TWEED SHIRE COUNCIL

Eviron Road Quarry & Landfill Restoration Plan

Version 4

August 2023

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1 Introduction

Tweed Shire Council (TSC) has concept plan approval (#08_0067) under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to establish two new quarries, three landfills and a haul road in Eviron, in the far North Coast of NSW (Eviron Rd Q&L). Refer to Figure 1.

Project approval has also been attained for Stage 1 of the project, which involves landfill within the existing Quirks Quarry and development of the new West Valley Quarry and associated infrastructure (including haul rd) (#08_0068).

One of the Biodiversity offset conditions listed under Schedule 4 – Specific environmental conditions for West Valley Quarry, requires implementation of the Biodiversity Offset Strategy, which includes bushland restoration and management works within designated conservation areas on the site.

This Restoration Plan addresses the ecological restoration works required in Conservation Area 2 and 3. These areas were strategically selected to establish and/or enhance wildlife corridors across the site. Refer to Figure 2.

The subject Restoration Plan is intended to guide ecological restoration on-ground works. The proposed restoration program includes: seed collection, propagation, site preparation, out-planting and a five-year maintenance and monitoring program. Beyond the five year maintenance/monitoring period, management of these restoration areas will be incorporated into general site management in accordance with a site-wide Environmental Management Plan (EMP).

2 Project location

2.1 Site location

The Eviron Road Q&L site is located at Eviron, within the Tweed Local Government Area, and comprises Lot 1 DP1159352, Lot 602 DP1001049 and Lot 1 DP34555 (as depicted in Figure 1).

The site occurs on the northern and easterly slopes of the Condong Range and the adjoining floodplain. The site is bound by Eviron Road in the south, the Pacific Highway to the east and sugar cane fields to the north and west. Stott's Creek Resource Recovery Centre adjoins the site to the northwest and Quirk's Quarry occurs in the eastern portion of the site.

Figure 1: Eviron Quarry and Landfill site plan

Eviron Road Quarry and Landfill Restoration Plan

Legend

Site Boundary

Parcel Boundary

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Figure 2: Eviron Quarry and Landfill

Figure 3: Eviron Quarry and Landfill Conservation Areas Plan

Eviron Road Quarry and Landfill Restoration Plan

Legend

- Conservation Area 1
- Conservation Area 2 - Northern Riparian Corridor
- Conservation Area 3 - Southern Ridgeline Corridor
- Conservation Area 5
- Conservation Area 6
- North Valley development footprint
- West Valley development footprint
- Quirks quarry / landfill fooprint
- Parcel Boundary
- Site Boundary

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Figure 4: Eviron Quarry and Landfill

2.2 Nominated restoration work areas

In accordance with the approved Biodiversity Offset Strategy, the ecological restoration works are to focus on corridor planting and enhancement to provide wildlife corridors and facilitate wildlife movements across the site. Two suitable corridor alignments have been approved: Northern Riparian Corridor and Southern Ridgeline Corridor (refer to Figures 3-4).

2.2.1 Northern Riparian Corridor

The Northern Riparian Corridor is aligned along a heavily modified and degraded drainage line which flows in a north-westerly direction across the northern portion of the site. This drainage line discharges into Ledday's Creek approximately 1 km to the north-west of the site; Ledday's Creek discharges into the Tweed River at Stott's Island. The intent of the Northern Riparian Corridor is to reconstruct habitat and provide a lowland route across the site for native wildlife. This corridor will connect lowland areas to the Condong Range ridgeline and connect the patch of retained sclerophyll forest/camphor laurel forest east and south of Quirk's Quarry with the patch of retained sclerophyll forest in the central west of the site.

A small narrow strip of Broad-leaved Paperbark – Camphor Laurel Open Forest was recorded along this drainage line (GHD, 2010). This community was determined to be analogous with Endangered Ecological Community (EEC): Swamp Sclerophyll Forest on Coastal Floodplains (SSFF) (GHD, 2010). The remainder of the drain is cleared and dominated by exotic groundcovers.

It is proposed that this corridor be planted out with swamp sclerophyll forest species, including koala feed tree species (eg. Swamp Mahogany – *Eucalyptus robusta* and Forest Red Gum – *E. tereticornis*). The goal is to achieve a corridor width of 20m. The length of the drainage line is approximately 956m, amounting to a total restoration area of approximately 1.9 ha.

An existing access road occurs parallel to the drainage line. This road has been built up with fill which is not a suitable growing medium for bush restoration. Rather than remove the road fill, it is proposed that the vegetated corridor be established around the existing access track. The access track will provide good access for planting, maintenance and monitoring during the establishment phase of works. Given the close proximity of the track to the drainage line, the restoration area will be wider on one side of the bank than the other (generally wider on the southern and western side of the bank) in order to achieve the 20 m wide corridor.

An existing revegetation screen occurs on the north-eastern side of the access road. These plantings were previously established for the purpose of a visual screen and are currently 4-6m in height. These plantings will continue to serve the function of screening the site, both visually and from weed seed; however, will remain separate from the SSFF plantings by the access road. The species selection used for the existing visual screen is characteristic of riparian rainforest rather than SSFF.

An aerial photograph of the Northern Riparian Corridor and the nominated revegetation and assisted regeneration areas are depicted in Figure 3.

2.2.2 Southern Ridgeline Corridor

The Southern Ridgeline Corridor occurs along the ridge of the Condong Range in the southern portion of the site. It provides for upland east-west movement of native fauna and connects the patch of retained sclerophyll forest/camphor laurel forest east and south of Quirk's Quarry with the retained sclerophyll forest in the western portion of the site. The western portion of this corridor is vegetated with Blackbutt Wet Sclerophyll Open Forest and the eastern portion is vegetated with camphor laurel forest and, further east, sclerophyll forest. The central portion of this corridor, in the vicinity of the existing haul road and the residence of Lot 1 DP 34555, is largely cleared of native vegetation and represents a break in the linkage across the site.

It is proposed that this area be planted to reconstruct wet sclerophyll habitat and in turn improve the connectivity of this east-west corridor. The revegetation area will be down slope of the existing residence of Lot 1 DP 34555, generally between the 40 and 70m contour for a length of approximately 220m. The nominated width of the Southern Ridgeline Corridor revegetation area is approximately 20m amounting to a restoration area of approximately 0.44ha.

An existing 11kV powerline easement traverses the site approximately parallel to the southern boundary from the Eviron Road reserve at the existing haul road entrance in a west-north-westerly direction across the site. The revegetation works need to accommodate the existing powerlines and provide an adequate gap in plantings so as to no interfere with the safe operation of the powerlines. Specifically, a 20m cleared easement is required around the existing overhead powerline to maintain the safe functioning of the power supply.

An aerial photograph of the Southern Ridgeline Corridor is provided in Figure 4.

Refer to section 5 for more information on proposed on-ground works.

Figure 3: Conservation Area 2 - Northern Riparian Corridor

Eviron Road Quarry and
Landfill Restoration Plan

Legend

- Conservation Area 2 - Northern Riparian Corridor
- Conservation Area 5
- Conservation Area 6
- West Valley development footprint
- Quirks quarry / landfill fooprint
- Parcel Boundary
- Site Boundary

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Figure 3: Conservation Area 2 - Northern

Figure 4: Conservation Area 3 - Southern Ridgeline Corridor

Eviron Road Quarry and
Landfill Restoration Plan

Legend

- Conservation Area 3 - Southern Ridgeline Corridor
- Conservation Area 6
- Site Boundary
- Parcel Boundary

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Figure 4: Conservation Area 3 - Southern

3 Restoration objectives

The restoration objectives are as follows:

- To contribute to 'maintaining or improving biodiversity values' at the site and its locality.
- To reconstruct bushland habitat that connects areas of retained bushland on the site (and adjoining the site) to facilitate wildlife movement (and genetic transfer) throughout the site and wider locality.
- To provide a fauna refuge across the site to minimise the risk of fauna injuries and mortalities from quarry and landfill operations and natural disturbance events (e.g. fire or storms).
- To reconstruct native vegetation communities consistent with that likely to have occurred prior to clearing, or where the existing environment is highly modified, reconstruct a suitable alternative native vegetation community.
- Along the Northern Riparian Corridor, the objective is to reconstruct a swamp sclerophyll forest that is commensurate with SSFF EEC.
- Along the Southern Ridgeline Corridor, the objective is to reconstruct Blackbutt wet sclerophyll forest.
- To revegetate with species that provides significant habitat values as much as possible (e.g. Koala and Glossy Black-cockatoo feed trees).
- To restore and improve the ecological integrity of degraded areas of existing vegetation along the corridors through assisted regeneration.
- It is not expected that mature swamp sclerophyll forest or Blackbutt wet sclerophyll forest communities will be achieved within the period of the five year establishment phase. However, at the completion of the five year period, it is expected that the revegetation areas will represent healthy self-sustaining regrowth communities with a floristic and structural diversity comparable to benchmark swamp sclerophyll/Blackbutt wet sclerophyll forest communities. The assisted regeneration areas are expected to have a significant cover of native vegetation.
- At the end of the five-year program it is expected that the presence of exotic species be significantly reduced.

Refer to Section 5.6 and Appendix C for detailed Key Performance Indicators (KPIs).

4 Biological and ecological considerations of target vegetation communities

4.1 Swamp sclerophyll forest EEC

The suitability of the proposed Northern Riparian Corridor restoration area, in terms of landform, elevation, inundation and soil type, for establishing SSFF is discussed below.

4.1.1 Landform, elevation and inundation

Swamp sclerophyll forest generally occurs on alluvial flats and drainage lines associated with coastal floodplains on soils that are either waterlogged or subject to periodic flooding or inundation (DECC, 2007; Scientific Committee, 2004). This community is generally found below 20 m elevation (DECC, 2007).

Floodplains are level landform patterns on which there may be active erosion and deposition of sediment by flooding, where the average interval is 100 years or less (DECC, 2007). The Northern Riparian Corridor restoration area is flat (<8 degrees) and subject to flooding, being situated within the probable maximum flood inundation area. As no filling is proposed within this area, the site will continue to be subject to flooding.

The landform, elevation and periodic flooding at the Northern Riparian Corridor restoration area are suitable for the re-establishment of SSFF.

4.1.2 Soil type

Swamp sclerophyll forest is associated with humic clay loams and sandy loams (Scientific Committee, 2004). Soil investigations undertaken by Gilbert+Sutherland (2007) included three boreholes along the drainage line associated with the Northern Riparian Corridor restoration area and an additional two boreholes in close proximity (on the north-eastern side of the drainage line). The boreholes revealed the soil profile in the area consists of medium clay to a depth of 40 cm overlying heavy clay along the drainage line and clayey sand to loam (10 and 20 cm, respectively) overlying heavy clay on the north-eastern side of the drainage line. The borehole soil profile results are consistent with the 1:100,000 soil landscape mapping of the area which maps the entire site as occurring within the Tweed (tw) alluvial landscape (Morand, 1996). The Tweed soil landscape consists of deep Quaternary alluvium and estuarine sediments; the soils are described as deep (>200 cm), poorly drained Brown Alluvial Clays on levees and Humic Gleys on backplains (Morand, 1996).

The soils within the Northern Riparian Corridor restoration area are potentially a little heavier (higher in clay content) than what is typical host to SSFF; however, the clayey sand and loam detected on the north-east side of the drainage line are more suitable soil types and restoration area is likely to harbour soils with varying clay:sand ratios. Given the occurrence of a small patch of regrowth SSFF already exists within this area, it is considered suitable for this community type. It is expected that the heavier soils would allow for the incorporation of some rainforest species within the community composition.

Given the known occurrence of Acid Sulfate Soils (ASS) in this area and a history of ‘drain clearing’ involving removal of accumulated sediment within the drain and subsequent liming to treat ASS, there is a risk that some areas along the drain may have unfavourable pH levels and potentially high concentrations of Aluminium and other heavy metals, if oxidation of ASS has occurred. To address this risk, soil testing is recommended prior to out-planting. Refer to Section 5.2.2 for more details.

4.2 Blackbutt wet sclerophyll forest

The suitability of the proposed Southern Ridgeline Corridor restoration area, in terms of landform, elevation, inundation and soil type, for establishing Blackbutt wet sclerophyll forest is discussed below.

Blackbutt wet sclerophyll forest was recorded along the ridgeline that occurs around the western and southern boundaries of the site, with another patch occurring on a spur east of Quirks Quarry. This community was found to be analogous with TVMS community 201: Blackbutt Open Forest Complex and Biometric vegetation type 24: Blackbutt - Tallowwood tall moist forest of the far north east of the North Coast.

4.2.1 Landform, elevation and inundation

The landscape position for Biometric vegetation type 24: Blackbutt - Tallowwood tall moist forest of the far north east of the North Coast is described as the eastern Mount Warning Shield. The TVMS community Blackbutt Open Forest Complex is described as occurring on ridges and hillslopes, with floristic composition varying with soil fertility and aspect (Kingston *et al*, 2004). The existing occurrence of this community on site is along the ridgeline and hillslopes associated with Condong Range, with elevation varying between approximately 10 – 60 AHD. This community occurs on elevated coastal hills and ridges where the soils are moderately well draining.

4.2.2 Soil type

This community is associated with the Burringbar (bu) soil landscape (Morand, 1996). Soil investigations undertaken by Gilbert+Sutherland (2007) included nine boreholes along the ridgeline. The results from the boreholes found the soil profile to comprise silty/sandy/gravelly clay, loam and clayey gravelly sand (to a depth of 90cm) overlying siltstone, silty sand, sandy gravel, silty medium clay and gravelly sandy light clay (Gilbert+Sutherland, 2007). The borehole investigations are generally consistent with Morand (1996) description which describes a typical profile of a shallow layer of crumbly clay loam overlying silty clay loam overlying quartite phyllite on the ridge top; a shallow layer of crumbly clay loam overlying silty clay loam overlying red plastic clay overlying siltstone/mudstone/shale on the upper slopes; and a shallow layer of crumbly clay loam overlying stony silty clay/yellow mottled clay and red crumbly clay overlying quartzite/phyllite on the lower slopes.

Blackbutt forest is known to occur on all of these variations of the Burringbar soil landscape. Accordingly, the soil within the southern ridgeline restoration area is considered suitable for this community.

5 Scope of works

The scope of revegetation works is detailed in the following sections.

5.1 Seed collection and propagation

Seed is to be collected from the Eviron Quarry and Landfill site in the first instance, where seed is to be collected for as many of the species on the revegetation species list (Appendix A) as can be located. Several seed collection events may be required throughout the year to suit the fruiting seasons of particular groups of species. For those species where no seed, or not enough seed, is available from the site within the collection year, tubestock may be sourced from local nurseries prior to planting out.

In accordance with the florabank Model Code of Practice, it is recommended that no more than 20% of fruit is removed from any one plant (in any one season).

Records will be kept for each sample of propagation material and maintained from the time of collection, to the raising of seed/cuttings, planting out of tubestock and maintenance and monitoring period. The following information will be collected for each sample:

- Sample id code (unique code to be created for each sample – eg. 'EP_1', which represents *Eucalyptus pilularis*, plant 1);
- Source plant location (GPS coordinates and description);
- Date of collection;
- Type of material collected (eg. seed, cutting);
- Amount of material collected;
- Seed treatment technique;
- Date of sowing;
- Date of germination;
- Date of out-planting;
- Location of out-planting (description).

Collected seed is to be stored in accordance with the florabank *Guidelines for Native Seed Storage for Revegetation*.

Collected seed is to be delivered to TSC Nursery or contracted private nursery for propagation. Sample id codes are to be kept with the sample at all times on a label that is not going to deteriorate with water and sun exposure.

5.1.1 Seed provenance

Local seed is typically endorsed as the preferred source of stock for revegetation plantings, primarily because local seed is considered best adapted to local conditions and it is in the interest of conserving local variation in genetic material. However, it is noted that problems can arise from limiting revegetation stock to that which is locally sourced. Namely, by encouraging the establishment of populations that do not harbour sufficient evolutionary potential for future environmental change (Moritz, 1999). Or through the selection of inbred or genetically inferior stock (Lowe, 2009), particularly in highly degraded landscapes which are likely to have inherently high levels of inbreeding due to fragmentation and genetic isolation of populations. To simulate gene flow in highly fragmented landscapes, revegetation programs may employ 'composite provenancing' which involves sourcing a mixture of seed stock from varying distances from the nominated revegetation site (Lowe, 2009). This method utilises predominantly local seed but also incorporates proximate and eco-geographically matched sources, with a small proportion (~10-30%) being sourced from much further afield (Lowe, 2009) (refer to Figure 5). Composite provenancing theory is based on providing a variety of genes to an area to allow for the redistribution of preadapted genes and the evolution of new adaptive gene combinations. This creates an environment where natural selection can take place.

The level of genetic diversity in the local seed stock is expected to be highly variable depending on the individual species, the abundance of that species in the locality and the connectivity between patches of similar vegetation types within the locality. Blackbutt forest is well represented and relatively well connected in the locality, so the genetic diversity of Blackbutt is expected to be considerably diverse. However, there is very little Swamp Mahogany dominated communities in the locality and as a result, obtaining local provenance Swamp Mahogany stock with high genetic diversity is likely to be more difficult. Accordingly, sourcing the stock for this species will require an element of composite provenancing, where a variety of sources, likely from further afield, will be utilised.

For species that are poorly represented in the locality, the seed stock will be sourced from local and intermediate (e.g. nursery sourced stock) distances from the revegetation site. For species well represented in the locality, all seed will be of local provenance.

5.2 Site preparation

5.2.1 Control of grazing

A cow was seen grazing throughout the Northern Riparian Corridor. Further, patches of flattened groundcovers characteristic of a resting place of a cow were observed within this area. The presence of cattle has the potential to significantly reduce restoration success through trampling and grazing of planted tubestock and natural regeneration. Access by cattle to the restoration area will need to be controlled, either through destocking or fencing. Temporary fencing, such as electric tape, could be employed around revegetation clusters; however, would require maintenance to remain effective.

There was no evidence of cattle grazing within the Southern Ridgeline Corridor; however, macropod scats were observed. The potential for macropod grazing on planted tubestock and natural regeneration exists. However, fencing is not considered necessary, at least initially. If herbivore grazing becomes a significant problem in this area, tree guards may be required.

5.2.2 Soil testing and amelioration

Given the investment in revegetation works proposed and the known history of excavating ASS in the vicinity of the Northern Riparian Corridor, it is considered prudent to undertake some soil fertility testing within the proposed Northern Riparian Corridor revegetation area.

Considering the homogenous soil landscape within which the Northern Riparian Corridor revegetation area occurs (Tweed (tw) alluvial landscape), it is recommended that composite samples are collected for testing. However, given the length of the area being tested it is recommended that the revegetation area is broken up into 300m long sections to provide three separate sample areas: NRC1, NRC2 & NRC3. Both surface and subsoil testing is recommended.

Surface soil sampling

Within each sample area, it is recommended that boreholes are excavated every 10-15 m along the revegetation area, to a depth of 150mm below ground level. In the event that the boreholes encounter more than one soil stratum within the 150mm depth profile, the surface layer only is to be sampled with the depth range of the surface layer recorded. Samples from the surface stratum of each borehole are to then be mixed to create the composite surface soil sample. In summary, it is estimated there will three composite surface samples: NRC1 – surface; NRC2 – surface, NRC3 – surface.

Subsoil sampling

Within each sample area, subsoil samples are to be collected approximately every 50m and combined to form a composite sub-soil sample. These boreholes are to be excavated to a depth of 300mm with samples collected from the 150-300mm depth range. Samples from the subsoil stratum of each borehole are to then be mixed to create the composite subsoil sample. In summary, it is estimated there will three composite subsoil samples: NRC1 – sub; NRC2 – sub, NRC3 – sub.

General sampling requirements

- Each composite sample must total a minimum of 200g (e.g. half a plastic lunch bag).
- Each sampling bag is to be labelled clearly with site description/sampling area/soil stratum and date of sampling (e.g. Eviron Q&L – NRC1 – surface – 28/06/16).
- Package samples in a postpak, suitable envelope or small box.
- Complete Chain of Custody (COC) form and enclose in a sealed plastic sleeve along with any other instructions and include in sample postpak.
- Send or deliver to soil testing laboratory.

Laboratory testing

It is recommended that a routine soil test (Australian Reams/Albrecht) be applied to each of the samples. Laboratory results are to be accompanied by an analysis with recommendations for soil treatments, if required.

Amelioration

Based on the recommendations provided in the soil analysis report, soil amelioration such as liming, fertilizing and/or application of compost to be undertake as required.

5.2.3 Primary weed control

Refer to Section 5.4 for proposed primary weed control works.

5.3 Revegetation

5.3.1 Nominated revegetation areas

The areas to be revegetated include:

- Northern Riparian Corridor: a 20m wide strip along the existing drainage line (approximately 956m long). This amounts to a total restoration area of approximately 1.9ha. Of this, approximately 0.3ha is occupied by regrowth native vegetation which would be subject to assisted regeneration works. The remaining 1.6ha would be subject to reconstruction through revegetation works.
- Southern Ridgeline Corridor: focussed on gap in existing ridgeline vegetation centred around the existing residence on Lot 1 on DP34555. A 220m x 20m strip (an estimated 0.44ha will be revegetated) (refer to Figure 4).

5.3.2 Revegetation species selection

The Northern Riparian Corridor is to be revegetated with species characteristic of SSFF. The Southern Ridgeline Corridor is to be revegetated with species characteristic of Blackbutt wet sclerophyll forest. A species list for revegetation works is provided in Appendix A, it has been developed with consideration for the list of flora species recorded at site, characteristic species for each community, site conditions and suitable pioneer species. No threatened species are to be included in the plantings.

The species list included in Appendix A provides an indication of species abundance previously recorded at the site. This, along with the Key Performance Indicators (KPIs) relating to floristic and structural diversity (Appendix B), will be used to guide the planting composition. It is noted that the revegetation species composition will differ from a mature community composition in that there will be a higher proportion of pioneer species during the establishment phase of the community.

In the Northern Riparian Corridor, Swamp Oak (*Casuarina glauca*) saplings are prevalent, particularly near the existing patch of SSFF. This species is successfully regenerating itself in this area and in the absence of establishing other SSFF species, there is risk that Swamp Oak forest will dominate the area. Accordingly, plantings of Swamp Oak are not proposed, however, their establishment as part of the SSFF will be supported through assisted regeneration.

5.3.3 Revegetation planting density and tubestock quantity

Within the Northern Riparian Corridor, the revegetation area will be planted out with tubestock at a density of 1 plant per 1.5m^2 with a ratio of 3 trees/shrubs to 1 groundcover.

The Southern Ridgeline Corridor will be planted out with tubestock at a density of 1 plant per 1.5m^2 with a ratio 4 trees/shrubs to 1 groundcover.

The tubestock quantities required, based on the above density and ratio, are presented in Table 5.1.

Table 5.1: Tubestock quantities required for revegetation.

	Ground covers	Trees / shrubs	Total
Northern Riparian Corridor			
Revegetation area (1.6ha with 1 plant per 1.5m^2)	8 060	2 687	10 747
Southern Ridgeline Corridor	734	2 200	2 934
Total	8 794	4 887	13 681

At least an 80% survival rate of planted stock is expected throughout the duration of the five-year establishment phase. Any plant losses experienced above this will be replaced through supplementary planting events.

Refer to Section 5.6 for maintenance and monitoring requirements.

5.3.4 Mulching

At the out-planting stage, where resources allow revegetation areas are to be mulched to a depth of 75 - 100 mm. Mulch is beneficial for weed suppression, water retention and reducing soil erosion. It is recommended that either wood chip or cane mulch is used. Soybean mulch is not recommended as it generally contains viable soy seed which is likely to be introduced to the area.

Any approved tree clearing on site is a valuable source of mulch. Where possible, cleared vegetation is to be chipped and distributed throughout the nominated revegetation areas in consultation with a TSC Environmental Scientist and the revegetation contractor.

Care is to be taken in sourcing mulch to guard against introducing weed propagules to the area. Where possible mulch from native vegetation cleared on site will be used to maximise potential germination of local seed within the restoration areas. Use of Camphor Laurel mulch is acceptable as long as no foliage is mulched with the timber, as this is likely to contain camphor seed. Mulch is to be placed clear of the tubestock stems to minimise the risk of stem rot.

5.4 Weed control

5.4.1 Weed control target areas

Weed control is to take place throughout the restoration areas, in both the revegetation and assisted regeneration areas.

5.4.2 Primary and follow-up control events

A primary weed control event is required as part of site preparations for revegetation works. This is to remove any existing weeds to allow for out-planting and mulching.

Follow-up weed control works are to be undertaken as required to achieve the Key Performance Indicators (refer to Appendix C). However, six follow-up weed control events per year would be considered the minimum requirement. Follow-up weed control would be undertaken as revegetation maintenance works (Section 5.6) and assisted regeneration works (Section 5.5).

5.4.3 Priority weed species

Weed species recorded within the restoration areas are listed in Appendix B, Table B.1.

The priority weed species to be targeted in control works are:

- Weeds of National Significance (WoNS)
- noxious weeds listed under the *Noxious Weeds Act 1993*
- weeds associated with a Key Threatening Process listed under the TSC Act
- environmental weeds which have been identified by NSW *North Coast Weed Advisory Committee* (NCWAC) as one of 187 species considered to have the greatest potential impact on native vegetation.

Refer to Appendix B, Table B.1 for designations of weeds recorded on site. A brief discussion on each of these categories is provided below.

<u>WoNS</u>

The Australian Weeds Committee (2009) has identified 32 WoNS. WoNS are species that have degraded large portions of Australia's natural and productive landscape and require action at a national level to reduce their impacts (AWC, 2009). There is a national strategy for each WoNS specifying actions to better manage the weed (AWC, 2009). Two WoNS were recorded on site: Lantana (*Lantana camara*) and Fireweed (*Senecio madagascariensis*).

<u>Noxious weeds</u>

Within the site, three noxious weeds were recorded:

- Groundsel Bush (*Baccharis halimifoila*) - Class 3
- Camphor Laurel (*Cinnamomum camphora*) - Class 4
- Lantana - Class 4.

Class 3 noxious weeds are plants that pose a potentially serious threat to primary production or the environment of a region to which the order applies, are not widely distributed in the area and are likely to spread in the area or to another area. The legal requirement for class 3 weeds is: 'the plant must be fully and continuously suppressed and destroyed'. Groundsel Bush is a class 3 weed known to occur on site within the Northern Riparian Corridor.

Class 4 noxious weeds are plants that pose a threat to primary production, the environment or human health, are widely distributed in the area to which the order applies and are likely to spread in the area or to another area. The control objective for weed control class 4 is to minimise the negative impact of those plants on the economy, community or environment of NSW. The legal requirement for class 4 weeds is: 'the growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority'. Class 4 weeds recorded on site include Camphor Laurel and Lantana. Management of the sites class 4 noxious weeds is to be in accordance with the NSW North Coast Weed Advisory Committee (NCWAC) Regional Management Plans for these species.

Weeds associated with a TSC Act Key Threatening Process listed under TSC Act

Key Threatening Processes (KTPs) listed under Schedule 3 of the TSC Act of relevance to the weeds species recorded on the site and the rehabilitation works on site include:

- Invasion and establishment of exotic vines and scramblers (ie. *Ipomoea cairica*).
- Invasion, establishment and spread of *Lantana camara*
- Invasion of native plant communities by exotic perennial grasses (ie. *Paspalum urvillei* and *Setaria sphacelata*).

Environmental weeds

The NSW NCWAC's Environmental Weed Taskforce, in consultation with organisations and individuals involved in weed control, identified 187 weeds as having, or with potential to have, a significant impact on native vegetation on the NSW North Coast (NCWAC, 2000). These weeds were weighted for their current major or minor impact and their potential for major or minor impact on North Coast native vegetation communities (NCWAC, 2000). They are ranked in order of potential impact, with 1 being the species with the greatest potential impact.

Of the NCWAC 187 environmental weed species (with greatest potential impact on native vegetation), nine were recorded on site (refer to Appendix B, Table B.1).

5.4.4 Best practice

Weed removal techniques and herbicide application is to be conducted according to current best practice methods in bushland restoration. Specifically, works are to be undertaken in accordance with the following guidelines:

- SERA (2015) Draft National Standards for the Practice of Ecological Restoration in Australia;
- The Department of Primary Industries (DPI) (2014) *Noxious and environmental weed control handbook a guide to weed control in non-crop, aquatic and bushland situations* 6th Edition and
- The Department of Environment and Conservation's *Guidelines for bush regeneration in threatened species habitat and endangered ecological communities*.

Best practice guidelines recommend an integrated approach to weed control spanning several years, with the final combination of control treatments being site-specific. Integrated weed management is the coordinated use of a range of suitable chemical and non-chemical control methods and reduces reliance upon herbicides (DPI, 2014).

Throughout herbicide application, weather conditions are to be assessed and monitored to reduce the risk of drift and subsequent off-target damage (DPI, 2014) as heavy rains following herbicide application can reduce the effectiveness of a treatment and may cause contamination through run- off (DPI, 2014).

5.4.5 Legislative considerations

All herbicide applications are to be undertaken in accordance with the requirements of the *Pesticides Act 1999*. Under this Act all pesticide users must:

- use only pesticides registered by the Australian Pesticides & Veterinary Medicines Authority (APVMA) that are approved for the intended situation of use
- read the registered label on the pesticide container (or have them read to the user) and strictly follow the label directions
- not risk injury to persons, property and non-target plants and animals through the use of the pesticide
- obtain an AVPMA permit if the user wishes to vary the label directions or use pattern
- make a record of pesticide applications
- be trained (WorkCover, 2006).

5.4.6 Pesticide use reporting and notification

The *Pesticides Regulation 2009* requires persons using pesticides, and acting for or on behalf of a public authority, takes a record of each use. For treatments undertaken by hand or by hand-held applicators, the supervisor of the herbicide application works is the person responsible for the record keeping.

It is also a requirement of the *Pesticides Regulation 2009* that any pesticide use in public places includes public notification in accordance with the *Tweed Shire Council Pesticide Use Notification Plan* (TSC, 2016).

Under the TSC Pesticide Use Notification Plan, publicly accessible landfill sites are considered low to moderate use areas. For control of weeds and grasses, both spot and directed applications of selective and non-selective herbicide may be used. For this type of weed treatment, the TSC Pesticide Use Notification Plan requires a temporary sign is displayed at the time of application, however, no prior notification is required as it is recognised that this is a regular, ongoing practice. The restoration areas occur in areas of the proposed landfill site that won't be publicly accessible. Irrespective, temporary signs should be displayed during weed treatment works involving pesticide use.

5.4.7 Fauna considerations

The habitat requirements of fauna species known, or likely, to occur on site are to be considered when controlling weeds. For example, herbicides without surfactants are to be used (i.e. Roundup Biactive® or Weedmaster® Duo) to minimise impacts to aquatic fauna within the Northern Riparian Corridor.

5.5 Assisted regeneration

Assisted regeneration is to occur within areas of the Northern Riparian Corridor and Southern Ridgeline Corridor which are vegetated with existing regrowth native vegetation.

Within the Northern Riparian Corridor, it is estimated that approximately 0.3ha (~16%) of the 1.9ha Northern Riparian Corridor restoration area is covered in existing regrowth native vegetation.

Within the Southern Ridgeline Corridor, the majority of the existing vegetation is dominated by Camphor Laurel which would be subject to staged removal in accordance with the NSW North Coast Weed Advisory Committee (NCWAC) Regional Management Plan for Camphor Laurel.

The objective of the assisted regeneration work is to expand on areas of existing native vegetation by promoting natural regeneration of native species, primarily through targeted weed control.

The existing areas of regrowth native vegetation are weed infested which is characteristic of cleared, highly disturbed, areas. The regeneration potential of these areas is considered high because of the in-situ soil and canopy seed bank. Once the planted tubestock reach reproductive maturity, they are expected to contribute to the seed bank within the restoration areas and further improve regeneration success.

Weed control works within these areas is to employ targeted spot applications around regenerating natives growing amongst the weeds to reduce competition from weeds and promote the establishment and growth of native recruits.

5.6 Maintenance, monitoring and adaptive management

The works are to be maintained and monitored over a five year period. To measure progress of the works programs, KPI's have been developed (Appendix C). The KPIs would be applied to each restoration area separately. The bush regeneration contractor will be required to undertake the level of maintenance and monitoring necessary to achieve the KPIs, however, the minimum requirements are described below.

5.6.1 Maintenance

The proposed maintenance program is outlined in Table 5.2.

Table 5.2: Proposed maintenance program

Task	Frequency and method
Watering	The plants would initially be watered in during out-planting. Thereafter watering would be undertaken on an 'as-required' basis, being dependent on climatic conditions such as rainfall and temperature.
Weed control	Primary weed control would be undertaken prior to out-planting as part of site preparations. For the duration of the five-year program, weed control would be undertaken on an 'as required' basis, however, at a minimum of six times a year.

5.6.2 Monitoring

The proposed monitoring schedule is annual monitoring events for the duration of the five-year program.

5.6.3 Adaptive management

In line with the principles of adaptive management, the frequency of maintenance and monitoring is subject to change with achievement of the project objectives the primary requirement.

The KPIs are provided in Appendix C in the form of an assessment checklist which is intended to be used and submitted by the bush regeneration contractor as part of the annual self-assessment and reporting requirement. The methodology for measuring the KPIs would be negotiated between TSC and the bush regeneration contractor.

An annual on-site meeting would be held with attendance of TSC Environmental Scientists and the bush regeneration contractor to discuss progress and any adaptive measures required throughout the contract.

5.7 Hygiene and safety requirements

5.7.1 Handling and application of herbicides

Herbicides have potentially harmful effects on human health. By following label instructions and applying herbicides in the correct manner, using best practices and trained staff, adverse effects can be avoided (DPI, 2014).

Bush regenerators handling pesticides are to do so in accordance with the WorkCover NSW *Code of practice for the safe use of pesticides in non-agricultural workplaces* (2006). This code of practice provides guidance on the safe use of pesticides, to protect the health and safety of workers using pesticides and is intended to assist with achieving compliance with the *Work Health and Safety Act 2011*.

All personnel handling pesticides are to be familiar with the most current Material Safety Data Sheet (MSDS) available for the product.

5.7.2 Managing against the introduction of harmful pathogens

The bush regenerator should take precautions to avoid the introduction of pathogens into the site. In particular, the bush regeneration contractor should ensure no infected nursery stock is planted at the site.

5.8 Reporting

The bush regeneration contractor commissioned for the subject works will be required to provide annual progress reporting at the completion of each year of the five year program. The annual report will be a brief document (1-2 pages) including the following:

- a brief discussion of works completed to date, including an update on revegetation, weed control and assisted regeneration works. Indicative photos may be included where deemed appropriate
- a description of outstanding works planned for the subsequent year, highlighting priority tasks
- a self-assessment against the KPIs (provided in Appendix C)
- any recommendations for adapting works to suit changing conditions, shifting priorities (e.g. new listing of noxious weed species, or outbreak of particular weed species at site)
- copies of Daily Work Sheets.

In addition to progress reports, an evaluation report is to be prepared at the end of the five year program. The evaluation report will summarise the monitoring data over the five year period, discuss findings and provide recommendations for future management of the restoration areas.

The reports will be submitted to the TSC Waste Management Coordinator.

6 Schedule of works

The schedule of works, based on the minimum requirements for maintenance and monitoring, is presented in Table 6.1. Additional maintenance and monitoring events may be required to achieve the annual KPIs and the overall project objectives by the end of the program. Adaptive management will be employed to adjust the maintenance and monitoring frequency, and KPI's if required, to best achieve the project objectives.

Timing of out-planting is to be determined by the revegetation contractors in consultation with the TSC Environmental Scientist and is to coincide with a period of favourable climatic conditions.

Table 6.1: Schedule of works based on minimum maintenance and monitoring requirements

Task	Prior to clearing	Year 1												Year 2												Year 3												Year 4												Year 5											
		J		M		M	J	J	A	S	O	N		J		M		M		J	A	S		N		J	F	M		M		J	A	S		N		J	F		A	M		J		S		N		J		M	A	M		J	A	S	O	N	D
Seed collection & propagation																																																												
Site preparation																																																												
Out-planting																																																												
Watering																																																												
Weed control																																																												
Monitoring																																																												
Reporting																																																												

Note: A coloured box indicates one event for the month.

7 Breakdown of tasks and delegation of responsibilities

The breakdown of tasks and delegation of responsibilities is presented in Table 7.1.

Table 7.1: Breakdown of tasks and delegation of responsibilities

Task	Responsible authority
Seed collection	TSC – environmental scientists/bush regeneration contractor
Propagation of seed and raising of seedlings	TSC – nursery staff/private nursery staff
Sourcing of tubestock	Bush regeneration contractor in consultation with TSC environmental scientists
Site preparation – control of grazing	TSC – Waste Coordinator in consultation with adjoining landholders (cattle/horse); bush regeneration contractor in consultation with TSC environmental scientists (tree guards)
Site preparation – primary weed control	Bush regeneration contractor
Revegetation – initial out-planting and supplementary planting as required	Bush regeneration contractor
Weed control – follow-up maintenance	Bush regeneration contractor
Contractor OHS	Bush regeneration contractor
Monitoring – self assessment	Bush regeneration contractor
Monitoring – on site meeting	Bush regeneration contractor and TSC environmental scientist
Annual reporting – submission	Bush regeneration contractor
Annual reporting – review	TSC environmental scientist
Adaptive management	Collaboration between bush regeneration contractor and TSC environmental scientists

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Appendix A: Revegetation species list

Table A.1: Revegetation species list for Northern Riparian Corridor

Family	Botanical name	Common name	Abundance recorded within vegetation community on site
Trees canopy species			
Myrtaceae	*Eucalyptus resinifera*	Red Mahogany	Not recorded
Myrtaceae	*Eucalyptus robusta*	Swamp Mahogany	Occasional
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum	Not recorded
Myrtaceae	*Lophostemon suaveolens*	Swamp Box	Not recorded
Myrtaceae	*Melaleuca linariifolia*	Flax-leaved Paperbark	Not recorded
Myrtaceae	*Melaleuca quinquenervia*	Broad-leaved Paperbark	Common
Rhamnaceae	*Alphitonia excelsa*	Red Ash	Not recorded
Rhamnaceae	*Alphitonia petriei*	White Ash	Not recorded
Small trees / shrubs			
Araliaceae	*Polyscias sambucifolia*	Elderberry Ash	Not recorded
Elaeocarpaceae	*Elaeocarpus obovatus*	Hard Quandong	Not recorded
Elaeocarpaceae	*Elaeocarpus reticulatus*	Blueberry Ash	Not recorded
Euphorbiaceae	*Homalanthus populifolius*	Bleeding Heart	Not recorded
Euphorbiaceae	*Macaranga tanarius*	Macaranga	Uncommon
Euphorbiaceae	*Mallotus philippensis*	Red Kamala	Not recorded
Fabaceae - Mimosoideae	*Acacia melanoxylon*	Blackwood	Common
Malvaceae	*Hibiscus diversifolius*	Swamp Hibiscus	Common
Moraceae	*Ficus coronata*	Sandpaper Fig	Not recorded
Myrsinaceae	*Myrsine variabilis*	Muttonwood	Not recorded
Myrtaceae	*Acmena smithii*	Creek Lilly Pilly	Uncommon (planted)
Myrtaceae	*Callistemon salignus*	Willow Bottlebrush	Not recorded
Myrtaceae	*Melaleuca alternifolia*	Tea Tree	Not recorded
Phyllanthaceae	*Glochidion ferdinandi*	Cheese Tree	Not recorded
Phyllanthaceae	*Glochidion sumatranum*	Umbrella Cheese Tree	Not recorded
Sapindaceae	*Cupaniopsis anacardioides*	Tuckeroo	Uncommon (planted)
Sapindaceae	*Jagera pseudorhus*	Foam Bark Tree	Not recorded
Groundcovers			
Cyperaceae	*Gahnia clarkei*	Tall Saw-sedge	Not recorded
Cyperaceae	*Gahnia sieberiana*	Red-fruit Saw-sedge	Not recorded
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush	Not recorded
Phormiaceae	*Dianella caerulea*	Blue Flax Lily	Not recorded

Table A.2: Revegetation species list for Southern Ridgeline Corridor

Family	Botanical name	Common name	Abundance recorded within vegetation community on site
Trees canopy species			
Myrtaceae	*Corymbia intermedia*	Pink Bloodwood	Occasional
Myrtaceae	*Eucalyptus crebra*	Narrow-leaf Ironbark	Occasional
Myrtaceae	*Eucalyptus pilularis*	Blackbutt	Dominant
Myrtaceae	*Eucalyptus propinqua*	Small-fruited Grey Gum	Occasional
Myrtaceae	*Eucalyptus siderophloia*	Grey Ironbark	Common
Myrtaceae	*Lophostemon confertus*	Brush Box	Common
Rhamnaceae	*Alphitonia excelsa*	Red Ash	Not recorded
Small trees / shrubs			
Casuarinaceae	*Allocasuarina littoralis*	Black She-oak	Not recorded
Casuarinaceae	*Allocasuarina torulosa*	Forest Oak	Not recorded
Euphorbiaceae	*Homalanthus populifolius*	Bleeding Heart	Not recorded
Euphorbiaceae	*Macaranga tanarius*	Macaranga	Occasional
Euphorbiaceae	*Mallotus philippensis*	Red Kamala	Common
Lauraceae	*Neolitsea dealbata*	Hairy-leaved Bolly Gum	Common
Meliaceae	*Synoum glandulosum*	Scentless Rosewood	Common
Sapindaceae	*Jagera pseudorhus*	Foam Bark Tree	Not recorded
Sterculiaceae	*Commersonia bartramia*	Brown Kurrajong	Not recorded
Ulmaceae	*Trema tomentosa var. aspera*	Poison Peach	Not recorded
Groundcovers			
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush	Not recorded
Lomandraceae	*Lomandra multiflora*	Many-flowered Mat-rush	Common
Phormiaceae	*Dianella caerulea*	Blue Flax Lily	Not recorded

Appendix B: Weed species recorded at the site

Table B.1: Weed species recorded at the site

Family	Botanical name	Common Name	Status*	Restoration area recorded and abundance#
Apocynaceae	*Gomphocarpus fruticosus*	Balloon Cotton Bush	Environmental weed	NRC – common; SRC – common
Asteraceae	*Ageratum houstonianum*	Blue Billygoat Weed	Environmental weed – ranked 56	NRC – uncommon
Asteraceae	*Aster subulatus*	Wild Aster	Environmental weed	NRC – occasional
Asteraceae	*Baccharis halimifoila*	Groundsel Bush	Class 3 noxious weed; environmental weed – ranked 26	NRC – uncommon
Asteraceae	*Bidens pilosa*	Farmers Friends	Environmental weed – ranked 131	NRC – occasional
Asteraceae	*Senecio madagascariensis*	Fireweed	WoNS; Environmental weed	NRC – uncommon
Convulvulaceae	*Ipomoea cairica*	Five-leaved Morning Glory	Environmental weed – ranked 23; KTP	NRC – common
Fabaceae - Faboideae	*Desmodium uncinatum*	Silver-leaved Desmodium	Environmental weed – ranked 83	NRC – common
Fabaceae - Faboideae	*Neonotonia wightii*	Perennial Soybean	Environmental weed	NRC – common
Haloragaceae	*Myriophyllum aquaticum*	Parrots Feather	Environmental weed	NRC – common
Lauraceae	*Cinnamomum camphora*	Camphor Laurel	Class 4 noxious weed	NRC – common; SRC – common
Poaceae	*Paspalum mandiocanum*	Broad-leaved Paspalum	Environmental weed	NRC – dominant; SRC – common
Poaceae	*Paspalum urvillei*	Vasey Grass	Environmental weed – ranked 104; KTP	NRC – dominant
Poaceae	*Setaria sphacelata*	Setaria	Environmental weed – ranked 68; KTP	NRC – dominant; SRC – dominant
Rosaceae	*Rubus bellobatus*	Kittatinny Blackberry	Environmental weed	NRC - Common
Solanaceae	*Solanum capsicoides*	Devil's Apple	Environmental weed	NRC – uncommon

Solanaceae	*Solanum chrysotrichum*	Devil's Fig	Environmental weed	NRC – common; SRC – dominant
Solanaceae	*Solanum mauritianum*	Tobacco Bush	Environmental weed	NRC – common; SRC – common
Solanaceae	*Solanum nigrum*	Blackberry Nightshade	Environmental weed	NRC – occasional
Verbenaceae	*Lantana camara*	Lantana	WoNS; Class 4 noxious weed; environmental weed – ranked 10; KTP	NRC – occasional; SRC – common
Verbenaceae	*Verbena bonariensis*	Purpletop	Environmental weed – ranked 178	NRC – common

* WoNS are Weeds of National Significance.

Noxious weeds are those listed under the NSW *Noxious Weeds Act 1993*.

Key Threatening Process (KTP) listed under the NSW *Threatened Species Conservation Act* 1995 (TSC Act).

Environmental weeds are exotic invasive species, those with a ranking have been identified by NSW North Coast Weed Advisory Committee as one of 187 species considered to have the greatest potential impact on native vegetation.

NRC – Northern Riparian Corridor SRC

– Southern Ridgeline Corridor

Appendix C: Key Performance Indicators Assessment Proforma

Table C.1: Key Performance Indicators Assessment Proforma

KPI	Description	Target	Annual performance achieved
Revegetation			
Tubestock survival	Proportion of planted tubestock survived	80%	
Floristic diversity and species composition	Number of surviving future tree canopy species	>5	
	Number of surviving future small trees/shrubs species	>10 in NRC >5 in SRC	
	Number of surviving future groundcover species	>2	
Structural diversity	Proportion of surviving plant which are future tree species (emergent and canopy species)	=/>50%	
	Proportion of surviving plant which are future shrub species	=/>25%	
	Proportion of surviving plant which are future ground cover species (concentrated along verge of drainage line)	=/>10%	
Weed control			
Representation of weeds in revegetation and assisted regeneration areas	% cover of weeds in tree stratum	<1%	
	% cover of weeds in shrub stratum	<1%	
	% cover of weeds in ground stratum	<5%	
Assisted regeneration			
Recruitment of native species	Number of stems of native species within nominated assisted regeneration areas	Greater than previous year	

Appendix D: Biodiversity Offset Strategy

Introduction

The Biodiversity Strategy provides the strategic direction for the implementation of biodiversity management across the Eviron road Quarry and Landfill Project to inform programs, standards, and targets for the Project.

The strategy and action plan also seeks to further develop a coordinated approach to ensuring that ecosystems are healthy, resilient, productive, and connected across the landscape for future generations whilst providing a genetic diversity.

This appendix aims to identify a brief synopsis of the biodiversity of the site. The landscape management plan and the restoration plan encompass the threats to conserving ecosystem function and identifies opportunities to enhance and protect these functions.

Implementation Plan for Biodiversity Offset Strategy

There are 5 areas that have been nominated in the Environmental Assessment for the project. Each of these areas has a summary of what is proposed to be done in each area. Site personnel will be made aware of retained vegetation areas and the requirements for the protection of these areas.

This appendix lists the timeframes for establishing the proposals of each area. The areas nominated below are numbered as per table 9 that was included in the project approval schedule 4 item 29.

Area 1

This area is to have the existing vegetation retained, protected, and managed as a natural area of bushland. It is also the proposed location for the translocation of the White Lace Flower. The area is to be registered with an S88B instrument. Activities that will be carried out will be weed management, restoration and translocation activities and the activities described in the landscape management plan and associated restoration plan.

The land will be marked and signposted prior to commencement of construction to prevent accidental access and or use of the work area. Work described above will be carried out over the first 12 months of the project with ongoing monitoring and maintenance after this period.

Area 2

Revegetation of the drainage lines will be undertaken progressively during the construction of the Haul Road and the Quirks Quarry Landfill. The work will be complete prior to the operation of the Quirks Quarry. As with area 1 there will be ongoing monitoring and maintenance of this area.

Area 3

Revegetation of the ridgelines will be carried out in the areas shown in the Landscape Management Plan. This revegetation work will commence once construction work on site commences, and the revegetation will be complete prior to the operation of the Quirks Landfill. As with Area 1 above there will be ongoing monitoring and ma9intenance of this area.

Area 5

Retention and management of native vegetation will be carried out in the areas shown in the Landscape Management Plan. Koala feed trees and other fauna resources will be used to enhance the connectivity across the ridgeline. This work will commence once when construction on site commences a and the work will be complete prior to the operation of the Quirk Landfill. As with area 1 above there will be ongoing monitoring and maintenance of this area.

Area 6

Retention of vegetated corridor along the ridgeline and connectivity to native vegetation will be carried out in the areas shown in the Landscape Management Plan. This work will commence once when work on site commences and the work will be ongoing for the life of the project as there will be ongoing monitoring and maintenance of this area. This is related to the work carried out in Area 3 above.

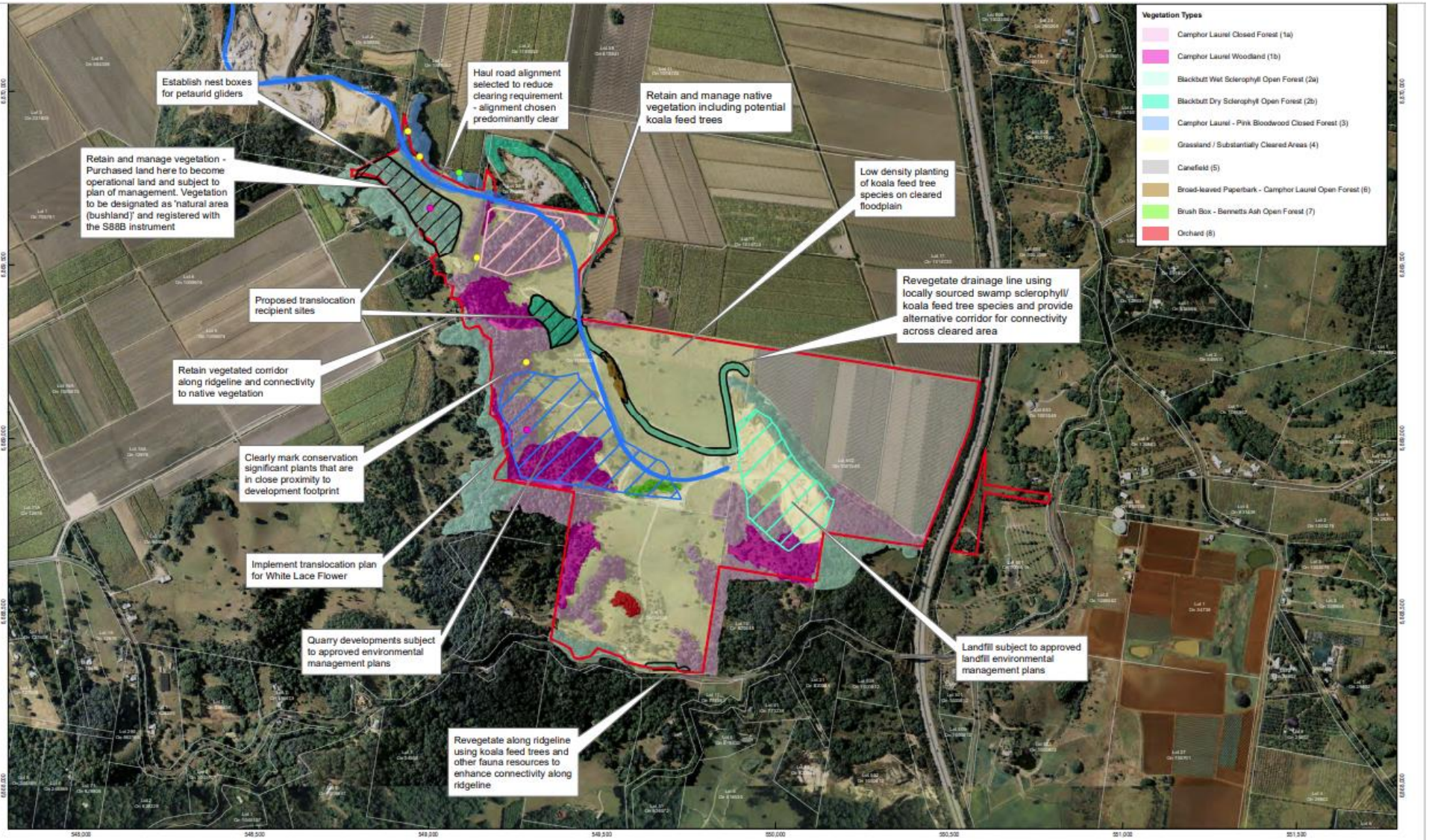
The landscape management plan details the staged biodiversity actions to be implemented in conjunction with the restoration plan.

Biodiversity Offset Strategy Action Plan August 2023

KPI	Action	When	Responsible Officer	Status
Area 1				
Establish nest box areas for petaurid gliders.	9 Nest boxes are to be installed within Blackbutt Open Forest of Conservation area.	Monitoring & maintenance at the end of year 1 Monitoring and maintenance during spring of year and during spring of year 5 after installation.	Council ecologist	Installed Ongoing maintenance required
Purchased land here to become operational land and subject to a plan of management.	Land purchase	Before Commencement	Project Manager	Completed
Retain and manage vegetation.	Ongoing weed and planting management	From the commencement of project	Site Supervisor	Ongoing
Vegetation to be designated as natural area (Bushland) and registered with the S88B instrument.	Area to be registered with S88B	Before the commencement of project	Project Manager	Ongoing discussions with Dept. Planning
Proposed white lace flower recipient site.	Translocation and management of white lace flower as per plan	As per Translocation plan	Site Supervisor	Commenced
Area 2				
Revegetate drainage line using locally sourced swamp sclerophyll koala feed trees species and provide alternative corridor for connectivity across cleared area.	Planting and weed management ongoing throughout the life of the project	As per landscape management plan	Site Supervisor	Ongoing

Area 3				
Revegetate along ridgeline using koala feed trees and other fauna resources to enhance connectivity along ridgeline.	Planting and weed management ongoing throughout the life of the project	As per landscape management plan	Site Supervisor	Ongoing
Area 5				
Proposed white lace flower translocation recipient site	Translocation and management of white lace flower as per plan	As per Translocation plan	Site Supervisor	Commenced
Establish nest box areas for petaurid gliders.	9 Nest boxes are to be installed within Blackbutt Open Forest of Conservation area.	Monitoring & maintenance at the end of year 1 Monitoring and maintenance during spring of year and during spring of year 5 after installation.	Council ecologist	Installed Ongoing maintenance required
Retain and manage native vegetation and habitat including potential koala feed trees.	Undertake a program of progressive revegetation and maintenance.	For the life of the project	Site Supervisor	Commenced
Haul Road				
Haul road alignment selected to reduce clearing requirement. Alignment chosen predominantly clear.	Conservation areas to be clearly marked. All haul road works to follow environmental controls as per table 6.1 Landscape Management and Mitigation Measures.	On commencement and throughout the life of the project.	Project manager Contractor	On commencement of works
Quarry & Landfill				
Quarry development subject to approved environmental management plans.	Licence approvals and Environmental Management plans gained and approved.	Before the commencement of Quarry project	Project Manager	Before commencement of quarrying projects
Landfill subject to approval landfill environmental management plans.	Licence approvals and Environmental Management plans gained and approved.	Before the commencement of Landfill project	Project Manager	Before commencement of landfilling

Miscellaneous				
Retain vegetated corridor along ridgeline and connectivity to native vegetation	Undertake a program of progressive revegetation and maintenance.	For the life of the project	Site Supervisor	Commenced
Clearly mark conservation significant plants that are in close proximately to the development footprint.	Significant plants to be identified and marked. Significant areas to be fenced and sign posted	Before the commencement of any works	Project Manager Site Supervisor	Permanent fencing to occur in October 2023
Implement translocation plan for white lace flower.	Translocation and management of white lace flower as per plan	Before the commencement of haul road and throughout the life of the project	Project Manager Site Supervisor	Commenced



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Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

N

LEGEND

Site Boundary
Cadastre Boundary
Management Areas
Revegetation Areas
Quirks Quarry
North Valley Footprint
West Valley Footprint
Haul Road

Conservation Significant Plants
Black Walnut
Long-leaved Tuckeroo
Smooth Scrub Turpentine
White Lace Flower (vulnerable)

GHD
CLIENTS | PEOPLE | PERFORMANCE

Tweed Shire Council
Eviron Road Quarry and Landfill Environmental Assessment

Job Number 41-20806
Revision 1
Date 27 MAY 2011

Management Measures

Figure 51

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Data source: Tweed Shire Council - Aerial Photography (2008), Haul Road (2011), Cadastre boundary (2011), GHD - Site Boundary (2011), Vegetation Mapping (2010), Habitat Trees (2010), Management Areas (2010), Revegetation Areas (2010), Quirks Quarry (2010), West Valley (2010), North Valley (2011).

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