Proposed Restoration of the Erskine Park Landfill, Erskine Park

Detailed Landscape Plan

Cleanaway Waste Management

19 December 2019

Building exceptional outcomes together

Document History and Status

Rev	Description	Author	Reviewed	Approved	Date
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Executive Summary

Tonkin Consulting (Tonkin) was engaged by Enviroguard Pty Ltd (ABN: 23 060 919 164) owned and operated by Cleanaway Waste Management to update the Landscape Plan (LP) for the Erskine Park Landfill (EPL), previously prepared by GHD for Enviroguard Pty Ltd (Ref. 22/13022/11160 dated February 2007). The EPL site is located in the eastern sector of the Penrith City Council (PCC) local government area and within the Erskine Park Employment Area (EPEA). Environment Protection Authority licence 4865 incorporates Lot 4 DP1094504, Lot 1 DP1140063 and Lot 103 DP1143935 on Quarry Road near the corner of Mamre Road and Erskine Park Road.

The LP is a consent condition of DA05/1740.01 from PCC. It aims to provide a clear, concise and practical framework for the landscaping of the final landform of the EPL, in accordance with the requirements of the *Landscape Development Control Plan (2014)* and both the *Biodiversity Restoration Plan (2005)* and *Management Plan (2006)* for the *Erskine Park Employment Area*. The final landform and landscaping was to provide bird habitat, a seed bank resource and form part of the biodiversity corridor in the area.

The objectives of the LP are to:

- determine local vegetation characteristics;
- describe the landscaping activities necessary to restore the native vegetation;
- describe the maintenance program to ensure establishment;
- utilise cost efficient restoration techniques;
- restore the EPL in a manner which minimises management costs in perpetuity; and
- provide an indication of the costing for the landscaping work.

The site was quarried from 1925 until 1994 for volcanic breccia as well as some clays and shales to a depth of 30 m below the nearby creek level. Since 1992, the site has been used as a landfill under a development consent issued by PCC . It used to receive approximately 1 Mt/yr of non-putrescible waste. Cleanaway proposes to continue using the quarry site as a landfill for non-putrescible waste to a height of 92 m AHD. It is proposed to cap the landfill with a seal bearing layer, a clay sealing layer, a revegetation infiltration layer and a revegetation topsoil layer.

The LP provided an assessment of the opportunities and constraints at the site in relation to landscaping and a detailed description of all activities required to implement the LP. Four distinct areas that will require different vegetation management were identified in the LP, these were:

Zone 1 – This was the rim of the quarry. Planting on the rim was recommended to consist of Shale Hills Woodland vegetation to link with the adjacent corridors.

Zone 2 – This was the 12.2 ha capping of the landfill. Due to the shallow capping, it is recommended that the LP for this zone will be restricted to a mixture of native shrubs and grasses.

Zone 3 – This zone consisted of a 4.6 hectare areas on the peak of the landfill capping. It is anticipated that this area forms part of the biodiversity corridor in the area and therefore recommended to be landscaped by lawn and native gardens.

Zone 4 – This is the wet areas surrounding the sediment basins. The landscaping in this area is recommended to consist of native wetland species.

A species list and densities are outlined for each Zone, as is the seed collection, plant propagation, site preparation, landscaping, maintenance, monitoring and reporting requirements. To assist with the implementation of the LP an indicative program of works and costings is also provided. The program of works is for a period of five years. The first two years are for establishment and the remaining three for maintenance.

1 Introduction

1.1 Overview

Tonkin Consulting (Tonkin) was engaged by Enviroguard Pty Ltd (ABN: 23 060 919 164) owned and operated by Cleanaway Waste Management to update the Landscape Plan (LP) previously prepared by GHD for Enviroguard Pty Ltd (Ref. 22/13022/11160 dated February 2007) for the Erskine Park Landfill (EPL). The LP is a consent condition of DA05/1740.01 from Penrith City Council (PCC). The LP has been developed in accordance with the Council's *Landscape Development Control Plan* (PCC, 2014) and the *Biodiversity Restoration Plan for the Erskine Park Employment Area* (Greening Australia NSW, 2005).

1.2 Aims and Objectives

The LP aims to provide a clear, concise and practical framework for the landscaping of the final landform of the EPL, in accordance with the requirements of the *Landscape Development Control Plan* (PCC, 2014) and the *Biodiversity Restoration Plan for the Erskine Park Employment Area* (Greening Australia NSW, 2005). The final landform and landscaping was to provide bird habitat and a seed bank resource and to form part of the biodiversity corridor in the area.

The objectives of the LP are to:

- determine local vegetation characteristics;
- describe the landscaping activities necessary to restore the native vegetation;
- describe the maintenance program to ensure establishment;
- utilise cost efficient restoration techniques;
- restore the EPL in a manner which minimises management costs in perpetuity; and
- provide an indication of the costing for the landscaping work.

1.3 Relationship with Existing Reports

Several reports and documents exist regarding the native vegetation occurring on site and possible restoration programs. The LP has taken into consideration the impacts of the following documentation:

- Landscape Development Control Plan (PCC, 2014);
- Biodiversity Management Plan Erskine Park Employment Area (HLA, 2006);
- Biodiversity Restoration Plan for Erskine Park Release Area, 2005;
- Conservation and Development Strategy Erskine Park Release Area, 2003;
- Vegetation Management Plan Bluescope Steel, 2004;
- Vegetation Management Plan Chep Site, 2005;
- Flora and Fauna Assessment Lots 3, 4, & 7, 2002; and
- Bush Fire Risk Management Plan, 2004.

The LP has also been prepared to be consistent with and enhance the Greening Western Sydney Project because it links with vegetation restoration work being undertaken along South Creek.

All work to be performed on site will also be in accordance with the following guidelines, or as updated:

- "Recovering Bushland" Best Practices Guidelines for Vegetation Restoration on the Cumberland Plain, DEC, 2005;
- Florabank Seed Collection and Management Guidelines, updated 2004;
- DIPNR's Best Practice Guidelines for Bush Regeneration on the Cumberland Plain, 2004; and
- GANSW Best Practice Revegetation Guidelines, 1999.

1.4 Relevant Legislation and Policies

The LP has been prepared in accordance with the provisions contained in relevant legislation and policy guidelines, including but not limited to the following:

- Biodiversity Conservation Act 2016 No 63;
- Hawkesbury Nepean Catchment Blue Print 2002;
- Local Government Act 1993 and Local Government Amendment (Community Land Management) Act 1998; and
- Penrith City Council Local Environmental Plan and relevant policies.

1.5 List of Abbreviations

The following summarises the various abbreviations used throughout the LP.

DEC	Department of Environment & Conservation. Now called Office of Environment and Heritage
DNR	Department of Natural Resources
OEH	Office of Environment and Heritage
EEC	Endangered Ecological Community
EPL	Erskine Park Landfill
EPEA	Erskine Park Employment Area
GANSW	Greening Australia NSW
GWS	Greening Western Sydney Project
LEP	Penrith Local Environment Plan
LGA	Local Government Area (Penrith City Council)
LP	Landscape Plan
PCC	Penrith City Council
SCRFF	Sydney Coastal River Flat Forest
SHW	Shale Hills Woodland
SPW	Shale Plains Woodland
BCA	Biodiversity Conservation Act 2016 No 63

2 Site Analysis

This section was prepared by GHD (2007) and is repeated herein as it provides a general description of the proposed development site, as reported in the *Erskine Park Landfill EIS* (2005). Only minor updates have been made to reflect changes in legislation.

2.1 Site Location

The Erskine Park Landfill (EPL) site is located 85-87 Quarry Road in the eastern sector of the Penrith LGA at Erskine Park. The site access is shared with Cleanaway's waste transfer station to the front of the property. Erskine Park is located 45 km from the Sydney CBD, 15 km south-east of Penrith and approximately 6 km south of St Marys. EPL is described as Lot 4 DP1094504, Lot 1 DP1140063 and Lot 103 DP1143935 and is situated within the EPEA near the corner of Mamre Road and Erskine Park Road, as shown in Figure 1 Appendix A. The EPL site is approximately 22 ha in size. The EPEA is land identified by Penrith City Council in the 1990s as suitable industrial land and is currently being developed for industrial purposes. The EPEA land is bounded by the Sydney Water pipeline and rural properties to the south, Mamre Road to the west, Erskine Park to the north and Ropes Ck to the east.

The land known as the EPEA was previously zoned Rural 1(a) under Interim Development Order No 93 – Penrith. The site is currently zones as the Erskine Park Employment Lands as part of the Western Sydney Employment Area by the NSW Government.

2.2 Site History

The initial land use of the area was agricultural with settlement occurring from the early 1880s. Quarrying began in 1925 on a prominent hill formed by a volcanic neck. This hill was RL 87 m in height and was quarried until 1994, extracting volcanic breccia as well as some clays and shales. Approximately 2.04 Million tonnes (Mt) of resources were available in the hill and another 3.57 Mt were available as quarrying continued to 30 m below the nearby creek level.

During the majority of the quarrying era, the neighbouring areas were zoned agricultural use, however urban development has taken place in the Erskine Park area all around the EPL.

2.3 Current Development

The landfill operates under a development consent issued by Penrith Council:

- DA No 163/92 on 11 November 1992,
- DA05/1740 on 25 May 2006 (revised landform), and
- DA05/1740.01 (Modification to Approved Final Landform).

It receives non-putrescible waste currently at an average of 25,000 to 35,000 tonnes per month. Site access is off Mamre Road through the adjacent industrial area. Figure 2 shows the existing site layout.

The landfill is open from 7 am to 4 pm Monday to Friday for pre-authorised commercial contractors An office/weighbridge building is located on the access road with two weighbridges. There is a vehicle wheel wash facility. Other office and amenities buildings are located on the site.

Previous landfilling has been below the quarry rim and the overburden mounds which resulted from the previous quarrying activities. Filling is currently taking place above this level.

2.4 Climate

The general climate of the Penrith area is warm-subtropical with a summer-autumn rainfall peak. The region experiences a dry winter and spring with rainfall becoming unreliable in late winter / early spring. The average monthly summer temperature is 28 °C and the average monthly winter temperature is 4.5 °C. The average monthly summer rainfall is 64 mm and the average monthly winter rainfall is 13 mm while the average annual rainfall total is less than 850 mm.

2.5 Topography

The EPEA lands have an elevation of approximately 67 m AHD in the west to approximately 35 m AHD at Mamre Road. The landforms are gently undulating slopes rising in an easterly direction. Slopes that surround the quarry, not including the batters, are between 7% and 13% with the majority of the slopes at the site being less than 5%.

The original hill in the Erskine Park Landfill site was approximately 500 m long and between 200 – 300 m in width rising to about 50 m above the nearby creek line with steep southern and western slopes and gentle northern and eastern slopes (Mitchell McCotter, 1992).

This landform was subsequently quarried with the quarry excavated to approximately 100 m deep, from the quarry rim height in 1983, as the base of the quarry had recorded elevations of -40 m AHD. This topography has changed over subsequent years as the quarry filled up with landfill materials.

2.6 Local Hydrology

The two major drainage channels in the surrounding area are Ropes and South Creek. There are also numerous intermittent/ephemeral watercourses in the area around the EPL site. Two drainage lines drain the EPL site and these enter South Creek approximately 2.5 km downstream of the site. South Creek flows in a north direction to the west of Mamre Road and joins the Hawkesbury River at Windsor.

The area has a low flooding potential due to the site topography, the ephemeral flow regime of on-site creeks and the site location in the 'upper sub catchment' of South Creek.

Leachate that is produced by the landfill is currently pumped out and transferred to the leachate treatment plant prior to discharge to Sydney Water sewer. Stormwater / sediment control dams are located to the NE and SE of the landfill.

2.7 Geology and Soils

The EPEA is located near to the central part of the Sydney Basin where the geological sequence is part of the Wianamatta Group. Bringelly Shale is the uppermost formation of this Group and comprises the ground layer of the site. Various lithologies occur within Bringelly Shale with the most common being claystone, siltstone and sandstone. The quarried material of the landfill site was comprised of basalt and dolerite. Borehole depths of between 25 m and 60 m indicate alternating layers of claystone, siltstone and sandstone.

The soil landscape was identified as the Blacktown Unit which commonly forms on Wianamatta Group shales. Depending on topographic position within the study area, the soil depth of the site varies from shallow to moderately deep red, brown or yellow podzolic soils. There is a generally shallow topsoil of maximum depth of 30 – 50 cm and a texture contrast with depth. The soil is grey brown to dark brown in colour and includes hardsetting silt loams and clay loams. Subsoils occur to depths greater than 70 cm and are silty clays to medium clays, yellowish brown and exhibit an acid soil reaction trend. The high clay content and indurated particles contribute to very slow drainage conditions.

The Blacktown Unit soil landscape is limited by moderate reactivities, a highly plastic subsoil, low soil fertility and poor soil drainage. Clays are derived from in situ bedrock weathering.

2.8 Flora and Fauna

The vegetation communities of the lands of the EPEA are predominately Shale Plains Woodland (SPW) or Shale Hills Woodland (SHW). Both are listed sub communities of Cumberland Plain Woodland and are listed as critically endangered ecological communities (CEEC's) under the Biodiversity Conservation Act (BCA) 2016.

The drainage lines leaving the EPL also contain vegetation indicative of River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions. This community is also a listed endangered ecological community (EEC) under the BCA.

Flora species of the area include *Eucalyptus fibrosa*, *E. moluccana*, *E. tereticornis*, *Melaleuca decora*, *Pultenaea microphylla*, *Acacia decurrens*, *A. falcata*, *A. parramattensis*, *Burseria spinosaand Themeda australis*. The regionally significant species *Grevillea juniperina* and *Pultenaea microphylla* have been previously recorded near the landfill site. Weeds are also present on the site.

A freshwater wetland area appears to be present along the vegetated drainage line adjacent to Lenore Lane. It contains an open sedge land community of Tall Spike Rush *Eleocharis sphacelata* with *Juncus usitatus* growing around the edge of the wetland area. Kangaroo Grass and exotic pasture species dominate the slopes while *Grevillea juniperina* occurs in close proximity to the waterline. Associated wetland trees are Swamp Oak (*Casuarina glauca*) and Forest Red Gum (*E. tereticornis*). This system is heavily infested with *Juncas acutus*, an environmental weed with high tolerance to increased levels of salinity.

A number of fauna surveys have been conducted in the study area. Findings have included fauna that are consistent with urban bushland area such as the house mouse and various feral species including cats, dogs and foxes. The rare *Succinea macgillivarayi* has been previously recorded in the area as well as the endangered Cumberland Plain Land Snail *Meridolum corneovirens*. A search of the Department of the Environment and Energy (Cth) Protected Matters Search Tool shows that there are 5 listed threatened ecological communities, 35 listed threatened species and 15 listed migratory species that may be present in the area. Of these listed threatened species, eight are birds, two are fish, two are frogs, one is an insect and seven are mammals. So far the highest total of fauna species recorded in the area has been 112 species consisting of 74 avifauna, 20 mammal, 12 reptile and 6 amphibian species.

The majority of the EPEA lands and the EPL site are highly disturbed and have been assessed to have limited conservation value. However the forested and wetland areas were noted as having a conservation value as these habitats are limited in the Penrith area and have been incorporated, where possible, into the biodiversity corridors of the EPEA.

2.9 Heritage

An archaeological survey was undertaken in 1983 to determine the existence of aboriginal relics in the area surrounding the Erskine Park Landfill site. Two isolated finds and one open site of a sparse scatter of eight artefacts were located during the survey. The sites were assessed to have limited significance and have since been extensively disturbed due to the quarrying activities. The nature of quarrying effectively removed any potential evidence contained in the ground surface and there are no known heritage sites or archaeological deposits in the landfill area (HLA, 2004). The site is not known to be of historical significance and little evidence remains of the original settlement of the area.

Items of potential heritage significance were located in the surrounding area and included a stockyard and remnant fencing, farm dams, airstrip and building, model plane club and quarry workshop. These items were assessed to have little or no heritage significance (HLA, 2004).

3 Description of Proposed Development

This section provides a general description of the proposed development, as reported in the *Erskine Park Landfill EIS (2005),* the *Erskine Park Landfill Final Capping and Rehabilitation Landfill Closure Plan (SLR, 2017) and Technical Specification (SLR 2017).*

3.1 General

Cleanaway proposes to continue landfilling of the quarry site with non-putrescible waste and site rehabilitation to a post closure, pre- settlement height of 92m AHD. Landfilling rates will not change from current levels. This would require ongoing use of site facilities including the two existing sedimentation basins. A plan of the final landform and sediment basins is shown on Figure 3, Appendix A.

The final landform has been designed to take account of a number of considerations including:

- The visual prominence of the original landform relating to similar elevations to the south and east of the site;
- Creation of a single primary high point similar to the original landform;
- Side slopes of up to 1:4 gradients similar to the original landform and suitable for long-term stability and for final land use; and
- The need for positive surface drainage to minimise infiltration of water through the capping layer with variation of the side slopes to provide more defined drainage ways on the northern and southern slopes.

3.2 Landfill Capping System

It is proposed in the currently approved landform and in the proposed revised landform, that the capping system will be constructed in accordance with the *Solid Waste Landfill Environmental Guidelines (NSW EPA, 2016)*.

Generally, the capping system will consist of the following layers:

- A minimum 300mm-thick seal bearing layer, comprising of materials presently *in situ* in the landfill mound – maximum elevation at RL 92;
- A minimum 500mm-thick sealing layer, comprising clay from on-site sources – finish at RL 92.5;
- A minimum 900mm-thick revegetation infiltration layer, comprising Virgin Excavated Natural Material (VENM) and/or Excavated Natural Material (ENM) – maximum elevation at RL 93.4;
- A minimum 100mm-thick revegetation topsoil layer – maximum elevation at RL 93.5.

A gas drainage layer is excluded due to the provision of a landfill gas collection and treatment system.

Figure 4 Appendix A provides an indicative cross section of the restored EPL including soil layers and capping layers.

3.3 Surface Water

There are two existing storm water/sedimentation basins operating on the site. These are located in the north west and south east corners of the site. A surface water management plan is included in the Landfill Closure Plan (SLR, 2017).

4 Landscape Plan

The following information provides an assessment of the opportunities and constraints at the site in relation to landscaping and a detailed description of all activities required to implement the LP. The opportunities, constraints and activities were determined by GHD (2007) using field investigations and desk-top research of existing reports pertaining to the site, and current vegetation maps and restoration guidelines and liaison with DNR, DEC, GANSW, PCC and relevant landowners.

4.1 Site Opportunities and Constraints

The restoration of such a large area provides numerous opportunities and constraints. To ensure the success of the project it is important to identify these prior to developing a design or undertaking any works.

4.1.1 Opportunities

The opportunities that this project provides include:

- Restoring a large area of native vegetation/habitat;
- Providing valuable bird habitat through the mass installation of native shrubs;
- Linking with local habitat corridors;
- Improving aesthetics of the area;
- Converting two existing sediment ponds to act as ephemeral wetlands;
- Providing a passive recreation area for local residents;
- Utilising 'best practice' vegetation restoration techniques specified in DEC (2005);
- Integrating ecological function and engineering design to achieve balanced landscape outcomes; and
- Improving water quality leaving the development site and entering South Creek Catchment.

4.1.2 Constraints

Constraints to be considered during project design include:

- Highly modified/artificial site conditions;
- Shallow capping;
- Depleted natural seed source; and
- Maintenance requirements of the landscaped area.

4.2 Restoration Zones

EPL was divided into four distinct areas that require different vegetation management approaches. These areas are:

Zone 1 – This is the rim of the quarry. Planting on the rim will consist of SHW vegetation to link with the adjacent corridors.

Zone 2 – This is the 12.2 ha capping of the landfill. Due to the shallow capping, the LP for this zone will include a mixture of native shrubs and grasses only. All plants in this zone must have maximum root depth of 1 m.

Zone 3 – This zone consisted of a 4.6 hectare areas on the peak of the landfill capping. It was anticipated that this area be used for passive recreation and therefore recommended to be landscaped by lawn and native gardens. All plants in this zone must have maximum root depth of 1 m.

Zone 4 – This is the wet areas associated with the sediment basins. The landscaping in this area will consist of native wetland species.

Figures 3 and 4 in Appendix A indicate the location of the zones. A species list for each zone is provided in Appendix B, as is an indicative established density for each species. The established density is provided as an average for the total area as denser plantings in patches to represent the shrub layer in SHW.

4.3 Seed Collection

To allow sufficient lead-in time for the propagation of provenance species, seed collection should start as soon as possible. Due to the large volume of seed required for this project, Specialist seed collectors should be engaged to undertake this activity, including gaining licences from OEH, as required. For example, GANSW has an existing seed bank for the EPRA that they may be able to draw on to minimise delays and holds an existing licence for the biodiversity restoration works. Approval would require a letter from the Seed Collector to OEH outlining the additional works required under their collection program.

All seed collection, management, cleaning and storage should be in accordance with *Florabank Seed Collection Guidelines* (prepared by Greening Australia and now accepted as industry best practice). All plant material to be used throughout the project will be of local provenance, collected from within a 5 km radius of the site. The species collected should be consistent with those listed in Appendix B.

4.4 Plant Propagation

Plant propagation refers to the germination of collection seed and the 'growing on' of plants in enviro cells, hiko cells or forestry tubes. This activity should be managed by a suitably qualified and experienced native plant production nursery.

4.5 Site Preparation

4.5.1 Site Protection

Once the bulk earthworks are complete and to ensure the success of the LP, it will be necessary to control access into the area. Fencing of the biodiversity corridor boundary surrounding the EPL shall be consistent with the fence described in the *Biodiversity Restoration Plan*. On-site fencing should be limited to temporary fencing to delineate landscaping zones. No machines should be allowed inside the landscaping zones other than for landscaping purposes and re-shaping areas of erosion or maintaining a free draining surface.

4.5.2 Erosion control

At the completion of earthworks, appropriate sediment control fencing will be installed as necessary and maintained throughout the duration of the program. Installation will be in accordance with Landfill Closure Plan (SLR, 2017) and/or technical specifications issued for construction purposes. Areas of high erosion potential may require the installation of jute matting or 'Wetland' mats. The remaining areas should be sprayed with an appropriate hydro mulch medium. The "mixture" will include a sterile cover crop, jute fibre and a mixture of pre-treated native seed. Experience has shown that using a mixture of native peas and Acacia's in the hydro mulch is an inexpensive way to establish native vegetation at difficult sites.

4.5.3 Litter Removal

All litter from the site should be removed prior to the commencement of landscaping works.

4.5.4 Weed Control

Being highly modified, the site is unlikely to contain significant weed seed loads at the completion of the bulk earthworks, other than those growing on existing batters. Inspection for and removal of any

noxious weeds prior to any landscaping works should be undertaken. All weed control activities are to be completed by a suitably qualified contractor.

Table 1 lists the noxious weeds identified on EPEA site while Appendix C provides a complete list of priority weeds found in the Penrith LGA. Control of these plants usually requires several treatments and is most effective during spring and summer.

Table 1 Noxious Weeds Found on Site

Botanic Name	Common Name	Duty*
Rubus fruticosus	Blackberry	Prohibition on dealings
Lycium ferocissimum	African boxthorn	Prohibition on dealings
Ageratina adenophora	Crofton weed	General biosecurity duty
Opuntia spp	Prickly pear	Prohibition on dealings

*Refer to NSW WeedWise for a full description of the duty for each weed and suggested control measures

GHD (2007) noted that of the above listed species, only blackberry has heavily infested the site with the remaining weeds have only scattered specimens represented across the site.

4.5.5 Installation of Drip Irrigation System

Before revegetation activities commence a drip irrigation system, e.g. T Tape, should be installed throughout Zones 1 and 2 (refer Figure 3) to assist in the watering of the landscaped areas. The system will be installed underground to provide an efficient method of watering (no loss through evaporation) for such a large area for up to three years. Installation of this system helps ensure survival targets are achieved as the contractor can adapt the watering regime to suit the climatic conditions.

4.6 Landscaping

To implement the LP, a combination of landscaping techniques should be employed in each of the zones to maximise the potential for good establishment of plants. Due to the different characteristics of each zone and the different type of vegetation to be established (as described in Section 4.2 and Appendix B), the landscaping techniques recommended for each zone are also different. The landscaping techniques to be used for each zone are summarised in Table 2 and described in more detail below.

Table 2 Landscaping Technique for Each Zone

Technique	Zone 1	Zone 2	Zone 3	Zone 4
Hydromulch	X	X	X	
Tube stock	X	X		X
Native seed	X	X		X
Lawn seed			X	

4.6.1 Hydromulch

Hydromulch is the means by which mulch in the form of plant fibre can be placed onto topsoil using water as a carrier. Pre-treated native seed and fertiliser can be added to the mulch. Hydromulch encourages vegetation cover and provides protection against raindrop erosion. Initially, it is

recommended that blends of the appropriate pre-treated native seed mix be added to the mulch and spread across Zones 1, 2 and 3. It is recommended that 2-3 kg/ha of seed be added to the mulch.

4.6.2 Installation of Native Tube stock

Native tube stock will be used to landscape Zones 1, 2 and 3. The species to be used in each Zone are described in Section 4.2 and Appendix B. The recommended planting density for trees and shrubs for each zone is 1 per 2 m^2 and for groundcovers it is 1.5 per m^2.

Most plants will be planted as hiko or enviro cells. Each plant will have a recycled paper disc placed around its base and then bagged using a plastic tree guard, stabilised by three bamboo stakes. This is to prevent herbivory and weed competition and to encourage optimum growing conditions.

In general, autumn is the best season for planting to reduce stress on young plants from high temperatures or frost. Planting in early spring can be effective as long as a suitable watering regime is implemented; however has higher risk of lower survival rates. The larger area of Zones 1 and 2, can be planted using a mechanical planter, such as a Treeliner®, or by hand. Due to site conditions hand planting is the recommended planting method for Zone 4.

4.6.3 Hand Broadcasting of Native Seed

To supplement the establishment of native trees, shrubs and lower storey species in Zones 1, 2 and 4, native grass seed should be hand broadcast throughout the maintenance period of the landscaping program. This will add further diversity to the site, particularly ground covers. It is recommended that 2-3 kg/ha of seed be used.

4.6.4 Hand Broadcasting of Lawn Seed

Similar to above, to supplement the establishment of the lawn in Zone 3, lawn seed should be hand broadcast throughout the maintenance period of the landscaping program.

4.7 Maintenance Program

The completion of the landscaping will be considered the date of 'Practical Completion' for the landscaping works and will signal the commencement of the 36-month maintenance program. The completion of the 36-month maintenance program will be considered as 'Final Completion' for the landscaping works. The maintenance program will optimise plant establishment and weed control.

Activities will include watering, herbicide spraying, replacement planting and general maintenance. The aim of the maintenance program is to ensure a survival rate of 80-85% is achieved at Final Completion.

4.7.1 General Maintenance

Six general maintenance visits have been scheduled throughout the three - year maintenance period. These activities will include repairing and removing tree guards, monitoring survival and growth rates, installing replacement plants as required, weeding inside the tree guards and continued follow-up spot spraying.

4.7.2 Watering

All plants will be 'watered in' on installation, with each plant receiving a minimum five litres. All plantings have been scheduled to receive a further three applications of water during the first 6 weeks to assist establishment, depending on rain fall. Irrigation will be undertaken by drip or sprinkler irrigation or by hand watering, depending on the zone and resources available.

4.7.3 Weed Control

To ensure the success of the revegetation activities it is essential to control weeds. Weeds compete with the newly installed plants for nutrients and water thereby limiting their survival and growth rates.

In Zones 2 and 3, weed control will include the removal of any emergent tree species to minimise the potential for roots to penetrate the landfill capping.

Areas where landscaping activities are dominated by hand planting, spraying will be with suitable selective herbicides using "back packs".

The maintenance program includes nine scheduled visits targeting maintenance spraying. All spraying will be carried out by suitably trained contractors.

4.8 Monitoring and Reporting

In order to accurately evaluate the success of the landscaping works, the PCC *Landscaping DCP* require that a monitoring and evaluation program be put into place. The monitoring and reporting requirements are:

- An implementation report;
- A maintenance report; and
- A landscape report for Years 1 - 3.

All reports should be prepared by suitably qualified consultants.

4.8.1 Implementation Report

When the landscape works are completed, an Implementation Report is to be provided to Council. This will provide written certification that:

- The individual or company that completed the construction of the landscape component of the development, is listed on Council's Register of Approved Landscape Consultants and is able to construct that category of work;
- The landscape works have been implemented substantially in accordance with the approved plans. Minor variations to the approved plans, such as small changes in plant quantities, however are acceptable;
- The landscape works have been implemented in accordance with the Landscape DCP;
- The landscape works have been implemented in accordance with best practice industry standards; and
- A landscape maintenance program has been set.

4.8.2 Maintenance Report

Twelve months after the landscaping works have been complete, a Maintenance Report needs to be submitted to Council. This will provide written certification that the approved landscaping has been completed in accordance with the approved landscape plan and consent conditions.

The Maintenance Report should also state that all the work has been completed in accordance with all relevant Australian Standards and that all plants are healthy with no evidence of die-back, stress, disease or loss.

4.8.3 Three Year Landscape Report

Due to the large scale of this project, PCC may require a landscape report three years after the landscaping works have been complete. This report is to certify one of the following:

- Landscaping has matured and is in accordance with original landscape approval; or
- The landscaping has not matured in accordance with the original design philosophy and requires significant restoration. If this is the case restoration plans are to be submitted to Council for approval and implemented at the expense of the property owners.

5 Program of Works

It is envisaged that the site preparation works, which includes; installation of temporary fencing, seed collection and weed control will begin as soon as site conditions allow. This will be followed by the landscaping, maintenance and monitoring works described above. The Gantt chart in Appendix D provides a detailed program of works.

6 Costings

Approximate costs to complete the landscape plan are provided in Table 3. These costs are indicative only (+/- 40% at present value) and are providing for budgeting purposes and should not be used for any other purpose. Detailed costs will need to be requested prior to commencing works.

Table 3 Estimated Costs for Riparian Zone Revegetation Works

Tasks	Estimated Costs
Seed Collection	$42,350
Weed Control	$10,550
Hydro mulching	$149,250
Plant Propagation	$194,750
Drip Irrigation System	$100,300
Direct Seeding	$4,100
Revegetation	$797,400
Landscaping Zone 3	(To be determined)
Hand Broadcasting	$5,600
Maintenance	$237,800
Watering	$18,000
Project Management	$19,150
Monitoring and Reporting	$18,300
Total (ex GST)	**$1,597,500**

7 References and Recommended Reading

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Appendix A – Figures

ERSKINE PARK LANDFILL

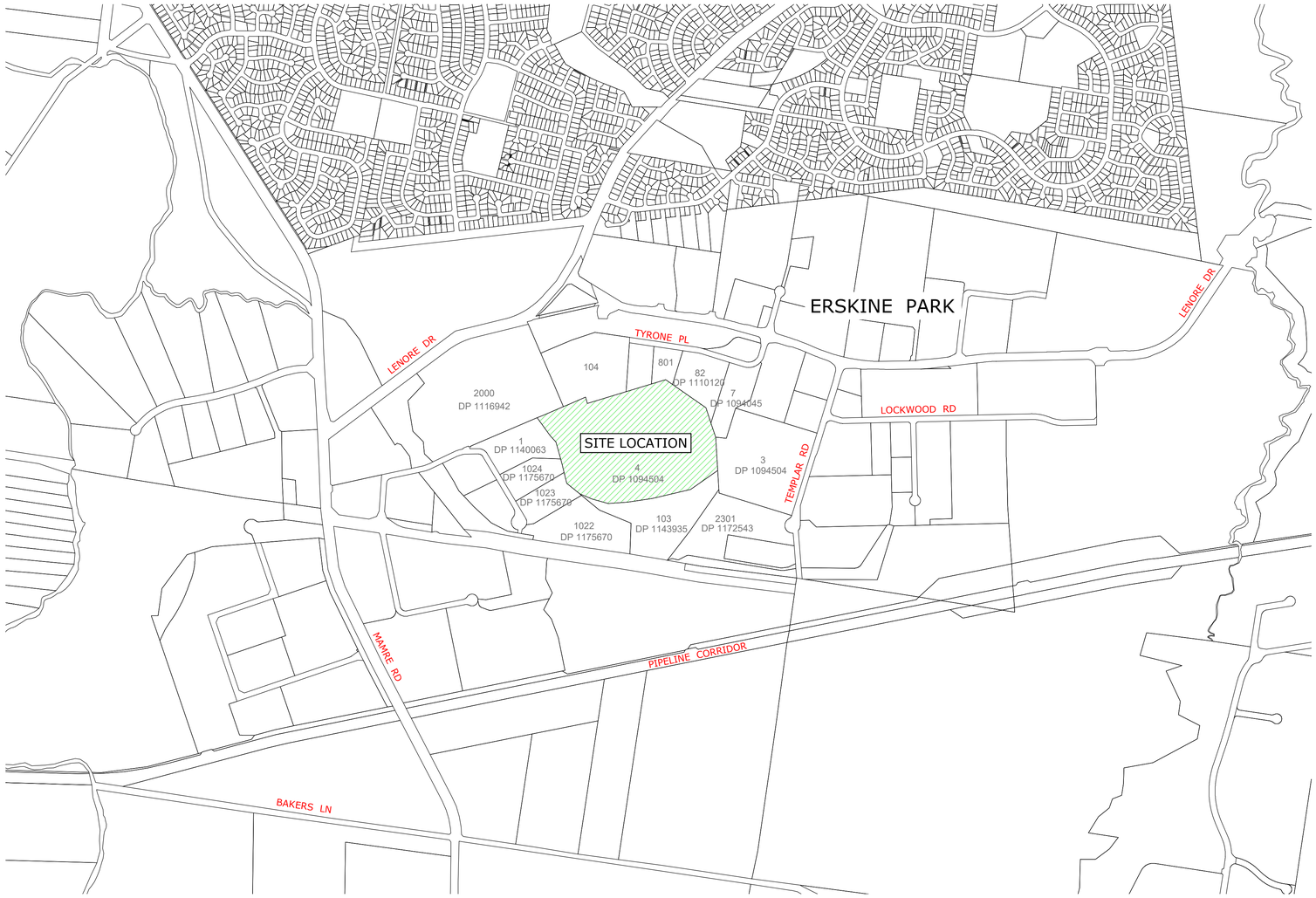

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FIGURE 1

CLEANAWAY SOLID WASTE

ERSKINE PARK LANDFILL
LOCATION PLAN

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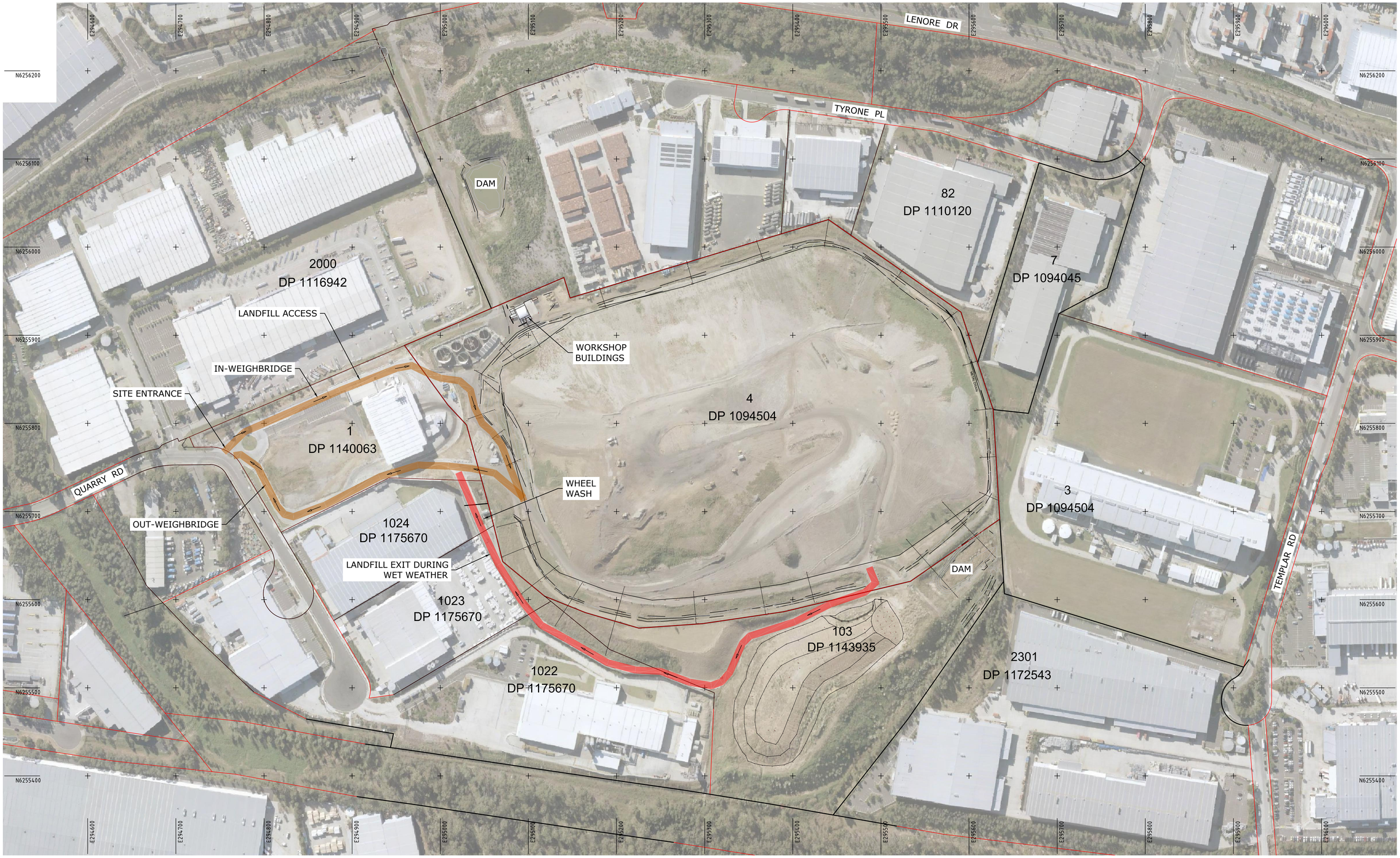

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FIGURE 2

CLEANAWAY SOLID WASTE

ERSKINE PARK LANDFILL
SITE LAYOUT PLAN

T:\2019\20192011 ERSKINE PARK LANDFILL - CLEANAWAY SOLID WASTE\4_WORKING\1 CAD\20192011_FIG2.DWG -FIG2- (12-18-19 3:15:30PM)

Landscape Activities

Restoration Zones

EPL was divided into four distinct areas that require different vegetation management approaches. These areas are:

Zone 1 - This is the rim of the quarry. Planting on the rim will consist of SHW vegetation to link with the adjacent corridors.

Zone 2 - This is the 12.2 ha capping of the landfill. Due to the shallow capping, the LP for this zone will include a mixture of native shrubs and grasses only. All plants in this zone must have maximum root depth of 1 m.

Zone 3 - This zone consisted of a 4.6 hectare areas on the peak of the landfill capping. It was anticipated that this area be used for passive recreation and therefore recommended to be landscaped by lawn and native gardens. All plants in this zone must have maximum root depth of 1 m.

Zone 4 - This is the wet areas associated with the sediment basins. The landscaping in this area will consist of native wetland species.

Figures 3 and 4 in Appendix A indicate the location of the zones. A species list for each zone is provided in Appendix B, as is an indicative established density for each species. The established density is provided as an average for the total area as denser plantings in patches to represent the shrub layer in SHW.

Seed Collection

To allow sufficient lead-in time for the propagation of provenance species, seed collection should start as soon as possible. Due to the large volume of seed required for this project, Specialist seed collectors should be engaged to undertake this activity, including gaining licences from OEH, as required. For example, GANSW has an existing seed bank for the EPRA that they may be able to draw on to minimise delays and holds an existing licence for the biodiversity restoration works. Approval would require a letter from the Seed Collector to OEH outlining the additional works required under their collection program.

All seed collection, management, cleaning and storage should be in accordance with Florabank Seed Collection Guidelines (prepared by Greening Australia and now accepted as industry best practice). All plant material to be used throughout the project will be of local provenance, collected from within a 5 km radius of the site. The species collected should be consistent with those listed in Appendix B.

Plant Propagation

Plant propagation refers to the germination of collection seed and the 'growing on' of plants in enviro cells, hiko cells or forestry tubes. This activity should be managed by a suitably qualified and experienced native plant production nursery.

Site Preparation

Site Protection

Once the bulk earthworks are complete and to ensure the success of the LP, it will be necessary to control access into the area. Fencing of the biodiversity corridor boundary surrounding the EPL shall be consistent with the fence described in the Biodiversity Restoration Plan. On-site fencing should be limited to temporary fencing to delineate landscaping zones. No machines should be allowed inside the landscaping zones other than for landscaping purposes and re-shaping areas of erosion or maintaining a free draining surface.

Erosion control

At the completion of earthworks, appropriate sediment control fencing will be installed as necessary and maintained throughout the duration of the program. Installation will be in accordance with Landfill Closure Plan (SLR, 2017) and/or technical specifications issued for construction purposes. Areas of high erosion potential may require the installation of jute matting or 'Wetland' mats. The remaining areas should be sprayed with an appropriate hydro mulch medium. The "mixture" will include a sterile cover crop, jute fibre and a mixture of pre-treated native seed. Experience has shown that using a mixture of native peas and Acacia's in the hydro mulch is an inexpensive way to establish native vegetation at difficult sites.

Litter Removal

All litter from the site should be removed prior to the commencement of landscaping works.

Weed Control

Being highly modified, the site is unlikely to contain significant weed seed loads at the completion of the bulk earthworks, other than those growing on existing batters. Inspection for and removal of any noxious weeds prior to any landscaping works should be undertaken. All weed control activities are to be completed by a suitably qualified contractor.

Table 1 lists the noxious weeds identified on EPEA site while Appendix C provides a complete list of priority weeds found in the Penrith LGA. Control of these plants usually requires several treatments and is most effective during spring and summer.

Table 1 Noxious Weeds Found on Site

Table 1 Noxious Weeds Found on Site

Botanic Name	Common Name	Duty*
Rubus fruticosus	Blackberry	Prohibition on dealings
Lycium ferocissimum	African boxthorn	Prohibition on dealings
Ageratina adenophora	Crofton weed	General biosecurity duty
Opuntia spp	Prickly pear	Prohibition on dealings

*Refer to NSW WeedWise for a full description of the duty for each weed and suggested control measures

GHD (2007) noted that of the above listed species, only blackberry has heavily infested the site with the remaining weeds have only scattered specimens represented across the site.

Installation of Drip Irrigation System

Before revegetation activities commence a drip irrigation system, e.g. T Tape, should be installed throughout Zones 1 and 2 (refer Figure 3) to assist in the watering of the landscaped areas. The system will be installed underground to provide an efficient method of watering (no loss through evaporation) for such a large area for up to three years. Installation of this system helps ensure survival targets are achieved as the contractor can adapt the watering regime to suit the climatic conditions.

Landscaping

To implement the LP, a combination of landscaping techniques should be employed in each of the zones to maximise the potential for good establishment of plants. Due to the different characteristics of each zone and the different type of vegetation to be established (as described in Section 4.2 and Appendix B), the landscaping techniques recommended for each zone are also different. The landscaping techniques to be used for each zone are summarised in Table 2 and described in more detail below.

Table 2 Landscaping Technique for Each Zone

Technique	Zone 1	Zone 2	Zone 3	Zone 4
Hydromulch	X	X	X	
Tube stock	X	X		X
Native seed	X	X		X
Lawn seed			X	

Hydromulch

Hydromulch is the means by which mulch in the form of plant fibre can be placed onto topsoil using water as a carrier. Pre-treated native seed and fertiliser can be added to the mulch. Hydromulch encourages vegetation cover and provides protection against raindrop erosion. Initially, it is recommended that blends of the appropriate pre-treated native seed mix be added to the mulch and spread across Zones 1, 2 and 3. It is recommended that 2-3 kg/ha of seed be added to the mulch.

Installation of Native Tube stock

Native tube stock will be used to landscape Zones 1, 2 and 3. The species to be used in each Zone are described in Section 4.2 and Appendix B. The recommended planting density for trees and shrubs for each zone is 1 per 2 m^2 and for groundcovers it is 1.5 per m^2.

Most plants will be planted as hiko or enviro cells. Each plant will have a recycled paper disc placed around its base and then bagged using a plastic tree guard, stabilised by three bamboo stakes. This is to prevent herbivory and weed competition and to encourage optimum growing conditions.

In general, autumn is the best season for planting to reduce stress on young plants from high temperatures or frost. Planting in early spring can be effective as long as a suitable watering regime is implemented; however has higher risk of lower survival rates. The larger area of Zones 1 and 2, can be planted using a mechanical planter, such as a Treeliner®, or by hand. Due to site conditions hand planting is the recommended planting method for Zone 4.

Hand Broadcasting of Native Seed

To supplement the establishment of native trees, shrubs and lower storey species in Zones 1, 2 and 4, native grass seed should be hand broadcast throughout the maintenance period of the landscaping program. This will add further diversity to the site, particularly ground covers. It is recommended that 2-3 kg/ha of seed be used.

Hand Broadcasting of Lawn Seed

Similar to above, to supplement the establishment of the lawn in Zone 3, lawn seed should be hand broadcast throughout the maintenance period of the landscaping program.

Maintenance Program

The completion of the landscaping will be considered the date of 'Practical Completion' for the landscaping works and will signal the commencement of the 36-month maintenance program. The completion of the 36-month maintenance program will be considered as 'Final Completion' for the landscaping works. The maintenance program will optimise plant establishment and weed control.

Activities will include watering, herbicide spraying, replacement planting and general maintenance. The aim of the maintenance program is to ensure a survival rate of 80-85% is achieved at Final Completion.

General Maintenance

Six general maintenance visits have been scheduled throughout the three - year maintenance period. These activities will include repairing and removing tree guards, monitoring survival and growth rates, installing replacement plants as required, weeding inside the tree guards and continued follow-up spot spraying.

Watering

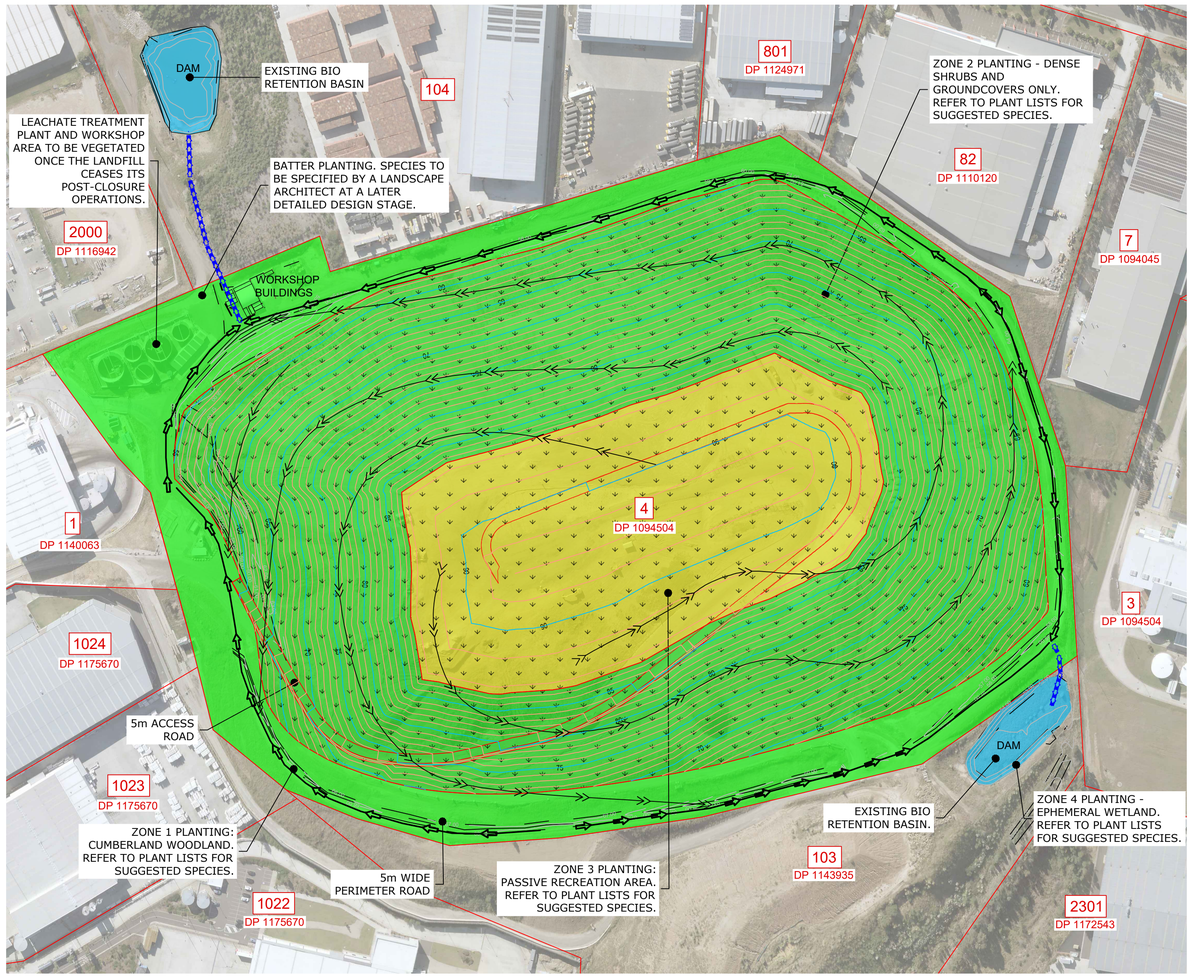
All plants will be 'watered in' on installation, with each plant receiving a minimum five litres. All plantings have been scheduled to receive a further three applications of water during the first 6 weeks to assist establishment, depending on rain fall. Irrigation will be undertaken by drip or sprinkler irrigation or by hand watering, depending on the zone and resources available.

Weed Control

To ensure the success of the revegetation activities it is essential to control weeds. Weeds compete with the newly installed plants for nutrients and water thereby limiting their survival and growth rates. In Zones 2 and 3, weed control will include the removal of any emergent tree species to minimise the potential for roots to penetrate the landfill capping.

Areas where landscaping activities are dominated by hand planting, spraying will be with suitable selective herbicides using "back packs".

The maintenance program includes nine scheduled visits targeting maintenance spraying. All spraying will be carried out by suitably trained contractors.



LEGEND

- ZONE 1 PLANTING: CUMBERLAND WOODLAND
- ZONE 2 PLANTING: DENSE SHRUBS AND GROUNDCOVERS ONLY
- ZONE 3 PLANTING: PASSIVE RECREATION AREA
- ZONE 4 PLANTING: EPHEMERAL WETLAND
- 82 DP 1110120 — LOT No. AND DP NUMBER
- LOT BOUNDARY
- 57.00 — EXISTING SURFACE CONTOUR
- 80 — DESIGN CONTOUR (MAJ 5.0m) (BY OTHERS)
- DESIGN CONTOUR (MIN 1.0m) (BY OTHERS)
- CONTOUR DRAIN
- PERIMETER SWALE
- CULVERT

Zone 1 & 2 Planting Species

Scientific Name	Common Name	Density
Canopy		
Angophora floribunda	Rough-barked apple	1 per 5m²
Eucalyptus amplifolia	Cabbage gum	1 per 10m²
Eucalyptus crebra	Narrow-leaved ironbark	1 per 10m²
Eucalyptus eugenioides	Thin-leaved stringybark	1 per 10m²
Eucalyptus tereticornis	Forest red gum	1 per 10m²
Middle storey		
Acacia decurrens	Sydney green wattle	1 per 2m²
Acacia falcata	Hickory wattle	1 per 2m²
Acacia elongata	Swamp wattle	1 per 2m²
Acacia parramattensis	Parramatta green wattle	1 per 2m²
Bursaria spinosa	Black thorn	1 per 2m²
Clematis glycinoides	Headache vine	1 per 2m²
Daviesia genistifolia	Broom bitter pea	1 per 2m²
Daviesia ulicifolia	Gorse bitter pea	1 per 2m²
Dillwynia sieberi		1 per 2m²
Melaleuca decora	White feather honey myrtle	1 per 2m²
Ozothamnus diosmifolium	Rice flower	1 per 2m²
Pultenaea microphylla	Bush pea	1 per 2m²
Ground Cover		
Aristida ramosa	Purple wiregrass	4 per m²
Arthropadium milleifolium	Pale vanilla lily	4 per m²
Brunoniella australis	Blue Trumpet	4 per m²
Chloris truncata	Windmill grass	4 per m²
Chloris ventricosa	Plump windmill grass	4 per m²
Chrysocephalum semipapaosum	Clustered everlasting	4 per m²
Commelina cyanea	Scurvy weed	4 per m²
Cymbopogon refractus	Barbed-wire grass	4 per m²
Dianella longifolia	Blue Flax lily	2 per m²
Dianella revoluta	Blue Flax lily	2 per m²
Dichelachne micrantha	Shorthair plume grass	4 per m²
Dichondra repens	Kidney weed	4 per m²
Echinopogon caespitosus var. caespitosus	Truffled hedgehog grass	4 per m²
Entolasia stricta	Wiry panic	4 per m²
Eremophila debilis	Winter apple	4 per m²
Glycine tabacina	Love creeper	4 per m²
Hardenbergia violacea	Hardenbergia	4 per m²
Hibbertia diffusa	Wedge guinea flower	4 per m²
Hypericum gramineum	Small St John's Wort	4 per m²
Imperata cylindrica	Blady grass	4 per m²
Lomandra filiformis	Wattle mat-rush	4 per m²
Lomandra longifolia	Spiny-headed mat-rush	2 per m²
Lomandra multiflora	Many-flowered mat-rush	2 per m²
Lotus australis	Australian trefoil	4 per m²
Microlaena stipoides var. stipoidea	Weeping Meadow grass	4 per m²
Oplismenus aemulus	Wavy beard grass	
Rytidosperma tenuius	Wallaby grass	4 per m²
Themeda triandra	Kangaroo grass	
Tricoryne elatior	Yellow autumn-lily	
Wahlenbergia gracilis	Native bluebell	4 per m²

Zone 3 Planting Species

Species Name	Common Name	Density
Shrubs		
Bursaria spinosa	Blackthorn	1 per 2m²
Daviesia ulicifolia	Gorse bitter pea	1 per 2m²
Dillwynia sieberi		1 per 2m²
Goodenia ovata	Hop goodenia	1 per 2m²
Grevillea spp.		1 per 2m²
Indigofera australis	Australia indigo	1 per 2m²
Ozothamnus diosmifolium	Rice flower	1 per 2m²
Pultenaea microphylla	Bush pea	1 per 2m²
Syzygium australe	Brush cherry	1 per 2m²
Groundcover		
Brunoniella australis	Blue trumpet	4 per m²
Cymbopogon refractus	Barbed-wire grass	4 per m²
Dianella longifolia	Blue Flax lily	2 per m²
Dianella revoluta	Blue Flax lily	2 per m²
Hardenbergia violacea	Hardenbergia	4 per m²
Lomandra longifolia	Spiny-headed mat-rush	2 per m²
Lomandra multiflora	Many-flowered mat-rush	2 per m²
Themeda triandra	Kangaroo grass	4 per m²
Wahlenbergia gracilis	Native bluebell	4 per m²
**Stenotaphrum secundatum*	"Palmetto' – Soft Leaf Buffalo grass	4 per m²

Zone 4 Wetland/Ephemeral Species

pecies Name	Common Name	Density
lisma plantago-aquatica	Water plantain	8 per m²
olboschoenus spp	Club-rush	8 per m²
arex appressa	Tall sedge	8 per m²
ycnogeton procerum	Water ribbons	8 per m²
leocharis sphacelata	Spike-sedge	8 per m²
uncus usitatus	common rush	8 per m²
udwigia peploides	Water primrose	8 per m²
tachaerina articulata	jointed twig-rush	8 per m²
arsilea hirsuta	Nardoo	8 per m²
aspalum distichum	water couch	8 per m²
ersicaria dicipiens	slender knotweed	8 per m²
hilydrum lanuginosum	Frogsmouth	8 per m²
hragmites australis	common reed	8 per m²
haenoplectiella mucronata	Bog Bullrush	8 per m²
haenoplectus validus	Great Bullrush	8 per m²

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FIGURE 3

CLEANAWAY SOLID WASTE

ERSKINE PARK LANDFILL
TOP OF CAP CONTOURS PLAN

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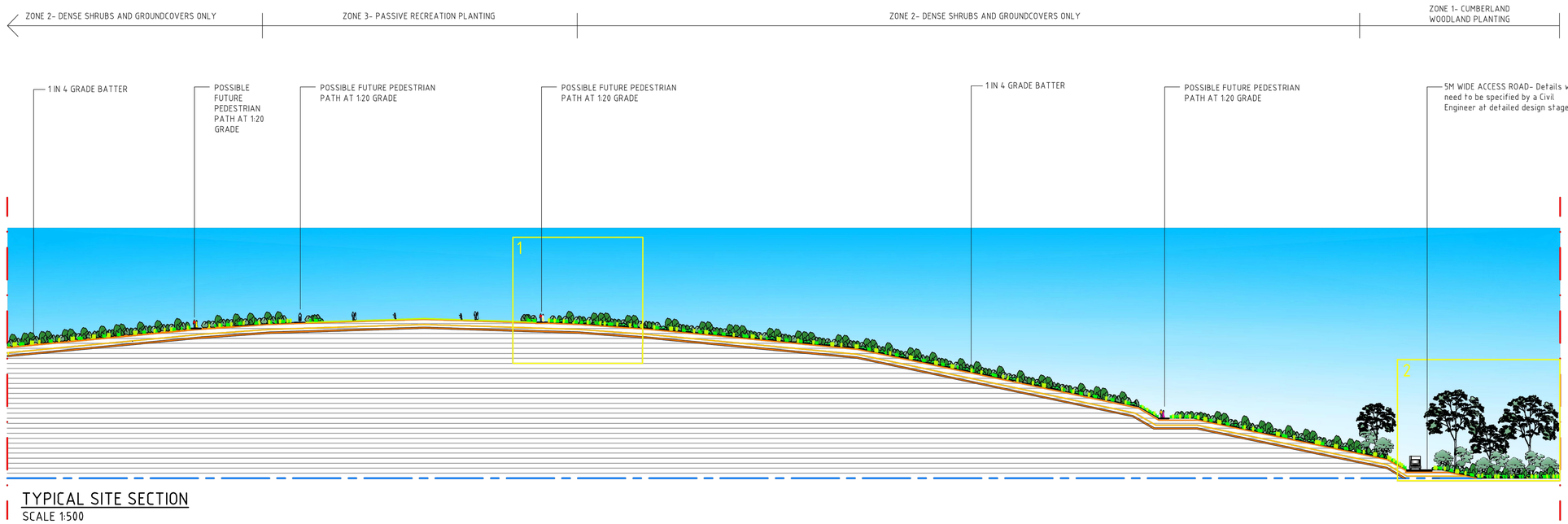
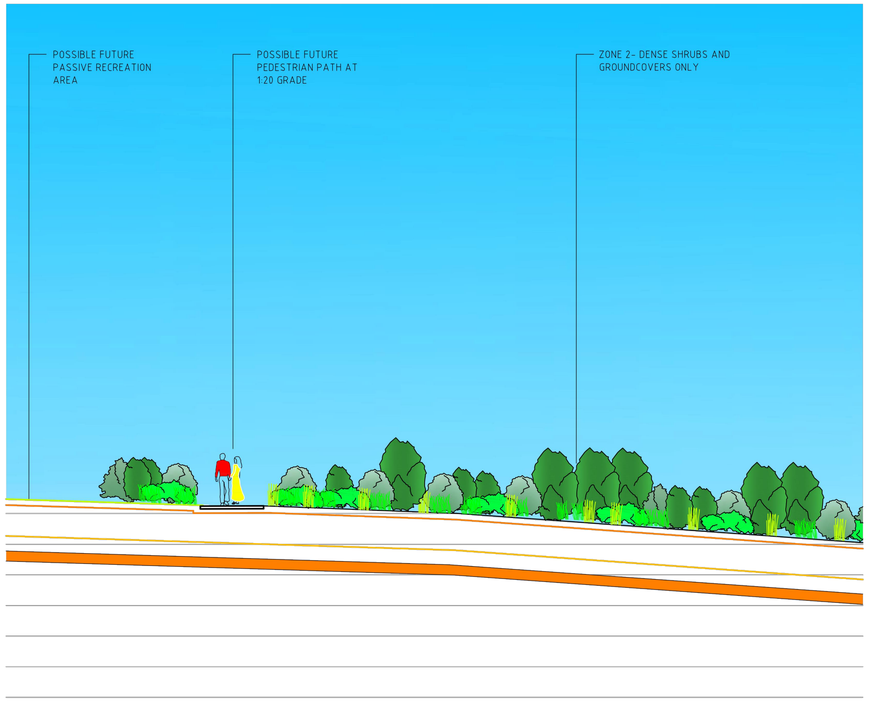


TYPICAL SITE SECTION
SCALE 1:500

LEGEND

- MIN 100mm THICK REVEGETATION TOPSOIL LAYER.
- MIN 900mm THICK REVEGETATION INFILTRATION LAYER
- MIN 500mm-THICK SEALING LAYER
- MIN 300mm THICK BEARING LAYER
- EXTENT OF TYPICAL SECTION
- PROPOSED LANDFILL CONTOURS
- ENLARGEMENT AREA



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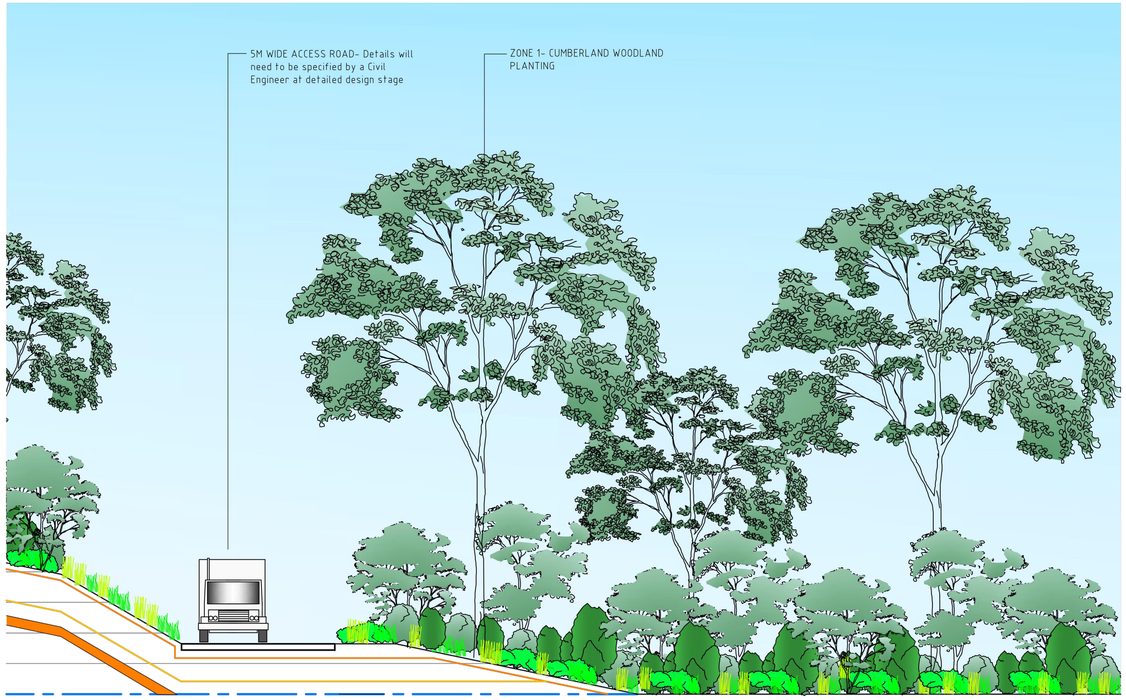

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FIGURE 4
CLEANAWAY SOLID WASTE
ERSKINE PARK LANDFILL
TYPICAL CROSS SECTIONS

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Appendix B – Species List

Table B1 Species List for Zones 1 and 2 (SPW and SHW)

Scientific Name	Common Name	Density
Canopy		
Angophora floribunda	Rough-barked apple	1 per 5m²
Eucalyptus amplifolia	Cabbage gum	1 per 10m²
Eucalyptus crebra	Narrow-leaved ironbark	1 per 10m²
Eucalyptus eugenioides	Thin-leaved stringybark	1 per 10m²
Eucalyptus tereticornis	Forest red gum	1 per 10m²
Middle storey		
Acacia decurrens	Sydney green wattle	1 per 2m²
Acacia falcata	Hickory wattle	1 per 2m²
Acacia elongata	Swamp wattle	1 per 2m²
Acacia parramattensis	Parramatta green wattle	1 per 2m²
Bursaria spinosa	Black thorn	1 per 2m²
Clematis glycinoides	Headache vine	1 per 2m²
Daviesia genistifolia	Broom bitter pea	1 per 2m²
Daviesia ulicifolia	Gorse bitter pea	1 per 2m²
Dillwynia sieberi		1 per 2m²
Melaleuca decora	White feather honey myrtle	1 per 2m²
Ozothamnus diosmifolium	Rice flower	1 per 2m²
Pultenaea microphylla	Bush pea	1 per 2m²
Ground Cover		
Aristida ramosa	Purple wiregrass	4 per m²
Arthropodium millefolium	Pale vanilla lily	4 per m²
Brunoniella australis	Blue Trumpet	4 per m²
Chloris truncata	Windmill grass	4 per m²
Chloris ventricosa	Plump windmill grass	4 per m²
Chrysocephalum semipapaosum	Clustered everlasting	4 per m²
Commelina cyanea	Scurvy weed	4 per m²
Cymbopogon refractus	Barbed-wire grass	4 per m²
Dianella longifolia	Blue Flax lily	2 per m²
Dianella revoluta	Blue Flax lily	2 per m²

Scientific Name	Common Name	Density
Dichelachne micrantha	Shorthair plume grass	4 per m²
Dichondra repens	Kidney weed	4 per m²
Echinopogon caespitosus var. caespitosus	Truffled hedgehog grass	4 per m²
Entolasia stricta	Wiry panic	4 per m²
Eremophila debilis	Winter apple	4 per m²
Glycine tabacina	Love creeper	4 per m²
Hardenbergia violacea	Hardenbergia	4 per m²
Hibbertia diffusa	Wedge guinea flower	4 per m²
Hypericum gramineum	Small St John's Wort	4 per m²
Imperata cylindrica	Blady grass	4 per m²
Lomandra filformis	Wattle mat-rush	4 per m²
Lomandra longifolia	Spiny-headed mat-rush	2 per m²
Lomandra multiflora	Many-flowered mat-rush	2 per m²
Lotus australis	Australian trefoil	4 per m²
Microlaena stipoides var. stipoidea	Weeping Meadow grass	4 per m²
Oplismenus aemulus	Wavy beard grass	
Rytidosperma tenuius	Wallaby grass	4 per m²
Themeda triandra	Kangaroo grass	
Tricoryne elatior	Yellow autumn-lily	
Wahlenbergia gracilis	Native bluebell	4 per m²

Note: Zone 1 includes the full structure of vegetation for planting. Zone 2 includes the use of ground cover and middle storey species only.

Table B2 Species List from Zone 3

Species Name	Common Name	Density
Shrubs		
Bursaria spinosa	Blackthorn	1 per 2m²
Daviesia ulicifolia	Gorse bitter pea	1 per 2m²
Dillwynia sieberi		1 per 2m²
Goodenia ovata	Hop goodenia	1 per 2m²
Grevillea spp.		1 per 2m²
Indigofera australis	Australia indigo	1 per 2m²
Ozothamnus diosmifolium	Rice flower	1 per 2m²
Pultenaea microphylla	Bush pea	1 per 2m²
Syzygium australe	Brush cherry	1 per 2m²
Groundcover		
Brunoniella australis	Blue trumpet	4 per m²
Cymbopogon refractus	Barbed-wire grass	4 per m²
Dianella longifolia	Blue Flax lily	2 per m²
Dianella revoluta	Blue Flax lily	2 per m²
Hardenbergia violacea	Hardenbergia	4 per m²
Lomandra longifolia	Spiny-headed mat-rush	2 per m²
Lomandra multiflora	Many-flowered mat-rush	2 per m²
Themeda triandra	Kangaroo grass	4 per m²
Wahlenbergia gracilis	Native bluebell	4 per m²
**Stenotaphrum secundatum*	"Palmetto' – Soft Leaf Buffalo grass	4 per m²

* introduced species

TableB3 Wetland/Ephemeral species for Zone 4

Species Name	Common Name	Density
Alisma plantago-aquatica	Water plantain	8 per m^2
Bolboschoenus spp	Club-rush	8 per m^2
Carex appressa	Tall sedge	8 per m^2
Cycnogeton procerum	Water ribbons	8 per m^2
Eleocharis sphacelata	Spike-sedge	8 per m^2

Species Name	Common Name	Density
Juncus usitatus	common rush	8 per m^2
Ludwigia peploides	Water primrose	8 per m^2
Machaerina articulata	jointed twig-rush	8 per m^2
Marsilea hirsuta	Nardoo	8 per m^2
Paspalum distichum	water couch	8 per m^2
Persicaria dicipiens	slender knotweed	8 per m^2
Philydrum lanuginosum	Frogsmouth	8 per m^2
Phragmites australis	common reed	8 per m^2
Schoenoplectiella mucronata	Bog Bullrush	8 per m^2
Schoenoplectus validus	Great Bullrush	8 per m^2

Appendix C – Priority weeds for the Penrith LGA

Priority Weeds

The following weeds are declared priority in the Greater Sydney area (including Penrith council area).

*Refer to NSW WeedWise for a full description of the duty for each weed and suggested control measures

Table C1 Priority Weeds in Greater Sydney Area

Scientific Name	Common Name	Duty*
All Plants		General Biosecurity Duty
Lycium ferocissimum	African boxthorn	Prohibition on dealings
Olea europaea subsp. cuspidata	African olive	Regional Recommended Measure
Alternanthera philoxeroides	Alligator weed	Prohibition on dealings
Alternanthera philoxeroides	Alligator weed	Biosecurity Zone
Alternanthera philoxeroides	Alligator weed	Regional Recommended Measure
Eichhornia azurea	Anchored water hyacinth	Prohibited Matter
Asparagus virgatus	Asparagus fern	Regional Recommended Measure
Tamarix aphylla	Athel pine	Prohibition on dealings
Jatropha gossypiifolia	Bellyache bush	Prohibition on dealings
Chrysanthemoides monilifera subsp. rotundata	Bitou bush	Prohibition on dealings
Chrysanthemoides monilifera subsp. rotundata	Bitou bush	Biosecurity Zone
Centaurea x moncktonii	Black knapweed	Prohibited Matter
Salix nigra	Black willow	Prohibition on dealings
Salix nigra	Black willow	Regional Recommended Measure
Salix nigra	Black willow	Regional Recommended Measure
Rubus fruticosus species aggregate	Blackberry	Prohibition on dealings
Chrysanthemoides monilifera subsp. monilifera	Boneseed	Prohibition on dealings
Chrysanthemoides monilifera subsp. monilifera	Boneseed	Control Order
Cylindropuntia fulgida var. mamillata	Boxing glove cactus	Prohibition on dealings
Asparagus asparagoides	Bridal creeper	Prohibition on dealings
Asparagus declinatus	Bridal veil creeper	Prohibited Matter
Orobanche species	Broomrapes	Prohibited Matter
Cabomba caroliniana	Cabomba	Prohibition on dealings
Cabomba caroliniana	Cabomba	Regional Recommended Measure

Scientific Name	Common Name	Duty*
Austrocylindropuntia cylindrica	Cane cactus	Prohibition on dealings
Genista monspessulana	Cape broom	Prohibition on dealings
Dolichandra unguis-cati	Cat's claw creeper	Prohibition on dealings
Dolichandra unguis-cati	Cat's claw creeper	Regional Recommended Measure
Nassella neesiana	Chilean needle grass	Prohibition on dealings
Persicaria chinensis	Chinese knotweed	Regional Recommended Measure
Asystasia gangetica subsp. micrantha	Chinese violet	Control Order
Asparagus africanus	Climbing asparagus	Prohibition on dealings
Asparagus africanus	Climbing asparagus	Regional Recommended Measure
Asparagus plumosus	Climbing asparagus fern	Prohibition on dealings
Opuntia stricta	Common pear	Prohibition on dealings
Hygrophila polysperma	East Indian hygrophila	Regional Recommended Measure
Myriophyllum spicatum	Eurasian water milfoil	Prohibited Matter
Senecio madagascariensis	Fireweed	Prohibition on dealings
Genista linifolia	Flax-leaf broom	Prohibition on dealings
Limnobium laevigatum	Frogbit	Prohibited Matter
Andropogon gayanus	Gamba grass	Prohibited Matter
Solanum chrysotrichum	Giant devil's fig	Regional Recommended Measure
Sporobolus pyramidalis	Giant rat's tail grass	Regional Recommended Measure
Arundo donax	Giant reed	Regional Recommended Measure
Gloriosa superba	Glory lily	Regional Recommended Measure
Ulex europaeus	Gorse	Prohibition on dealings
Ulex europaeus	Gorse	Regional Recommended Measure
Cestrum parqui	Green cestrum	Regional Recommended Measure
Salix cinerea	Grey sallow	Prohibition on dealings
Salix cinerea	Grey sallow	Regional Recommended Measure
Asparagus aethiopicus	Ground asparagus	Prohibition on dealings
Baccharis halimifolia	Groundsel bush	Regional Recommended Measure
Hieracium species	Hawkweeds	Prohibited Matter
Senecio glastifolius	Holly leaved senecio	Regional Recommended Measure
Equisetum species	Horsetails	Regional Recommended Measure

Scientific Name	Common Name	Duty*
Cylindropuntia pallida	Hudson pear	Prohibition on dealings
Hydrocotyle ranunculoides	Hydrocotyl	Prohibited Matter
Hygrophila costata	Hygrophila	Regional Recommended Measure
Hymenachne amplexicaulis and hybrids	Hymenachne	Prohibition on dealings
Hymenachne amplexicaulis and hybrids	Hymenachne	Regional Recommended Measure
Vachellia karroo	Karroo thorn	Prohibited Matter
Dovyalis caffra	Kei apple	Regional Recommended Measure
Heteranthera reniformis	Kidney-leaf mud plantain	Regional Recommended Measure
Bassia scoparia	Kochia	Prohibited Matter
Clidemia hirta	Koster's curse	Prohibited Matter
Pueraria lobata	Kudzu	Regional Recommended Measure
Lagarosiphon major	Lagarosiphon	Prohibited Matter
Lantana camara	Lantana	Prohibition on dealings
Pereskia aculeata	Leaf cactus	Regional Recommended Measure
Ludwigia peruviana	Ludwigia	Regional Recommended Measure
Anredera cordifolia	Madeira vine	Prohibition on dealings
Prosopis species	Mesquite	Prohibition on dealings
Nassella tenuissima	Mexican feather grass	Prohibited Matter
Miconia species	Miconia	Prohibited Matter
Mikania micrantha	Mikania vine	Prohibited Matter
Mimosa pigra	Mimosa	Prohibited Matter
Asparagus macowanii var. zuluensis	Ming asparagus fern	Regional Recommended Measure
Caesalpinia decapetala	Mysore thorn	Regional Recommended Measure
Carduus nutans subsp. nutans	Nodding thistle	Regional Recommended Measure
Cortaderia species	Pampas grass	Regional Recommended Measure
Parkinsonia aculeata	Parkinsonia	Prohibition on dealings
Parkinsonia aculeata	Parkinsonia	Control Order
Parthenium hysterophorus	Parthenium weed	Prohibited Matter
Parthenium hysterophorus	Parthenium weed	Prohibition on dealings
Annona glabra	Pond apple	Prohibited Matter
Vachellia nilotica	Prickly acacia	Prohibited Matter

Scientific Name	Common Name	Duty*
Austrocylindropuntia species	Prickly pears - Austrocylindropuntias	Prohibition on dealings
Cylindropuntia species	Prickly pears - Cylindropuntias	Prohibition on dealings
Opuntia species	Prickly pears - Opuntias	Prohibition on dealings
Cylindropuntia imbricata	Rope pear	Prohibition on dealings
Cryptostegia grandiflora	Rubber vine	Prohibited Matter
Sagittaria platyphylla	Sagittaria	Prohibition on dealings
Salvinia molesta	Salvinia	Prohibition on dealings
Salvinia molesta	Salvinia	Regional Recommended Measure
Cytisus scoparius subsp. scoparius	Scotch broom	Prohibition on dealings
Cytisus scoparius subsp. scoparius	Scotch broom	Regional Recommended Measure
Euphorbia paralias	Sea spurge	Regional Recommended Measure
Gymnocoronis spilanthoides	Senegal tea plant	Regional Recommended Measure
Nassella trichotoma	Serrated tussock	Prohibition on dealings
Nassella trichotoma	Serrated tussock	Regional Recommended Measure
Chromolaena odorata	Siam weed	Prohibited Matter
Limonium hyblaeum	Sicilian sea lavender	Regional Recommended Measure
Asparagus falcatus	Sicklethorn	Regional Recommended Measure
Solanum elaeagnifolium	Silverleaf nightshade	Prohibition on dealings
Sphagneticola trilobata	Singapore daisy	Regional Recommended Measure
Paederia foetida	Skunk vine	Regional Recommended Measure
Opuntia monacantha	Smooth tree pear	Prohibition on dealings
Asparagus scandens	Snakefeather	Prohibition on dealings
Spartium junceum	Spanish broom	Regional Recommended Measure
Limnobium spongia	Spongeplant	Prohibited Matter
Centaurea stoebe subsp. micranthos	Spotted knapweed	Prohibited Matter
Opuntia aurantiaca	Tiger pear	Prohibition on dealings
Opuntia aurantiaca	Tiger pear	Regional Recommended Measure
Solanum viarum	Tropical soda apple	Control Order
Opuntia tomentosa	Velvety tree pear	Prohibition on dealings
Trapa species	Water caltrop	Prohibited Matter

Scientific Name	Common Name	Duty*
Eichhornia crassipes	Water hyacinth	Prohibition on dealings
Eichhornia crassipes	Water hyacinth	Biosecurity Zone
Eichhornia crassipes	Water hyacinth	Regional Recommended Measure
Pistia stratiotes	Water lettuce	Regional Recommended Measure
Hydrocleys nymphoides	Water poppy	Regional Recommended Measure
Stratiotes aloides	Water soldier	Prohibited Matter
Heteranthera zosterifolia	Water star grass	Regional Recommended Measure
Rubus niveus	White blackberry	Regional Recommended Measure
Salix species	Willows	Prohibition on dealings
Striga species	Witchweeds	Prohibited Matter
Limnocharis flava	Yellow burrhead	Prohibited Matter

Appendix D – Program of Works Gantt Chart

Provided by Cleanway Waste Management