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Flora and Fauna
Assessment of Significance

For the increased production at Runnymede Quarry

SMK CONSULTANTS
September 2014

SMK Consultants

Document Control

Proponent: Johnstone Concrete and Quarries Development Application for the Increase in Annual Production.	
Report No. 14/09 Flora and Fauna Assessment	
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Revision History

Revision No.	Date Issued	Reason/Comment
0	April 2014	Initial Issue
1	September 2014	Amended as per OEH Comments

1. Background

SMK Consultants was commissioned by Johnstone Concrete and Quarries (the Proponent) to prepare an Assessment of Significance for a proposed increase in annual production from their existing quarry located on Lots 52 & 53 DP 751093 known as “Runnymede”. The quarry is located approximately 20 km east of the village of Pallamallawa. (**Figure 1**). The proposal will involve the stockpiling of topsoil (overburden) to allow access to the hard rock below the surface. This rock is then drilled, blasted and crushed for use in the construction of roads and buildings in the region. The site has a significant history of farming and grazing along with forestry operations within the adjoining Bullala National Park (Formerly State Forest). The proposed area of expansion consists of farmland that was historically used for cultivation and grazing and more recently used only for grazing with some regrowth species regenerating across the site. There are large areas of forest/woodland vegetation within the property boundary that will be retained as areas of native vegetation as they have no grazing value and are not in the path of the proposed quarry operation.

The following figure 1 presents a locality plan of the property.

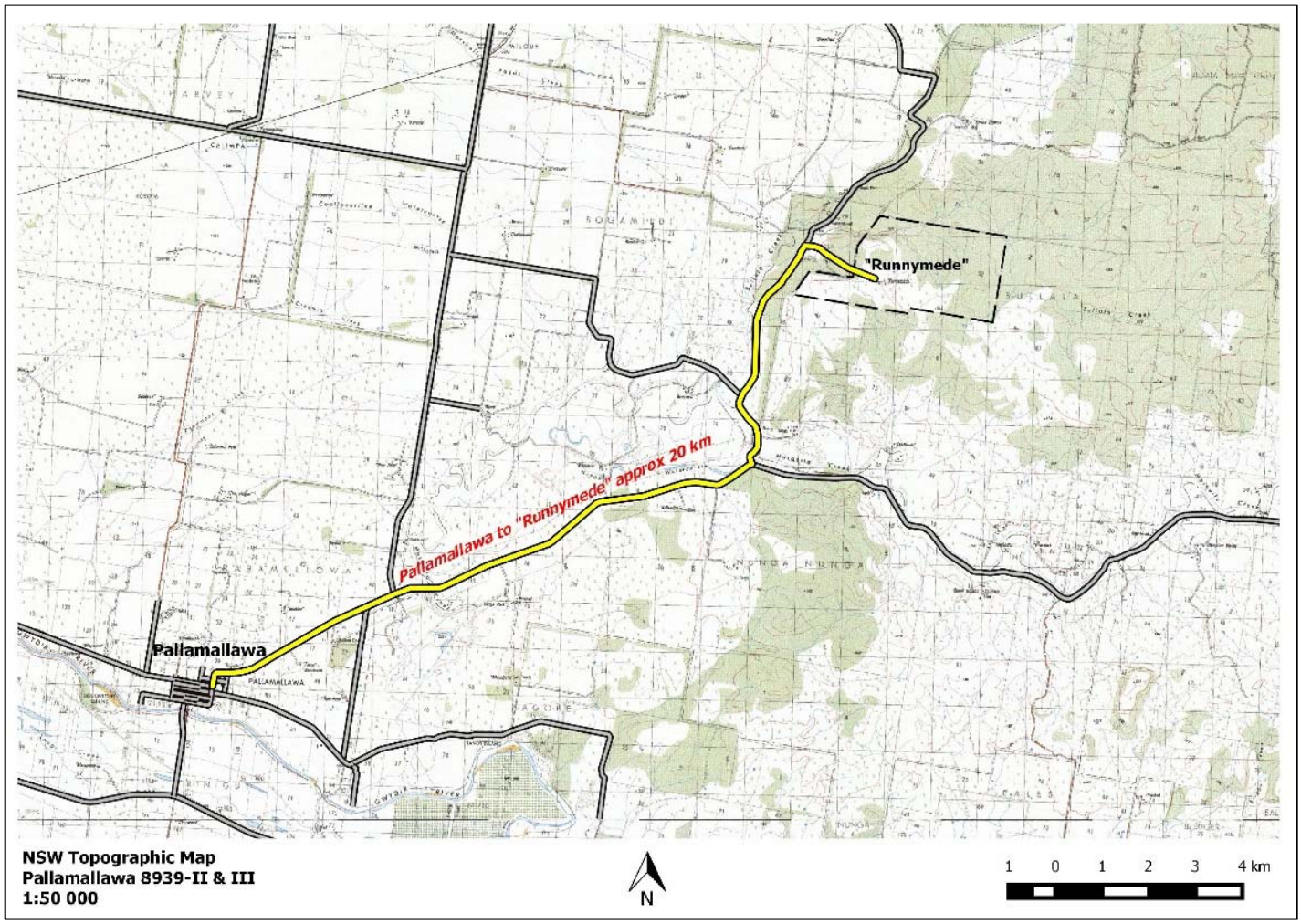


Figure 1: Locality Plan

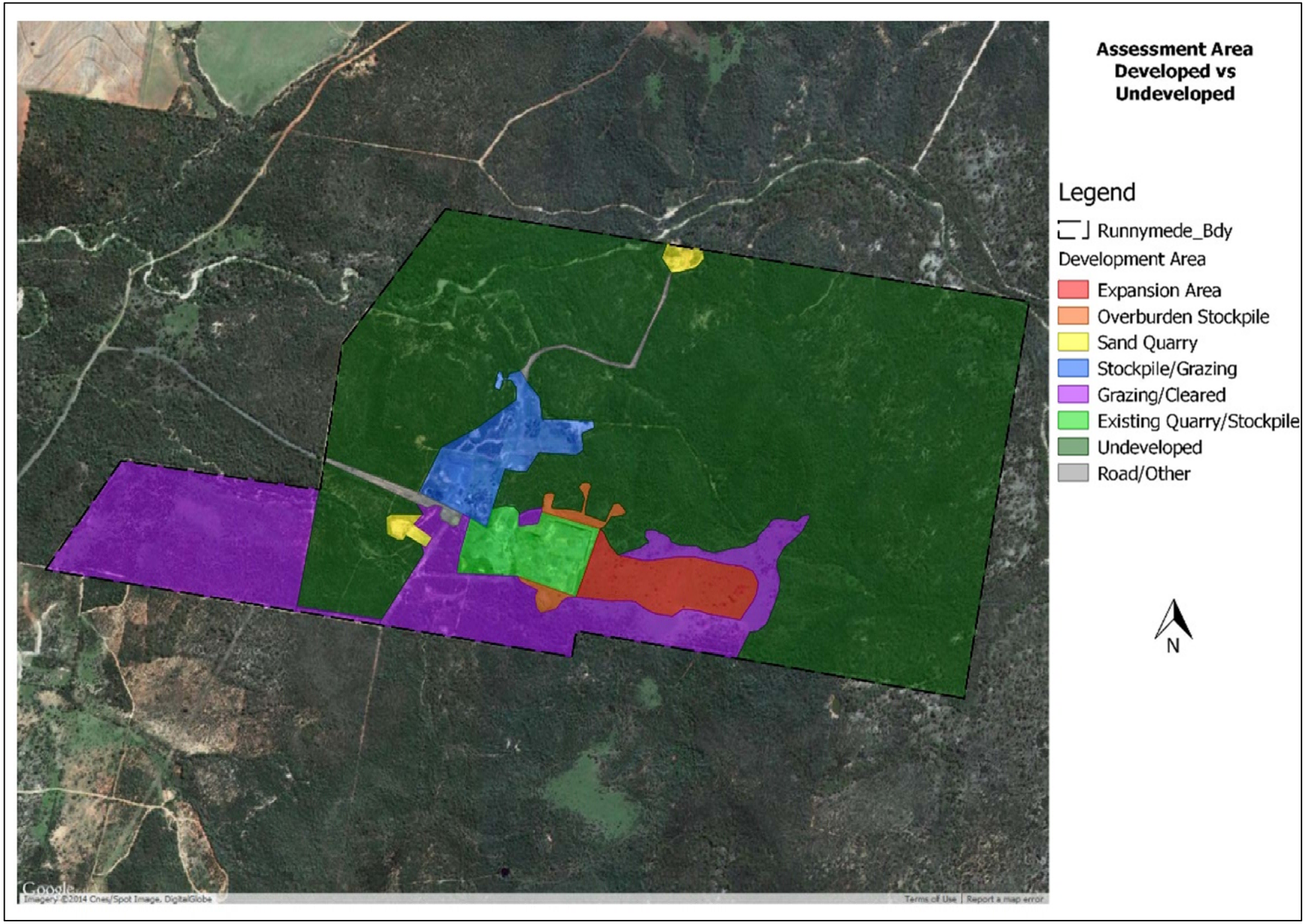


Figure 2: Runnymede – Aerial Image showing landuse descriptions at present as proposed under existing approvals

2. Purpose

The 'Assessment of Significance' refers to factors that are to be assessed to determine whether the proposed development and associated works are likely to have a significant effect on threatened biodiversity ('7 part test')

In addition to fulfilling this statutory requirement, the aim of undertaking an Assessment of Significance is to improve the standard of consideration and protection afforded to the threatened biodiversity in the planning and decision making process.

3. Scope of Assessment

The scope of the assessment can be summarised in three points, mainly:

1. Determine the extent of native vegetation in the local area and the ground disturbance works required for the development proposal; and
2. Determine the extent of likely impact(s) of the proposal on the vegetation and faunal populations within and adjoining the proposed development area.
3. Assess the potential impact on threatened species, populations and ecological communities that are likely to occur on the development site and adjoining study area

Subject site means the area directly affected by the proposal as defined by the property boundary on **Figure 2**. Study area means the subject site and any additional areas which are likely to be affected by the proposal, either directly or indirectly. This assessment has considered all features within the proposed "expansion area" as shown by the red shading on **Figure 2** and the immediate environs connecting to land. In particular the assessment considered impact of the proposal on the Bullala National Park and other adjoining properties (Sheba Downs, Kirkton, Milgai & Eastlands)

4. Methodology

The methodology adopted for this investigation has been guided by the *Threatened Biodiversity Survey and Assessment: Guidelines for Development and Activities* (DECCW, 2004) and follows the '9 step process' outlined in Section 3 – Survey and Assessment Requirements & Process.

Steps 1-3 were conducted and managed by Sarah Grady (SMK Consultants) in the preparation for this report.

Steps 4-6 were used to guide the assessment overall and the final assessment under each of the headings mentioned by the assessment scope.

The survey methodology consisted of two parts, mainly a desktop database search, then field searches. A database search of the Bionet Atlas of NSW Wildlife was undertaken and provides a list of threatened species recorded on the site. A broader search was undertaken of species known or predicted to occur in the Border Rivers-Gwydir CMA subregion. Searches were also performed using the EPBC Protected matters Search Tool for matters of state and national significance.

Once a list of species and habitat preferences were determined from databases, field work was initiated. The field work included:

1. An initial inspection of the site to determine the extent of various micro-habitats within the study area and to identify stratification units.
2. Secondary inspections to obtain an appreciation of the dominant flora species and conditional variations within the habitat whilst targeting specific habitat requirements for threatened species.

3. Ground traverses of the site using Transects and quadrats within each stratification unit as well as a targeted search for threatened species.

The initial inspections were undertaken on the 14th March 2014 and the 23rd April 2014 with secondary inspections on the 3rd and 8th of September 2014.

4.1. Field Assessment

A variety of methods were employed during the field assessment stage. The field assessment was designed to capture as much information about the vegetation on the site whilst gaining an understanding of the use (or potential use) of the site and surrounding area by threatened species.

Listed threatened species were targeted during the searches. No trapping or destructive fauna searches were undertaken as these methods were not considered warranted given the habitats likely to be used by threatened species (as defined by the desktop assessment prior to entering the field). Table 1 provides as summary of field methodologies/targets and field notes.

4.1.1. Habitat Searches

Systematic habitat searches were undertaken for reptiles and mammals during the warmest hours of the day. Scats and other evidence of animal presence were searched for concurrently. Vehicle searches were undertaken as well as 100 metre transects and quadrats within each of the RCV areas. Searches along these transects included point observations, scats, tracks and flora Identification. Spotlighting was not undertaken during the final site assessments. For those species that require spotlighting it was assumed that the species occur on the site.

Flora assessment was undertaken using the *Working Draft Threatened Species Survey and Assessment Guidelines (Nov 2004)*. Chapter 5 of this guideline details the filed sampling techniques and requirements. As per Table 5.1, 100 metre transects were undertaken in each of the stratification units (being the identified Regional Vegetation Communities). The guideline recommends 10 x 100 metre transects for areas < 501 hectares. The development site is approximately 570 ha. The field assessment undertaken overall included 10 x 100 metre transects, 2 x 300 metre transects, 1 x 100 metre transect with $1m^2$ quadrants ever 5 metres, random meander with 20 minute spots for bird calls and fauna searches.

4.1.2. Opportunistic Methods

Opportunistic survey of the adjoining roadside environs was undertaken during travel to and from the site. Whilst affected by weeds, they offered a range of habitats not found on the development site.

Table 1: Field survey methods used

Intended Target	Methodology	Conducted	Survey Period Notes
Diurnal Birds	Area search, where the observer walked the length and width of the site twice in its entirety	Yes, SMK Consultants	Weather was mild, clear with some patchy cloud. Quarry was not operational on the day of survey
	Point count method where observations were made from for 20mins each	Yes, SMK Consultants	Weather was mild, clear with some patchy cloud. Quarry was not operational on the day of survey
Nocturnal Birds	Day habitat search. Search habitat for pellets, and likely hollows plus spotlighting	Yes, SMK Consultants	Weather was mild, clear with some patchy cloud. Quarry was not operational on the day of survey
Non-Flying Mammals	Spotlighting	No	Assume Species occur onsite

Intended Target	Methodology	Conducted	Survey Period Notes
	Search for scats and signs – 30 minutes searching relevant habitat, including trees for scratch marks	Yes, SMK Consultants	
Bats	Spotlighting on foot – 2 hours walking the site on 1 night	No	Assume species occur on site
Reptiles	Day habitat search	Yes, SMK Consultants	Weather was mild, clear with some patchy cloud. Quarry was not operational on the day of survey
Invertebrates	Day habitat search	Yes, SMK Consultants	Weather was mild, clear with some patchy cloud. Quarry was not operational on the day of survey
Amphibians	Day habitat search	Yes, SMK Consultants	Weather was mild, clear with some patchy cloud. Quarry was not operational on the day of survey

5. The Existing Environment

5.1. Meteorological data

The climate in the area of the development is characterised as warm to hot summers, mild winters and summer dominant rainfall. Average rainfall in the area is 688.3 mm. Climate records for this area are recorded from the Warialda Post Office (Station Number: 054029) and the Moree Meteorological station (Station Number: 053115).

Weather data for the days of survey are included in the table below:

Date of Survey	Min Temp (°C)	Max Temp (°C)	Rainfall (mm)	Wind Speed/Direction	
				9 am	3 pm
23/4/2014	15.2	30.2	0	NNE 20 km/h	NNW 19 km/h
3/9/2014	4.8	19.2	0	SW 26 km/h	SW 35 km/h
8/9/2014	10.0	24.9	0	E 20 km/h	ESE 17 km/h

5.2. Landform and Geology

The landform in the area comprises undulating low stone hills with sandy wash and a mixture of sandy loams and heavy clays deposited on the valley floors. The area to be quarried consists of a ridgeline approximately 300 m in width, moderate to steep natural slopes on either side with the ridge rising to the east. Rocky outcrops are present across the site.

The surrounding gullies are steep and contain small ephemeral water holes that fill after rain. Dams were constructed in main gullies through Runnymede to provide stock water. The dams are now used as a potential alternative source of water for dust suppression on the site once the internal sediment control ponds are emptied.

The crest of the east-west ridge was cultivated prior to the Proponent's purchase of the property. The cultivated and cropped area was limited to the crest area which is more level and less prone to potential soil erosion than the steeper sides of the main crest. The quarry operation is moving along the crest of the ridge and not the hill or valley areas which have more significant sandstone outcrops.

5.3. Soil Types and Properties

Surface soils on the site consist of shallow black loams with extensive rock outcrops and rocky subsoil material. The soils on the slopes consist of similar soil; however they have been naturally affected by erosion and the extent of exposed rock increases with slope.

Soils on the lower flatter areas on the western part of the property consist of sands and sandy loams to a depth of 2 metres or more. These sands appear to exist as a result of erosion of the sandstone material in the surrounding gullies and hillsides.

Clay content of the surface soils increases to the west. On the western side of Bullala Creek, only a few areas of sand are present. The majority of surface soils to the west consist of grey black and brown clays.

5.4. Vegetation Pattern and Bioregion

The dominant species across the site is Cypress Pine with various Acacia and Eucalypts species.

Two distinct soil types are present, mainly basalt derived red-brown well-structured clays and the sandy clay loams. These two main soil groups are considered to define the distribution and abundance of native trees, shrubs, grasses and forbs across the site.

Vegetation forms and communities vary within the property. Rocky slopes have less ground cover and more mid to upper stratum, consisting of Cypress Pine (*Callitris endlicheri* & *Callitris glaucophylla*), Ironbark (Silver Leaved and Narrow Leaved), Dean's Wattle (*Acacia deanei*), Curracabah (*Acacia leiocalyx*) and Tea Tree species. Ground cover species consisted of Wiregrass (*Asristida sp*), Kidney Weed (*Dichondra repens*) and Clover Medic (*Medicago sp*).

Vegetation on the open grazing and old cultivation (more level ground) consists of scattered Cypress Pine, Wilga, various Acacia and Tea Tree species and ground cover species including Clover Medic, Grey Copper Burr, Smooth Darling Pea, Prickly Pear, Mimosa Bush, Wiry Panic and *Aristida spp*. The distribution of species within this more level ground has been impacted by landuse and existing approvals relating to the quarry operation for clearing and development as well as grazing of the land.

The adjoining properties to the west of Runnymede include several additional soil types, vegetation communities and land use including permanent cultivation and grazing. Cultivation is concentrated on selected clay soils which have been cleared and maintained for cultivation for an extended period of more than 30-years. Grazing areas within remnant woodland and grassland have been partially cleared and subject to some ongoing clearing of invasive native species. These remnants provide important connectivity in the local area but were not included in detailed assessments.

The adjoining Bullala National Park has a long history of forestry for extraction of mainly Cypress pine. Much of the area within the Bullala National Parks exhibits visible disturbance from timber harvest, fire and grazing. A species list for Bullala National Park is presented in Appendix 1. This list was generated by Dr John Hunter in 2009 as part of an internal report he prepared for the then "National Parks and Wildlife Service". The dominant upper strata species noted in this area was Dirty Gum (*Eucalyptus. Cloroclada*), Dwyer's Red Gum (*Eucalyptus dwyeri*) Blakely's Red Gum (*Eucalyptus blakelyi*), Cypress Pine (*Callitris endlicheri* & *Callitris glaucophylla*), Ironbark (Narrow Leaved and Silver Leaved) and White Box (*Eucalyptus. Albens*). Much of the park area consists of deep sands interspersed with rocky knobs. The species list prepared by Hunter has been relied upon as representative of the park as the area has been subjected to extensive fires which has removed a significant proportion of ground species and cover.

5.4.1. Regional Vegetation Community (RVC)

Regional Vegetation Communities for the Border Rivers Gwydir CMA (BRG-CMA) have been mapped and defined by DECC (2014) who commissioned Eco Logical Australia in 2006 & 2009 to integrate a series of vegetation data sets into standard regional vegetation community (RVC) classifications.

The Figure 3 shows a map of the RVC on and around the Quarry site. The following table (Table 2) provides a description of each of the Regional Vegetation Communities shown in Figure 3.

Table 2: Regional Vegetation Communities

Regional Vegetation Community	Description*
Derived grasslands, Brigalow Belt South and Nandewar	Derived Grassland resulting from clearing of woodland of open forest vegetation. Most common grass species are wiregrasses (*Aristida ramose*, *A personata*, *A vagans*), Queensland Blue Grass (*Dicanthium sericeum*), Spear Grass (*Austrostipa scabra*) Red Grass (*Bothriochloa decipiens* and/or *B. macra*), Plains Grass (*Austrostipa aristiglumis*), Slender Bamboo Grass (*Austrostipa verticillata*), Yadbila Grass (*Panicum queenslandicum*), Barbed Wire Grass (*Cymbopogon refractus*), Hairy Panicum (*Panicum effusum*) and Niggerheads (*Enneapogon gracilis*). Other common species include Common Woodruff (*Asperula conferta*), Slender Sedge (*Cyperus gracilis*), Glycine spp. and Kidney Weed (*Dichondra repens*). Scattered trees such as White Cypress Pine (Callitris glaucophylla), White Box (*Eucalyptus albens*), Yellow Box (*E. melliodora*), Blakely's Red Gum (*E. blakelyi*), Narrow-leaved Ironbark (*E. crebra*) and Silver-leaved Ironbark (*E. melanophloia*) are sometimes present. Occasional shrubs include Wilga (*Geijera parviflora*) and Native Olive (*Notelaea microcarpa*).
Dirty Gum – pine – Smooth-barked Apple open forests, northern Brigalow Belt South and Nandewar	Open Forests dominated by Northern Smooth-barked Apple (*Angophora leiocarpa*), Rough-barked Apple (*Angophora floribunda*), Long-fruited Bloodwood (*Corymbia dolichocarpa*), Caley's Ironbark (*Eucalyptus caleyi* subsp. *caleyi*), Black Cypress Pine (*Callitris endlicheri*), Silver-leaved Ironbark (*Eucalyptus melanophloia*) with Slender Teatree (*Leptospermum brevipes)*, Blunt Beard-heath (*Leucopogon muticus*), Purple Wire Grass (*Aristida ramosaI), Cheilanthes sieberi subsp. sieberi, Cheilanthes distans, Eragrostis brownie* in lower storeys
Narrow-leaved Ironbark – pine – box woodlands and open forests, Brigalow Belt South and Nandewar	Either a shrubby or grassy woodland or open forest dominated by Narrow-leaved Ironbark (*Eucalyptus crebra*) with Black Cypress Pine (*Callitris endlicheri*) and/or White Cypress Pine (*C. glaucophylla*). Other tree species present may include White Box (*E. albens*), Tumbledown Red Gum (*E. dealbata*), Red Stringybark (*E. macrorhyncha*), Dwyer's Red Gum (*E. dwyeri*), Dirty Gum (*E. chloroclada*), Yellow Box (*E. melliodora*), Orange Gum (*E. prava*), Norton's Box (*E. nortonii*) and Silver-leaved Ironbark (*E. melanophloia*). There is sometimes a well-developed shrub layer of species such as Motherumbah (*Acacia cheelii*), Sticky Daisy-Bush (*Olearia elliptica*), Native Olive (*Notelaea microcarpa*), Sticky Hopbush (*Dodonaea viscosa*), Deane's Wattle (*Acacia deanei*), Cough Bush (*Cassinia quinquefaria*), Urn-heath (Melichrus urceolatus), Sticky Wallaby Bush (*Beyeria viscosa*) and Spurwing Wattle (*A. triptera*). The ground layer is variable with common species being wiregrasses (*Aristida spp*.), Mulga Fern (*Cheilanthes sieberi*), Red-anther Wallaby Grass (*Joycea pallida*), Speargrass (*Austrostipa scabra*), Pomax (*Pomax umbellata*), Clustered Lovegrass (*Eragrostis elongata*) and Kidney Weed (*Dichondra sp. A*).
River Red Gum riverine woodlands and forests, Darling Riverine Plains, Brigalow Belt South and Nandewar	Tall open forest or woodland with large spreading trees up to 30 m tall dominated by River Red Gum (Eucalyptus camaldulensis) with occasional Black Box (*Eucalyptus largiflorens*), Coolabah (*E. coolabah*), Yellow Box (*E. melliodora*), Rough-barked Apple (*Angophora floribunda*) and, in the easterly-most extent, River Oak (*Casuarina cunninghamiana*) may be present. The shrub layer may vary from absent to relatively dense with River Cooba (*Acacia stenophylla*), Black Tea-tree (*Melaleuca bracteata*), River Cooba (*Acacia stenophylla*), Lignum (*Muehlenbeckia florulenta*), tea-

	trees (*Leptospermum spp*.) and various bottlebrushes (*Melaleuca spp.*) usually being the most common species. In more western occurrences short chenopods such as Galvanized Burr (*Sclerolaena birchii*) and Ruby Saltbush (*Enchylaena tomentosa*) are sometimes present. The ground layer is often a dense mixture of native and exotic grasses and herbs such as Warrego Summer Grass (*Paspalidium jubiflorum*), Couch Grass (*Cynodon dactylon*), Umbrella Cane Grass (*Leptochloa digitata*) and Spiny-headed Mat-rush (*Lomandra longifolia*). Along the water's edge are often moisture-loving plants such as Nardoo (*Marsilea drummondii*) and a range of sedges (*Cyperus spp*.) and rushes (*Juncus spp*.).
White Box – pine – Silver-leaved Ironbark shrubby open forests, Brigalow Belt South and Nandewar	A shrubby open forest or woodland that is usually dominated by some combination of White Box (*Eucalyptus albens*), Silver-leaved Ironbark (*E. melanophloia*) and cypress pine (*C. endlicheri* and/or *C. glaucophylla*). Other tree species sometimes present include Rough-barked Apple (*Angophora floribunda*), Yellow Box (*E. melliodora*), Tumbledown Red Gum (*E. dealbata*), Blakely's Red Gum (*E. blakelyi*), Red Stringybark (*E. macrorhyncha*), Caley's Ironbark (*E. caleyi*), Norton's Box (*E. nortonii*), Dirty Gum (*E. chloroclada*) and Narrow-leaved Ironbark (*E. crebra*). There is usually a well-developed shrub layer with frequently occurring species being Sticky Daisy-bush (*Olearia elliptica*), Native Olive (*Notelaea microcarpa*), Motherumbah (*Acacia cheelii*), Cough Bush (*Cassinia quinquefaria*), Sifton Bush (*Cassinia arcuata*), Western Silver Wattle (*Acacia decora*), Sticky Wallaby Bush (*Beyeria viscosa*) and Currant Bush (*Carissa ovata*). The ground layer is variable and some of the common species are purple wiregrass (*Aristida ramosa* and *A. vagans*), Snow Grass (*Poa sieberiana*), Spear Grass (*Austrostipa scabra*), Large Tick-trefoil (*Desmodium brachypodum*), Mulga Fern (*Cheilanthes sieberi*), Barbed Wire Grass (*Cymbopogon refractus*), Yellow Burr Daisy (*Calotis lappulacea*) and Kidney Weed (*Dichondra sp. A*).
Non-vegetation land cover (scalds, mines, quarry, large roads, large water bodies and dams, urban)	Cleared land that contains developed sites or scalded sites eg: scalds, mines, quarry, large roads, large water bodies and dams, urban
Undetermined non-woody veg	Non- Woody Vegetation that has not yet mapped or identified under RVC.
Undetermined woody veg	Woody Vegetation that has not yet mapped or identified under RVC.

*Descriptions sourced from Namoi CMA (2013), and Biometric Vegetation Types Database (OEH, 2014).

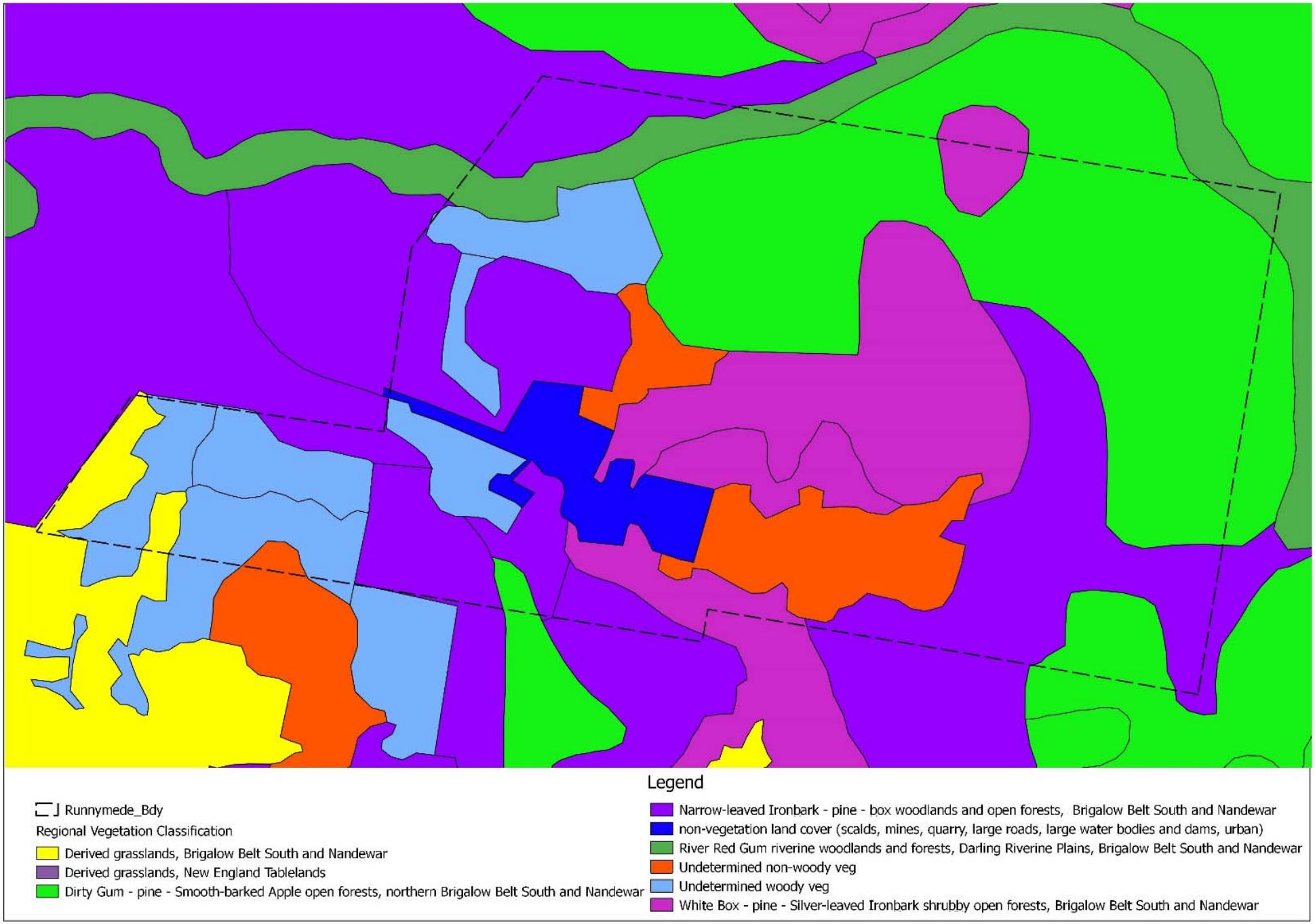


Figure 3: Regional Community Vegetation Map

5.4.2. Validation and Confirmation of RCV Communities

Inspections undertaken in the area of the proposed development site have been done to validate and confirm the vegetation communities listed and mapped. The inspections also sought to clarify/ identify species in the areas mapped as that are described under the data bases as "undetermined". Photographs taken during the site surveys are presented in Appendix 2.

The following table outlines the vegetation located at each of the inspection sites, the RCV Community description and whether the RCV mapping is valid or if alternate listing is required:

Inspection Site	Species Identified	RCV Mapped Community	Mapping Valid	Alternate Listing
Transect 1	Cypress Pine, Urn Heath, Three Awned Spear Grass, Wiry Panic, Dirty Gum, Kidney Weed, Dean's Wattle, Tea tree, Silver Leaved Ironbark, Bimble Box, White Mat Rush, Slender Flat Sedge	Dirty Gum - pine – Smooth barked Apple open forests, northern BBS & N	Yes	-
Transect 2	Cypress Pine, Dwyer's Red Gum, Tea Tree, Curracabah, Three Awned Spear Grass, Mulga Fern	Narrow-leaved Ironbark – Pine – Box woodlands & open forests (BBS & N)	Yes	-
Transect 3	Cypress Pine, Dwyer's Red Gum, Curracabah, Three Awned Spear Grass, Tea Tree, Dean's Wattle, Stink Grass.	Narrow-leaved Ironbark – Pine – Box woodlands & open forests (BBS & N)	Yes	-
Transect 4	Medic, Grey Copper Burr, Smooth Darling pea, Prickly Pear, Mimosa Bush, Wiry Panic	Undetermined non-woody Veg	No	Agricultural or Derived Grasslands (BBS & N). This site has a history of cultivation and is currently grazed by goats and cattle
Transect 5	Cypress Pine, White Box, Three Awned Spear Grass, Dean's Wattle, Curracabah, Urn Heath, Tea Tree, Slender Flat Sedge, White Mat Rush, Stink Grass and Prickly Pear.	Narrow-leaved Ironbark – Pine – Box woodlands & open forests (BBS & N)	Yes	-
Transect 6	Cypress Pine, Dwyer's Red Gum, Dirty Gum, Curracabah, Deans' Wattle, Silver Leaved Ironbark, Urn Heath, Kidney Weed, Prickly Pear	Narrow-leaved Ironbark – Pine – Box woodlands & open forests (BBS & N)	Yes	-
Transect 7	Cypress Pine, Curracabah, Three Awned Spear Grass, Kidney Weed, Silver leaved Ironbark, White Box, Urn Heath, Wiry Panic, Prickly Pear, Dean's Wattle.	Narrow-leaved Ironbark – Pine – Box woodlands & open forests (BBS & N)	Yes	
Transect 8	Cypress Pine, Curracabah, Three Awned spear grass, Five Corners, Urn heath, Tea tree.	Undetermined woody Veg	No	White Box – pine – Silver-leaved Ironbark shrubby open forests, (BBS & N)
Transect 9	Cypress pine, *Eucalyptus Dwyeri*, Deans Wattle, Three Awned Spear Grass.	Undetermined woody Veg	No	White Box – pine – Silver-leaved Ironbark shrubby

Inspection Site	Species Identified	RCV Mapped Community	Mapping Valid	Alternate Listing
				open forests, (BBS & N)
Transect 10	Cypress Pine, Silver leaved Ironbark, Wilga, Curracabah, Dean's Wattle, Smooth Darling Pea, Kidney Weed and with scattered Prickly pear.	White Box – Pine – Silver-leaved Ironbark shrubby open forest (BBS & Nandewar)	Yes	-
Transect 11	Scattered upper strata of Cypress Pine, Wilga, Myall, tea tree, mimosa bush, Five Corners and ground cover consistent with Transect 4 high numbers of Weed species	Undetermined non-woody Veg	No	Agricultural or Derived Grasslands (BBS & N). This site has a history of cultivation and is currently grazed by goats and cattle
Transect 12	Scattered upper strata of Cypress Pine, Wilga, Myall, tea tree, Five Corners and ground cover consistent with Transect 4 high numbers of Weed species Mimosa Bush, Prickly Pear, Cape Weed and Woolly Copper Burr	Undetermined non-woody Veg	No	Agricultural or Derived Grasslands (BBS & N). This site has a history of cultivation and is currently grazed by goats and cattle
Transect 13	Cypress Pine, Curracabah, Tea Tree, Urn Heath, Three Awned Spear Grass, Wilga, Deans Wattle, Mulga Fern and Prickly Pear	Undetermined woody Veg	No	Cypress Pine Shrubby Woodlands (BBS) or Narrow-leaved Ironbark – Pine – Box woodlands & open forests (BBS & N)
Transect 14	Cypress Pine, Curracabah, Three Awned Spear Grass, Silver leaved Ironbark, Bimbil Box, Myall, Wilga, Prickly Pear, Dean's Wattle.	Narrow-leaved Ironbark – Pine – Box woodlands & open forests (BBS & N)	Yes	-
Transect 15	Cypress Pine, Apple, Wattle, Bimbil Box, Wilga, Myall, Hickory Wattle, Three Awned Spear Grass, Cobbler's Peg, Prickly Pear	Poplar Box grassy woodland on alluvial clay soils, Brigalow Belt South	Yes	-

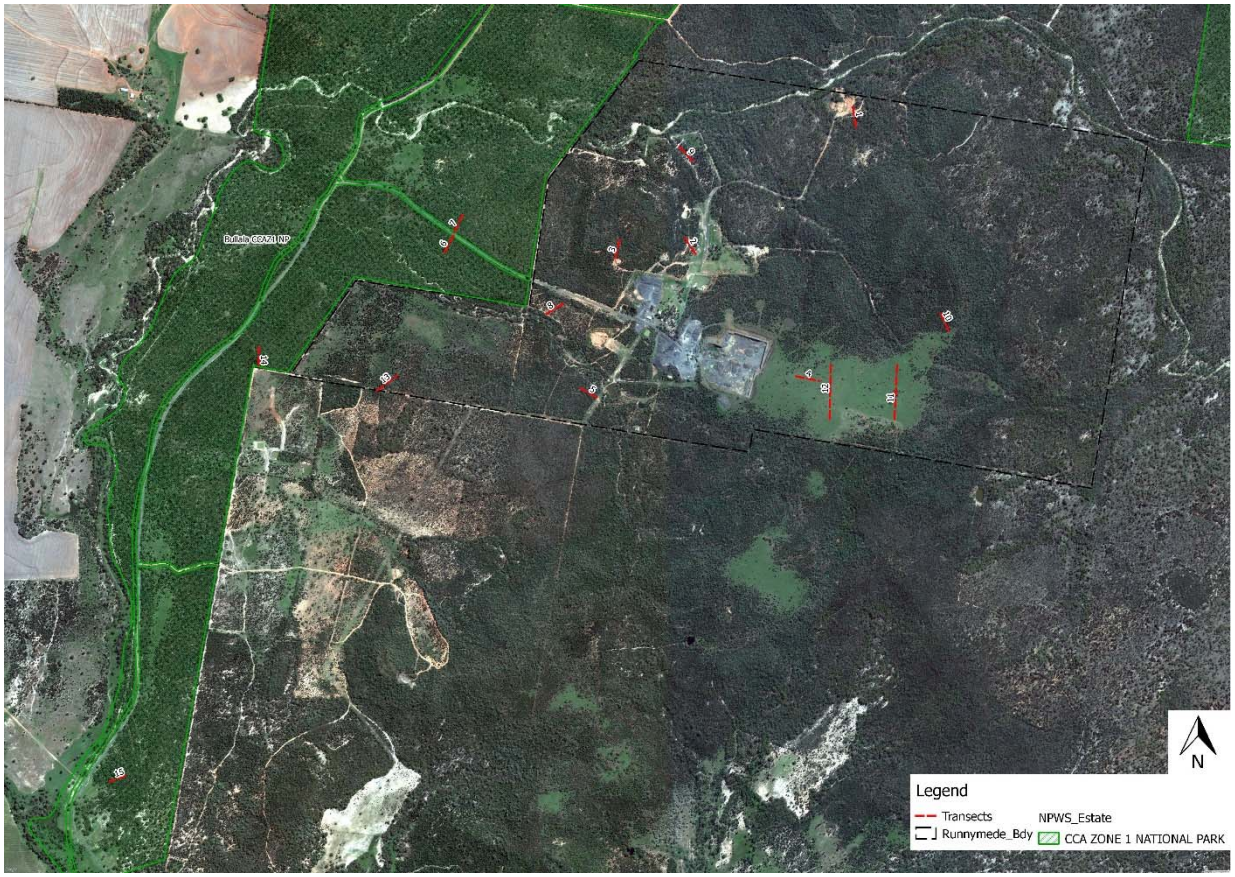


Figure 6: Mapped Transects

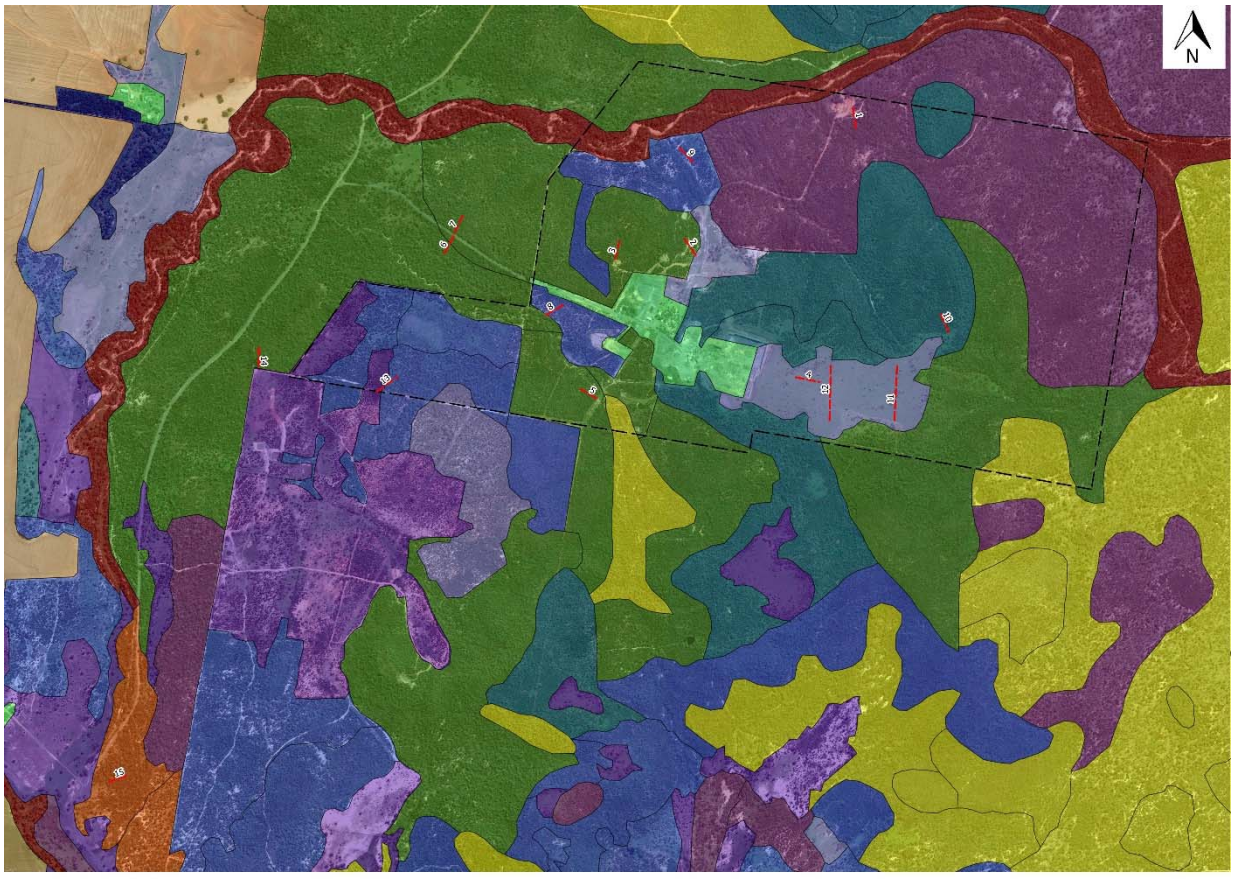


Figure 5: Transects overlayed on RCV Mapping

6. Threatened Species, Populations and Ecological Communities

The content of this section is guided by STEP 4 in Threatened Species Survey and Assessment Guidelines (DECCW, 2004) and intends to determine the likely hood of the study area and subject site supporting threatened species.

6.1. Description of the study area

The subject site to be used for the quarry consists of cleared grazing land that was cultivated for an extended period prior to purchase of the property by the quarry operator. There is minimal shrub layer in the area of proposed disturbance and the scattered trees are a mixture of regrowth of Cypress Pine, Wilga and various Acacia Species. Ground Cover species include Cape Weed, Woolly Copper Burr, Wiry Panic, Three Awned Spear Grass, Medic, Kidney Weed with scattered Mimosa Bush, Prickly Pear and Tiger Pear. There is evidence of grazing on the subject site with domestic scats including cattle, horses and goats in addition to other scats including Kangaroo, Wallaby and Fox.

Ground Cover across the property varies depending on the upper strata and soil type. The dominant trees in the upper strata consist of Cypress Pine, Dirty Gum, Silver Leaved Ironbark, Narrow Leaved Iron Bark, Wilga, Dwyer's Red Gum, Curracabah and Dean's Wattle. The mid strata consists of shrubby species such as Tea Tree, Hop Bush, Buddah and juvenile pine, acacias and eucalypts. The ground cover species consisted of Three Awned Spear Grass, Wiry Panic, Smooth Darling Pea, Kidney Weed, Stink Grass, White Mat-Rush, Slender Flat Sedge, and Prickly Pear. The following tables present a listing of observed flora and fauna from the site surveys.

Table 3: Observed Flora onsite

Scientific Name	Common Name	Scientific Name	Common Name
Paspalum dilataum	Paspalum	*Acacia leiocalyx*	Curracabah
Aristida vagans	Three-Awned Spear Grass	*Callitris endlicheri*	Black Cypress
Cynodon dactylon	Couch	*Acacia deanei*	Dean's Wattle
Entolasia stricta	Wiry Panic	*Callitris glaucophylla*	White Cypress
Bothriochola decipiens	Pitted Bluegrass	*Eucalyptus creba*	Ironbark
Aristida Spp	Wiregrass	*Eromophila mitchelli*	Budda
Hyparrhenia herta	Coolatai Grass	*Geijera paviflora*	Wilga
Acacia farnesiana	Mimosa	*Eucalyptus chloroclada*	Dirty Gum
Opuntia stricta sp	Prickly Pear	*Eucalyptus Dwyeri*	Dwyer's Red Gum
Opuntia aurantiaca	Tiger Pear	*Neptunia gracilis*	Native Sensitive Plant
Dodonaea viscosa	Hop Bush	*Swainsona grayana*	Smooth Darling Pea
Dichondra repens	Kidney Weed	*Medicago sp*	Medic
Glycine sp	Native Glycine	*Cyperus gracilis*	Slender Flat-sedge
Lepidium africanum	Common Peppercress	*Lomandra leucocephala leucocephala*	White Mat-rush

Table 4: Observed Fauna during field survey

Scientific Name	Common Name *	Scientific Name	Common Name*
Macropus giganteus	Grey Kangaroo (Ob, Sc)	*Geopelia striata*	Peaceful dove (Ob)
Cracticus tibicen	Australian Magpie (Ob,Sc)	*Acanthiza sp*	Thornbill (Ob,Hd)
Capra aegagrus hircus	Goats (Ob,Sc)	*Heteronympha merope*	Common Brown Butterfly (ob)
Bos primigenius	Cattle (Ob,Sc)	*Anthophila sp*	Bee
Cacatua galerita	Sulphur Crested Cockatoo (Ob,Hd)	*Dromaius novaehollandiae*	Emu (Ob)
Dacelo novaeguineae	Laughing Kookaburra (Ob,Hd)	*Strepera graculina*	Pied Currawong (Ob,Hd)
Struthidea cinerea	Apostle Birds (Ob,Hd)	*Sus scrofa*	Pigs (Ob,Sc)

*Ob – Observed, Sc – Scats, Hd- Heard

6.2. Surrounding land uses

The development site is located in a rural environment. The surrounding land is used for conservation, recreation and forestry within the Bullala National Park (formerly state forest) and grazing and dry land cropping on adjoining farms.

6.3. Offset Areas

The quarry face is moving in an easterly direction and as such the vegetation within the area will be cleared, the site will be blasted and the rock excavated. Top soil from these areas is stock piled for later use in the remediation of the site. The vegetation to be cleared consisted of scattered and regrowth Cypress Pine, Wilga and various Acacia species with ground cover comprising a mixture of native and weed species such as Cape Weed, Woolly Copper Burr, Mimosa Bush, Prickly Pear and grasses such as Wiry Panic, Three Awned Spear Grass and Paspalum. Forbs such as Smooth Darling Pea, Kidney Weed and Medic are also present as scattered ground cover.

The proponent intends to offset this area to be quarried and the areas along the road ways with areas within the property that contain similar species. The offset proposal intends to be based on a strategy of “improve or maintain” areas to be offset. The proponent is prepared to engage in a property vegetation plan or conservation agreement to ensure the maintain and improve strategy is implemented. The proponent will undertake a weed control program to reduce the impact of weeds on native plants, the installation of nesting boxes for any tree with hollows that are removed and the fencing and reducing grazing pressure from the offset areas by rotating stock and not allowing grazing during flowering and seeding of grasses to allow the seed banks to be renewed. The map below shows the areas the proponent is prepared to offset in order to allow the quarry face to proceed in an easterly direction.

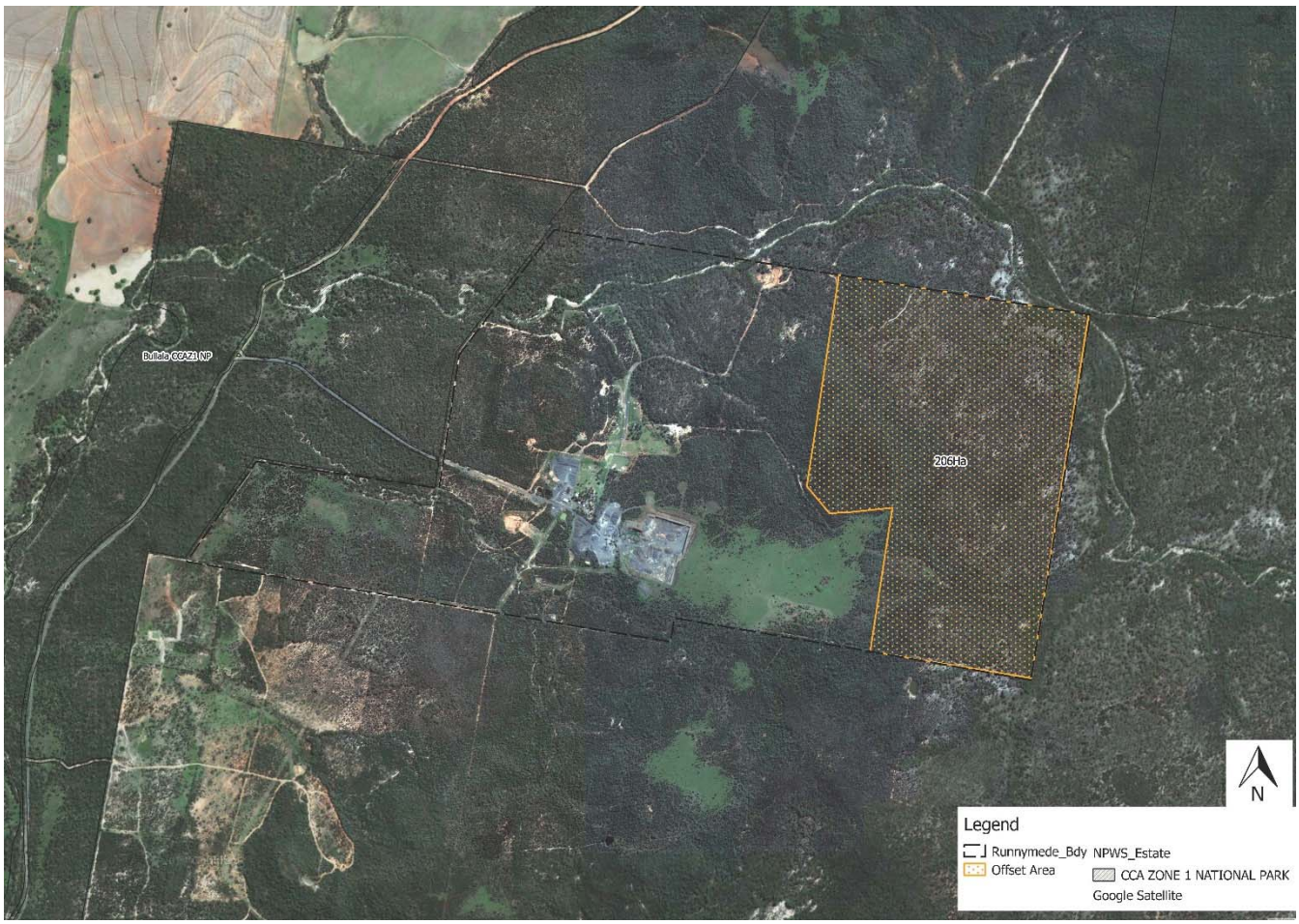


Figure 7: Offset Area

The strategy is considered relatively straight forward other than the issue that the area subject to extension of the quarry has been cleared and cultivated. There is no other similar habitat on Runnymede. The remaining habitat consists of various woodland communities that remain relatively undisturbed from the quarry operation. The intention is therefore to retain these remnants rather than clear them to replace the area of open grassland on the crest of the ridge which is to be disturbed by the quarry operation. This is considered as a logical offset agreement given the land available on Runnymede and the need to maintain native vegetation buffers between the quarry operation and adjoining land. This buffer is especially significant along boundaries adjoining Bullala National Park.

6.4. Known threatened species, populations and ecological communities

6.4.1. Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) Threatened Species

Flora

Consultation with the EPBC Protected Matters Search Tool for the proposed development area returned 2 Endangered Communities, 3 Critically Endangered Communities and 5 vulnerable species whose habitat may or is likely to occur within the specified geographic range. The table below considers their likely hood of occurring on the development site.

Table 5: EPBC Protected Matters Search Results - Flora

Species	Preferred Habitat	EPBC Act Status	Likelihood*
Cooilbah – Black Box Woodlands of the Darling Riverine Plans and the Brigalow Belt South Bioregions	-	Endangered	No – the community does not occur on the site.
Natural Grasslands on basalt and fine textured alluvial plains of northern NSW and southern QLD	-	Critically Endangered	Likely – Grassland areas occur on the site however they are in a degraded state and have significant evidence of disturbance as a result of cultivation and extended grazing history.
New England Peppermint (*Eucalyptus novaangelica*) Grassy Woodlands	-	Critically Endangered	No - the community does not occur on the site.
Weeping Myall Woodland	-	Endangered	Potential – Myall trees have been located in the area, however no tress are present on the site.
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland	-	Critically Endangered	Likely – Species that make up this community are known to occur in the area. The community is known to occur on

			adjoining land but was not noted on the subject development site
Ooline – Cadellia pentatylis	Ooline is found in undulating terrain on a variety of soil types usually between 300-450 m ASL. Forms a closed canopy with Eucalypts and Cypress pine species.	Vulnerable	Unlikely – The species is recorded in the region but was not observed on the site or adjoining land.
Belson's Panic – *Homopholis belsonii*	Belson's Panic occurs in roadside corridors and beneath remnant and regrowth Brigalow in poorer soils.	Vulnerable	Unlikely – The species is recorded in the region but was not recorded on the site.
Bluegrass – *Dicanthium setosum*	Blue grass is found in a variety of communities such as dry sclerophyll woodland, grassy sclerophyll woodlands and grasslands in varying soil types.	Vulnerable	Unlikely – The area of disturbance has been heavily grazed in the past and was not observed on the site.
Slender Darling Pea – *Swainsona murrayana*	Slender Darling-pea is found in grassland, herb land, and open Black-box woodland, often in depressions.	Vulnerable	Unlikely – species not previously recorded or identified onsite
Tylophora lineris	*Tylophora lineris* grows in dry scrub and open forest. Recorded from low-altitude sedimentary flats.	Vulnerable	Unlikely – species not previously recorded or identified onsite.

Fauna

Consultation with the EPBC Protected Matters Search Tool for the Development area returned 2 Endangered, 10 Vulnerable and 9 Migratory species whose habitat may or is likely to occur within the specified geographic range. The table below considers their likely hood of occurring on the site.

Table 6: EPBC Protected Matters Search Results – Fauna

Species	Preferred Habitat	EPBC Act Status	Likelihood*
Birds			
Regent Honeyeater – *Anthochaera phrgia*	Temperate woodlands and Open forests	Endangered	Potential – Habitat may be present in adjacent woodlands
Red Goshawk – *Erythrotriorchis radiatus*	Open woodland and forest vegetation in proximity to permanent water.	Vulnerable	Potential – Habitat may be present in the area.
Squatter Pigeon (Southern) *Geophaps scripta scripta*	Grassy Woodlands and plains. Sandy areas close to water.	Vulnerable	Potential – Habitat may be present in the area.
Australian Painted Snipe – *Rostratula australis*	Margins of densely vegetated swamps and wetlands	Endangered	Unlikely – subject site does not contain suitable habitat.
Fish			
Murray Cod – *Maccullochella peelii*	Slow flowing turbid rivers and billabongs.	Vulnerable	No – No suitable habitat.
Mammals			
Large-eared Pied Bat – *Chalinolobus dwyeri*	Roosts in caves, crevices in cliffs, old mine workings and the disused mud nests of Fairy Martins. Forages in open forest, woodland and timbered gully areas.	Vulnerable	Potential – Habitat may be present in the area.
South-eastern Long-eared Bat, Corbens	Most abundant in vegetation with a distinct canopy and a dense cluttered shrub layer	Vulnerable	Unlikely – subject site does not contain suitable habitat.

Long-eared bat – *Nyctophilus cobeni*			Suitable habitat may be available on adjoining land.
Koala (combined Populations QLD,NSW, ACT) – *Phascolarctos cinereus*	Temperate, sub-tropical and woodland communities dominated by Eucalypts	Vulnerable	Potential – subject site contains some secondary feed trees, no evidence of scratch marks on trees or scats.
Reptiles			
Five-Clawed Worm Skink – *Anomalopus mackayi*	Deep tunnel like burrows and deep soil cracks in deep cracking loose clay soils and moist black soils with fallen timber and leaf litter particularly grassy white box woodlands.	Vulnerable	Potential – Site does contain some suitable habitat.
Pink-tailed Worm-lizard, Pink-tailed legless Lizard – *Aprasia parapulchella*	Open woodland areas with native grass cover, well drained soils and rocky outcrops.	Vulnerable	Potential – Site does contain some suitable habitat.
Border Thick-tailed Gecko – *Uvidicolus sphyrurus*	Forest and woodland areas with steep rocky slopes usually with dense canopy.	Vulnerable	Potential – Site does contain some suitable habitat.
Bell's Turtle – *Wollumbinia belli*	Shallow to deep pools in upper reaches or small tributaries of major rivers in granite country.	Vulnerable	No – No suitable habitat
Migratory Marine Birds			
Fork Tailed Swift – *Apus pacificus*	Spend most their life airborne. Build their nests on cliffs.	Migratory	No – No suitable habitat
Migratory Terrestrial Birds			
White-bellied Sea-Eagle – *Haliaeetus leucogaster*	Habitats are characterised by the presence of large areas of open water (larger rivers, swamps, lakes, and the sea).	Migratory	Unlikely – Site does contain some suitable habitat (sediment ponds). Species may utilise the site opportunistically
White Throated Needletail – *Hirundapus caudacutus*	Spend most their life airborne. Build their nests on rocky hills.	Migratory	No – No suitable habitat
Rainbow Bee-eater – *Merops ornatus*	Occurs mainly in open forests and woodlands, shrub lands.	Migratory	Unlikely – Site does contain some suitable habitat. (Sediment Ponds). Species may use the site opportunistically.
Satin Flycatcher – *Myiagra cyanolueca*	Inhabit eucalypt forests, often near wetlands or watercourses.	Migratory	Unlikely – Site does contain some suitable habitat. (Sediment Ponds). Species may use the site opportunistically.
Migratory Wetland Species			
Great Egret – *Ardea alba*	Reported in a wide range of wetland habitats usually frequents shallow waters.	Migratory	Unlikely – Site does contain some suitable habitat. (Sediment

			Ponds). Species may use the site opportunistically.
Cattle Egret – *Ardea ibis*	Occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands	Migratory	Unlikely – Site does contain some suitable habitat. (Sediment Ponds). Species may use the site opportunistically.
Latham's Snipe – *Gallinago hardwickii*	Usually inhabit open, freshwater wetlands with low, dense vegetation.	Migratory	Unlikely – Site does contain some suitable habitat. (Sediment Ponds). Species may use the site opportunistically.
Painted Snipe – *Rostratula benghalensis (sensu lato)*	Inhabits shallow terrestrial freshwater lakes, swamps and claypans.	Migratory	Unlikely – Site does contain some suitable habitat. (Sediment Ponds). Species may use the site opportunistically.

* The categories of Likelihood of occurrence used are based on recorded sightings listed in credible databases, the presence or absence of suitable habitat, other features of the site, results of the field survey and professional judgement. These categories are:

'Yes' The species/community was or has been observed on the site.

'Likely' A medium to high probability that a species uses the site

'Potential' A suitable habitat for a species occurs on the site, but there is insufficient information to categorise the species as 'likely' or 'unlikely' to occur.

'Unlikely' A very low to low probability that a species uses the site.

'No' Habitat on the site and in the vicinity in unsuitable for the species.

6.4.2. Threatened Species Conservation Act 1995 (TSC Act) searches

Flora

A search of the Bionet Atlas of NSW Wildlife website revealed no threatened flora species recorded in the specific geographical search area.

Fauna

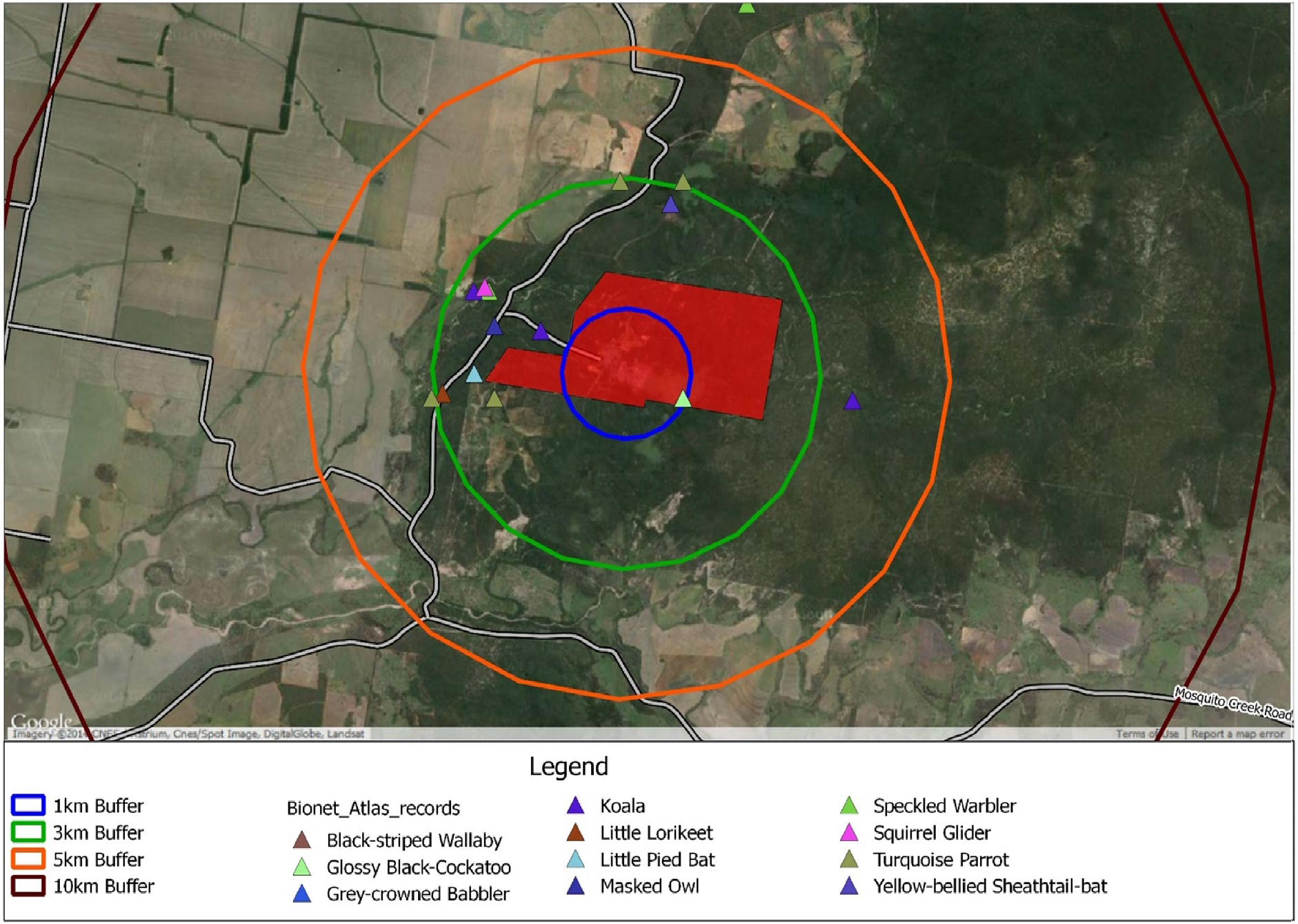
A search of the Bionet Atlas of NSW Wildlife website revealed 10 vulnerable species and one endangered species recorded in the specific geographical search area.

Table 7: Bionet Threatened Fauna

Species	Preferred Habitat	TSC Act Status	Likelihood*
BIRDS			
Glossy Black-Cockatoo – *Callyptorhynchus lathami*	Forest and Woodland Areas made up of Allocasurinas, Eucalypts, Cypress and Acacia	Vulnerable	Likely – has been recorded in the area. Was not observed on the site as no preferred feed trees present.
Little Lorikeet – *Glossopsitta pusilla*	Open forests and woodlands and riparian habitats containing	Vulnerable	Potential – habitat may be available in the area.

Species	Preferred Habitat	TSC Act Status	Likelihood*
	Eucalypts, Angophora and Melaleuca.		
Turquoise Parrot – *Neophema pulchella*	Edges of eucalypt woodlands adjoining clearings timbered ridges and creeks. Forages on the ground for seeds, grasses and herbaceous plants	Vulnerable	Potential – habitat may be available in the area.
Masked Owl – *Tyto novaehollandiae*	Eucalypt forest and open woodlands feeding on small ground and tree dwelling mammals.	Vulnerable	Potential – habitat may be available in the area.
Speckled Warbler – *Chthonicola sagittata*	Eucalypt woodlands with grassy understorey.	Vulnerable	Potential – habitat may be available in the area.
Grey-crowned Babbler (eastern Species) – *Pomatostomus temporalis temporalis*	Open Box-Gum Woodlands, Box-Cypress Woodlands and open Box woodlands on alluvial plains.	Vulnerable	Potential – habitat may be available in the area.
FISH			
Murray Cod – *Maccullochella peelii peelii*	Slow flowing turbid rivers and billabongs.	Vulnerable	No – No suitable habitat.
MAMMALS			
Squirrel Glider – *Petaurus norfolcensis*	Mature (old growth) Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Divide.	Vulnerable	Potential – Habitat may be available in the undeveloped area on the site and on adjoining land.
Black-striped Wallaby – *Marcropus dorsalis*	Dense woody or shrubby vegetation within 3 m of the ground near open grassy areas for feeding.	Endangered	Potential – the undeveloped area may provide suitable habitat.
Yellow-bellied Sheathtail-bat – *Saccolaimus flaviventris*	Roosts in tree hollows, buildings and burrows. Foraging above the forest canopy and low in open country.	Vulnerable	Potential – habitat may be available in the area.
Little Pied Bat – *Chalinolobus picatus*	Dry open forest & woodlands, mulga woodland, chenopod shrub lands, roosting in caves, tree hollows, rock outcrops, tunnels, shafts and buildings.	Vulnerable	Potential – habitat may be available in the area.
Koala – *Phascolarctos cinereus*	Temperate, sub-tropical and woodland communities dominated by Eucalypts	Vulnerable	Potential – subject site contains some secondary feed trees, no evidence of scratch marks on trees or scats.

Figure 8: Threatened Fauna and Flora - Bionet Atlas of NSW Wildlife



7. Physical and Chemical Impacts

7.1. Is the proposal likely to impact on soil quality or land stability?

Soil Quality – No.

Land Stability – Yes, There is likely to be mobilisation of some soil as a result of the nature of the proposal (Quarry). The quarry will be extended as a below ground activity and all major disturbance to soil will be located within the quarry floor area apart from the development of a surrounding road to access the quarry face area for drilling and blasting. The site is also susceptible to some movement as a result of vibrations from blasting activities. Mitigation measures that are implemented on the site extend to but are not limited to the following:

- An approved Erosion and Sediment Control Plan has been prepared for the existing development and is being progressively implemented as the quarry moves the cut face to the east.
- Maintenance and checking of the erosion and sediment controls to be undertaken on a regular basis in accordance with existing approvals. These include actions such as sediment to be cleared from behind barriers on a regular basis and all controls are continuously managed to ensure they work effectively at all times.
- No Stockpiles to be established on areas of vegetation to be retained.
- If heavy rain is predicted vehicle movements on and around the site are limited.
- Prior to and after blasting check of areas surrounding the site for suspect stability issues and rectify problem areas immediately.

7.2. Is the activity likely to affect a water body, watercourse or wetland or natural drainage system?

No – The existing site has an established sediment control system to capture dirty water that runs off the disturbed site and diversion banks to minimise clean water run onto the site. Works will continue to be developed as the operation progressively extends further east.

7.3. Is the activity likely to change flood or tidal regimes, or be affected by flooding?

No – The proposed activity is not likely to change flood or tidal regimes or be affected by flooding. Water runoff from clean areas is diverted round the quarry to prevent the flow of water through the quarry site. All water captured within the quarry site is directed into sediment dams for settling and reuse.

7.4. Does the proposal involve the use, storage or transport of hazardous substances or the use or generation of chemicals which may build up residues in the environment?

Yes. The proposal requires the storage of diesel on the site. The storage area is currently established in a bunded area. The proposed development **would not** increase the amount of diesel to be stored on site. The bitumen coating products are also kept on site in a bunded area to prevent potential spills and leaks entering the surrounding environment. There are no hazardous materials designated to be stored on site or to be introduced to areas of undeveloped native vegetation.

7.5. Does the activity involve the generation or disposal of gaseous, liquid or solid wastes or emissions?

Yes. The operation of machinery and equipment on the site produce mainly diesel motor emissions. No disposal of liquids, gases or solid wastes is required on the site. All waste is removed from the site and is disposed of at the local Council Waste Management Facility.

7.6. Will the activity involve the emission of dust, odours, noise, vibration, or radiation in the proximity of residential/urban areas or other sensitive locations?

The development involves the emission of dust, noise and vibrations however not in the proximity of residential or urban areas. The surrounding area is a rural area in addition to an area of National Park reserve which is irregularly used for recreational purposes. Dust generated on the access roads can cause some issues with visibility and air quality. There is an agreement in place between the proponent and Gwydir Shire Council for Gwydir Shire Council to take over administrative control of the Gil Gil Creek road and the access road into the quarry. As part of this agreement these roads would be bitumen sealed up to the quarry boundary which would significantly reduce the impacts of dust in the area. In the meantime the roads would be regularly watered

8. Biological Impacts

8.1. Is any vegetation to be cleared or modified?

The area of vegetation that will be cleared under existing and proposed approvals was originally cleared for farming and grazing prior to development of the quarry. Suitable timber in the area was used for construction of fences and cattle yards. Scattered areas of regrowth pine and acacia species occur in the area of proposed disturbance and would be required to be removed as the quarry progresses east. The vegetation in the disturbance area is to be cleared on an as needed basis, usually in small increments as the quarry face moves east.

The existing quarry and infrastructure footprint covers an area of approximately 40 ha. Current approvals allow the quarry to expand in an easterly direction to mine approximately 20 ha of additional land. The 20 Ha area consists of open grazing land. The remainder of the property includes 70 ha of open woodland used for opportunity grazing of cattle in addition to an area of approximately 500 ha of undisturbed woodland. It is proposed to offset approximately 200 ha of the undisturbed woodland through official documentation with improve and maintain measures to be implemented.

8.2. Is the activity likely to have a significant effect on threatened flora or fauna species, populations, or their habitats, or critical habitat; or an endangered ecological community or its habitat?

The proposed development is to extend within an existing approved area for development as a quarry. The quarry is extending eastward across an area that has a history of disturbance from cultivation and cattle grazing on generally sparse native pasture and weeds. The proposal requires the removal of minimal vegetation within this disturbed zone. The proposal also requires the upgrade of the Haul roads under an agreement with Council. Minimal clearing would be required for these works and if any mature hollow bearing trees are remover nesting boxes would be installed in their place.

The proposal is not considered to cause any additional fragmentation of habitat as this area was cleared prior before the mid 1990's when the land was originally farmed. The adjoining woodland on the property has been retained to continuously link the woodland vegetation on the property to surrounding woodland areas in turn linking all adjoining land including the adjacent National Park.

8.3. Does the activity have the potential to endanger, displace or disturb fauna (including fauna of conservation significance) or create a barrier to their movement?

Endanger – No. The rural based activity on the land and the proposed development has been an ongoing activity since the mid-90's. The degraded habitat created prior to development of the quarry site would have moved any endangered species from the area of additional disturbance.

Displace – No. Species utilising the surrounding woodland as habitat have already been displaced as a result of clearing and farming of the land prior to development of the quarry.

Disturb – Yes. The approved expansion of the quarry follows the paddock which was previously cleared and farmed in the 90's. Some regrowth of Cypress Pine and Acacia with grasses and weed species are present within this area identified for the continuing quarry operations. Connectivity between the areas of remnant vegetation will remain on all four sides of the quarry. The Runnymede property includes extensive areas of native vegetation surrounding the quarry activity which connects to surrounding remnants and habitats. The area proposed for significant disturbance has a history of disturbance from cultivation and grazing and contains scattered mature trees and large areas of regrowth vegetation. The daily operation of the quarry creates a barrier in addition to the 14 m to 18 m deep approved excavation. The excavation will occur under existing approvals. The barrier of the quarry would mean that fauna would need to migrate around to the east or west to link between habitat on the northern and southern side of the quarry.

8.4. Is the activity likely to impact on an ecological community of conservation significance?

No. The proposed development does not include the clearing or disturbance of an ecological community of conservation significance.

8.5. Is the activity likely to cause a threat to the biological diversity or ecological integrity of an ecological community?

No. The proposed development is not likely to cause a threat to the biological diversity or ecological integrity of an ecological community.

8.6. Is the activity likely to introduce noxious weeds, vermin, feral species or genetically modified organisms into an area?

Vermin – No.

Feral Species – No.

Noxious Weeds - Possible. The movement of vehicles, plant, equipment and people on and off the quarry site has the potential to introduce noxious weeds to the area. Due to the nature of the quarry, vehicle movements are generally restricted to gravel paved roads which does not offer a viable seed bed for weed species. No specific noxious weed species have invaded the property since commencement of operations in 1995.

Additionally, the following strategies are to apply to weed management within the site:

- Minimal impact techniques are to be used, ensuring no native species are damaged during weed control activities.
- Soil disturbance by vehicle and pedestrian access is to be kept to a minimum outside the construction footprint.

- Herbicide application is to be administered by authorised personnel only (e.g. Chem Cert Accreditation – AQF 3), in accordance with the directions on the container (application rates, MSDS requirements) and any applicable Work Cover requirements.
- All machinery used within the site is to be thoroughly cleaned by removing all plant material, dust or soil, and any accumulation of grease from the machine prior to the commencement of the construction.
- Any weeds removed (particularly those bearing seeds) are to be disposed of appropriately at the nearest waste management facility.
- If required, only topsoil from areas with no noxious or highly invasive weed species should be re-used in rehabilitation (it is generally assumed that if there is no evidence of noxious or invasive weeds in an area, the topsoil in this area is not contaminated with the seeds of such weeds).

9. Assessment of Significance

The following section assesses whether the proposal (as discussed and reviewed in this assessment) is likely to have significant effect on threatened biodiversity by addressing the factors of s5A of the EP&A Act and s94 of the TSC Act.

The factors that need to be considered when assessing whether an action, development or activity is likely to significantly affect threatened species, populations or ecological communities or their habitats was revised under the Threatened Species Conservation Amendment Act 2002 (previously known as the '8 Part Test'). These changes affect s5A of the EP&A Act s94 of the TSC Act and s220ZZ of the Fisheries Management Act 1994 (FM Act).

The revised factors maintain the same intent as earlier legislation but focus particularly on the likely impacts to local rather than regional environment, as the long-term loss of biodiversity at all levels arises primarily from the accumulation of losses and depletions of populations at a local level.

When applying each factor, the following sections have considered all perceived likely direct and indirect impacts of the proposal as outline by previous sections of this document.

- Direct impacts are those that directly affect the habitat and individuals. They include, but are not limited to, death through predation, trampling, poisoning of the animal/plant itself and the removal of suitable habitat.
- Indirect impacts occur when project related activities affect species, populations or ecological communities in a manner other than direct loss. Indirect impacts can include loss of individuals though starvation exposure, predation by domestic and/or feral animals, loss of breeding opportunities, loss of shade/shelter, deleterious weed invasion, fertiliser drift, or increased soil salinity, erosion, inhibition of nitrogen fixation, sensitive habitat areas.

The species considered under this assessment listed in the tables above have been categorised into the following:

- Woodland Birds
  Glossy Black Cockatoo, Little Lorikeet, Turquoise Parrot, Speckled Warbler & Grey-Crowned Babbler
- Birds of Prey
  Masked Owl
- Arboreal Mammals
  Koala & Squirrel Glider
- Terrestrial Mammals
  Black Striped Wallaby

- Bats
  Little Pied Bat & Yellow-bellied Sheath-tail bat

9.1. Factors for consideration – s5A EP&A Act and s94 of the TSC Act

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

Comment: The project does not require the removal of any mature hollow bearing trees. And requires minimal clearing of otherwise viable foraging habitat of all those species listed. There will be no loss of connectivity as a result of the proposed development. Dust impacts from the use of roads in the area may cause some problems for those species that occur in the vegetation along the road corridors, however there is an agreement in place with Gwydir Shire Council that once administration right of the roads have been transferred to Council the roads will be bitumen sealed. Thereby reducing dust impacts in the long term.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the lifestyle 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.

Comment: No. There are no Endangered Populations listed for this site and are unlikely to utilise the development site in its current form.

(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.*

Comment: The proposed development does not require the clearing of any of the endangered ecological communities listed. The extent of works is within an area that has a history of disturbance. Therefore the proposal is unlikely to have an adverse effect on the extent of an EEC, nor will it substantially or adversely modify the composition of an EEC.

(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

Comment: The proposal does not require the removal of any hollow bearing trees and would result in the minimal removal of otherwise viable foraging habitat of the Woodland Birds, Birds of Prey, Terrestrial Mammals and Bats.

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

Comment: The proposed development is in an area of existing disturbance and is unlikely to result in fragmentation or isolation of habitat. The remaining vegetation onsite would have good connectivity to the undeveloped area on the property and adjoining land.

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.

Comment: The area to be developed has a history of disturbance. The vegetation in the area of the development that requires removal is of minimal significance to those species within the locality.

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

Comment: There is no critical habitat listed for the proposed development site.

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

From the Species listed in Table 7 the Masked Owl and the Koala have recovery plans. The proposed development is consistent with the objectives of the listed recovery plans as minimal to no remnant vegetation is required to be cleared by this proposal and the proposal is unlikely to cause further fragmentation of the listed species habitats.

(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.

Comment: A threatening process is something that threatens, or could potentially threaten, the survival or evolutionary development of a species, population or ecological community. A threat can be listed under the TSC Act as a 'Key Threatening Process' if it adversely affects threatened species, populations or ecological communities or if it could cause species, populations or ecological communities that are not threatened to become threatened. There are currently 34 listed threatening process recognized by the TSC Act (NSW) and a further 19 by the EPBC Act (Commonwealth).

The following Key Threatening processes are considered relevant:

Key threatening Process	**Is the proposal of a class of activity that is recognised as a threatening process?**		
	Likely	**Possible**	**Unlikely**
Land Clearance (Cwth)		✓	
Clearing of native vegetation (NSW)		✓	
Removal of dead wood and dead trees (NSW)			✓

The proposal requires clearing within the already disturbed area. Clearing would be undertaken to the minimum extent necessary and would involve the removal of ground cover, shrubs and scattered trees. Any fallen timber would be relocated within the development site to be retained as potential habitat. There would be no loss of hollow bearing trees or limbs. The proposal therefore is not likely to be part of or increase the impact of a key threatening process.

10. Additional Impact Parameters

The following section addresses additional potential impacts of the proposed development.

10.1. Roads

The haul roads from the quarry are currently gravel roads. There is an agreement between Gwydir Shire Council and the Proponent to bitumen seal the entirety of the haul road to the Quarry. The Council are prepared to take over the administrative rights of the access roads which are currently not under their control but are under the control of the Minister for National Parks. The proponent is willing to take out a licence over these roads until such a time that the transfer process can be completed. Once the roads are under Council administration the roads will be bitumen sealed in a joint initiative between the Proponent and Council and will be undertaken in stages. The first stage has already been completed and that is the sealing of the road from the County Boundary Road across Mosquito Creek for a distance of 2.5 km. The remaining 13 km of road will be undertaken in stages when Council have the available staff and equipment and the Proponent has the available product.

The upgrade of the roads would require minimal clearing. If any mature hollow bearing trees are removed as part of this upgrade process, nest boxes would be installed in their place.

10.2. Construction and Operation

The construction and operation of the quarry is undertaken in stages. The overburden from the extension area is removed and stockpiled for later use in regeneration of the site. This stockpile is allowed to vegetate to allow continual regeneration of the seed bank. The face of the quarry is drilled and blasted with all material being crushed within the quarry walls and stockpiles to reduce the impact of noise and dust on the surrounding areas. Water captured in the sediment dams is used for dust suppression both at the machine level and on access roads. These sediment dams provide a source of permanent water that may not otherwise be available reducing the distance animals have to travel to seek out water.

11. References

Brooker, M.I.H. and Kleinig D.A (1990) Field Guide to Eucalypts Volume 1 South Eastern Australia. Inkata Press Australia.

Burns, A. Rotherham, E.R. (1969) Australian Butterflies in Colour. Reed Sydney.

Department of Environment and Heritage and Eco Logical Australia. (2009) Composite API Mapping of RVCs in BRG.

Department of Environment and Conservation, 2004, Threatened Species Survey and Assessment: Guidelines for developments and activities (working draft), New South Wales Department of Environment and Conservation, Hurstville, NSW.

Hunter, J.T. (2009) Vegetation and floristics of Bullala National Park. Unpublished report to the Department and Environment and Climate Change.

Office of Environment and Heritage (2014) BioMetric: Terrestrial Biodiversity Tool for the NSW Property Vegetation Planning System. http://www.environment.nsw.gov.au/projects/BiometricTool.htm#vegtype, Accessed March 2014

Office of Environment and Heritage (2014) NSW Bionet the website for the Atlas of NSW Wildlife. http://www.bionet.nsw.gov.au/ Accessed March 2014.

Office of Environment and Heritage (2014) NSW Threatened Species. http://www.environment.nsw.gov.au/threatenedspecies/index.htm Accessed March 2014.

Kahn L., Heard, B. Whalley, W. (2003) Pasture Plants of the slopes and tablelands of NSW: a field guide to the recognition and attributes of 70 plants. Department of Land and Water Conservation Armidale.

Keast A., Recher, H.F., Ford, H. and Saunders, D. (1985) Birds of Eucalypt Forests and Woodlands: Ecology, Conservation, Management. Surrey Beatty & Sons Pty Limited, Chipping Norton.

Muir S., Rose HI. and McCormick LH. (2009)Grasses of the Boarder Rivers Gwydir Catchments Field Guide. The State of NSW Industry and Investment.

Namoi Catchment Management Authority (2013) Regional Vegetation Communities in the Namoi Catchment. http://www.namoi.cma.nsw.gov.au/416845.html?2 accessed April 2014

The Cotton Catchments Communities CRC, (2009) Common Plants of Grazing Pastures on the Lower Namoi Floodplain.

The Royal Botanic Gardens and Domain Trust (2014). PlantNET - The Plant Information Network System of The Royal Botanic Gardens and Domain Trust, Sydney, Australia (version 2). http://plantnet.rbgsyd.nsw.gov.au accessed April/May 2014

Appendix 1 – Bullala National Park Flora Species List (Dr John T. Hunter: 2009)

Flora of Bullala National Park (Dr John T. Hunter)	
Appendix B: Taxon list with recognised authorities and common names.	
Scientific name	**Common name**
Fern & Fern Allies	
Adiantaceae	
Cheilanthes distans (R.Br.) Mett.	Hairy Rock Fern
Cheilanthes sieberi Kunze	
subsp. *sieberi*	Narrow Rock Fern
Marsileaceae	
Marsilea drummondii A.Braun	Common Nardoo
Gymnosperms	
Cupressaceae	
Callitris endlicheri (Parl.) F.M.Bailey	Black Cypress Pine
Callitris glaucophylla Joy Thomps. & L.A.S.Johnson	White Cypress Pine
Monocotyledon	
Amaryllidaceae	
Crinum flaccidum Herb.	Darling Lily
Anthericaceae	
Arthropodium minus R.Br.	Small Vanilla Lily
Laxmannia compacta Conran & P.I.Forst.	Wire Lily
Laxmannia gracilis R.Br.	Wire Lily
Tricoryne elatior R.Br.	Yellow Autumn-lily
Commelinaceae	
Commelina cyanea R.Br.	Scurvy Weed
Murdannia graminea (R.Br.) G.Bruckn.	Chocolate Lily
Cyperaceae	
Carex inversa R.Br.	Knob Sedge
Cyperus fulvus R.Br	Sticky Sedge
Cyperus gracilis R.Br.	Sedge
Cyperus victoriensis C.B.Clarke	Yelka
Eleocharis pusilla R.Br.	Small Spike Rush
Fimbristylis dichotoma (L.) Vahl	Common Fringe Rush
Gahnia aspera (R.Br.) Spreng.	Rough Saw Sedge
Lepidosperma laterale R.Br.	Variable Saw Sedge
Schoenus apogon Roem. & Schult.	Common Bog Rush
Schoenus ericetorum R.Br.	Bog Rush
Scleria mackaviensis Boeck.	White Head Sedge
Iridaceae	
Patersonia sericea R.Br.	Silky Purple Flag
Juncaceae	
Vegetation of Bullala	
Dr John T. Hunter (02) 6775 2452	
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Juncus continuus L.A.S.Johnson	Rush
Juncus dolichanthus L.A.S.Johnson	Rush
Juncus usitatus L.A.S.Johnson	Common Rush

Lomandraceae	
Lomandra filiformis	
subsp. *flavior* (Thunb.) Britten	Wattle Mat-rush
Lomandra filiformis (Thunb.) Britten subsp. *filiformis*	Wattle-leaved Mattrush
Lomandra leucocephala (R.Br.) Ewart subsp. *leucocephala*	Woolly Mat-rush
Lomandra longifolia Labill.	Spiny-headed Mat-rush
Lomandra multiflora (R.Br.) Britten subsp. *multiflora*	Many-flowered Mat-rush
Orchidaceae	
Caladenia carnea R.Br.	Pink Fairy
Phormiaceae	
Dianella caerulea Sims	Rough Flax Lily
Dianella longifolia R.Br.	Pale Flax Lily
Dianella revoluta R.Br. var. *revoluta*	Speading Flax Lily
Poaceae	
Ancistrachne uncinulata (R.Br.) S.T.Blake	Hooked-hairy Panic Grass
Aristida benthamii var. *benthamii* Henrard	Kerosene Grass
Aristida caput-medusae Domin	Many-headed Wiregrass
Aristida echinata Henrard	Purple Wiregrass
Aristida gracilipes Henrard	Kerosene Grass
Aristida jerichoensis subsp. *subspinulifera* Henrard	Jericho Wiregrass
Aristida jerichoensis (Domin) Henrard var. *jerichoensis*	Jericho Wiregrass
Aristida leptopoda Benth.	White Speargrass
Aristida personata Henrard	Purple Wiregrass
Aristida vagans Cav.	Threeawn Speargrass
Arundinella nepalensis Trin.	Reedgrass
Austrodanthonia bipartita (Link) H.P.Linder	Wallaby Grass
Austrodanthonia racemosa var. obtusata H.P.Linder	Wallaby Grass
Austrodanthonia racemosa (R.Br.) H.P.Linder var. *racemosa*	Wallaby Grass
Austrostipa aristiglumis (F.Muell.) S.W.L.Jacobs & J.Everett	Plains Grass
Austrostipa nitida (Summerh. & C.E.Hubb.) S.W.L.Jacobs & J.Everett	Speargrass
Austrostipa ramosissima (Trin.) S.W.L.Jacobs & J.Everett	Stout Bamboo Grass
Austrostipa scabra (Lindl.) S.W.L.Jacobs & J.Everett subsp. *scabra*	Rough Speargrass
Austrostipa setacea (R.Br.) S.W.L.Jacobs & J.Everett	Corkscrew Grass
Austrostipa verticillata (Nees ex Spreng.) S.W.L.Jacobs & J.Everett	Slender Bamboo Grass
Bothriochloa bladhii S.T.Blake subsp. *bladhii*	Forest Bluegrass
Bothriochloa decipiens (Hack.) C.E.Hubb.	Pitted Bluegrass
Bothriochloa macra (Steud.) S.T.Blake	Red Grass
Chloris truncata R.Br.	Windmill Grass
Chloris ventricosa R.Br.	Tall Chloris

Cleistochloa rigida (S.T.Blake) R.D.Webster	Cleisochloa
Cymbopogon refractus (R.Br.) A.Camus	Barbed Wire Grass
**Cynodon dactylon* (L.) Pers.	Couch - Bermuda Grass
Dichanthium sericeum S.T.Blake subsp. *sericeum*	Queensland Bluegrass
Dichelachne micrantha (Cav.) Domin	Short-haired Plumegrass
Digitaria breviglumis (Domin) Henrard	Finger Panic Grass
Digitaria brownii (Roem. & Schult.) Hughes	Cotton Panic Grass
Digitaria diffusa Vickery	Panic Grass
Digitaria divaricatissima (R.Br.) Hughes	Spreading Umbrella Grass
Digitaria ramularis (Trin.) Henrard	Finger Panic Grass
Echinopogon caespitosus C.E.Hubb. var. *caespitosus*	Tufted Hedgehog Grass
Enneapogon gracilis (R.Br.) P.Beauv.	Slender Nineawn
Enneapogon nigricans (R.Br.) P.Beauv.	Niggerheads
Enteropogon acicularis (Lindl.) Lazarides	Curly Windmill Grass
Entolasia stricta (R.Br.) Hughes	Wiry Panic
Eragrostis benthamii Mattei	Lovegrass
Eragrostis elongata (Willd.) J.Jacq.	Clustered Lovegrass
Eragrostis lacunaria F.Muell. ex Benth.	Purple Lovegrass
Eragrostis leptostachya Steud.	Paddock Lovegrass
Eragrostis parviflora (R.Br.) Trin.	Weeping Lovegrass
Eriochloa pseudoacrotricha (Stapf ex Thell.) J.M.Black	Early Spring Grass
Heteropogon contortus (L.) P.Beauv. ex Roem. & Schult.	Bunch Speargrass
**Hyparrhenia hirta* (L.) Stapf	Coolatai Grass
Imperata cylindrica var. *major* (Nees) C.E.Hubb	Blady Grass
Lachnagrostis filiformis (Forst.) Trinius	Blown Grass
Leptochloa ciliolata (Jedwabn.) S.T.Blake	Canegrass
Microlaena stipoides (Labill.) Druce var. *stipoides*	Weeping Meadow Grass
Panicum effusum R.Br.	Hairy Panic
Panicum queenslandicum Domin var. *queenslandicum*	Yadbila Grass
Paspalidium constrictum (Domin) C.E.Hubb	Knottybutt Grass
Paspalidium gracile (R.Br.) Hughes	Slender Panic
**Paspalum dilatatum* Poir.	Paspalum
Poa sieberiana Spreng.	Snow Grass
Sporobolus caroli Mez	Fairy Grass
Sporobolus creber De Nardi	Slender Rat's Tail Grass
Sporobolus elongatus R.Br.	Slender Rat's Tail Grass
Sporobolus mitchellii (Trin.) C.E.Hubb. ex S.T.Blake	Rats tail Couch
Thyridolepis mitchelliana (Nees) S.T.Blake	Mulga Mitchell Grass
Triodia mitchellii Benth.	Buck Spinifex
Tripogon loliiformis (F.Muell.) C.E.Hubb.	Five Minute Grass
Urochloa foliosa (R.Br.) R.D.Webster	Leafy Panic
**Vulpia bromoides* (L.) Gray	Squirrel Tail Fescue
Xanthorrhoeaceae	
Xanthorrhoea johnsonii A.T.Lee	Grasstree
Dicotyledon	

Acanthaceae	
Brunoniella australis (Cav.) Bremek.	Blue Trumpet
Rostellularia adscendens (R.Br.) R.M.Barker subsp. *adscendens*	Pink Justicia
Amaranthaceae	
**Gomphrena celosioides* Martius	Gomphrena Weed
Nyssanthes diffusa R.Br.	Barb-wire Weed
Apiaceae	
Actinotus helianthi Labill.	Flannel Flower
**Ciclospermum leptophyllum* (Pers.) Sprague	Slender Celery
Daucus glochidiatus (Labill.) Fisch. C.A.Mey. & Ave-Lall.	Native Carrot
Platysace ericoides (Sieber ex Spreng.) C.Norman	Platysace
Apocynaceae	
Alstonia constricta F.Muell.	Quinine Bush
Carissa ovata R.Br.	Currant bush
Parsonsia eucalyptophylla F.Muell.	Gargaloo
Parsonsia lanceolata R.Br.	Silkpod
Araliaceae	
Astrotricha longifolia Benth.	Star-hair
Asclepiadaceae	
**Gomphocarpus fruticosus* (L.) R.Br.	Narrow-leaved Cotton Bush
Marsdenia viridiflora R.Br.	Native Pear
Rhyncharrhena linearis (Decne.) K.L.Wilson	Rhyncharrhena
**Tweedia caerulea* D.Don	Tweedia
Asteraceae	
**Aster subulatus* Michaux	Wild Aster
**Bidens pilosa* L..	Cobbler's Pegs
**Bidens subalternans* DC.	Greater Beggar's Ticks
Brachyscome ciliaris	
var. *subintegrifolia* G.L.R.Davis	Variable Daisy
Brachyscome melanocarpa Sond. & F.Muell.	Black-seeded Daisy
Brachyscome multifida DC. var. *multifida*	Cut-leaved Daisy
Brachyscome nova-anglica G.L.R.Davis	New England Daisy
**Calendula arvensis* L.	Field Marigold
Calotis cuneifolia R.Br.	Purple Burr-daisy
Calotis dentex R.Br.	Burr-daisy
Calotis lappulacea Benth.	Yellow Burr-daisy
Calotis scabiosifolia var. *integrifolia*	Rough Burr-daisy
Cassinia laevis R.Br.	Cough Bush
Cassinia quinquefaria R.Br.	Rosemary Cassinia
**Chondrilla juncea* L.	Skeleton Weed
Chrysocephalum apiculatum (Labill.) Steetz	Common Everlasting
Chrysocephalum semipapposum (Labill.) Steetz	Yellow Buttons
**Cirsium vulgare* (Savi) Ten.	Spear Thistle
**Conyza bonariensis* (L.) Cronq.	Flaxleaf Fleabane
**Conyza sumatrensis* (Retz.) E.Walker	Tall Fleabane
Cotula australis (Sieber ex Spreng.) Hook.f.	Common Cotula
Cymbonotus lawsonianus Gaudich.	Bears Ears
Eclipta platyglossa F.Muell.	Twin-heads

Euchiton sphaericus (Willd.) Holub	Cudweed
Glossogyne tannensis (Spreng.) Garn.-Jones	Cobbler's Tack
**Hedypnois rhagadioloides* subsp. *cretica* L.	Cretan Weed
**Hypochaeris glabra* L.	Smooth Catsear
**Hypochaeris radicata* L	Catsear
Leiocarpa leptolepis (DC.) Paul G.Wilson	Plover-daisy
Olearia elliptica DC.	Daisy Bush
Olearia ramosissima (DC.) Benth.	Daisy Bush
Pycnosorus thompsonianus Everett & Doust	Billy Buttons
**Schkuhria pinnata* var. *abrotanoides* L.	Dwarf Marigold
Senecio prenanthoides A.Rich.	Fireweed
Senecio quadridentatus Labill.	Cotton Fireweed
**Silybum marianum* (L.) Gaertn.	Variegated Thistle
Solenogyne bellioides Cass.	Solenogyne
**Soliva stolonifera* (Brot.) Loudon	Carpet Burweed
**Sonchus oleraceus* L.	Common Sowthistle
**Taraxacum officinale* Weber	Dandelion
Vernonia cinerea (L.) Less. var. *cinerea*	Vernonia
Vittadinia cervicularis N.T.Burb. var. *cervicularis*	Fuzzweed
Vittadinia cuneata var. *hirsuta* DC.	Fuzzweed
Vittadinia cuneata DC. var. *cuneata*	Fuzzweed
Vittadinia dissecta var. *hirta* N.T.Burb.	New Holland Daisy
Vittadinia muelleri N.T.Burb	Fuzzweed
Vittadinia pustulata N.T.Burb.	Fuzzweed
Vittadinia sulcata N.T.Burb.	Fuzzweed
**Xanthium occidentale* Bertol.	Noogoora Burr
**Xanthium spinosum* L.	Bathurst Burr
Bignoniaceae	
Pandorea pandorana (Andrews) Steenis	Wonga Wonga Vine
Boraginaceae	
Cynoglossum suaveolens R.Br.	Cynoglossum
Ehretia membranifolia R.Br.	Peach Bush
Brassicaceae	
**Lepidium africanum* (Burman f.) DC.	Peppercress
**Lepidium bonariense* L.	Peppercress
**Rapistrum rugosum* (L.) All.	Turnip Weed
Cactaceae	
**Opuntia stricta* (Haw.) Haw. var. *stricta*	Common Prickly Pear
**Opuntia tomentosa* Salm-Dyck	Velvet Tree Pear
Campanulaceae	
Wahlenbergia communis Carolin	Tufted Bluebell
Wahlenbergia graniticola Carolin	Granite Bluebell
Wahlenbergia planiflora subsp. *longipila* Carolin	Bluebell
Wahlenbergia stricta (R.Br.) Sweet	Tall Bluebell
Capparaceae	
Capparis lasiantha R.Br. ex DC.	Nepine
Capparis mitchellii Lindl.	Wild Orange
Caryophyllaceae	
**Paronychia brasiliana* DC.	Brazilian Whitlow

**Petrorhagia nanteuilii* (Burnat) P.W.Ball & Heywood	Proliferous Pink
Casuarinaceae	
Allocasuarina inophloia (F.Muell. & F.M.Bailey) L.A.S.Johnson	Woolly Sheoak
Allocasuarina luehmannii (R.Baker) L.A.S.Johnson	Bulloak
Casuarina cristata Miq.	Belah
Celastraceae	
Maytenus cunninghamii (Hook.) Loes.	Yellow-berry Bush
Chenopodiaceae	
Atriplex spinibractea R.Anderson	Spiny-fruited Saltbush
Chenopodium pumilio R.Br.	Goosefoot
Einadia hastata (R.Br.) A.J.Scott	Berry Saltbush
Einadia nutans (R.Br.) A.J.Scott subsp. *nutans*	Climbing Saltbush
Enchylaena tomentosa R.Br.	Ruby Saltbush
Maireana microphylla (Moq.) Paul G. Wilson	Eastern Cottonbush
Rhagodia parabolic R.Br.	Saltbush
Sclerolaena birchii (F.Muell.) Domin	Galvanized Burr
Chloanthaceae	
Spartothamnella juncea (A.Cunn. ex Walp.) Briq.	Bead Bush
Convolvulaceae	
Convolvulus erubescens Sims	Bindweed
Dichondra repens Forst. & Forst.f.	Kidney Weed
Dichondra sp. A	Kidney Weed
Evolvulus alsinoides var. *decumbens*	Evolvulus
Crassulaceae	
Crassula colorata var. *acuminata*	Stonecrop
Crassula sieberiana (Schult. & Schult.f.) Druce	Australian Stonecrop
Dilleniaceae	
Hibbertia linearis R.Br. ex DC.	Guinea Flower
Hibbertia obtusifolia DC.	Grey Guinea Flower
Hibbertia riparia (R.Br. ex. DC.) Hoogl.	Common Guinea Flower
Droseraceae	
Drosera peltata Thunb.	Sundew
Drosera spatulata Labill.	Sundew
Epacridaceae	
Brachyloma daphnoides subsp. *glabrum* (Blakely) J.T.Hunter	Red-Flowered Daphne Heath
Brachyloma daphnoides subsp. *pubescens* J.T.Hunter	Hairy Daphne Heath
Leucopogon attenuatus A.Cunn.	Beard Heath
Leucopogon biflorus R.Br.	Twin-flowered Beard Heath
Leucopogon muticus R.Br.	Twisted Beard Heath
Melichrus urceolatus R.Br.	Urn Heath
Styphelia triflora Andrews	Fivecorners
Euphorbiaceae	
Beyeria viscosa (Labill.) Miq.	Sticky Spurge
Breynia cernua (Poir.) Muell.Arg.	Coffee Bush
Chamaesyce drummondii (Boiss.) D.C.Hassall	Caustic Weed
Chamaesyce sp. A	

Phyllanthus virgatus G.Forst.	Wiry Spurge
Ricinocarpos bowmanii F.Muell.	Wedding Bush
Fabaceae	
Acacia cheelii Blakely	Motherumbah
Acacia conferta A.Cunn. ex Benth.	Crowded-leaved Wattle
Acacia deanei (R.T.Baker) M.B.Welch Coombs & McGlynn subsp. *deanei*	Green Wattle
Acacia flexifolia A.Cunn. ex Benth.	Bent-leaved Wattle
Acacia gunnii Benth.	Ploughshare Wattle
Acacia harpophylla F.Muell. ex Benth.	Brigalow
Acacia homalophylla A.Cunn. ex Benth.	Yarran
Acacia ixiophylla Benth.	Wattle
Acacia jucunda Maiden & Blakely	Wattle
Acacia juncifolia Benth. subsp. *juncifolia*	Rush-leaved Wattle
Acacia leiocalyx (Domin) Pedley subsp. *leiocalyx*	Curracabah
Acacia oswaldii F.Muell.	Miljee
Acacia pendula A.Cunn. ex G.Don.	Weeping Myall
Acacia penninervis Sieber ex DC. var. *penninervis* Sieber ex DC.	Mountain Hickory
Acacia pilligaensis Maiden	Pilliga Wattle
Acacia polybotrya Benth.	Western Silver Wattle
Acacia salicina Lindl.	Cooba
Acacia sparsiflora Maiden	Wattle
Aotus subglauca var. *filiformis* Benth.	Aotus
Bossiaea rhombifolia subsp. *concolor*	Round-leaved Bossiaea
Daviesia nova-anglica Crisp	New England Bitter Pea
Daviesia ulicifolia subsp. *pilligensis*	Gorse Bitter Pea
Desmodium brachypodum A.Gray	Large Tick Trefoil
Desmodium varians (Labill.) Endl.	Slender Tick Trefoil
Glycine canescens F.J.Herm.	Silky Glycine
Glycine clandestina Wendl.	Twining Glycine
Glycine tabacina (Labill.) Benth.	Variable Glycine
Glycine tomentella Hayata	Woolly Glycine
Gompholobium aspalathoides A.Cunn. ex Benth.	Leafy Wedge Pea
Hovea lanceolata Sims	Grey Hovea
Hovea longipes Benth.	Hovea
Indigofera australis Willd.	Australian Indigo
Indigofera brevidens Benth.	Indigo
Jacksonia scoparia R.Br.	Dogwood
Lotus australis Andrews	Australian Trefoil
**Medicago minima* (L.) Bartal.	Woolly Burr Medic
**Medicago polymorpha* L.	Burr Medic
Mirbelia pungens A.Cunn. ex G.Don.	Mirbelia
Pultenaea cinerascens Maiden & Betche	Bush Pea
Pultenaea foliolosa A.Cunn. ex Benth.	Bush Pea
Pultenaea sp. G	Nandewar Bush Pea
Senna barclayana (Sw.) Randell	Smooth Senna
Senna sp. 'zygophylla'	Senna
Swainsona galegifolia (Andrews) R.Br.	Smooth Darling Pea
Swainsona queenslandica Joy Thomps.	Darling Pea

**Vachellia farnesiana* (L.) Wight & Arn. var. *farnesiana*	Mimosa Bush
Geraniaceae	
Geranium solanderi Carolin var. *solanderi*	Native Geranium
Goodeniaceae	
Goodenia bellidifolia Sm. subsp. *bellidifolia*	Goodenia
Goodenia cycloptera R.Br.	Serrated Goodenia
Goodenia fascicularis F.Muell. & Tate	Silky Goodenia
Goodenia glabra R.Br.	Pale Goodenia
Goodenia glauca F.Muell.	Pale Goodenia
Goodenia hederacea Sm. subsp. *hederacea*	Ivy Goodenia
Goodenia heterophylla Sm. subsp. *heterophylla*	Variable Goodenia
Velleia paradoxa R.Br.	Velleia
Haloragaceae	
Gonocarpus teucrioides DC.	Raspwort
Haloragis serra Brongn.	Raspwort
Lamiaceae	
Ajuga australis R.Br.	Australian Bugal
Mentha diemenica Spreng.	Pennyroyal Mint
Mentha satureioides R.Br.	Mintbush
Prostanthera cryptandroides subsp. *euphrasioides*	Mint-bush
**Salvia reflexa* Hornem	Mintweed
Lauraceae	
Cassytha pubescens R.Br.	Hairy Devil's Twine
Lobeliaceae	
Pratia concolor (R.Br.) Druce	Poison Pratia
Loranthaceae	
Amyema bifurcatum (Benth.) Tieghem var. *bifurcatum*	Rusty Mistletoe
Amyema miquelii (Lehm. ex Miq.) Tiegh.	Drooping Mistletoe
Amyema miraculosum subsp. *boormanii* Teigh	Fleshy Mistletoe
Amyema pendulum (Sieber ex Spreng.) Tiegh	Drooping Mistletoe
Amyema quandang Teigh	Grey Mistletoe
Dendrophthoe glabrescens (Blakely) Barlow	Golden Mistletoe
Malvaceae	
Abutilon leucopetalum (F.Muell.) F.Muell. ex Benth.	Lantern Bush
Abutilon oxycarpum (F.Muell.) F.Muell. ex Benth.	Straggly Lantern Bush
Hibiscus sturtii Hook. var. *sturtii*	Hill Hibiscus
**Malvastrum americanum* (L.) Torr	Spiked Malvastrum
Malvastrum coromandelianum (L.) Garcke	Prickly Malvastrum
Sida corrugata Lindl.	Corrugated Sida
Sida fibulifera Lindl.	Pin Sida
Sida filiformis A.Cunn.	Fine Sida
**Sida rhombifolia* L.	Sida
Sida trichopoda F.Muell.	High Sida
Meliaceae	
Owenia acidula F.Muell.	Gruie Apple
Myoporaceae	
Eremophila debilis (Andrews) Chinnock	Winter Apple

Eremophila deserti (A.Cunn. ex Benth.) Chinnock	Turkeybush
Eremophila longifolia (R.Br.) F.Muell.	Emu Bush
Eremophila mitchellii Benth.	Budda
Myoporum montanum R.Br.	Western Boobialla
Myrtaceae	
Angophora floribunda (Sm.) Sweet	Rough-barked Apple
Angophora leiocarpa (L.A.S.Johnson ex G.Leach) K.Thiele & Ladiges	Smooth-barked Apple
Calytrix tetragona Labill.	Fringe Myrtle
Corymbia dolichocarpa (D.J.Carr. & S.G.M.Carr.) K.D.Hill & L.A.S.Johnson	Long-fruited Bloodwood
Corymbia tessellaris (F.Muell.) K.D.Hill & L.A.S.Johnson	Carbeen
Corymbia trachyphloia subsp. *amphistomatica* D.J.Carr & S.G.M.Carr	White Bloodwood
Eucalyptus albens Benth.	White Box
Eucalyptus blakelyi Maiden	Blakely's Red Gum
Eucalyptus camaldulensis Dehnh.	River Red Gum
Eucalyptus chloroclada (Blakely) L.A.S.Johnson & K.D.Hill	Dirty Gum
Eucalyptus crebra F.Muell.	Narrow-leaved Ironbark
Eucalyptus dwyeri Maiden & Blakely	Dwyer's Red Gum
Eucalyptus fibrosa F.Muell.	Red Ironbark
Eucalyptus melanophloia F.Muell.	Silver-leaved Ironbark
Eucalyptus melliodora A.Cunn. ex Schauer	Yellow Box
Eucalyptus pilligaensis Maiden	Narrow-leaved Grey Box
Eucalyptus populnea subsp. *bimbil*	Poplar Box
Eucalyptus sideroxylon A.Cunn. ex Woolls	Mugga
Eucalyptus viridis R.Baker	Green Mallee
Harmogia densifolia (Sm.) Schauer	Babingtonia
Leptospermum polygalifolium subsp. *transmontanum* Thomps.	Creek Tea-tree
Melaleuca bracteata F.Muell.	Black Tea-tree
Melaleuca thymifolia Sm.	Melaleuca
Melaleuca uncinata R.Br.	Broombush
Micromyrtus sessilis J.W.Green	Heath Myrtle
Nyctaginaceae	
Boerhavia dominii Meikle & Hewson	Tarvine
Oleaceae	
Jasminum lineare R.Br.	Desert Jasmine
Jasminum suavissimum Lindl.	Small-leaved Jasmine
Notelaea microcarpa R.Br. var. *microcarpa*	Native Olive
Oxalidaceae	
Oxalis chnoodes Lourteig	Wood Sorrel
Oxalis exilis A.Cunn.	Wood Sorrel
Oxalis perennans Haw.	Wood Sorrel
Papaveraceae	
**Argemone ochroleuca* Sweet subsp. *ochroleuca*	Mexican Poppy
Pittosporaceae	
Pittosporum angustifolium Lodd.	Weeping Pittosporum
Plantaginaceae	

Plantago debilis R.Br.	Small Plantain
**Plantago lanceolata* L.	Lamb's Tongues
Plantago turrifera B.G.Briggs	Carolin & Pulley
Polygonaceae	
**Fallopia convolvulus* (L.) A.Love	Black Bindweed
Rumex brownii Campd.	Swamp Dock
Portulacaceae	
Calandrinia eremaea Ewart	Small Purslane
Portulaca filifolia F.Muell.	Purslane
Portulaca oleracea L.	Pigweed
Primulaceae	
**Anagallis arvensis* L.	Blue Pimpernel
Proteaceae	
Conospermum taxifolium C.F.Gaertn.	Coneseeds
Hakea laevipes	
subsp. *graniticola*	Granite Hakea
Isopogon petiolaris R.Br.	Drumsticks
Persoonia sericea R.Br.	Silky Geebung
Persoonia terminalis L.A.S.Johnson & P.H.Weston subsp. *terminalis*	Geebung
Petrophile canescens A.Cunn. ex R.Br.	Prickly Conesticks
Ranunculaceae	
Clematis microphylla R.Br. var. *microphylla*	Small-leaved Clematis
Ranunculus sessiliflorus R.Br. ex DC. var. *sessiliflorus*	Small-flowered Buttercup
Rhamnaceae	
Alphitonia excelsa (Fenzl) Reisseck ex Benth.	Red Ash
Rubiaceae	
Asperula conferta Hook.f.	Common Woodruff
Galium gaudichaudii DC.	Rough Bedstraw
Galium migrans Ehrend. & McGillivray	Bedstraw
Opercularia diphylla Gaertn.	Stinkweed
Pomax umbellata (Gaertn.) Sol. ex A.Rich.	Rich.Pomax
Psydrax odoratum (Forst.f.) S.T.Reynolds & R.J.F.Hend.	Iamboto
Psydrax oleifolium (Hook.) S.T.Reynolds & R.J.F.Hend.	Wild Lemon
Rutaceae	
Boronia glabra (Maiden & Betche) Cheel	Boronia
Geijera parviflora Lindl.	Wilga
Santalaceae	
Choretrum pauciflorum DC	Dwarf Sour Bush
Santalum lanceolatum R.Br.	Northern Sandalwood
Sapindaceae	
Alectryon oleifolius subsp. *elongatus*	Western Rosewood
Atalaya hemiglauca (F.Muell.) F.Muell. ex Benth.	Whitewood
Dodonaea peduncularis Lindl.	Stalked Hopbush
Dodonaea sinuolata J.G.West subsp. *sinuolata*	Hop Bush
Dodonaea triangularis Lindl.	Hop Bush
Dodonaea viscose subsp. *angustifolia* J.G.West	Hop Bush
Dodonaea viscose subsp. *cuneata* J.G.West	Wedge-leaf Hopbush

Dodonaea viscose subsp. *spatulata* J.G.West	Hop Bush
Scrophulariaceae	
Gratiola pedunculata R.Br.	Brooklime
Limosella curdieana F.Muell.	Large Mudwort
Veronica calycina R.Br.	Hairy Speedwell
Solanaceae	
**Lycium ferocissimum* Miers	*African Boxthorn*
Solanum brownii Dunal	Violet Nightshade
Solanum esuriale Lindl.	Quena
Solanum ferocissimum Lindl.	Spiny Potato Bush
Solanum parvifolium R.Br.	Nightshade
Solanum prinophyllum Dunal	Forest Nightshade
Solanum semiarmatum F.Muell.	Nightshade
Stackhousiaceae	
Stackhousia monogyna Labill.	Creamy Candles
Stackhousia muricata Lindl.	Stackhousia
Sterculiaceae	
Brachychiton populneus (Schott & Endl.) R.Br. subsp. *populneus*	Kurrajong
Stylidiaceae	
Stylidium graminifolium Sm. ex Willd.	Grass Triggerplant
Thymelaeaceae	
Pimelea curviflora R.Br.	Curved Rice Flower
Pimelea linifolia subsp. *collina* Sm.	Rice Flower
Pimelea linifolia Sm. subsp. *linifolia*	Rice Flower
Pimelea linifolia Sm.	Rice Flower
Pimelea neo-anglica Threlfall	New England Rice Flower
Pimelea pauciflora R.Br.	Rice Flower
Pimelea strigosa Gand.	Rice Flower
Urticaceae	
Parietaria debilis Forst.f.	Native Pellitory
Urtica incisa Poir.	Stinging Nettle
Verbenaceae	
**Verbena aristigera* S.Moore	Purpletop
**Verbena bonariensis* L.	Purpletop
**Verbena gaudichaudii* (Briquet) P.W.Michael	Purpletop
Violaceae	
Hybanthus monopetalus (Schult.) Domin	Slender Violet-bush
Hymenanthera dentata R.Br. ex DC	Tree Violet