WOLLONGONG WASTE AND RESOUCE RECOVERY PARK

LANDSCAPE STRATEGY

SUMMARY REPORT

14 APRIL 2021

prepared for

Wollongong City Council

by

Corkery Consulting

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23.01.12	Issue A	Preliminary Draft	
28.02.12	Issue B	Final Draft	
07.03.12	Issue C	Final	
14.04.21	Issue D	Revised Final	

1.0 OBJECTIVES AND PRINCIPLES

The Landscape Strategy presented in this Report provides the basis for planning and design of the post-completion landscape at the Wollongong Waste and Resource Recovery Park (WWARRP). The Landscape Strategy will guide the transition from the operational stage of the new landfill to the post completion stage by addressing the recommendations of the Visual Impact Assessment carried out as part of the Environmental Assessment prepared by Golder Associates.

The Strategy aims to create a landscape that is both robust and visually compatible with the character of surrounding areas while requiring minimum maintenance once it is established. The Strategy takes account of the operational requirements of the Landfill, which includes staging of the landfill operations, slope stability, stormwater management, maintenance access and bushfire management.

The proposed plant species and planting structure will establish vegetation that forms a sustainable ecosystem similar to the adjoining areas of remnant vegetation providing wildlife habitat and contributing to the ecological values of the region.

The proposed landscape works will also add value to the site by creating potential public open space recreation opportunities following completion of the landfill operations and closure of the site.

2.0 KEY COMPONENTS

The Landscape Strategy incorporates the following Key Components:

- staging of the revegetation will aim to ensure the area of un-vegetated landfill slope is minimised by progressively establishing a vegetation cover on each section of slope as it is completed
- existing vegetation on the portions of site not required for landfill, particularly mature remnant trees, will be retained wherever possible to provide visual screening and contribute to the landscape character of the site
- vegetation to be established on the landfill slopes will include a mix of shrubs and small trees with areas of grass that will create a landscape character similar to adjoining rural areas
- the top of the new landform will be designed to ensure it is visually compatible with the surrounding topography
- views to the coast will be maintained from the potential lookout area on the landfill ridgeline as well as from properties upslope of the site
- screen planting with dense tall tree planting on natural ground will be used to block views to the site, particularly from adjoining residences
- biodiversity and habitat values will be maintained and increased where possible by planting a range of indigenous species
- the potential will be created for future public open space facilities such as a lookout and passive recreation areas with the final landform incorporating access roads to the lookout, with maintenance access tracks to other areas
- the visibility of drainage channels on the landfill slopes will be minimised by design options that could include the use of dark coloured stone and native grasses
- provision of a maintenance program that includes regular removal of identified weed species
- coordination of vegetation planting with bushfire management requirements that include access tracks and fuel management zones.

3.0 PLANT SELECTION

The selection of plant species to be used in implementing the Landscape Strategy has taken account of various considerations that include:

- visual and landscape character of surrounding areas
- growing conditions that include soils, aspect and drainage
- functional requirements that include visual screening, erosion control, weed management and minimising maintenance
- ecological and biodiversity values of the site and adjoining areas.

In selecting the plant species to be used in the various locations, the following planting types have been identified and are shown on the Landscape Strategy Plan:

Type 1 - Screen planting along site boundary

Type 2 - Tree planting on natural ground

Type 3 - Shrub and small tree planting on the landfill

Type 4 - Grass planting, both native and exotic, on landfill and including drainage channels where possible

In identifying the mix of species to be used in each Planting Type, reference has been made to the following documents:

- Whytes Gully New Landfill Cell Development Flora & Fauna Assessment Report, 2011: Section 3.1 Vegetation Communities and Appendix 1, Flora Studies Inventory by Biosis Research for Golder Associates
- Vegetation Management Plan, 2020 by Biosis addressing Approval Conditions 49 and 50 relating to vegetation and biodiversity management.

Existing remnant plant communities including Lowland Dry Subtropical Rainforest, Coastal Grassy Redgum Forest and Lowland Woolybutt-Melaleuca Forest occurring on the WWARRP site, are to be retained and protected where possible.

Planted vegetation is to be retained wherever possible, subject to the bushfire mitigation measures described in the Bushfire Report Section 5.0, which include:

- the canopies of retained trees are to be a minimum of 10m from any building
- planted trees are to have lower branches trimmed to a height of 2m above the ground.

The Bushfire Report recommends that fuel load formed by vegetation should not exceed 2t/ha.

4.0 PLANTING TYPES

The Landscape Strategy includes four recommended Planting Types that respond to different growing conditions and aim to achieve specific landscape objectives. Each of these Planting Types are described in terms of their objective and implementation requirements.

Type 1 - Screen planting along boundaries

The proposed planting along sections of the site boundary is intended to provide visual screening of the landfill operations from adjoining properties. To fulfil this function, the planting will need to be carried out in advance of the landfill operations. A minimum of 5 years growth will be required to provide the intended visual screening. Mixture of tall and small canopy trees combined with shrub understorey along the edges is proposed to provide visual screening and to form a closed canopy that will minimise the growth of weeds. Detailed design of the planting will need to take account of access roads, maintenance tracks and fuel load levels required for bushfire management.

Planting Type 1 – Planting along site boundary

Site preparation is to include cultivation to a minimum depth of 300mm to create suitable soil profile for tree root growth. Coarse wood chip mulch is to be applied to maintain soil moisture and reduce weed growth. Tree guards are to be installed to protect the plants from rabbits and other animals while providing an improved microclimate for the plant and protection from wind.

Type 2 - Tree planting on natural ground

The objective of this Planting Type is to provide additional visual screening to views of the landfill operations from public roads and areas adjoining the site. Trees are to be planted in informal clumps to create an appearance that is similar to the remnant clumps of trees occurring on the site and adjoining areas. Spacing between 1.5 and 3m centres is recommended, depending on species.

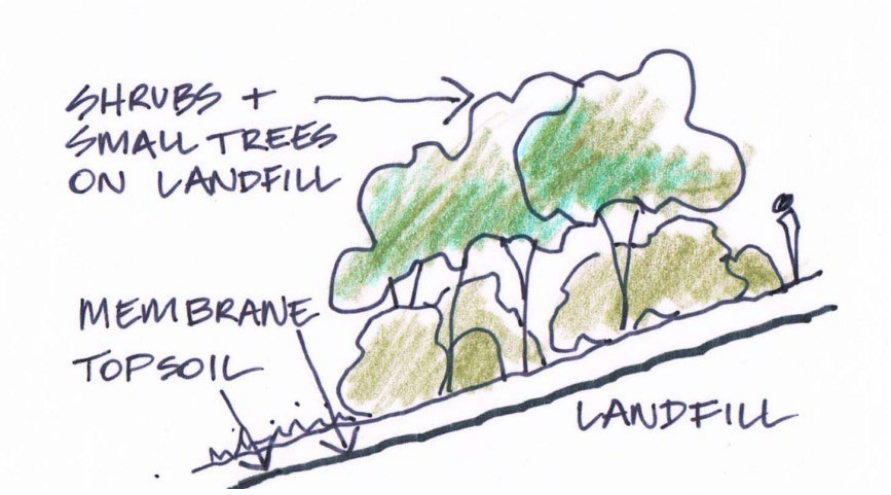
Planting Type 2 – Tree planting on natural ground

The locations identified for this Planting Type have natural soil profiles that generally provide good growing conditions. Ground preparation should include cultivation to a minimum of 300mm and removal of existing grass and weeds using a non-residual herbicide, taking all recommended safety precautions.

Trees to be planted should be supplied in 5 litre container sizes. Tree guards are to be installed to protect the plants from deer and other animals while providing an improved microclimate for the plant and protection from wind. Coarse wood chip mulch is to be placed over the soil surface to maintain soil moisture and reduce weed growth.

Type 3 – Shrubs and small trees on landfill

The objective of this Planting Type is to establish areas of vegetation consisting of shrubs and small trees to reduce the visual prominence of the landfill landform by creating a landscape character similar to adjoining rural land use areas. It will also create visual variation in the apparent height of the ridgeline that will be created by the proposed landfill operations.



Planting Type 3 – Planting on landfill

Requirements for ongoing maintenance will be reduced by establishing a continuous canopy cover that will suppress weed growth. The densely layered vegetation structure will resemble the ecosystems within the remnant vegetation adjoining the landfill, enhancing wildlife habitat and biodiversity.

The recommended species are suitable for the limited soil depth that will be provided on top of the impermeable membrane over the landfill cells. Planting of tube stock is recommended to allow plants to adapt to these growing conditions. Plant roots should be pruned in the nursery to encourage lateral root development prior to planting.

Dense planting in an informal layout will create a closed canopy relatively quickly to minimise weed growth and visually relate the new vegetation to existing vegetation adjoining the landfill.

A minimum depth of 1 metre will be required to allow adequate root growth to ensure plant survival during periods of low rainfall. If shallower soil depths are adopted the final vegetation height may be reduced and some of the trees and shrubs may die during prolonged dry periods unless irrigation is provided. The growing medium will need to contain adequate nutrients and organic matter for healthy plant growth. As soil to be used as the growing medium is likely to come from various sources there is likely to be significant variation from one area to another. Regular Soil Testing will therefore need to be carried out in a registered testing laboratory and recommended treatments implemented.

Site preparation is to include removal of existing grass and weeds using a non-residual herbicide and cultivation of the topsoil to a minimum depth of 300mm.

Coarse wood chip mulch is to be applied to the soil surface to minimise weed growth and associated maintenance requirements. On slopes 1:3 or flatter utilize logs where available from clearing works to lay across the slope for soil stabilisation and fauna habitat. On areas of slope are steeper than 1:3 apply 'Jute mesh' or similar surface protection to provide erosion control.

Type 4 - Grass planting on landfill

The objective of this Planting Type is to establish a grass cover on the final landfill slopes that is visually compatible with the landscape character of adjoining rural land use areas and requires minimum maintenance.

A combination of native grasses and pasture species is recommended. The pasture species are to be established on the side slopes of the landfill which are generally 1:4 gradients. Areas of native grass are proposed on the gentler slopes on top of the final landform of the landfill. Native grass species are also recommended for use along the drainage ways where moist growing conditions occur and soil-binding grasses are required.

Planting Type 4 – Grass planting on landfill

The grass cover is to be established progressively as each section of landfill is completed so that areas of slope are protected from soil erosion. In those areas where tree and shrub planting is proposed as the long term treatment in accordance with the Landscape Strategy the interim grass cover will need to be removed as part of the soil preparation for the planting works.

Soil depth of 800mm is recommended to allow the development of deep roots that will assist survival during periods of low rainfall. Soil depth of 500mm may be adequate but the vigour of grasses is likely to be reduced in drought periods due to the reduced soil volume and associated moisture provided by 500mm unless irrigation is adopted.The quality of soil used will need to be monitored to ensure adequate nutrients and organic matter content for healthy growth of the grass. Soil preparation should include cultivation to minimum depth of 150mm and removal of existing weeds using a non-residual herbicide applied at least two weeks before planting. Maintenance will include periodic slashing as required for bushfire management and spot spraying of weeds with a non-residual herbicide.

5.0 PLANTING PLANS

The Indicative Plant Schedule presented on the following pages lists recommended species to be used in each Planting Type. These species are to be used in preparing detailed Planting Plans that will be required for implementation of the Landscape Strategy. The Planting Plans will need to be coordinated with detailed layout of infrastructure elements including roads, tracks, surface drainage and landfill gas collection well heads. A Landscape Maintenance Schedule will also need to be prepared that is coordinated with the landfilling operations and Landfill Closure Plan.

INDICATIVE PLANT SCHEDULE - Whytes Gully Recovery Park

BOTANICAL NAME	COMMON NAME	Type 1 Screen Planting along Boundary	Type 2 Tree Planting on Natural Ground	Type 3 Shrub & Small Tree Planting on Landfill	Type 4 - Grass planting on landfill
Tall Canopy Trees					
Acacia melanoxylon	Black Wattle				
Acacia maidenii	Maidens Wattle				
Angophora floribunda	Rough-barked Apple				
Casuarina glauca	Swamp Oak				
Diploglottis australis	Native Tamarind				
Cryptocarya glaucescens	Jackwood				
Eucalyptus botryoides x saligna	Blue x botryoides Gum				
Eucalyptus bosistoana	Coast Grey Box				
Eucalyptus crebra	Narrow-leaved ironbark				
Eucalyptus eugenioides	Thin-leafed Stringybark				
Eucalyptus longifolia	Woolybutt				
Eucalyptus quadrangulata	White-topped Box				
Eucalyptus tereticornis	Forest Red Gum				
Ficus rubiginosa	Port Jackson Fig				
Syzygium australe	Brush Cherry				
Toona australis	Red Cedar				
Small Trees					
Acacia mearnsii	Black Wattle				
Acacia implexa	Hickory Wattle				
Acmena smithii	Lilly Pilly				
Alphitonia excelsa	Red Ash				
Backhousia myrtifolia	Grey Myrtle				
Brachychiton populneus	Kurrajong				
Cassine australis	Red-olive Plum				
Croton verreauxii	Green Native Cascarilla				
Diospyros australis	Black Plum				
Glochidion ferdinandi	Cheese Tree				
Melaleuca decora	Feather Honey Myrtle				
Melaleuca linariifolia	Snow in Summer				
Melaleuca stypheliodes	Prickly-leafed Tea Tree				
Notelaea venosa	Large-leaved Mock-olive				
Streblus brunonianus	Whalebone Tree				
Shrubs / Vines					
Acacia binervata	Two Veined Hickory				
Acacia falcata	Sickle Wattle				
Acacia longifolia	Sydney Golden Wattle				

BOTANICAL NAME	COMMON NAME	Type 1 Screen Planting along Boundary	Type 2 Tree Planting on Natural Ground	Type 3 Shrub & Small Tree Planting on Landfill	Type 4 - Grass planting on landfill
Breynia oblongifolia	Coffee Bush				
Clerodendrum tomentosum	Hairy Clerodendrum				
Commersonia fraseri	Brush Kurrajong				
Dodonaea viscosa	Common Hop Bush				
Bursaria spinosa	Blackthorn				
Hakea salicifolia	Willow-leafed Hakea				
Kunzea ambigua	Tick Bush				
Ozothamnus diosmifolius	Rice Flower				
Pandorea pandorana	Wonga Vine				
Pultenaea retusa	Notched Bush-pea				
Smilax australis	Sarsaparilla Vine				
Grasses Native (Dry Zones)					
Astrodanthonia monticola	Small-flower Wallaby Grass				
Dianella caerulea	Blue Flax Lily				
Imperata cylindrica	Blady Grass				
Lomandra longifolia	Spiny-headed Mat Rush				
Microlaena stipoides	Weeping grass				
Poa labillardieri	Tussock Grass				
Themeda australis	Kangaroo Grass				
Fimbristylis dichotoma	Common Fringe-sedge				
Grasses Native (Wet Zones)					
Carex appressa	Tall Sedge				
Carex longebrachiata	Drooping Sedge				
Cymbopogon refractus	Barbed Wire Grass				
Gahnia sieberiana	Red Fruited Saw Sedge				
Juncus continuus	Rush				
Lepidosperma laterale	Variable Sword Sedge				
Oplismenus imbecillis	Basket Grass				
Pasture Grasses/Groundcover					
Austrodanthonia richardsonii	Wallaby Grass				
Cynodon dactylon	Unhulled Couch				
Dichondra repens	Kidney Weed				
Microlaena stipoides	Weeping grass				
Themeda australis	Kangaroo Grass				
Cover Crop					
Echinocloa itilis (Sept-Mch) or Secale cereale (Apr-Aug)	Japanese Millet or Rye Corn				
Lolium multiflorum	Eclipse Rye				
Trifolium pratense	Red clover				

6.0 LANDSCAPE MAINTENANCE

The Landscape Strategy incorporates measures to minimise maintenance requirements that will decline as the new vegetation is established. However, there will be a need for some ongoing landscape maintenance to ensure it achieves the objectives of the Landscape Strategy and meets fire management requirements. The maintenance requirements have taken in to account the recommendations of Table 5 of the VMP: 5 February 2020 by Biosis where appropriate.

The main ongoing maintenance will involve weed management. The primary objective will be to minimise the introduction of weeds to the site and control those that currently occur.

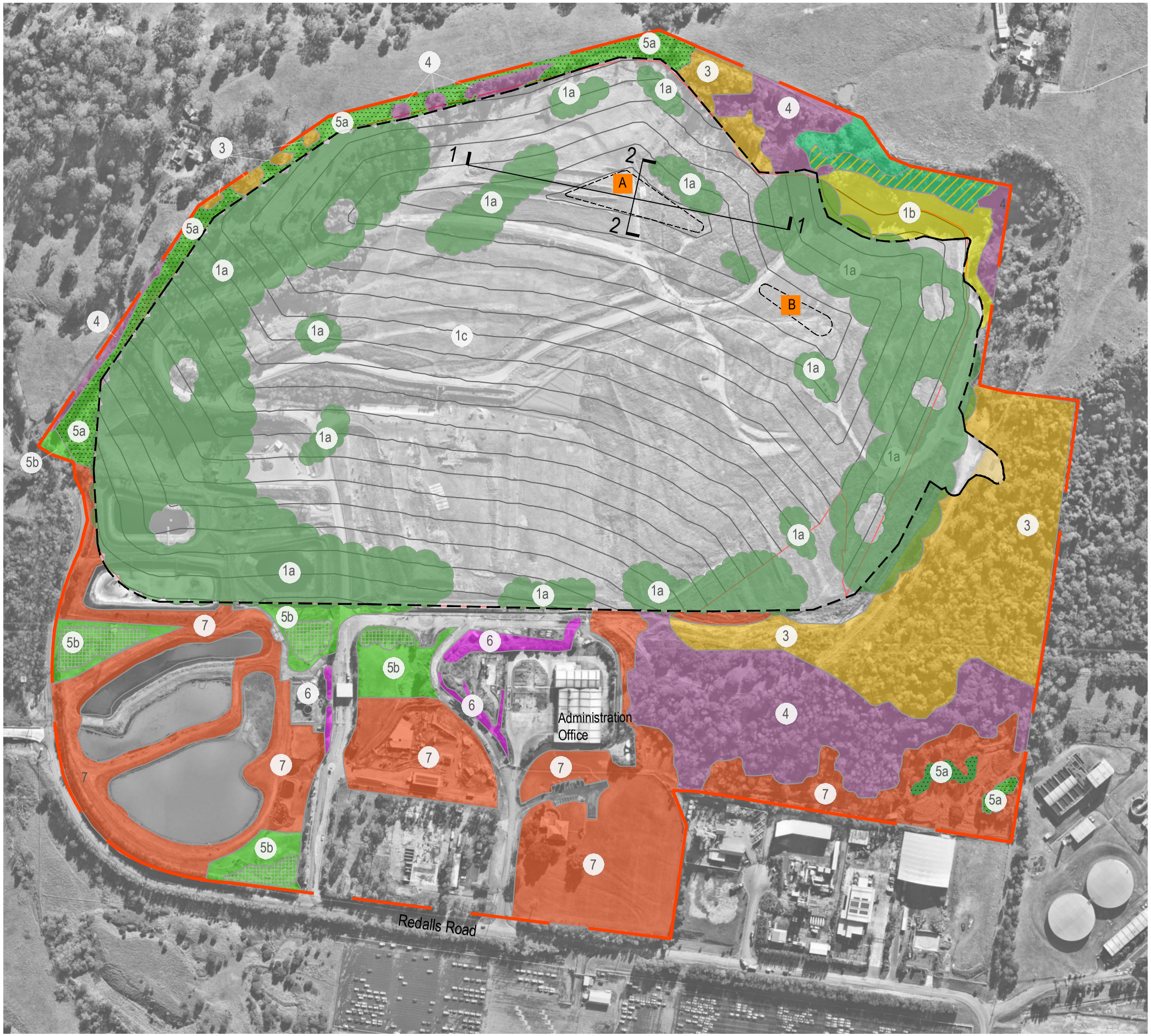
The following general recommended measures should be incorporated into Maintenance Schedules as part of Detailed Planting Plans:

- ensure plant stock as well as wood chip mulch are free of weeds
- carry out regular inspections of the site to identify the presence of weeds, including noxious weeds and implement appropriate control measures
- remove dead vegetation and replace failed plantings
- replace areas of failed grass sowing to ensure continual cover of vegetation over the landfill ground surface
- check and repair or replace tree guards if damaged or missing
- fertilise plants at start of the growing season
- prune trees and shrubs to meet bushfire mitigation requirements
- check for pests and diseases and implement control measures
- maintain an adequate depth of surface mulch
- slash and / or mow grasses to maintain a fuel load that does not exceed 2t/ha.
- implement a bush regeneration program in areas of retained native vegetation to enhance natural regeneration and control weeds
- monitor and report on all components of the maintenance program.

7.0 LANDSCAPE STRATEGY PLAN AND CROSS SECTIONS

The Landscape Strategy Plan presented on the following page incorporates the seven (7) Vegetation Management Zones identified in the Vegetation Management Plan prepared by Biosis in 2020. The Management Zones include areas of natural ground on which existing vegetation is to be retained and managed or planted. The Plan also covers landfill areas that are to be planted as part of the site remediation and Landfill Closure Plan.

Cross sections are also presented on a subsequent page to show the configuration of the landform and vegetation structure on top of the completed landfill. The Landscape Strategy Plan provides for a potential lookout and recreation area on top of the landfill after it is completed and revegetated. Final design of these facilities would be determined in the context of the post-closure use of the site.



LEGEND

- SITE BOUNDARY
- NEW LANDFILL BOUNDARY
- LOWLAND SUBTROPICAL RAINFOREST
- A — POTENTIAL LOOKOUT AREA
- B — POTENTIAL OPEN SPACE RECREATION AREA

MANAGEMENT ZONES

Landfill Areas

- Zone 1a - Proposed Tree Planting
- Zone 1b - Eastern Gully Stormwater Diversion
- Zone 1c - Proposed grass planting

Natural Ground

- Proposed Tree Planting
- Zone 2 - Retained Native Vegetation (moderate - good condition)
- Zone 3 - Retained Native Vegetation (poor condition)
- Zone 4 - Acacia Scrub / Exotic (outside of landfill area)

Proposed Revegetation Areas

- Zone 5a - Coastal Grassy Redgum Association
- Zone 5b - Lowland Woollybutt Association
- Zone 6 - Planted Vegetation
- Zone 7 - Closed Exotic Grassland
- Cross Sections

1:4000 @ A3

Project
Wollongong Waste and Resource Recovery Park

Client
Wollongong City Council

Drawing Title
Landscape Strategy Plan

Date
14 April 2021 Final

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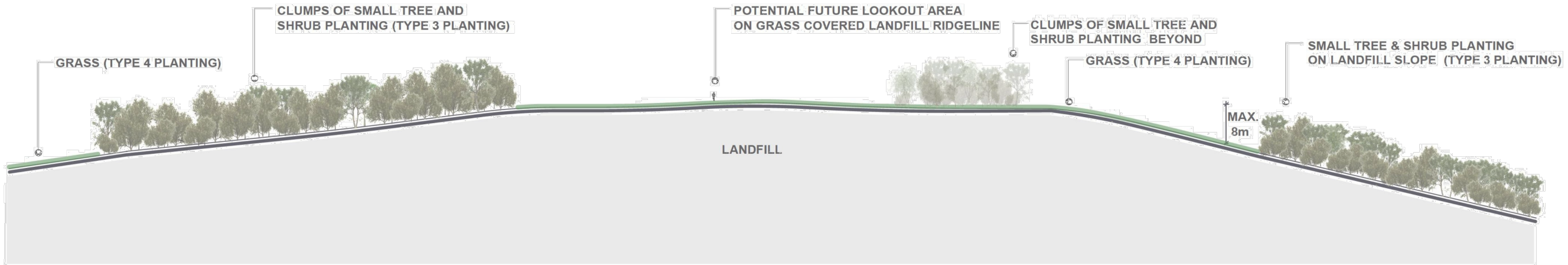

1 Section 1-1 Through Potential Lookout
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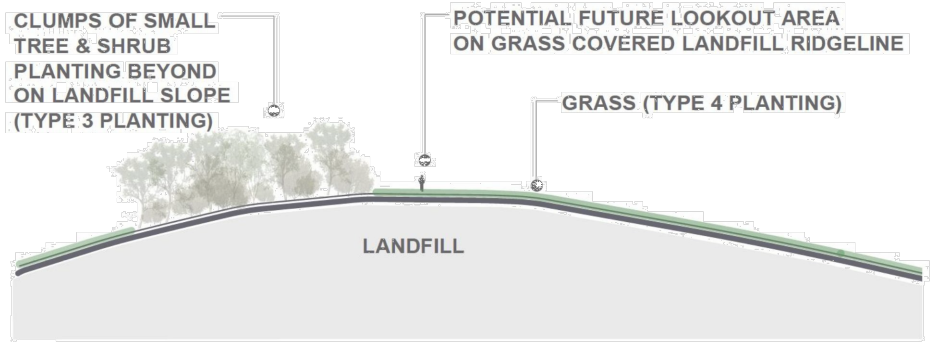

2 Section 2-2 Through Potential Lookout Area
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