Biodiversity Management Plan

Lidsdale Siding

Prepared by:

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Approval for Issue

Name	Signature	Date
Ziggy Andersons		03/10/2013

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1.0 Introduction

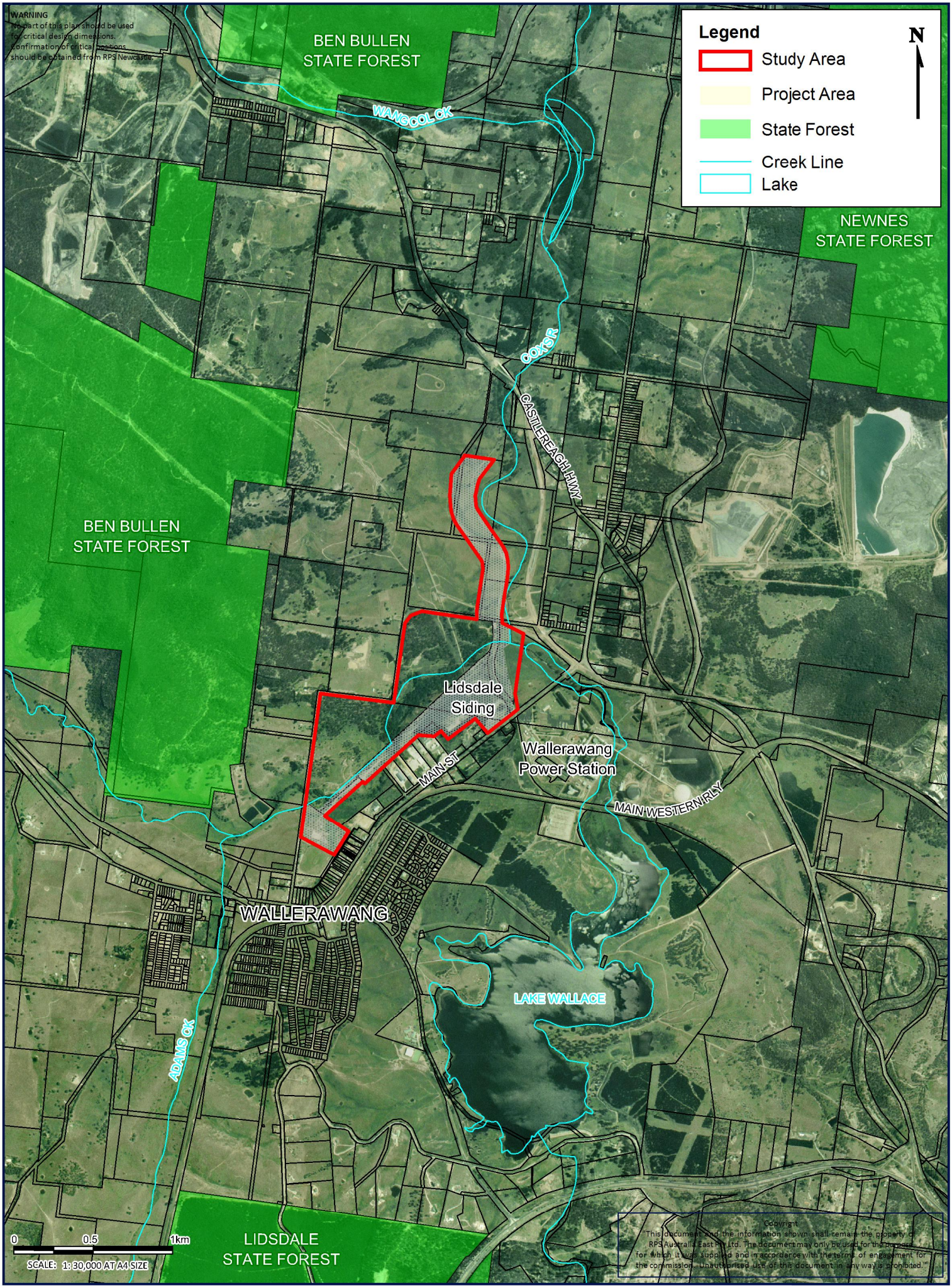
RPS Australia East (RPS) has been engaged by Centennial Ivanhoe Pty Ltd (Centennial) to develop a Biodiversity Management Plan (BMP) for Lidsdale Siding, approximately 10 kilometres north-west of Lithgow in NSW, hereafter referred to as the 'Project Area' (see **Figure 1**). This report was prepared to satisfy conditions of consent within Project Approval 08_0223 Schedule3 condition 22 of Section 75J of the Environmental Planning & Assessment Act 1979 (EP&A Act). This report addresses separate environmental issues, as subject to the Conditions of Schedule 2 to 5 issued by the Minister for Planning and Infrastructure.

These conditions are required in order to:

- Prevent or minimise adverse environmental impacts;
- Set standards and performance measures for acceptable environmental performance;
- Satisfy regular monitoring and reporting requirements; and
- Provide for the ongoing environmental management of the project.

An ecological assessment was completed by RPS (2012) for Lidsdale Siding Upgrade Project Environmental Assessment. This ecological assessment has been utilised to inform this report.

Figure 1 illustrates the site context.



TITLE: FIGURE 1: SITE LOCATION

LOCATION: LIDSDALE SIDING

DATUM: (GDA 94)
PROJECTION: MGA ZONE 56

DATE: 01/07/2013
PURPOSE: BMP

LAYOUT REF: 105704 Neubecks - Blackmans Flat\10- Drafting\ Lidsdale Sidings
VERSION (PLAN BY): A A4 (JS)

CLIENT: CENTENNIAL COAL
JOB REF: 105704

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2.0 Overview

2.1 Description of the Development

Centennial is upgrading the existing Lidsdale Siding rail loading facility by automating the transfer of coal from the existing overland conveyor onto trains. The project will require the construction of above and below ground facilities, including a stockpile conveyor, an extension and duplication of the existing rail siding, loading bin, new above and below ground conveyor, and coal stockpiles.

Figure 2 illustrates the project's components.

2.2 Conditions of Consent

The Conditions of Consent relevant to this Biodiversity Management Plan (BMP) are listed under Schedule 3 Condition 22 of the Project Approval. The following table (**Table 1**) lists the Conditions of Consent as set out in the Project Approval that are addressed in this BMP.

Table 1 Conditions of Consent and location of relevant documentation

Schedule	Condition	Section of this Document
Schedule 3 Condition 22 Biodiversity Management Plan	a) report to be submitted to the Director General for approval within six months of the date of approval;	Prepared by Ecologist
	b) be prepared by a suitably qualified ecologist;	
	c) Include a detailed description of measures that would be implemented over the life of the project to protect and conserve biodiversity, including:	
	▪ Management and enhancement of retained native vegetation, (particularly *Eucalyptus aggregata*) and habitat on site;	Section 4.1.1
	▪ A detailed program (both proposed works and timetable) for the removal of Willow Trees from Pipers Flat Creek; and	Section 4.1.2
	▪ Measures to manage and control weeds, feral animals and fire (including asset protection management zones).	Sections 4.3, 4.6, 4.6.1 and 4.7
Schedule 5 Condition 2	a) Provide detailed baseline data;	Section 3

Schedule	Condition	Section of this Document
Management Plan requirements	b) Provide a description of: ▪ The relevant statutory requirements (including any relevant approval, licence or lease conditions) ▪ Any relevant limits or performance measures/criteria; ▪ The specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures;	Section 1 Table 4, Table 6 and Table 8 Table 4, Table 6 and Table 8
	c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	Section 4
	d) a program to monitor and report on the: ▪ Impacts and environmental performance of the project; ▪ Effectiveness of any management measures in (c) above;	Section 5
	e) a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;	N/A
	f) a protocol for managing and reporting any: ▪ Incidents; ▪ Complaints; ▪ Non-compliance with statutory requirements; and ▪ Exceedances of the impact assessment criteria and/or performance criteria; and	Section 5.4
	g) a protocol for periodic review of the plan.	Section 5.4

2.3 Aims and Objectives

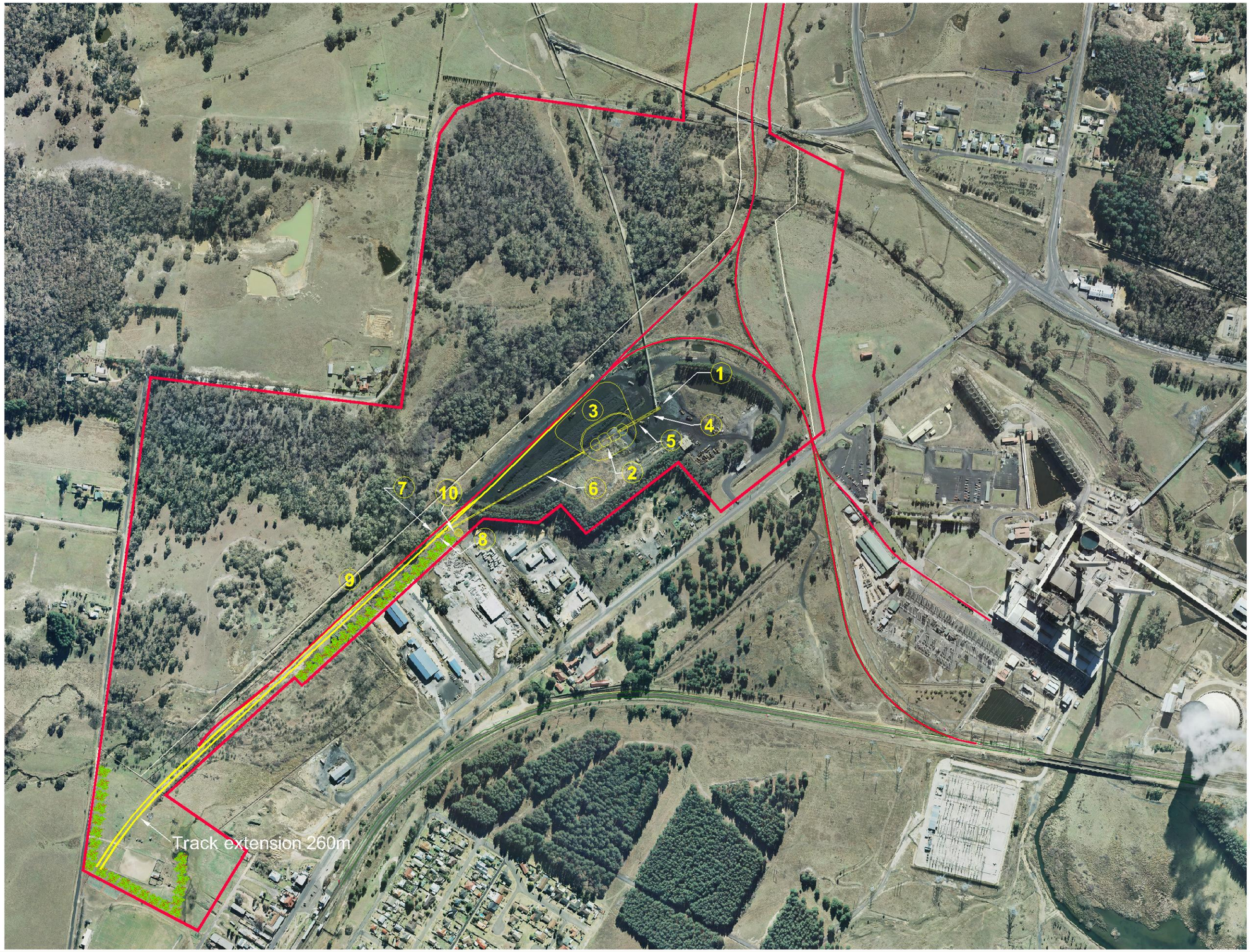
The aim of this BMP is to ensure that important ecological attributes of the Project Area are properly protected, managed, maintained and enhanced.

More specifically, the objectives of the BMP are to preserve, protect, and enhance retained native vegetation where practical during the operation phase of this project, with specific regard to the threatened species *Eucalyptus aggregata* (Black Gum) which will include:

- Specify appropriate measures for the re-vegetation and regeneration of the remnant bushland and riparian areas where necessary;
- Identify the appropriate timing of works including site preparation, planting, weed management;
- Provide a detailed program for the removal of *Salix fragilis* (Crack Willow); and
- Detail measures to manage bushfire on site.

2.4 Roles and Responsibilities

- This BMP will be implemented and managed by the Site Manager with the assistance of staff and qualified contractors.
- It is the responsibility of the Site Manager to audit and review this BMP.
- A list of suitable bush regeneration contractors is provided in **Appendix 3**.



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Proposed Components:

1. Diversion chute at the end of the existing overland conveyor (Auxiliary Stockpile beneath)
2. 50 000 t elongated conical stockpile
3. General Pushout Area for elongated conical stockpile
4. Elevating conveyor to elongated conical stockpile
5. Reclaim tunnel beneath the stockpile.
6. Ground conveyor from the reclaim tunnel, elevating to the train loading bin
7. A train loading bin (nominal 250 tonne capacity)
8. Control room adjacent to the loading bin
9. Notional alignment of New Rail Line and adjacent shunt
10. Transtank

Lidsdale Siding Study Area

EXISTING RAIL LINE

PROPOSED COMPONENTS

LANDSCAPING BUFFER

0 100 200 300 400

SCALE 1 : 7000 (A3)

TITLE: FIGURE 2: PROPOSED COMPONENTS | LOCATION: WALLERAWANG | DATUM: (GDA 94) PROJECTION: MGA Zone 56 | DATE: 1/07/2013 PURPOSE: BMP | AUTOCAD REF: ECO FIGURE 2 VERSION (PLAN BY): PROPOSED 2

CLIENT: CENTENNIAL COAL
JOB REF: 105704

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3.0 Site Biodiversity

3.1 Ecological Assessment of the Project Area

A review of the following was undertaken to consider the key factors in preparation of this BMP:

- *Ecological Assessment-Lidsdale Siding Upgrade Project (RPS 2012)* - highlighting vegetation communities, existing flora and fauna datasets and potential impacts on sensitive ecological attributes of the Site.

The Ecological Assessment (EA) was undertaken over the wider Study Area (**Figure 1**). The field surveys recorded one threatened flora species, two threatened fauna species and one Endangered Ecological Community (EEC) onsite. This section provides a summary of the findings to support the priority management areas of this BMP.

3.2 Flora

A total of 125 flora species were recorded onsite during field surveys of the EA Study Area. Of these, one threatened flora species, namely *Eucalyptus aggregata* (Black Gum) was recorded on site. *E. aggregata* is listed as Vulnerable under the NSW TSC Act 1995.

Numerous weed species were identified across the Study Area (See **Appendix 4**), particularly in the riparian zones associated with Pipers Flat Creek. The dominant weed species of concern was Crack Willow (*Salix fragilis*), which was largely restricted to riparian zones.

3.3 Ecological Communities

Ground truthing of the Study Area by RPS ecologists described eight vegetation communities as occurring, as outlined in **Table 2**.

Table 2 Vegetation Communities Identified within the Study Area

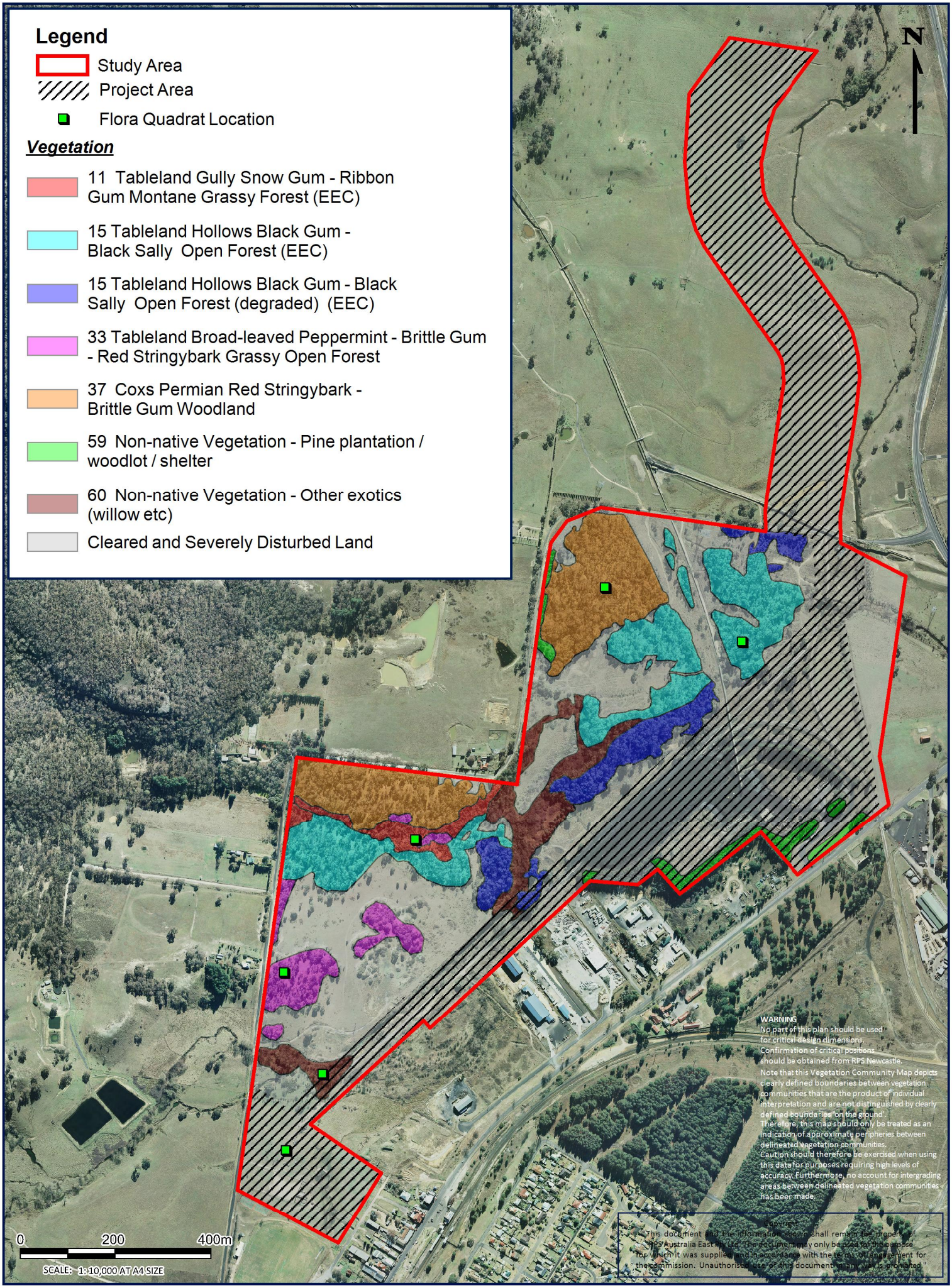
Vegetation Community
MU 11 Tableland Gully Snow Gum - Ribbon Gum Montane Grassy Forest
MU 15 Tableland Hollows Black Gum - Black Sally Open Forest (degraded)
MU 15 Tableland Hollows Black Gum - Black Sally Open Forest
MU 33 Tableland Broad-leaved Peppermint - Brittle Gum - Red Stringybark Grassy Open Forest
MU 37 Coxs Permian Red Stringybark - Brittle Gum Woodland
MU 59 Non-native Vegetation - Pine plantation / woodlot / shelter
MU 60 Non-native Vegetation - Other exotics (willow etc)
MU 62 Cleared and Severely Disturbed Land

MU 11 and MU 15 are classified as EECs under the TSC Act, as they are commensurate with the *Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions*.

Figure 3 displays the location of vegetation communities within the Study Area.

3.4 Fauna

A total of 51 bird, 13 mammal, six reptile and nine amphibian species were recorded onsite during field surveys of the EA Study Area. Of these species, the Gang-gang Cockatoo (*Callocephalon fimbriatum*) and Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*), both listed as Vulnerable under the NSW TSC Act, were recorded onsite. Two invasive species, namely the Red Fox (*Vulpes vulpes*) and European Rabbit (*Oryctolagus cuniculus*) were also recorded onsite.



TITLE: FIGURE 3: VEGETATION COMMUNITIES

LOCATION: LIDSDALE SIDING

DATUM: (GDA 94)
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4.0 Management Actions

4.1 Vegetation Management

4.1.1 Threatened Flora and Ecological Communities

The TSC Act listed EEC Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions was delineated within the Study Area during the Ecological Surveys for the Ecological Assessment but does not occur within the Project Area. However, it is important that the EEC is considered during construction works and rehabilitation workings to ensure weed encroachment and erosion do not occur in this community.

A number of individual *Eucalyptus aggregata* (Black Gum), which is listed as Vulnerable under the TSC Act, occur within the Project Area.

4.1.2 Crack Willow (*Salix fragilis*) Management

A detailed program for the removal of willow trees from Pipers Flat Creek is a priority for this BMP. No Willow trees are present within the Project Area however to satisfy the conditions of consent outlined in **Table 1**, Willow Trees that occur within the Study Area are proposed to be removed where appropriate.

All *Salix* (Willow) species in Australia (except S*. babylonica*, *S. reichardtii* and *S. x calodendron*) are declared Class 5 noxious weeds under the Noxious Weeds Act 1993. Although Willow trees are known to stabilise stream banks, these large trees outcompete and replace native species that would provide the same stability and add to the natural values of the surrounding environment. The method used to remove the Crack Willow trees from the Study Area must consider the terrain of the site, and the potential impacts upon Pipers Flat Creek and associated biodiversity. The management of debris associated with Willow tree must be comprehensive, as Willow trees can re-establish through the dispersal of remnant stems, twigs and seeds.

Table 3 outlines the optional removal methods for Willow trees.

Table 3 Removal Techniques for Willow Trees (Holland Clift and Davies 2007)

Trees <200 mm stem diameter	Trees >200 mm stem diameter
(a) Hand removal (suitable for small seedlings up to 2 years old)	(e) Excavator plus tree feller with chainsaw;
(b) Foliar spray and leave (suitable for seedlings up to 2m high)	(f) Excavator with a built-in grabber, chainsaw attachment and poison applicator;
(c) Cut, paint and remove	(g) Tree feller with a chainsaw and team to manually cut up and stack material; or
(d) Stem inject and leave standing	(h) as per (f) – (g) but plants are first poisoned, via stem injection, 2-3 months before their removal.

Areas where the Crack Willows occur are sensitive and difficult to access due to undulating land and soft, potentially saturated, soil surrounding the riparian areas. For trees with a stem diameter of >200 mm it is highly recommended that machinery not be utilised, as machinery could potentially impact on native vegetation and affect the bank stability of Pipers Flat Creek.

Removal Method

It is recommended that for trees <200 mm stem diameter the hand removal or cut, paint and remove techniques are employed. Hand removal of plants will reduce the impact on the creek, as no chemical application is required; however, some smaller trees may prove difficult to remove by hand. In such instances, the cut, paint and remove technique should be adopted using Roundup Bi-active (or a similarly aquatic friendly herbicide), which is designed to be utilised in aquatic environments. The cut, paint and remove method involves:

- Limbs and seedlings being cut as close to the ground as possible with a horizontal cut, to avoid spiked or tripping hazards (if working near water, ensure that no smaller debris can break off into the water);
- Chemical is then applied to both the trunk and cut stem to reduce the risk of re-sprouting.

Option (g) in **Table 3** is the preferred removal technique of Willow >200 mm stem diameter onsite, as this is the option least likely to cause harm to Pipers Flat Creek and associated biodiversity. This option includes the following methods:

- A qualified feller cuts the trees in situ using a chainsaw and paints the sapwood layer of the stump with herbicide as soon as possible (<2 mins);
- Chainsaw operators cut the woody material into small pieces small enough to be moved manually;
- Other workers collect the material (starting with the smallest branches first), pile it into heaps and burn;
- The site is raked and all pieces are picked up and placed on piles for burning.

Willows can be effectively removed at any time of the year. However, other site factors should be considered when planning willow removal — such as climate, other activities onsite, risk of soil disturbance, bank damage during wet conditions and risk of floods..

Following removal of Willows, regular monitoring from photo monitoring points will determine if rehabilitation should continue to ensure no regrowth of seedlings occurs and the areas of removal are stabilised.

Based on the guidelines for Willow management by Holland Clift and Davies (2007) site rehabilitation should include the following:

- Follow-up monitoring and control of willows and other weeds;
- Managing for erosion and other structural changes;
- Fencing and stock access;
- Re-establishing suitable vegetation; and
- Monitoring, evaluation and reporting of program outcomes.

Debris Management

Debris management techniques include the following:

- Piling and burning;
- Mulching; and
- Feeding to stock, furniture and firewood.

Piling and burning is the only method of waste management that does not require machinery to be brought onto the site. This method is the preferred waste management method for willow material, as it is relatively cheap in comparison to mulching, it creates space for revegetation, reduces the regeneration from willow debris and it leaves the site clear of debris that looks aesthetically pleasing. The pile and burn method involves the following:

- Stack the material in tight piles on high ground, preferably out of the flood zone, intertwining branches into the heaps to resist break up in flood waters. Build heaps by first placing small, dead and dry timber at the bottom and larger logs on top;
- Allow piles to dry (for up to six months if possible, depending on climate); and
- Burn onsite at the appropriate time of year — during the colder months where fire threat is lowest.

4.2 Regeneration

Natural regeneration should be encouraged through weed management and erosion control before revegetation is attempted. The Bradley Method of regeneration is a widely accepted method throughout Australia and includes the following principles:

(1) Work (weed) from areas in good condition towards degraded areas;

(2) Disturb the soil as little as possible; and

(3) Let the regeneration of native plants govern the rate of weed removal (Bradley 2006).

It must be noted that this method is suitable where seeds or root stock of native plants are present so that natural regeneration can occur. In areas of the Project Area where native species are dominant, regeneration should be the primary focus with revegetation and rehabilitation occurring in the more disturbed and weed prone areas.

4.3 Weed Removal

Qualified and experienced bush regenerators (see **Appendix 3**) should undertake Primary, Secondary and ongoing weed control following the revegetation of disturbed areas. Weed control requires an integrated approach and as such, a single method of treatment should not be relied upon. Bush regeneration principles (Bradley 2006) designed for use in bushland settings, in combination with designated plantings should be employed.

The Bradley Method of bush regeneration employs four basic principles:

- Work outwards from good bush areas towards areas of weed;
- Make minimal disturbance to the environment;
- Weed control will involve primary, consolidation and long term maintenance; and
- Do not over-clear; where possible let native plant regeneration dictate the rate of weed removal.

The primary target species for the Project Area include Blackberry (*Rubus anglocandicans*) and St John's Wort (*Hypericum perforatum*). The majority of weeds are environmental weeds and are predominantly pasture species. There is one Class 3 species, five Class 4 species, and one Class 5 species listed under the *Noxious Weeds Act 1993* present within the Study Area (see **Appendix 4**).

Manual removal of herbaceous weeds, regrowth and seedlings is fairly impractical for this particular site. Areas of weeds that are not in close proximity to riparian zones would benefit more from spraying herbicides as opposed to individual removal. This should be followed by the planting or seeding of native vegetation once the weeds have sufficiently died back.

4.4 Erosion Control

An Erosion and Sediment Control Plan has been prepared by EcoLogical (2013) detailing the requirements associated with erosion within the Project Area. The plan has been based on the following principles:

- Minimise surface disturbance and restrict access to undisturbed areas as much as practically possible;

- Progressive rehabilitation/stabilisation of disturbed areas;
- Control of water from the top of and through the Project Area, including the separation of runoff from disturbed (dirty water) and undisturbed (clean water) areas where practicable;
- The construction of surface drains and other measures to control and manage surface runoff; and
- All erosion and control measures are maintained.

4.5 Restoration and Rehabilitation Works

Decommission restoration and rehabilitation works will be detailed within the Rehabilitation and Closure Plan. The works detailed below are to be undertaken during the operation phase of the project and are a guideline for activities if required.

4.5.1 Plant Stock

Naturally occurring remnant vegetation is the best source of material for re-vegetation. Generally, these plants will have evolved to suit local environmental conditions and, desirably, possess a broad genetic base. Ecologically and genetically, local seed complements other flora and fauna in the area, and poses the least potential threat of genetic contamination (Mortlock 1998). At worst, seed or tubestock material should at the very least be sourced from within the Lithgow LGA. Using locally derived species will also aid in the preservation of local vegetation communities. If sourcing seed from remnant vegetation is not possible, a list of suitable nurseries that grow native tubestock and advanced plants suitable for the Lithgow area is supplied in **Appendix 1**.

4.5.2 Planting Techniques

Re-planting will be undertaken by suitably experienced bushland regeneration contractors who will be able to assess the Project Area and develop a site-specific approach. Planting should occur in the cooler months after frosts to allow for plants to become acclimatized before hotter conditions occur over summer. Densities of plants should vary, based on their growth form. Better results will occur if regular watering occurs, especially in the drier, warmer months.

Planting should fill gaps in the canopy that will in turn benefit arboreal species. Understorey planting should occur in areas where extensive weed infestations have been removed. This will assist with erosion control as natural regeneration in these areas is predicted to be much slower than within less degraded habitats, in addition planting reduces the regrowth of weed species through competition for resources.

In areas where native vegetation is more dominant than weed species, natural regeneration is likely and planting should only occur as a last resort. If small areas are devoid of native plants or canopy cover, planting of a small area should occur through utilising the above methods.

Seeding of native grass, shrubs and tree species in areas where vegetation is scarce is the preferred technique to establish a suitable native vegetation cover. Weed control should occur in these areas to enhance recruitment of native species and reduce competition from exotic species.

4.6 Pest Fauna Management

The Ecological Assessment (2012) recorded foxes (*Vulpes vulpes*) and rabbits (*Oryctolagus cuniculus*) within the wider Study Area. These species are known to be prevalent in the area and both species are considered as a Key Threatening Process under the NSW Threatened Species Act 1995 due to their detrimental impact on native flora and fauna.

As the area of remnant vegetation within the Project Area is relatively small (<0.25 hectares) the first stage in the pest management program is monitoring to determine whether these species do actually present an issue that requires additional management. Monitoring techniques are outlined in **Section 5**.

4.6.1 Pest Fauna Management

Following monitoring of pest fauna, if management actions are deemed necessary the relevant management techniques have been outlined in **Table 4**.

Table 4 Pest Fauna Management Criteria

Action	Performance Criteria	Timing
Pest Management Audit that establishes trapping and baiting requirements.	Audit Occurs.	Annually
1080 baiting of foxes and rabbits in accordance with legislative requirements (usage signs erected around site, avoid placement near waterways), the disposal and recording of carcasses.	A reduction in fox and rabbit abundance onsite.	When required
Notification to neighbours regarding the commencement of a 1080 baiting program onsite.	All neighbours notified directly by Lidsdale Siding staff.	Prior to 1080 baiting program commencing
Trapping with cage traps; euthanasia undertaken in accordance with legislation (NSW Agriculture- Animal Care and Ethics Committee).	A reduction in fox and rabbit abundance onsite.	When required

4.7 Fire Management

A bushfire management plan does not exist for the Lidsdale Siding site due to the size of the site, however, risk assessments have been conducted for the Site. Further, the Site has not been considered under the Lithgow Bush Fire Management Committee Bush Fire Risk Management Plan (2012). As a result, general fire management guidelines are provided to ensure asset protection from potential hazardous fires whilst maintaining a fire management regime appropriate for maintaining the existing native vegetation. No Asset Protection Zones (APZ) are currently in place for the Site and as such, this BMP will outline areas of management for fire prevention.

Recommended inter-fire intervals are listed below in **Table 5** for the native vegetation types recorded on the wider Study Area and are based on the NPWS Fire Biodiversity Guidelines (2004). Appropriate inter-fire intervals are the time needed between fire events to allow for sustainable vegetation community recovery. A plants post fire recovery adaptations require time to develop and include reaching a maturity and size that will allow for reproduction to produce adequate seed for 'storage' in soil and/or canopy to survive subsequent fire events, and to have developed sufficient vegetative mass or parts to protect against fire and enable it to resprout after a fire. Fires that are too frequent and don't allow plants enough time to develop their fire recovery adaptations may lead to localised species extinctions or a contraction of a plant community extent. Conversely, prolonged inter fire intervals can lead to a dominance of a small suite of longer-lived taxa to the detriment of other plant community species.

As a result, it is important for land managers to be aware of the appropriate fire intervals for the specific vegetation types when considering either hazard reduction burns (for asset protection) or ecological burns (for biodiversity enhancement).

Table 5 Recommended Inter-fire Intervals

Vegetation Type	Equivalent Vegetation Formation (as per Bradstock 2004)	Minimum Interval (years)	Maximum Interval (Years)	Notes
Tableland Gully Snow Gum - Ribbon Gum Montane Grassy Forest	Sclerophyll Grassy Woodland	5	40	Need to consider grassland dynamics to and canopy species to assign appropriate burning schedule.
Tableland Hollows Black Gum - Black Sally Open Forest (degraded)	Sclerophyll Grassy Woodland	5	40	Need to consider grassland dynamics to and canopy species to assign appropriate burning schedule.
Tableland Hollows Black Gum - Black Sally Open Forest	Sclerophyll Grassy Woodland	5	40	Need to consider grassland dynamics to and canopy species to assign appropriate burning schedule.
Tableland Broad-leaved Peppermint - Brittle Gum - Red Stringybark Grassy Open Forest	Sclerophyll Grassy Woodland	5	40	Need to consider grassland dynamics to and canopy species to assign appropriate burning schedule.
Coxs Permian Red Stringybark - Brittle Gum Woodland	Sclerophyll Grassy Woodland	5	40	Need to consider grassland dynamics to and canopy species to assign appropriate burning schedule.

Notwithstanding the above, in reality, given that the Project Area contains a major infrastructure asset, contains a railway line and multiple conveyor belts and supports natural vegetation with surrounding residential properties, it is unlikely that any ecological or hazard reduction burns would be initiated by the local RFS to maintain recommended inter-fire intervals or to reduce fuel loads.

The Project Area does require ongoing bushfire protection measures. The implementation of a 10 metre fire protection buffer (see **Figure 4**) is recommended to adequately protect the infrastructure onsite. The buffer will be located 10 metres from the boundary of the Project Area inwards to the vegetated lands of the Study Area. This 10 metre buffer should be regularly slashed and mown to maintain a low fuel load in the case of a potential fire threat from either the vegetated lands or operations within the proposed works area. Five metre buffers should also be applied to either side of access tracks on the Project Area and the existing and proposed rail lines.

Sparks from trains can influence fire occurrence onsite, as can vehicle use over long grass during drier seasons. It may also be beneficial to nominate designated access routes for vehicles to minimise the amount of tracks across the Project Area, and ultimately reduce the risk of fire, erosion and weed introduction. The maintenance of buffer zones in areas of road access and railway lines will enhance the protection of both assets and native vegetation onsite.

All site boundaries abut roads offering suitable protective buffers to neighbouring properties. If areas of vegetation within the Site overhang fences creating canopy connection across roads with neighbouring vegetation, it is recommended that an arrangement be made with the neighbour to reduce canopy connectivity and decrease the possibility of fire spread from the Site to the neighbouring property and vice versa.

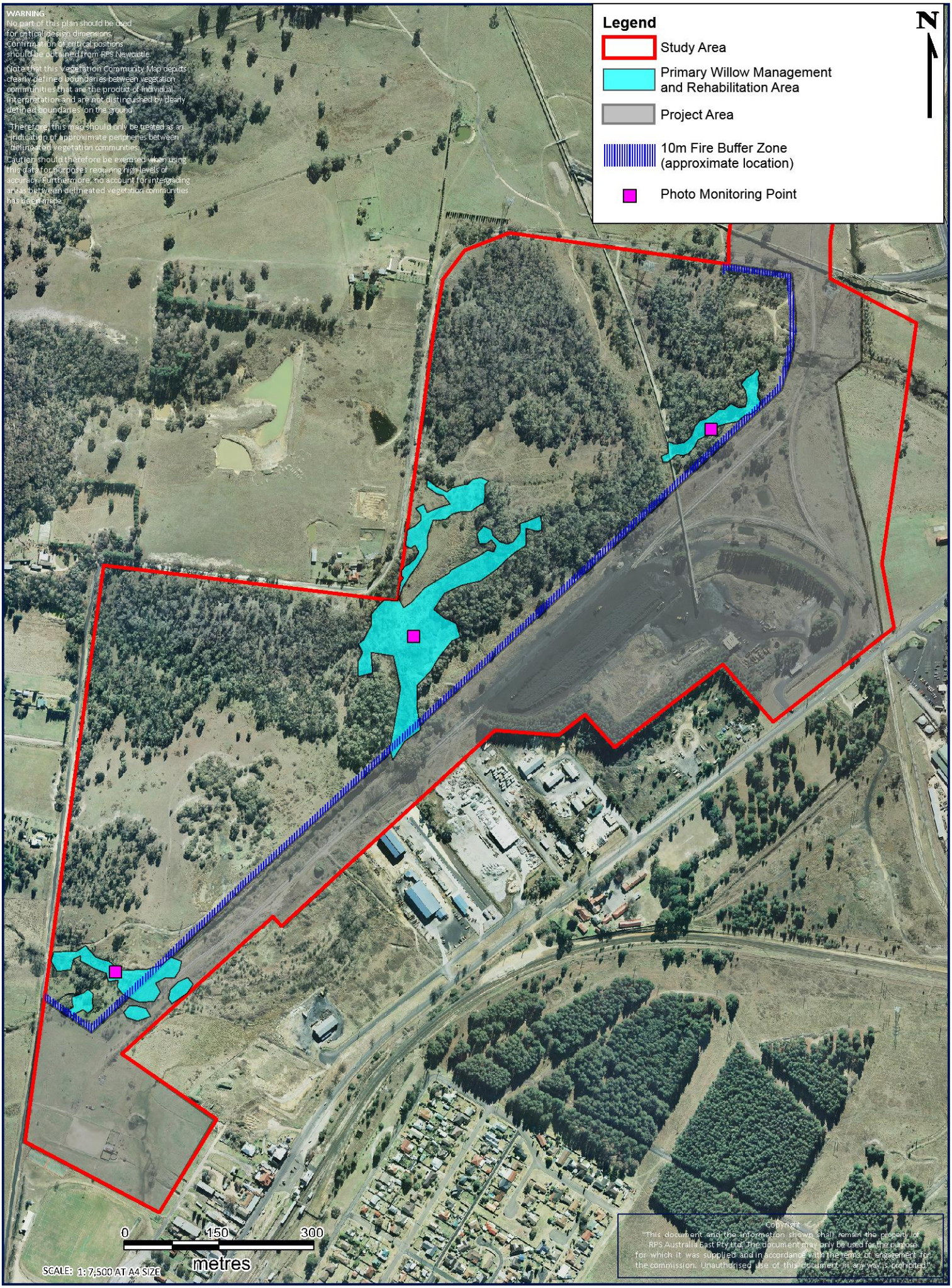
Other recommended bushfire control measures include:

- Adequate fire extinguishers in buildings;
- Smoke detectors in buildings;
- Ensure low fuel loads exist within close proximity to infrastructure; and
- Be aware of and designate areas available for surface water supplies to fight fires

Table 6 outlines the recommended fire management procedures and associated timing of works.

Table 6 Fire Management Criteria

Action	Performance Criteria	Timing
Determine burn frequency for site vegetation.	Consult with local RFS and landowner to establish a burning program, if required.	Ongoing
Implement a 10m buffer zone as outlined in **Figure 4** and beside tracks and railway lines.	Bushfire safe buffer zone	Established and ongoing
Maintenance - mowing, underscrubbing, edge maintenance, canopy thinning.	Bushfire safe buffer zone.	Ongoing
Canopy thinning over fence lines.	Agreement if required with neighbouring properties.	Ongoing



TITLE: FIGURE 4: DESIGNATED MANAGEMENT AREAS

LOCATION: LIDSDALE SIDING

DATUM: (GDA 94)
PROJECTION: MGA ZONE 56

DATE: 03/10/2013
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5.0 Flora and Fauna Monitoring and Reporting

The Lidsdale Siding Upgrade Project Approval Schedule 5 Section 2 requires a monitoring and reporting program on the:

- Impacts and environmental performance of the project; and
- Effectiveness of proposed management measures.

In addition, specific performance indicators to judge the performance of management measures are included.

Monitoring of BMP actions is required to demonstrate that the objectives of the actions are being achieved and that they have been effective in creating a self-sustaining ecosystem. **Table 7** details the survey effort required and the recommended timing, frequency and duration of the monitoring.

Monitoring should be conducted by suitably qualified and experienced personnel, with results provided for inclusion into the regular environmental report and independent environmental audit.

5.1 Flora

Monitoring activities within the areas to be replanted will include:

- Estimates of the success rate of plantings;
- Estimates of weed cover/abundance present in the replanting and weed infested areas; and
- Evaluation of the suitability of timing and responsibility for corrective measures and/or vegetation management.

5.1.1 Photo Monitoring

Designated permanent photo monitoring locations have been selected within the Project Area (**Figure 4**). The progressive photo monitoring will provide an indication of the success or failure of any areas of rehabilitation conducted in accordance with this BMP. They will enable contractors to adjust rehabilitation works accordingly to enhance the quality of retained vegetation further and provide required information for ongoing monitoring reports.

Monitoring points should be marked with steel star-pickets to ensure consistent replication of monitoring. Details on the direction the photo was taken, date, and height to camera should be recorded to allow for adequate comparisons between monitoring events. Photo monitoring can be conducted by rehabilitation contractors or Centennial employees.

5.1.2 Flora Surveys

Due to the project area being largely occupied by surface facilities and the area of native vegetation being relatively small (0.25 hectares), a random meander by a suitably qualified person across the entire Project Area will be sufficient.

The following parameters will be collected during the random meanders:

- Flora species diversity;
  - » Total number of flora species.
  - » Number and percent of native flora species.

  - » Number and percent of introduced flora species.
- Flora species abundance (Modified Braun-Blanquet 1-6);
- Dominant species and vegetation height in metres of each vegetation layer; and
- Presence of dieback.

Weed identification and monitoring will be undertaken in association with these works.

5.2 Fauna

Fauna monitoring will take place within the Project Area to determine what species are utilising the site and to determine if management techniques are required for pest animal species and the success of these measures if implemented. This will be achieved through various fauna survey techniques such as camera traps, bird censuses, and general observations.

5.3 Monitoring Frequency

Table 7 outlines the monitoring frequency and timing.

Table 7 Monitoring Frequency and Timing

Monitoring Action	Frequency	Timing
Photo Monitoring	Annual	Spring/Summer
Flora Survey	Annual to inform annual report (once management measures implemented)	Spring/Summer
Fauna Survey	2 yearly (or as required)	Spring/Summer

5.4 Assessment Criteria

Negative impacts to the environment are due to alteration of landscape structure and function; these can be either direct or indirect. For example, an indirect impact could be due to excessive noise levels limiting an animal's ability to hunt, a direct impact could be the unauthorised clearing of vegetation or the intentional injury of an animal. Such direct impacts are the responsibility of Site Manager to report and should be done so as soon as practical.

For flora, an indirect impact to individuals usually manifests itself as changes to growth and survivorship, whereas in vegetation communities it manifests itself as changes to composition and structure e.g. change from a forest community to a grassland community. For both flora and fauna, indirect impacts can be readily measured by monitoring for long term negative (or positive) trends in; species diversity and density; long term sustained change in community composition; and long term sustained changes in presence/absence relating to proximity to impacts in comparison to baseline (predisturbance) conditions. Data recorded during the EA will be used for baseline conditions and a reference site will be established to compare against natural fluctuations.

Monitoring will pick up on both direct and indirect impacts, which is why it is conducted at regular intervals over extended timeframes. Assessment criteria are detailed in **Table 8.**

Table 8 Monitoring Program Assessment Criteria

Ecosystem Element	Indicator	Criteria
Rehabilitation	General Weed Control	Successful reduction in weed cover to 5% or below.
	Willow Control	Successful removal of Willow within the site.
	Replanting	Successful establishment of tubestock.
	Habitat values	An increase in the value of the habitat present within the Site.
Flora	Species diversity	No sustained negative trends in the number of species compared to baseline conditions.
	Species composition	No significant change in species composition compared to baseline conditions.
	Species density	No significant reduction or a sustained negative trends in the number of individuals compared to baseline conditions.
	Vegetation cover	No significant reduction or sustained negative trends in vegetation cover compared to baseline conditions.
	Weed species	No additional weed species compared to baseline conditions.
Fauna	Species diversity	No sustained negative trends in the number of species compared to baseline conditions.
	Species composition	No significant change in species composition compared to baseline conditions.
	Species density	No significant reduction or sustained negative trends in the number of individuals compared to baseline conditions.
Pest Species	Fauna	No increase in the number and type of pest species compared to baseline conditions.
	Flora	No increase in the number and type of weed species.

5.5 Reporting

As per Schedule 5 Condition 4 of the Lidsdale Siding Upgrade Project Approval, by the end of February 2014, an Annual Review will be completed. This review is to describe what actions have been completed, what is to be completed, any non-compliances and resulting corrective measures, as well as a summary of monitoring results.

Annual Reviews should contain information regarding whether or not performance criteria have been met for all required tasks, address any incidents and complaints resulting from the project and associated management plans, and address any non-compliance with statutory requirements. In addition, the BMP should be reviewed annually to ensure it is current and meeting any potential additional performance criteria.

6.0 Conclusion

This BMP is aimed at providing a strategy for the preservation, protection and restoration of biodiversity on the Lidsdale Siding Upgrade site where it is required. The objectives are to increase the quality of vegetation onsite, manage pest fauna species and manage fire threats and regimes.

The implementation of the above mentioned actions will result in the protection, enhancement and maintenance of the native plant communities present within the Project Area, as well as reducing the abundance of invasive pest fauna and managing unpredictable fire events.

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Appendix 1

Plant Suppliers

Lithgow & District Community Nursery
2 Coalbrook St
Lithgow NSW 2790

Ph: 6356 1126

Good Earth Landscape & Building Supplies
879 Castlereagh Hwy
Lidsdale NSW 2790

Ph: 6355 1937
Web: www.good-earth.com.au

Maple Springs Nursery & Gardens
85 Baaners La
Little Hartley NSW 2790

Ph: 6355 2140

Great Western Nurseries
831 Jenolan Caves Rd
Good Forest NSW 2790

Ph: 6359 3300

Appendix 2

Recommended Plant Species for Revegetation Works

Family	Scientific Name	Common Name
Canopy species		
Myrtaceae	***Eucalyptus aggregata***	**Black Gum**
Myrtaceae	*Eucalyptus dives*	Broad-leaved Peppermint
Myrtaceae	*Eucalyptus macrorhyncha*	Red Stringybark
Myrtaceae	*Eucalyptus mannifera* subsp. *mannifera*	Red-spotted Gum
Myrtaceae	*Eucalyptus pauciflora*	Snow Gum
Myrtaceae	*Eucalyptus rubida subsp. rubida*	Candlebark
Myrtaceae	*Eucalyptus sieberi*	Silvertop Ash
Myrtaceae	*Eucalyptus stelluata*	Black Sallee
Myrtaceae	*Eucalyptus viminalis*	Ribbon Gum
Shrubs		
Fabaceae/faboideae/ Mimosoideae	*Acacia dealbata*	Silver Wattle
Fabaceae/faboideae/ Mimosoideae	*Acacia myrtifolia*	Red Stem Wattle
Lamiaceae	*Ajuga australis*	Austral Bugle
Rutaceae	*Boronia microphylla*	Small-leaved Boronia
Epacridaceae	*Brachyloma daphnoides*	Daphne Heath
Asteraceae	*Brachyscome sp.*	
Pittosporaceae	*Bursaria spinosa* var. *spinosa*	Blackthorn
Asteraceae	*Carduus nutans* subsp. *nutans*	Nodding Thistle
Asteraceae	*Cassinia aculeata*	Dolly Bush
Asteraceae	*Cassinia longifolia*	
Asteraceae	*Cassinia uncata*	Sticky Cassinia
Asteraceae	*Cymbonotus lawsonianus*	Bears-ear
Myrtaceae	*Leptospermum arachnoides*	-
Myrtaceae	*Leptospermum polygalifolium* subsp. *polygalifolium*	Tantoon
Epacridaceae	*Lissanthe strigosa*	Peach Heath
Asteraceae	*Ozothamnus diosmifolius*	Ball Everlasting
Groundcovers		
Poaceae	*Austrodanthonia tenuior*	Wallaby Grass
Anthericaceae	*Caesia parviflora*	Pale Grass Lily
Asteraceae	*Calotis cuneifolia*	Purple Burr Daisy
Poaceae	*Cynodon dactylon*	Common Couch
Cyperaceae	*Cyperus polystachyos*	-
Poaceae	*Dactylis glomerata*	Cocksfoot

Family	Scientific Name	Common Name
Scrophulariaceae	*Derwentia perfoliata*	Digger's Speedwell
Fabaceae/faboideae	*Desmodium varians*	Slender Tick-trefoil
Phormiaceae	*Dianella caerulea* var. *caerulea*	Flax Lily
Phormiaceae	*Dianella caerulea* var. *producta*	Blue Flax Lily
Phormiaceae	*Dianella revoluta* var. *revoluta*	Spreading Flax Lily
Convolvulaceae	*Dichondra repens*	Kidney Weed
Anthericaceae	*Dichopogon fimbriatus*	Nodding Chocolate Lily
Orchidaceae	*Dipodium punctatum*	Hyacinth Orchid
Orchidaceae	*Dipodium variegatum*	Blotched Hyacinth Orchid
Droseraceae	*Drosera peltata*	Sundew
Poaceae	*Echinopogon caespitosus* var. *caespitosus*	Tufted Hedgehog Grass
Poaceae	*Eragrostis brownii*	Brown's Lovegrass
Asteraceae	*Euchiton involucratus*	Star Cudweed
Asteraceae	*Euchiton sphaericus*	-
Geraniaceae	*Geranium homeanum*	Northern Cranesbill
Geraniaceae	*Geranium solanderi*	Cutleaf Cranesbill
Fabaceae/faboideae	*Glycine clandestina*	Twining Glycine
Haloragaceae	*Gonocarpus tetragynus*	Poverty Raspwort
Goodeniaceae	*Goodenia bellidifolia*	Daisy-leaved Goodenia
Goodeniaceae	*Goodenia hederacea* subsp. *hederacea*	Ivy-leaved Goodenia
Fabaceae/faboideae	*Hardenbergia violacea*	False Sarsparilla
Boraginaceae	*Heliotropium amplexicaule*	Blue Heliotrope
Dilleniaceae	*Hibbertia aspera*	Rough Guinea Flower
Dilleniaceae	*Hibbertia obtusifolia*	
Fabaceae/faboideae	*Hovea linearis*	-
Apiaceae	*Hydrocotyle peduncularis*	Pennywort
Clusiaceae	*Hypericum gramineum*	Small St Johns Wort
Hypoxidaceae	*Hypoxis hygrometrica*	Golden Star
Poaceae	*Imperata cylindrica*	Blady Grass
Asteraceae	*Leucochrysum albicans*	-
Epacridaceae	*Leucopogon virgatus*	-
Lomandraceae	*Lomandra confertifolia*	Mat-rush
Lomandraceae	*Lomandra filiformis* subsp. *filiformis*	Wattle Mat-rush
Lomandraceae	*Lomandra glauca*	Pale Mat-rush
Lomandraceae	*Lomandra longifolia*	Spiky-headed Mat-rush
Poaceae	*Microlaena stipoides* var. *stipoides*	Weeping Rice Grass
Orchidaceae	*Microtis sp.*	
Loganiaceae	*Mitrasacme polymorpha*	Mitrewort
Oxalidaceae	*Oxalis perrenans*	Yellow-flowered Wood Sorrel
Oxalidaceae	*Oxalis radicosa*	-
Poaceae	*Panicum sp.*	-
Proteaceae	*Persoonia chamaepitys*	Mountain Geebung

Family	Scientific Name	Common Name
Plantaginaceae	*Plantago debilis*	Slender Plantain
Apiaceae	*Platysace ericoides*	Heathy Platysace
Poaceae	*Poa labillardierei* var. *labillardierei*	Tussock Grass
Poaceae	*Poa seiberiana*	Tussock Grass
Poaceae	*Poa seiberiana* var. *cyanophylla*	-
Euphorbiaceae	*Poranthera microphylla*	-
Fabaceae/faboideae	*Pultenaea microphylla*	-
Anthericaceae	*Sowerbaea juncea*	Vanilla Plant
Stylidiaceae	*Stylidium sp.*	
Poaceae	*Themeda australis*	Kangaroo Grass
Anthericaceae	*Thysanotus tuberosus*	Fringed Lily
Anthericaceae	*Tricoryne elatior*	Yellow Rush Lily
Scrophulariaceae	*Veronica plebeia*	Creeping Speedwell
Violaceae	*Viola hederacea*	Ivy-leaved Violet
Campanulaceae	*Wahlenbergia gracilis*	Australian Bluebell
Campanulaceae	*Wahlenbergia stricta* subsp. *stricta*	Austral Bluebell
Asteraceae	*Xerochrysum bracteatum*	Golden Everlasting

Appendix 3

Recommended Bush Regenerators

Shane Grundy - The Bush Doctor
PO Box 694
Springwood 2777

Ph: 4751 3180
Mob: 0414 287 437
Email: shane@bushdoctor.com.au
Web: www.bushdoctor.com.au

Hugh Paterson - The Good Bush People
PO Box 319
Springwood 2777

Ph: 4751 2303
Mob: 0427 512 303
Email: fmatter@bigpond.com.au

A & S Bushcare Services
41 Seventh Ave
Katoomba 2780

Ph: 4782 5620
Email: admin@asbushcare.com.au
Web: www.asbushcare.com.au

Appendix 4

Weed Species List

Family	Scientific Name	Common Name	*Noxious Weeds Act* 1993 Listing
Poaceae	*Briza maxima*	Quaking Grass	
Poaceae	*Briza minor*	Shivery Grass	
Poaceae	*Cortaderia selloana*	Pampas Grass	**Class 4**
Poaceae	*Melinus repens*	Red Natal Grass	
Poaceae	*Pennisetum clandestinum*	Kikuyu	
Polygonaceae	*Acetosella vulgaris*	Sheep Sorrel	
Primulaceae	*Anagallis arvensis*	Scarlet Pimpernel	
Gentianaceae	*Centaurium erythraea*	Common Centaury	
Asteraceae	*Cirsium vulgare*	Spear Thistle	
Malaceae	*Crataegus monogyna*	Hawthorn	
Boraginaceae	*Echium plantagineum*	Paterson's Curse	**Class 4**
Clusiaceae	*Hypericum perforatum*	St Johns Wort	**Class 4**
Asteraceae	*Hypochaeris radicata*	Flatweed	
Lamiaceae	*Lamium amplexicaule*	Dead Nettle	
Solanaceae	*Lycium ferocissimum*	African Boxthorn	**Class 4**
Rosaceae	*Photinia serratifolia*	Hawthorn	
Plantaginaceae	*Plantago lanceolata*	Ribwort	
Ranunculaceae	*Ranunculus repens*	Creeping Buttercup	
Rosaceae	*Rubus fruiticosus*	Blackberry	**Class 4**
Salicaceae	*Salix fragilis*	Crack Willow	**Class 5**
Asteraceae	*Senecio madagascariensis*	Fireweed	
Caryophyllaceae	*Silene gallica*	French Catchfly	
Asteraceae	*Sonchus asper*	Prickly Sow-thistle	
Fabaceae/faboideae	*Trifolium repens*	White Clover	
Fabaceae/faboideae	*Ulex europaeus*	Gorse	**Class 3**
Scrophulariaceae	*Verbascum virgatum*	Twiggy Mullein	

Class 1 - The plant must be eradicated from the land and the land must be kept free of the plant

Class 2 - The plant must be eradicated from the land and the land must be kept free of the plant

Class 3 - The plant must be fully and continuously suppressed and destroyed

Class 4 - 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, and the plant may not be sold, propagated or knowingly distributed.

Class 5 - The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with.