan for the proposal, and would include:

- Pre-clearing surveys and clearing protocols to minimise risk of damage to resident fauna, minimise clearing of native vegetation and prevent encroachment into retained adjoining habitats.
- Standard environmental management measures to minimise the risk of indirect impacts on adjoining habitats through contaminated runoff, sedimentation, erosion, noise and vibration.

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Appendices

Appendix A – Likelihood of occurrence of threatened biota

Notes:

- All information in biota descriptions is derived from threatened biota profiles (OEH 2016b and/or DoE 2016b) unless otherwise stated.
- Marine and littoral threatened species (particularly turtles, dugongs etc.) which are restricted to coastal environments were excluded from the threatened biota table as they were considered irrelevant to the current proposal, given the extent of potential impacts and the location of the proposal site.
- Wildlife Atlas records: only records from 1980 or later were considered. The date of the last record is included for any species which have not been recorded within the last 20 years.
- DPI online records viewer (DPI 2016a) revealed no records of threatened fish species within the locality.

Threatened biota known or predicted from the locality, habitat association and suitable habitat present at the study area

Threatened Ecological Communities

Scientific Name	TSC/FM Act	EPBC Act	Habitat Association	Nature of record	Presence on site
Natural grasslands on basalt and fine textured alluvial plains of northern New South Wales and southern Queensland	Not listed	CEEC	Occurs mainly in the Darling Downs of southern Queensland and the Liverpool Plains and Moree Plains of northern NSW. The distribution of the ecological community is strongly reliant on soil type as it is associated with fine textured, often cracking clays derived from either basalt or quaternary alluvium.	Predicted to occur within 10 km (DotE 2016a)	Does not occur
New England Peppermint (<i>Eucalyptus nova-angelica</i>) Grassy Woodlands	CEEC	CEEC	Occurs Basalts and Sediments in the New England Tableland Bioregion - Northern Rivers is known to be associated with valley flats on poorly drained soils, often basalt	Predicted to occur within 10 km (DotE 2016a)	Does not occur
Upland Wetlands of the New England tablelands and the Monaro Plateau	EEC	EEC	The Upland Wetlands of the New England Tablelands and the Monaro Plateau are wetlands that are not connected to rivers or streams. Instead, they occur in depressions in the landscape. The persistence of the wetlands throughout the year depends on the depth of the depression in which they occur, the depth of water in the wetland, the catchment area supplying the wetland with water, rainfall patterns, and past and current disturbances.	Predicted to occur within 10 km (DotE 2016a)	Does not occur
White Box – Yellow Box – Blakey’s Red Gum Grassy Woodland and Derived Native Grassland	EEC	CEEC	Box-Gum Woodland is found from the Queensland border in the north, to the Victorian border in the south. It occurs in the tablelands and western slopes of NSW. The community is characterised by the presence or prior occurrence of White Box, Yellow Box and/or Blakey's Red Gum. The trees may occur as pure stands, mixtures of the three species or in mixtures with other trees, including wattles. Commonly co-occurring eucalypts include Apple Box (<i>E. bridgesiana</i>), Red Box (<i>E. polyanthemus</i>), Candlebark (<i>E. rubida</i>), Snow Gum (<i>E. pauciflora</i>), Argyle Apple (<i>E. cinerea</i>), Brittle Gum (<i>E. mannifera</i>), Red Stringybark (<i>E. macrorhyncha</i>), Grey Box (<i>E. microcarpa</i>), Cabbage Gum (<i>E. amplifolia</i>) and others.	Predicted to occur within 10 km (DotE 2016a)	Does not occur

Threatened Flora

Scientific Name	Common Name	TSC/FM Act	EPBC Act	Habitat Association	Nature of record	Presence on site
<i>Boronia granitica</i>	Granite Boronia	V	E	<p>Grows on granitic soils amongst rock outcrops, often in rock crevices, and in forests and woodlands on granite scree and shallow soils. Important site characteristics include low precipitation and high levels of solar radiation.</p> <p>Granite Boronia occurs in scattered localities on the New England Tablelands and North West Slopes north from the Armidale area to the Stanthorpe district in southern Queensland.</p> <p>In NSW, the species is restricted to the New England Tablelands between Armidale and Torrington.</p>	Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.
<i>Callistemon pungens</i>		Not listed	V	<p>Habitats range from riparian areas dominated by <i>Casuarina cunninghamiana</i> subsp. <i>cunninghamiana</i> to woodland and rocky shrubland. Often found in rocky watercourses, usually with sandy granite (occasionally basalt) creek beds from near Inverell to the eastern escarpment at New England NP.</p>	Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.
<i>Dichanthium setosum</i>	Bluegrass	V	V	<p>Associated with heavy basaltic black soils and red-brown loams with clay subsoil and often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. Locally common or found as scattered clumps in broader populations. The extensive distribution and wide environmental tolerances make predictions about suitable habitat difficult.</p> <p>Bluegrass occurs on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW, extending to northern Queensland. It occurs widely on private property, including in the Inverell, Guyra, Armidale and Glen Innes areas.</p>	Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.

Scientific Name	Common Name	TSC/FM Act	EPBC Act	Habitat Association	Nature of record	Presence on site
<i>Diuris pedunculata</i>	Small Snake Orchid	E	E	<p>The Small Snake Orchid grows on grassy slopes or flats and often on peaty soils in moist areas. This can extend to shale and trap soils, on fine granite, and among boulders. It is known to prefers moist areas, and has been found growing in open areas of dry sclerophyll forests with grassy understories, in riparian forests (including gallery rainforests), swamp forests, in sub-alpine grasslands and herbfields. The altitude range known for the species is 50–900 m.</p> <p>Confined to north east NSW. It was originally found scattered from Tenterfield south to the Hawkesbury River, but is now mainly found on the New England Tablelands, around Armidale, Uralla, Guyra and Ebor.</p>	Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.
<i>Eucalyptus mckieana</i>	Mckie's Stringybark	V	V	<p><i>Eucalyptus mckieana</i> is found in grassy open forest or woodland on poor sandy loams, most commonly on gently sloping or flat sites. McKie's Stringybark is locally abundant, forming in places a moderately dense forest in association with other local trees.</p> <p>Confined to the drier western side of the New England Tablelands of NSW, from Torrington to Bendemeer. Most populations occur on private property, but it does occur in Kings Plain National Park, Torrington State Conservation Area and Severn River Nature Reserve.</p>	Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.
<i>Eucalyptus nicholii</i>	Narrow-leaved Peppermint	V	V	<p>Typically grows in dry grassy woodland, on shallow soils of slopes and ridges and found primarily on infertile soils derived from granite or metasedimentary rock. Seedling recruitment is common, even in disturbed soils, if protected from grazing and fire. It tends to grow on lower slopes in the landscape.</p> <p>This species is sparsely distributed but widespread on the New England Tablelands from Nundle to north of Tenterfield, being most common in central portions of its range.</p>	Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.

Scientific Name	Common Name	TSC/FM Act	EPBC Act	Habitat Association	Nature of record	Presence on site
<i>Pelargonium sp. Striatellum</i> (G.W.Carr 10345)	Omeo Stork's bill	E	E	<p>Known from only 4 locations in NSW, with three on lake-beds it occurs at altitudes between 680 to 1030 m. It is known to occur in the local government areas of Goulburn-Mulwaree, Cooma-Monaro, and Snowy River, but may occur in other areas with suitable habitat; these may include Bombala, Eurobodalla, Palerang, Tumbarumba, Tumut, Upper Lachlan, and Yass Valley local government areas.</p> <p>It has a narrow habitat that is usually just above the high-water level of irregularly inundated or ephemeral lakes, in the transition zone between surrounding grasslands or pasture and the wetland or aquatic communities. It sometimes colonises exposed lake beds during dry periods. The extent of habitat at any one site and the persistence of the species is likely be closely related to the combined effects of: - frequency of inundation and the topography of lake bed and shoreline, which maintains a more or less extensive disturbed interzone between grass-dominated communities and sedge-dominated aquatic vegetation; and - past and current grazing regimes and other forms of disturbance.</p> <p>Nowhere at the proposal site where the plant would be exposed to period of inundation necessary for growth.</p>	Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.
<i>Prasophyllum petilum</i>	Tarengo leek Orchid	E	E	Natural populations are known from a total of five sites in NSW where it is known to grow in open sites within Natural Temperate Grassland as well as in grassy woodland in fertile soils. Apparently highly susceptible to grazing, it is only retained at little-grazed travelling stock reserves in relatively moist areas.	Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.
<i>Prasophyllum sp. Wybong</i> (C.Phelps ORG 5269)	Leek Orchid	Not listed	CE	Endemic to NSW, it is known from near Ilford, Premer, Muswellbrook, Wybong, Yeoval, Inverell, Tenterfield, Currabubula and the Pilliga area. It is known to occur in open eucalypt woodland and grassland.	Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.
<i>Thesium australe</i>	Austral Toadflax	V	V	Found in small, scattered populations along the east coast, northern and southern tablelands. Occurs in grassland or grassy woodland, and is often found in association with Kangaroo Grass (<i>Themeda australis</i>).	Predicted to occur within 10 km (DotE 2016a)	Possible. Marginal habitat present.

Threatened fauna

Scientific Name	Common Name	TSC/FM Act	EPBC Act	Habitat Association	Nature of record	Presence on site
Birds						
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	E	In NSW confined to two known breeding areas: The Capertee Valley and Bundarra-Barraba region. Non-breeding flocks occasionally seen in coastal areas foraging in flowering Spotted Gum and Swamp Mahogany forests, presumably in response to drought. Inhabits dry open forest and woodlands, particularly Box-Ironbark woodland and riparian forests of River Sheoak, with an abundance of mature trees, high canopy cover and abundance of mistletoes.	Predicted to occur within 10 km (DotE 2016a)	Possible. Marginal habitat present.
<i>Erythrotriorchis radiatus</i>	Red Goshawk	CE	V	Typically occurs in coastal and subcoastal areas, with 90% of recent records in NSW confined to the Northern Rivers and Northern Tablelands regions, north of the Clarence River. Formerly occurred south to Port Stephens. Prefer woodlands and forests with a mosaic of vegetation types that are open enough for fast manoeuvring flight, avoiding very open or very dense habitats. In NSW inhabits mixed subtropical rainforest, Melaleuca swamp forest and open eucalypt forest along coastal rivers. Nests built within 1km of a permanent freshwater body in a large, tall tree(>20m) within a remnant stand. Home ranges large (120-200km ²).	Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.
<i>Geophaps scripta scripta</i>	Squatter Pigeon	E	V	The Squatter Pigeon habitat is generally defined as open-forests to sparse, open-woodlands and scrub that are mostly dominated in the overstorey by Eucalyptus, Corymbia, Acacia or Callitris species in remnant, regrowth or partly modified vegetation communities, and within 3 km of water bodies or courses. It is known to access suitable waterbodies such as permanent or seasonal rivers, creeks, lakes, ponds and waterholes, and artificial dams to drink on a daily basis. The majority of it's know distribution is within QLD, but it is also noted within Border Rivers-Gwydir region in NSW.	Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.

Scientific Name	Common Name	TSC/FM Act	EPBC Act	Habitat Association	Nature of record	Presence on site
<i>Grantiella picta</i>	Painted Honeyeater	V	Not listed	Nomadic, occurring in low densities across most of NSW. Highest concentrations and almost all breeding occur on inland slopes of the Great Dividing Range. Inhabits Boree, Brigalow and Box Gum woodlands and Box-Ironbark forests. Specialist forager on the fruits of mistletoes, preferably of the <i>Amyema</i> genus. Nests in outer tree canopy.	Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.
<i>Lathamus discolor</i>	Swift Parrot	E	E	Migratory, travelling to the mainland from March to October. Breeds in Tasmania from September to January. On the mainland, it mostly occurs in the southeast foraging on winter flowering eucalypts and lerps, with records of the species between Adelaide and Brisbane. Principal over-winter habitat is box-ironbark communities on the inland slopes and plains. <i>Eucalyptus robusta</i> , <i>Corymbia maculata</i> and <i>C. gummifera</i> dominated coastal forests are also important habitat.	Predicted to occur within 10 km (DotE 2016a)	Possible. Marginal habitat present.
<i>Poephila cincta cincta</i>	Southern Black-throated Finch	E	E	Occurs mainly in grassy, open woodlands and forests, typically dominated by Eucalyptus, Corymbia and Melaleuca, and occasionally in tussock grasslands or other habitats (for example freshwater wetlands), often along or near watercourses, or in the vicinity of water. Requires access to seeding grasses and water, therefore needs a mosaic of different habitats.	Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.
<i>Rostratula benghalensis</i>	Painted Snipe (was Australian Painted Snipe)	E	V, M	Normally found in permanent or ephemeral shallow inland wetlands, either freshwater or brackish. Nests on the ground amongst tall reed-like vegetation near water. Feeds on mudflats and the water's edge taking insects, worm and seeds. Prefers fringes of swamps, dams and nearby marshy areas with cover of grasses, lignum, low scrub or open timber.	Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.
Mammals						
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Occurs from the coast to the western slopes of the divide. Largest numbers of records from sandstone escarpment country in the Sydney Basin and Hunter Valley (Hoye and Schulz 2008). Roosts in caves and mines and most commonly recorded from dry sclerophyll forests and woodlands. An insectivorous species that flies over the canopy or along creek	Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.

Scientific Name	Common Name	TSC/FM Act	EPBC Act	Habitat Association	Nature of record	Presence on site
				beds (Churchill 2008). In southern Sydney appears to be largely restricted to the interface between sandstone escarpments and fertile valleys.		
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	Inhabits a range of environments including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Den subject sites are in hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces. Females occupy home ranges of up to 750 ha and males up to 3,500 ha, which are usually traversed along densely vegetated creek lines.	Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.
<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	V	E	Corben's Long-eared Bat inhabits a variety of vegetation types, including mallee, bulloke <i>Allocasuarina leuhmanni</i> and box eucalypt dominated communities. Yet it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Preferring areas with a well-formed shrub layer and old, hollow bearing trees. Roosts in tree hollows, crevices, and under loose bark.	Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.
<i>Petaurus volans</i>	Greater Glider	-	V	The greater glider is restricted to eastern Australia and favours forests with a diversity of eucalypt species due to seasonal variation in its preferred tree species. It lives in a variety of eucalypt-dominated habitats, ranging from low open forests on the coast to tall forests in the ranges and low woodland westwards of the Dividing Range. It is considered to be particularly sensitive to forest clearance and to intensive logging.	Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.
<i>Petrogale pencillata</i>	Brush-tailed Rock-wallaby	E	V	Occurs from the Shoalhaven north to the Queensland border. Now mostly extinct west of the Great Dividing Range, except in the Warrumbungles and Mt Kaputar. Occurs on rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges facing north. Diet consists of vegetation in adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees.	Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.

Scientific Name	Common Name	TSC/FM Act	EPBC Act	Habitat Association	Nature of record	Presence on site
<i>Phascolarctos cinereus</i>	Koala	V	V	Occurs from coast to inland slopes and plains. Restricted to areas of preferred feed trees in eucalypt woodlands and forests. Home range varies depending on habitat quality, from < 2 to several hundred hectares.	1 record within 10 km (OEH 2016a) Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Roosts in camps within 20 km of a regular food source, typically in gullies, close to water and in vegetation with a dense canopy. Forages in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths, swamps and street trees, particularly in eucalypts, melaleucas and banksias. Highly mobile with movements largely determined by food availability (Eby and Law 2008). Will also forage in urban gardens and cultivated fruit crops.	Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.
Frogs						
<i>Litoria booroolongensis</i>	Booroolong Frog	CE	E	Lives along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. Adults occur on or near cobble banks and other rock structures within stream margins and shelter under rocks or amongst vegetation near the ground on the stream edge. The Booroolong Frog is restricted to NSW and north-eastern Victoria, predominantly along the western-flowing streams of the Great Dividing Range. It has disappeared from much of the Northern Tablelands, however several populations have recently been recorded in the Namoi catchment.	Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.

Scientific Name	Common Name	TSC/FM Act	EPBC Act	Habitat Association	Nature of record	Presence on site
<i>Litoria castanea</i>	Yellow-spotted Tree Frog	E	E	Require large permanent ponds or slow flowing 'chain-of-ponds' streams with abundant emergent vegetation such as bulrushes and aquatic vegetation. Shelter during autumn and winter under fallen timber, rocks, other debris or thick vegetation. The northern population of the Yellow-spotted Bell Frog is known from a relatively restricted distribution centred around the town of Guyra on the New England Tableland, New South Wales, at altitudes between 1000 and 1500 m.	Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.
Reptiles						
<i>Uvidicolus sphyrurus</i>	Border Thick-tailed Gecko	V	V	The Border Thick-tailed Gecko is most commonly found in undisturbed habitat remnants on rocky outcrops and stony hills (especially granite) within eucalypt and cypress-pine open forest or woodland between 500-1100 m elevation. Favours forest and woodland areas with boulders, rock slabs, fallen timber and deep leaf litter. Occupied sites often have a dense tree canopy that helps create a sparse understorey. It occurs in the New England Tableland, Nandewar and Brigalow Belt South Bioregions in northern New South Wales.	Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.
<i>Wollumbinia belli</i>	Bell's Turtle	V	V	Bell's Turtle normally occupies shallow to deep pools in upper reaches or small tributaries of major rivers in granite country. Most of which are commonly less than 3 m deep with rocky or sandy bottoms and patches of vegetation. Typically uses narrow stretches of rivers 30 - 40 m wide and has been found in areas where surrounding habitat has been converted to grazing land. In NSW, currently found in four disjunct populations in the upper reaches of the Namoi, Gwydir and Border Rivers systems, on the escarpment of the North West Slopes.	Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.
Fish						
<i>Maccullochella peelii</i>	Murray Cod	-	V	The Murray Cod occurs naturally in the waterways of the Murray–Darling Basin in a wide range of warm water habitats that range from clear, rocky streams to slow flowing turbid rivers and billabongs. The upper reaches of the Murray and Murrumbidgee Rivers are considered too cold to contain suitable habitat	Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.

Scientific Name	Common Name	TSC/FM Act	EPBC Act	Habitat Association	Nature of record	Presence on site
				They are frequently found in the main channels of rivers and larger tributaries. Preferred microhabitat consists of complex structural features in streams such as large rocks, snags (pieces of large submerged woody debris), overhanging stream banks and vegetation, tree stumps, logs, branches and other woody structures. Such structures reduce or influence stream flows and provide Murray Cod with shelter from fast-flowing water.		

Migratory species

Scientific Name	Common Name	TSC/FM Act	EPBC Act	Habitat Association	Nature of record	Presence on site
<i>Apus pacificus</i>	Fork-tailed Swift	Not listed	C,J,K	Recorded in all regions of NSW. Non-breeding, and almost exclusively aerial while in Australia. Occurs over urban and rural areas as well as areas of native vegetation.	Predicted to occur within 10 km (DotE 2016a)	Possible. Non-breeding visitor. Potential aerial foraging habitat present.
<i>Gallinago hardwickii</i>	Latham's Snipe	Not listed	C,J,K	Occurs along the coast and west of the Great Dividing Range. Non-breeding visitor to Australia. Inhabit permanent and ephemeral wetlands up to 2000 m asl. Typically, in open, freshwater wetlands with low, dense vegetation (incl. swamps, flooded grasslands and heathlands). Can also occur in saline/brackish habitats and in modified or artificial habitats close to human activity.	Predicted to occur within 10 km (DotE 2016a)	Possible. Non-breeding visitor. May forage within dams within the study area.
<i>Hirundapus caudacutus</i>	White-throated Needletail	Not listed	C,J,K	Recorded along NSW coast to the western slopes and occasionally from the inland plains. Breeds in northern hemisphere. Almost exclusively aerial while in Australia. Occur above most habitat types, but are more frequently recorded above more densely vegetated habitats (rainforest, open forest and heathland) than over woodland or treeless areas.	Predicted to occur within 10 km (DotE 2016a)	Possible. Non-breeding visitor. Potentially suitable aerial foraging habitat present.
<i>Monarcha melanopsis</i>	Black-faced Monarch	Not listed	M	Summer breeding migrant to south-east. Occurs along the coast of NSW. Inhabits rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating (Birds Australia 2005).	Predicted to occur within 10 km (DotE 2016a)	Possible. Potential habitat along drainage lines.
<i>Motacilla flava</i>	Yellow Wagtail	Not listed	M	This species breeds in much of temperate Europe and Asia. It is resident in the milder parts of its range, such as western Europe, but northern and eastern populations migrate to Africa and south Asia. Inhabits open country near water, such as wet meadows.	Predicted to occur within 10 km (DotE 2016a)	Possible. Non-breeding visitor. May forage within dams within the study area

Scientific Name	Common Name	TSC/FM Act	EPBC Act	Habitat Association	Nature of record	Presence on site
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	Not listed	M	In NSW widespread on and east of the Great Divide, sparsely scattered on the western slopes, very occasional records on the western plains. Inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, often near wetlands and watercourses. On migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests. Generally not in rainforests.	Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.
<i>Rhipidura rufifrons</i>	Rufous Fantail	Not listed	M	Found along NSW coast and ranges. Inhabits rainforest, dense wet forests, swamp woodlands and mangroves. During migration, it may be found in more open habitats or urban areas (Birds Australia 2008).	Predicted to occur within 10 km (DotE 2016a)	Unlikely. Preferred habitats not present.

Appendix B – Survey results

Flora species recorded

Family	Scientific Name	Common Name	Exotic	Plot 1		Plot 2		Plot 3	
				Cover	Abund	Cover	Abund	Cover	Abund
Apiaceae	<i>Hydrocotyle laxiflora</i>	Stinking Pennywort	0			2	500		
Asteraceae	<i>Aster subulatus</i>	Wild Aster	*	1	5				
Asteraceae	<i>Conyza bonariensis</i>	Flaxleaf Fleabane	*			1	20		
Asteraceae	<i>Cotula australis</i>	Common Cotula	0			1	50		
Asteraceae	<i>Cymbonotus lawsonianus</i>	Bear's Ear	0	1	50				
Asteraceae	<i>Euchiton involucratus</i>	Star Cudweed	0	1	50	1	20		
Asteraceae	<i>Hypochaeris radicata</i>	Catsear	*	3	100	3	1000	4	1000
Asteraceae	<i>Taraxacum officinale</i>	Dandelion	*	2	50				
Asteraceae	<i>Vernonia cinerea</i>	0	0					2	500
Asteraceae	<i>Vittadinia cuneata</i>	A Fuzzweed	0	1	20			2	50
Caryophyllaceae	<i>Cerastium sp.</i>	0	*			1	20		
Caryophyllaceae	<i>Paronychia brasiliiana</i>	Chilean Whitlow Wort, Brazilian Whitlow	*			1	10		
Caryophyllaceae	<i>Scleranthus biflorus</i>	Two-flowered Knawel	0	1	200	2	500		
Caryophyllaceae	<i>Scleranthus sp.</i>	0	0					2	100
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed	0	3	1000			3	1000
Fabaceae (Faboideae)	<i>Trifolium arvense</i>	Haresfoot Clover	*			1	50		
Fabaceae (Faboideae)	<i>Trifolium dubium</i>	Yellow Suckling Clover	*	3	1000	2	1000	2	11
Fabaceae (Faboideae)	<i>Trifolium repens</i>	White Clover	*	3	5000	3	1000	3	1000
Gentianaceae	<i>Centaurium erythraea</i>	Common Centaury	*					2	100
Geraniaceae	<i>Geranium homeanum</i>	0	0			2	100	2	50

Family	Scientific Name	Common Name	Exotic	Plot 1		Plot 2		Plot 3	
				Cover	Abund	Cover	Abund	Cover	Abund
Geraniaceae	<i>Geranium solanderi</i>	Native Geranium	0	2	100	2	100	3	500
Haloragaceae	<i>Haloragis heterophylla</i>	Variable Raspwort	0			1	5		
Loganiaceae	<i>Mitrasacme sp.</i>	0	0			1	20		
Myrtaceae	<i>Eucalyptus viminalis</i>	Ribbon Gum	0	3	22			2	1
Plantaginaceae	<i>Plantago lanceolata</i>	Lamb's Tongues	*	2	500	2	50	4	11
Plantaginaceae	<i>Veronica peregrina</i>	Wandering Speedwell	*					1	20
Poaceae	<i>Cymbopogon refractus</i>	Barbed Wire Grass	0			1	50	2	5
Poaceae	<i>Panicum simile</i>	Two-colour Panic	0			1	50		
Poaceae	<i>Poa labillardierei</i> var. <i>labillardierei</i>	Tussock	0	3	200	5	1000	3	600
Poaceae	<i>Poa sieberiana</i>	Snowgrass	0	4	200	4	500	2	200
Poaceae	<i>Themeda australis</i>	Kangaroo Grass	0			1	10		
Polygonaceae	<i>Acetosella vulgaris</i>	Sheep Sorrel	*	1	100				
Rosaceae	<i>Acaena novae-zelandiae</i>	Bidgee-widgee	0	1	100	1	2		
Rosaceae	<i>Rubus fruticosus</i> sp. <i>agg.</i>	Blackberry complex	*	1	5	1	1	1	5
Rubiaceae	<i>Asperula conferta</i>	Common Woodruff	0	1	500			2	200
Rubiaceae	<i>Galium propinquum</i>	Maori Bedstraw	0			2	500		
Verbenaceae	<i>Verbena rigida</i> var. <i>rigida</i>	Veined Verbena	*					1	10

Cover rankings within each survey area:

- 1 = Foliage sparsely or very sparsely present, cover less than 5%
- 2 = 1-5% Plentiful, foliage cover 1-5 %
- 3 = 5-25% foliage cover
- 4 = 26-50% foliage cover
- 5 = 51-75% foliage cover
- 6 = 76-100% foliage cover

Abundance refers to the relative number of individuals or shoots of a species within the plot.

Fauna species recorded

Family	Scientific Name	Common Name	TSC Status	EPBC Status
Birds				
Artamidae	<i>Cracticus tibicen</i>	Australian Magpie	P	0
Maluridae	<i>Malurus cyaneus</i>	Superb Fairy-wren	P	0
Psittacidae	<i>Platycercus elegans</i>	Crimson Rosella	P	0
Cacatuidae	<i>Cacatua galerita</i>	Sulphur-crested Cockatoo	P	0
Cacatuidae	<i>Eolophus roseicapillus</i>	Galah	P	0
Halcyonidae	<i>Dacelo novaeguineae</i>	Laughing Kookaburra	P	0
Artamidae	<i>Cracticus nigrogularis</i>	Pied Butcherbird	P	0
Artamidae	<i>Strepera graculina</i>	Pied Currawong	P	0
Falconidae	<i>Falco cenchroides</i>	Nankeen Kestrel	P	0
Meliphagidae	<i>Manorina melanocephala</i>	Noisy Miner	P	0
Meliphagidae	<i>Anthochaera carunculata</i>	Red Wattlebird	P	0
Psittacidae	<i>Platycercus eximius</i>	Eastern Rosella	P	0
Mammals				
Leporidae	* <i>Lepus capensis</i>	Brown Hare	0	0
Macropodidae	<i>Macropus giganteus</i>	Eastern Grey Kangaroo	P	0
	* <i>Vulpes vulpes</i>	Fox		

Appendix C – Assessments of significance for State-listed threatened biota

Assessments of significance have been prepared in accordance with the threatened species assessment guidelines (DEC & DPI 2005) for threatened species and communities recorded or likely to occur in the study area that have the potential to be impacted by the proposal. Where possible, assessments have been grouped for species with similar habitat requirements. Assessments are provided for the following:

- Threatened flora species
 - Austral Toadflax (*Thesium australe*)
- Threatened ecological communities
 - Ribbon Gum - Mountain Gum – Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion
- Threatened fauna species
- Woodland birds: Regent Honeyeater (*Anthochaera phrygia*), Swift Parrot (*Lathamus discolor*)

1. Threatened Ecological Communities

Ribbon Gum – Mountain Gum Grassy Forest/Woodland of the New England Tablelands Bioregion

Ribbon Gum - Mountain Gum - Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion is the name given to the ecological community characterised by the assemblage of species listed in paragraph 2 that typically occurs at elevations of 700 - 1500 m, and is mainly confined to the high undulating basalt plateau with deep, chocolate or krasnozern loam soils (Benson and Ashby 2000). The structure of the community is typically open forest 20 - 30 m tall, although it may assume the structure of woodland, sometimes less than 12 m tall, in exposed sites or where subject to past clearing or thinning. The understorey contains a sparse stratum of shrubs and a continuous groundcover composed mostly of grasses and herbs.

The community is listed as an endangered ecological community under the TSC Act.

A total of 71.35 hectares of Ribbon Gum - Mountain Gum - Snow Gum Grassy Woodland and 141.09 ha of derived native grassland EEC/ exotic grassland were identified within the study area (Figure 4). Due to land clearing activities and long term cattle grazing within the study area, the vegetation is considered to be in low condition. Given the modified nature of this community within the study area, any such impacts are unlikely to significantly influence the persistence of this community within the study area or surrounding lands.

The following Assessment of Significance has been prepared to assess the impacts of removal of 7.76 hectares of Ribbon Gum – Mountain Gum Grassy Woodland EEC within the disturbance footprint (2.29 ha of woodland EEC and 5.46 hectares of derived grassland EEC).

Section 5A Assessment

Ribbon Gum – Mountain Gum Grassy Forest/Woodland of the New England Tablelands Bioregion

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

Not applicable to this threatened ecological community.

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

Not applicable to this threatened ecological community.

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

A total of 212.44 hectares of vegetation consistent with a low condition form of the community are present within the study area. As it occurs within the study area, this vegetation type is modified and lacks the natural diversity typically present within this vegetation type. There is also a significant prevalence of other exotic species in the groundcover of this community.

The vegetation that may be directly impacted represents a very small portion of the native vegetation mapped within the locality. Approximately 204.68 hectares of the vegetation type will be retained within the study area. Therefore, the vegetation is unlikely to be placed at risk of extinction within the locality.

(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

Section 5A Assessment

Ribbon Gum – Mountain Gum Grassy Forest/Woodland of the New England Tablelands Bioregion

Within the study area, this ecological community has been degraded through historic and ongoing disturbances. The vegetation has been modified through past land clearing, cattle grazing and pasture improvement. Within the study area, this community occurs as a modified vegetation type, with lower than usual floristic diversity. Additionally, some areas support exotic species which can reduce potential for recruitment of native flora species. In this context, direct impacts to 7.76 ha of this historically modified community would be unlikely to further alter the composition of the community such that the local occurrence of this community 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 habitat is likely to be removed or modified as a result of the action proposed

The proposal has the potential to directly impact on up to 7.76 hectares of the community within the study area. The area that may be impacted is already modified from historical activities and supports numerous exotic understorey species.

The vegetation represents a very small portion of the native vegetation mapped within the locality. Given the small area of modified and degraded vegetation within the study area that may be impacted, any indirect impacts to a small area of this community are unlikely to impact the long-term survival of the community within the locality.

- (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

Vegetation in the study area appears to have been modified by historical land uses, including land clearing, cattle grazing and pasture improvement. The proposal will result in the removal of some mature trees; however, this will not affect the connectivity of the EEC in surrounding areas.

Indirect impacts resulting from altered hydrology have the potential to influence the floristic assemblage of the mid- and understorey of this community within the study area as result of changes to hydrology, however given the already degraded and modified nature of this vegetation within the study area, any such impacts are unlikely to be significant. Similarly, any potential influence of increased or new edge effects is unlikely to substantially modify the local occurrence of this community and will not result in any additional fragmentation or isolation.

The proposal is unlikely to increase fragmentation within the locality, or result in the isolation of habitat for this community from other areas of habitat.

- (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

Within the site, this vegetation type is already modified, and supports a large diversity of exotic species. Any changes to the floristic assemblage are unlikely to result in any further negative impacts to the community within the study area or surrounds.

The vegetation that may be indirectly impacted represents a very small portion of the native vegetation mapped within the locality. The small area of modified vegetation within the study area that may be impacted is not considered to be important to the long-term survival of the community in the locality.

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

There is no critical habitat listed for this threatened ecological community.

Section 5A Assessment

Ribbon Gum – Mountain Gum Grassy Forest/Woodland of the New England Tablelands Bioregion

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

No recovery plan has been developed for this community. In lieu of a formal recovery plan, OEH, (2016) lists the following activities to assist this community:

- Ensure remnants remain connected or linked to each other; in cases where remnants have lost connective links, re-establish them by revegetating sites to act as stepping stones for fauna, and flora (pollen and seed dispersal).
- Manage stock to reduce grazing pressure in high quality remnants and develop more sustainable fire regimes.
- Mark remnants onto maps (of the farm, shire, region, etc) and use to plan activities (e.g. remnant protection, rehabilitation or road, rail and infrastructure maintenance work). On-site markers can alert maintenance staff to the presence of a threatened species.

Mitigation measures are provided to limit the potential for negative influences associated with edge effects such as weed management and erosion and sediment control. As such, potential indirect impacts to this community are unlikely to interfere with the recovery of this community.

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

The proposal has the potential to introduce or increase the operation of the following KTPs within this community through soil disturbance and increased visitation to the area:

- Invasion of native plant communities by exotic perennial grasses.
- Infection of native plants by *Phytophthora cinnamomi*.
- Infection of native frogs by amphibian chytrid causing the disease chytridiomycosis.

A number of mitigation measures are provided in order to reduce the potential for the proposal to influence these KTPs (refer to Section 7).

Conclusion of Assessment of Significance

The proposal is highly unlikely to result in a significant impact on the EEC, pursuant to s.5A of the EP&A Act given:

- Only a small area (7.76 ha) of the EEC may be exposed to direct impacts which may result in further modifications to the already modified community within the study area.
- The relatively large areas of better quality vegetation that exist elsewhere within the locality that would not be impacted by the proposal.
- The modified nature of the vegetation that may be impacted.
- The proposal will not result in the isolation or fragmentation of this vegetation from other areas of vegetation or habitat.
- The proposal is unlikely to interfere with the recovery of this community as it occurs elsewhere within the locality.

2. Threatened flora species

Austral Toadflax (*Thesium australe*)

Thesium australe is a small, straggling herb to 40 cm tall. Leaves are pale green to yellow-green, somewhat succulent, 1 - 4 cm long and 0.5 - 1.5 mm wide. Flowers are minute and white, emerging where the leaves meet the stems and appearing in spring. The species occurs in small populations scattered across eastern NSW, from the Northern to Southern Tablelands. There are no records of the species in the locality of the proposal; however, it is predicted to occur within the locality.

The species was not recorded during the field survey; however potential habitat exists for this species in the 7.76 hectares of vegetation that may be impacted by the proposal. The removal of this potential habitat is the focus of this assessment.

Section 5A Assessment

Austral Toadflax (*Thesium australe*)

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,

Thesium australe flowers and fruits throughout the year on the coast, and in summer at higher altitudes. In subalpine and tableland climates, the species dies back to rootstock during winter and resprouts in spring. This is not the case in coastal areas where the species persists all year round and may live for longer than two years. The species appears to cope well with but does not require frequent disturbance. It is observed to germinate well after fire; however, fire is not essential for germination. The existence of buds near the soil surface allows the species to resprout after disturbance.

The proposal would result in removal of 7.76 hectares of potential marginal habitat from within the study area (see Table 17, Section 6.4.2). Approximately 204.68 hectares of similar habitat will be retained within the study area. The vegetation to be impacted is in a range of conditions, with some areas of extensive weed infestation as well as areas of dense Blady Grass and evidence of historical and ongoing disturbances associated with land clearing, cattle grazing and pasture improvement.

The removal of up to 7.76 hectares of potential habitat may result in the loss of individuals that occur within the area to be impacted, however will not result in any changes to abiotic conditions such as fire regimes that may influence the dispersal or germination of this species elsewhere in the locality.

The vegetation to be impacted by the proposal is likely to provide marginal habitat at best for the species, given that the habitat is degraded from cattle grazing.

The 7.76 hectares of potential marginal habitat to be impacted by the proposal represents a small area of comparable habitat within the locality.

Given that only marginal potential habitat would be removed as a result of the proposal, it is unlikely that the proposal would result in impacts such that a viable local population is placed at risk of extinction.

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,

Not applicable to these threatened species.

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

Section 5A Assessment

Austral Toadflax (*Thesium australe*)

(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,

Not applicable to these threatened species.

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

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

The proposal would remove up to 7.76 hectares of potential marginal habitat for the species from within the study area. Potential habitat to be impacted is of low value to these species, given the presence of a dense cover of exotic species. The species was not located within the habitat to be impacted during the field survey.

The vegetation that may be indirectly impacted represents a very small portion of the native vegetation mapped within the locality.

(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

Fragmentation from past clearing activities is already evident within the study area, although there are still large tracts of native vegetation within the surrounding lands.

The proposal would result in the loss of up to 7.76 hectares of marginal habitat for this species. The proposal would result in a minor increase to the level of fragmentation within the study area, compared to the existing conditions.

The proposal would not result in any impacts to vegetation outside of the study area and would not impose any barriers to dispersal for these species in retained vegetation.

(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

The marginal potential habitat for the species that would be impacted by the proposal does not contain any known individuals of the species. The vegetation to be impacted is unlikely to be important habitat for the species given that it is heavily degraded by cattle grazing. The area to be impacted represents only a small area of potential marginal habitat in relation to that in the surrounding locality.

The potential habitat that would be removed is not considered important to the long-term survival of the species in the locality.

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

No critical habitat has been listed for these species.

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

No recovery plan has been developed for these species. In lieu of a formal recovery plan, OEH, (2013) lists the following activities to assist the species recovery:

Thesium australe:

Section 5A Assessment

Austral Toadflax (*Thesium australe*)

- Protect known populations from changes to land use.
- Do not undertake road works, pasture modification or other changes in land use that may affect populations.
- Do not increase grazing pressures on sites where populations persist - reduce grazing pressures where possible.
- Undertake weed control in and adjacent to populations, taking care to spray or dig out only target weeds.
- Mark sites and potential habitat onto maps (of the farm, shire, region, etc) used for planning (e.g. road works, residential and infrastructure developments, remnant protection, rehabilitation).
- Search for new populations in potential habitat.

The proposal would remove up to 7.76 hectares of potential habitat for the species but there would not be any impact on known individuals or populations. Vegetation to be impacted is in low condition due to previous land clearing, cattle grazing and pasture improvement, which is likely to reduce the value of potential habitat for these species substantially. As such, the removal of a small area of marginal potential habitat for these species as a result of the proposal is unlikely to interfere with the recovery of these species.

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

The proposal would contribute to the operation of three KTPs relevant to the species:

- Clearing of vegetation – the proposal would remove up to 7.76 hectares of low condition vegetation that represents marginal habitat for the species.
- Invasion of exotic perennial grasses – clearing and disturbance within the study area could increase the incidence of these species in adjacent retained patches of vegetation. Mitigation measures to minimise the potential for spread and or/introduction of any additional species are recommended in Section 7.

Conclusion of Assessment of Significance

Removal of up to 7.76 hectares of marginal habitat is unlikely to result in a significant impact on *Thesium australe*, pursuant to section 5A of the EP&A Act, given that:

- No individuals have been recorded in the locality of the study area.
- Only marginal potential habitat would be removed that is likely to be of poor quality for the species due to habitat degradation.
- The potential habitat to be removed is unlikely to be necessary for the long-term survival of these species within the locality given no known individuals would be impacted.
- Clearing would not fragment habitat such that potential habitat in retained areas of vegetation would be impacted and no barriers to dispersal would be created outside of the proposal footprint.
- Only a small area of habitat would be impacted compared to the large areas that exist elsewhere in the locality, including within the various conservation reserves in the area.

Threatened Woodland birds

Section 5A Assessment

Regent Honeyeater (Critically Endangered)

Swift Parrot (Endangered)

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,

The proposal would not isolate any areas of habitat or cause significant habitat fragmentation that would affect the breeding, foraging or dispersive movements of these highly mobile species. The proposal would lead to an increase in noise, vibration and dust generation from quarrying activities during daylight hours. Mitigation measures including limiting blasting and installing noise shielding devices have been proposed to limit the impact of this noise increase on residential receivers as part of the Noise Impact Assessment (see relative section of EIS document). These measures would also reduce the impact of this noise on fauna in retained habitats around the proposal. It is therefore considered unlikely that the proposal would disrupt the breeding cycle of any locally occurring individuals.

The Swift Parrot and Regent Honeyeater are known to make large (up to several thousand kilometres) migratory movements. The species would therefore be likely to forage within the site on an opportunistic basis, in response to flowering events or local conditions, when present in the locality. There are extensive areas of alternative foraging habitat available for locally occurring individuals of these species outside the study area. In this context, the removal of up to 7.76 hectares of potential foraging habitat is unlikely to impact the lifecycle of these highly mobile species such that viable local population would be placed at risk of extinction.

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,

Not applicable to these threatened species.

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,

Not applicable to these threatened species.

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

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

The proposal would not remove any areas of suitable breeding habitat Swift Parrot or Regent Honeyeater. The proposal would remove up to 7.76 hectares of known or potential foraging habitat for these species, representing a small proportion of available habitat in the locality.

(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

Clearing for the proposal would not isolate any areas of native vegetation.

Habitat connectivity would be retained around the edges of the indicative footprint. These impacts represent an increase in existing gaps and disturbances rather than novel impacts, and the resulting gaps in vegetation would be readily traversed by these highly mobile, aerial species.

Section 5A Assessment

Regent Honeyeater (Critically Endangered)

Swift Parrot (Endangered)

(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

The proposal would remove up to 7.76 hectares of marginal foraging habitat for these species. The vegetation to be removed would represent a very small proportion of the home ranges of these highly mobile species. There are extensive areas of similar vegetation in adjoining areas and in the broader locality. It is therefore considered that the removal of habitats as described above would be unlikely to threaten the long-term persistence of these species in the locality.

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

No critical habitat has been listed for these species.

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

No recovery plan has been prepared for these species at the state level. National Recovery Plans have been prepared for the Swift Parrot and Regent Honeyeater. Targeted management strategies for the species are currently being developed under the Saving our Species program. The proposal would remove only marginal habitat for these species and is therefore not consistent with the overall objectives of the recovery strategies. The small area of foraging habitat to be removed would be unlikely to interfere with the recovery of these species, particularly given the lack of breeding habitat to be affected and the presence of extensive areas of alternative habitat 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

The proposed action would contribute to the operation of two KTPs of relevance to these species as follows:

- Clearing of vegetation – the proposal would remove about 7.76 hectares of Low condition EEC vegetation that represents potential foraging habitat for these species.

As previously discussed, the vegetation to be removed represents a minor proportion of vegetation within the locality. The proposal would therefore represent a minor increase in the operation of these KTPs.

Conclusion of Assessment of Significance

The proposal is unlikely to have a significant impact on the Regent Honeyeater or Swift Parrot pursuant to section 5A of the EP&A Act, given that:

- The Regent Honeyeater and Swift Parrot would be unlikely to breed within habitats to be removed;
- Vegetation to be removed comprises a negligible proportion of native vegetation present and conserved in surrounding areas and the broader locality; and
- Habitat connectivity would be retained for these highly mobile species

Appendix D – Vegetation within the study area

Heavily grazed groundcover dominated by exotic herbs and grasses



GHD

24 Honeysuckle Drive Newcastle NSW 2300


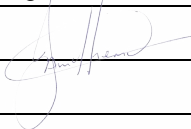
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https://projects.ghd.com/OC/Newcastle/wattlevalequarrypea/Delivery/Documents/2218380_Wattle%20Vale%20Quarry_EIS_V1.docx

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Appendix F Water Resources Assessment



Glen Innes Severn Council

Wattle Vale Quarry Water Resources Assessment

December 2016

Table of contents

1.	Introduction	1
1.1	Overview of proposal	1
1.2	Purpose of this report.....	1
1.3	Limitations.....	1
2.	Legislation and Policy	4
2.1	Legislation.....	4
2.2	Policy.....	4
3.	Existing Conditions	7
3.1	Topography.....	7
3.2	Geology.....	7
3.3	Hydrology.....	7
3.4	Hydrogeology.....	7
4.	Impact assessment.....	14
4.1	Surface water.....	14
4.2	Groundwater.....	18
5.	Mitigation measures.....	23
5.1	General.....	23
5.2	Water supply.....	23
5.3	Erosion and sedimentation control	23
5.4	Material storage and management.....	23
5.5	Monitoring.....	24

Table index

Table 3-1	GISC groundwater monitoring	9
Table 3-2	Results of NSW bore database search.....	10
Table 4-1	Predicted groundwater inflows and radius of influence	20

Figure index

Figure 1-1	Locality plan	2
Figure 1-2	Site overview.....	3
Figure 3-1	Groundwater monitoring locations	12
Figure 3-2	Registered bore search.....	13
Figure 4-1	Water balance schematic	15
Figure 4-2	Water balance results	17

1. Introduction

1.1 Overview of proposal

Glen Innes Severn Council (GISC) proposes to construct and operate a new hard rock quarry (Wattle Vale Quarry) to extract up to 300,000 tonnes per annum (tpa) and 3,000 tonnes per day over 30 years, with a total disturbance area of approximately eight hectares (the Project).. The site is owned by GISC and is approximately 200 hectares in size, located 13 kilometres west of Glen Innes (Figure 1-1).

The proposed extraction area is shown in Figure 1-2.

1.2 Purpose of this report

The purpose of this study is to assess potential impacts from the Project's operation and construction to local surface and groundwater resources (i.e. risks to water receptors). Where required, it also identifies feasible and reasonable management measures to mitigate the potential risks.

1.3 Limitations

This report: has been prepared by GHD for Glen Innes Severn Council and may only be used and relied on by Glen Innes Severn Council for the purpose agreed between GHD and the Glen Innes Severn Council as set out in section 1.2 of this report.

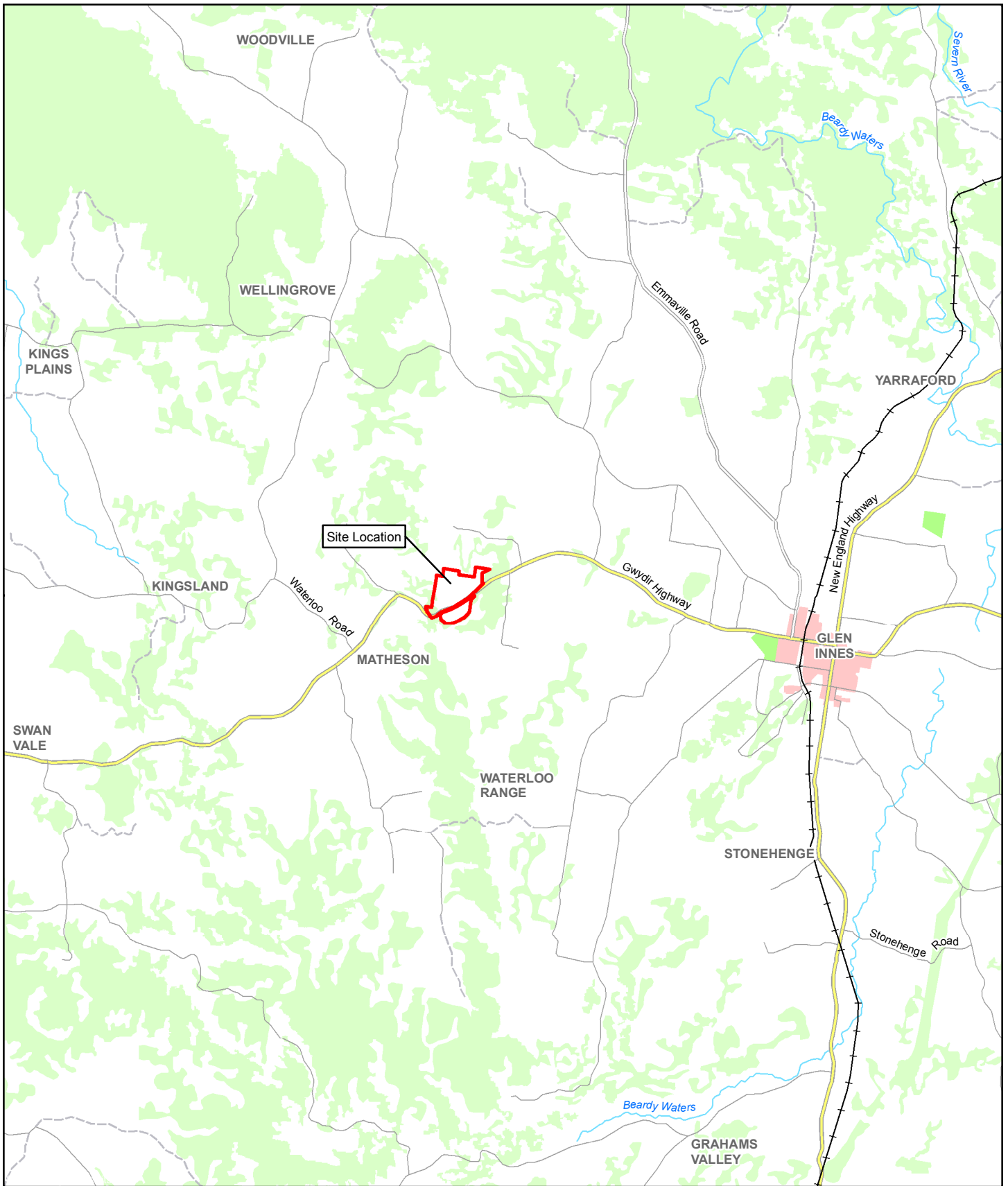
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The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

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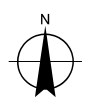
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LEGEND

Principal Road	Railway	Recreation Area
Secondary Road	Watercourse	Forest Or Shrub
Minor Road	Built Up Area	Project boundary
Track		

Paper Size A4
 0 0.75 1.5 3 4.5 6
 Kilometres
 Map Projection: Mercator Auxiliary Sphere
 Horizontal Datum: WGS 1984
 Grid: WGS 1984 Web Mercator Auxiliary Sphere



Glen Innes Severn Council
 Wattle Vale Quarry
 Water Resources Assessment

Job Number 22-18380
 Revision A
 Date 15 Nov 2016

Locality plan

Figure 1-1

G:\22\18380\GIS\Maps\Deliverables\SouthernQuarryEIS\Water\2218380_SQW101_SiteLocality_A.mxd
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