APPENDIX D
LANDSCAPE REPORT

AREA No.2 LOCAL STRUCTURE PLAN

Latitude 32

LANDSCAPE REPORT

EMERGE ASSOCIATES

November 2011

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1.0 EXISTING LANDSCAPE CONDITIONS

1.1 Existing Site Landscape Context

The Area 2 Local Structure Plan (LSP) is situated on the western edge of the overall Latitude 32 Development Area, central to the overall project area.

It is bounded on the western side by Rockingham Road and the future Fremantle / Rockingham Highway Road reserve, beyond which lies the western chain of the Beeliar Regional Park. This chain, running adjacent to the site, extends from Rockingham Road through to the coast and consists of a number of depressions behind the coastal dune system. Within this area of the Beeliar Regional Park is Brownman Swamp, Lake Mt Brown and the local high point of Mt Brown (70m AHD).

A majority of the eastern side of the site is bounded by the existing rail line, beyond which is future industrial development area and part of the wider Latitude 32 site.

The southern side of the site is bounded by Rowley Road. At the northern extent of the site is a Resource Recovery site which is operated by the City of Cockburn, beyond which lies additional land that forms part of the Latitude 32 site.

1.2 Existing Site Topography and Landform

The existing landform within the LSP area has largely been modified and changed by development over many years. Generally, the site rises from the west to the east and then drops away again on the eastern side of the site near the rail line. The site though sloped, is largely flat and has been used for commercial applications such as market gardens and turf farms, as well as for residential housing.

At the northern end of the site, there has been significant disturbance to the site levels, where resource extraction and waste recovery areas are located and are in operation. There are large mounds of fill acting as bunds and stockpiles, creating artificial landforms through this area.

A combination of the existing resource extraction licences, resource recovery areas and site disturbances, cut and fill requirements across the site to link the fixed levels in the east and the west and the current site having no significant landform features has meant that there is no significant areas of landform to be retained as part of the development.

1.3 Existing Site Vegetation

As has previously been identified within the HVWRP Biodiversity Strategy (2007), the vegetation of the site has been subjected to long term degradation through weed invasion, altered watering regimes, fire and development. The Area 2 site has been largely used for residential land and market gardens, with some areas being used for turf farms. Currently there is also a resource recovery operation onsite. The result is that no examples of original vegetation communities have been identified within this site (HVWRP Biodiversity Strategy (2007) (Stratagen 2009).

While there are no examples of vegetation communities within the site that have been identified as worthy of retention, there are some individual trees that have been identified as being desirable to retain from an aesthetics point of view if possible. The location of these trees is limited to areas where the existing levels are unlikely to be required to be significantly altered and on land that is owned by either LandCorp of the City of Cockburn. Due to the nature of the site and the limited areas where existing vegetation remains, the number of trees that may be able to be retained is minimal. Located along the eastern boundary of the site, adjacent to the existing rail line a small number of trees have been identified as being suitable for retention, should the final levels of the area, lot layout and the health of the trees determine that this can occur. The retention is seen as being advantageous rather than a requirement to meet any conditions within the Biodiversity plan as the trees are not considered significant.

2.0 PROPOSED LANDSCAPE RESPONSE

2.1 Proposed Site Topography and Landform

With the site largely being flat with a moderate slope from east to west, there are no areas of significant landform within the LSP site that are considered significant enough for retention. Instead, the proposed topography of the site is largely driven by the requirements of the engineering infrastructure, drainage and the linking of existing levels of either side of the constrained site.

The proposed levels across the site will be graded to assist drainage to the three basins as well as provide suitable grades for access and infrastructure.

In detailed areas of the site, more significant batters and slopes may occur along roads and rail lines. General treatment to level changes and slopes, particularly in regard to resource area rehabilitation are covered in Section 6.

West of the site, Mt Brown at 70m AHD is a significant high point that is accessible by the public and offer views into the Area 2 site. A landmark in an otherwise relatively flat landscape, Mt Brown offers views looking east across the development site and looking west, has views across Cockburn Sound. The development of the site, including the industries, transport networks and processes that go on within it, will mean a dynamic site that will be continually changing. The Mt Brown vantage point will offer views for the public into the site from a distance that will allow the safe surveying of the ever changing site.

2.2 Proposed Site Vegetation

The use of predominately native vegetation is proposed for the LSP area, with species selection based on the existing vegetation communities that previously would have existed within the site. Within each of the landscape and streetscape typologies sections included in the report, a proposed species list has been included that meets the purpose of the landscape proposals while also responding to the site conditions. In some areas the use of non native trees are proposed. The presence of non native trees within the LSP area relate to the history and past uses of the site and is relevant to make reference to through the landscape design. The use of deciduous trees also assists with solar passive principles and are proposed where it may not be as suitable to plant natives.

The street tree species selection is largely WA native plants, part of the commitment made to using 90% WA native plants in all streetscapes in the Latitude 32 Sustainability Benchmarks (GHD, 2009). Within drainage corridors, this commitment is to use 90% locally endemic species except where they are on roads, where again, 90% WA native plants should be used.

One key principle, particularly important around the landscape areas proposed to treat storm water runoff is to ensure that selected plant species selected have low fertiliser requirements. This is further outlined in Section 4.3 of this report. This will assist in safeguarding the ground water from increased nutrient loads which is important in the protection of the ground water and wetland water quality and to meet objectives in the *HVWRP Water Management Strategy* (RPS, 2007)

3.0 LANDSCAPE DEVELOPMENT - OVERALL

3.1 Landscape Design Intent and Character

The design intent of the landscape development within the LSP site is proposed to encompass a number of ideals. These include the aim to be sustainable, site responsive, unobtrusive, responsible, low key, low maintenance, relaxed, robust and community and environmentally orientated.

The key intent of the design is to support the environmental and biodiversity objectives as outlined in Strategen's Environmental Review Report (2009) as well as add amenity to the industrial area. The landscape within the site will be required to provide different functions including promoting outdoor use by workers, forming an integral part of the storm water management system and creating a remnant of the vegetation communities that once existed throughout this area. The proposed landscape is also designed to be suited to the industrial nature of the site, while expressing its location through form, materials and construction.

3.2 Design Components

Softworks

The provision of landscape soft works is the strongest method of creating a landscape character and the various species palettes proposed for use throughout the LSP area reflect the requirement of the location and the site conditions. Softworks can also assist with the following;

- Clear definitions of the street hierarchy.
- Preference for locally native species to maximise waterwise principles as part of the sustainability objective.
- Create permanent shade in areas where desirable.
- Create seasonal colour and feature highlights in some high profile communal areas.
- Provide solar passive design benefits facilitating winter sun and summer shade in particular areas.
- Provide a stable and even coverage to slopes and grades where possible.
- Provide habitat benefits and opportunities to local fauna.

Elements within the softworks palette include;

- Planting

The planting species and character will build on and reinforce the species that existing around the site and would have likely existed onsite prior to development. The character of the landscape proposals will look to draw on elements of the site that would previously have been found within the area and are therefore likely to perform well in the site conditions. There may be some opportunity to collect seed and cuttings from the endemic species found around the site and to contract grow required stock.

The indicative plant schedules that have been provided as part of the landscape typologies have been complied for the landscape areas to provide an overall legibility and visual aesthetic to the site, in response to the former vegetation that once would have existed onsite, the local character of the site and the planning intent of the development.

- Turf

Turf is proposed to be utilised within the public open spaces in key areas only. It is not to be part of streetscapes. The reduced use of turf is to assist in limiting the landscape's dependence on fertilisers, watering and maintenance given the

high ground water table and associated environmental preservation issues particularly in regard to the surrounding wetlands and Cockburn Sound. Limiting turf will also assist in reducing the ongoing maintenance that will be required. Some areas of turf are proposed in key areas where it is considered a community asset due to recreational, surveillance or aesthetic purposes. The proposed location of the turf does not conflict with the design criteria of the *Water Management Strategy* (RPS 2007).

- Mulch

It is proposed that any existing vegetation that is removed from site is mulched and used as site mulch within the landscape areas.

Waterwise Design Principles

Site specific waterwise design criteria have been considered as part of the landscape design. No potable water is proposed for irrigation of landscape, however ground water resources will be used to irrigate areas where required for aesthetic, environmental and habitat benefit. The aim of following these principles is firstly to meet the objectives as outline section 9.0 Local Water Management Objectives and Methods with the *HVWRP Water Management Strategy* (RPS, 2007*)* and secondly to ensure that best practice water management outcomes are achieved throughout the site. By following the most current design principles, the Water Corporation's "Waterwise" logo may be included on the entry statement signage as a positive promotion of the design intent.

Waterwise design principles to be followed include the following;

- An overall bore strategy is to be undertaken at as part of the Precinct Groundwater Management Plan, including consultation with City of Cockburn, who will be responsible for long term asset management.
- The design of the landscape areas is proposed as a balance of hard stand, garden beds planted with waterwise plants and non irrigated areas with surface treatments such as mulch or gravel. Irrigated turf has been limited due to the high water requirements.
- The irrigation system must be designed, installed and operated using best practice water efficient design. This includes such items as the controller being able to irrigate different zones with different irrigation rates.
- Soil is to be improved with a soil conditioner certified to Australian Standard AS4454 to a minimum depth of 150 mm where lawn is to be planted and a minimum depth of 300 mm for garden beds
- Garden beds to be mulched to 75mm with a product certified to Australian Standard AS4454.

Fertiliser Use

Fertilisers are a major ground water pollution issue. They significantly increase nutrient levels in waterways which can lead to numerous environmental issues such as algal blooms and native vegetation suffocation. Due to the past uses of the land within the LSP area and the surrounding sites, Cockburn Sound has been detrimentally impacted with contaminants, particularly nitrogen, in the past (RPS, 2007). One of the key design considerations it to ensure that fertiliser use can be restricted and inappropriate levels of nutrient loading not being able to enter the groundwater system and leave the site.

Within the *HVWRP Water Management Strategy* (RPS, 2007), there are a series of Local Water Management Objectives. In response to these, there are a list of Design Criteria and Guidelines that incorporate the Environmental Objectives as listed in Section 7.2 of the *HVWRP Masterplan* (WALA, 2004) and the development requirements for water resource management as listed in Section 7.3.2 of the *HVWRP Masterplan* (WALA, 2004).

The Design Criteria and Guidelines for Irrigation and Fertiliser Use are;

- Minimise fertiliser use for landscape areas by reducing the extent of exotic vegetation cover and irrigated areas, including lawn (RPS, 2007).
- Determine fertiliser requirements to minimise nutrient applications – identify areas of site to be fertilised including quantity, duration, frequency and method of application.
- Use slow release fertilisers and low fertiliser requirement plants
- Control fertiliser applications and other point sources of nutrient application to soil to meet the local Planning Policy of Cockburn Sound target which recommends a maximum application of total nitrogen of 25kg/ha/annum, with total nitrogen concentrations in surface or groundwater not exceeding 4 mg/l, with a decreasing trend over time.
- Encourage the reuse of waste water and storm water for irrigation of landscaping, greenbelts, streetscapes, parks and sport / recreational facilities.
- Minimise water use for landscape areas by adopting landscape water conservation techniques.

Materials

The materials to be used in the landscape works have been chosen to be responsive to the environment into which they are being placed. Once a final assessment of the number and conditions of the trees to be removed is made, an assessment can be undertaken as to whether it is viable to harvest any timber to be used as part of the landscape works onsite, or whether the green waste will be mulched and used onsite in this form.

All landscape elements shall be constructed of materials that fulfil the following criteria wherever possible;

- Responsible
- Cost effectiveness
- Robust, solid and weather resistant
- Minimal ongoing maintenance requirements
- Reinforce the identified industrial and landscape character
- Vandal and graffiti resistant
- Locally available parts, suppliers and labour
- Safe in design and finish

Colour

Colour will be used in the LSP area in furniture, built form and within the planting palette. Colour selection is to reflect the hues and tones of the natural and built landscape (existing and proposed) and to assist with site legibility and reference.

Street Furniture

Street furniture including way-finding and signage, seating, bollards, rubbish bins, street lighting, bus shelters, picnic shelters etc will consist of separate elements which should all be related in terms of design, materials, colour and style. Particular attention to street furniture within the Activity Centre will ensure that the selected components are suitable to the site.

Design recommendations and materials

- Galvanised metal frame.
- Aluminium infill highlights.
- Miniorb or colourbond highlights.
- Visible structural fixings with a robust character.
- Heavy low walls to anchor major elements.
- Use of Latitude 32 logo to reinforce sense of place in key areas.

Site Legibility - Way finding and signage

Signage within the site is to consist of directional, location and interpretive signage. Signage plays a key role in developing a sense of arrival within the site as well as offering assistance with navigation, giving a sense of place and reflecting on the character of the site. Signage types will direct users to specific locations, place them within the site, impart education information about the site or provide the name of the precinct. While each sign type will perform a different function within the site and may be a different shape, all should have a common design style and colouration.

Design Recommendations and Materials

- Vertical in design where possible to minimise maintenance, allow access and be visible from a wider area.
- Galvanised metal frame structure.
- Include a heavy solid walled element to visually anchor the structure.
- Possible allowance of communal noticeboard facility in prime locations.
- Lighting to be incorporated, as backlit signs or located nearby.
- Colours may reflect individual precincts.
- Street signs to be fixed to street lights at approx 3m height with clasp fixings coloured to match street lights.
- Etched lettering and logos preferred.

Lighting

Lighting is to consist of a combination of security feature lighting and street lighting. Street lighting will be governed by traffic and sightlines and in accordance with recognised standards. Feature lighting may be used on landscape elements or specific locations such as within POS areas, at axis points or on high points that can be seen throughout the site. There may be opportunities to provide light within the activity node and within the drainage POS areas for both usage and security reasons as seen as being required and where overspill from streetlights is minimal.

Design recommendations and materials

- Simple robust detailing.
- Galvanised powder coated metal structure.
- Colour scheme in keeping with the overall area's theme.
- Locally available fixtures and parts.

- Sub surface fittings to minimise maintenance.
- Street signs to be fixed to street lights where possible.
- Use of solar power where feasible.
- Use of LED and low power options where possible.

Public Art

All art that is proposed for use in the LSP area shall be required to work with the surrounding industrial and natural landscapes and reinforce the character of the area. It is important that the artwork of the site celebrate both the natural landscape and the layers of the post industrial landscape

The key objectives of the public art are;

- Public art to reinforce the character of the precinct and mark the arrival and departure and assist with navigation
- To engender goodwill in the local community through its commissioning and design, with the art being responsive to the industrial nature of the site.

Design recommendations and materials

- All art pieces will be encouraged to be durable with low maintenance requirements
- Pieces will be of high quality representing artistic excellence
- The art will need to respond to the unique site conditions
- Procurement of art can be done through a number of options including competition, partnership with local community groups, local artists and state art bodies

4.0 LANDSCAPE DEVELOPMENT TYPOLOGIES

The Area 2 LSP will have landscape serving a range of purposes including amenity, ecology, drainage, legibility and sustainability. There are several landscape typologies that will be developed within the site to suit these requirements, each of which are detailed below.

The landscape areas will be irrigated where appropriate using bore water. The irrigation of all landscapes will be minimised wherever possible to conserve water and limited to key areas such as entry points, activity centres, high use zones and key usable open space areas. Unirrigated planting, rehabilitation areas and areas of gravel and other surface treatments that do not require irrigation are proposed to some streetscapes to minimise irrigation. All irrigation that is proposed is to use waterwise principles as outlined in Section 3.2 Design Components – Waterwise Design Principles.

The planting that is used will also need to be chosen to require low levels of fertilising to protect groundwater and wetlands from increased nutrient loading. This is outlined in Section 3.2 Design Components – Fertiliser Use.

4.1 Entry Feature

An entry feature will be located at the main arrival into the site from the future Fremantle / Rockingham Highway. Its purpose here is to announce arrival into the area and to reinforce the character of the precinct.

The entry feature also assists with way finding and orientation within the site, through both unique design and clear signage. Lighting is proposed to the signage to allow clear legibility at night, as the site is likely to be in use 24 hours a day. It is also proposed that the entry incorporate art that reflects that industrial nature of the site. The location of the proposed Entry Feature Node is shown on Figure 1.

The key entry feature will have a landscape treatment including high quality planting and water wise irrigation, to ensure high quality presentation at the 'front door' of the development area.

4.2 Activity Centres

The site contains an 'Activity Centre', a higher density urban commercial zone which provides a meeting place and community facility for people within the site to access. The area provides an opportunity to create a high quality, comfortable and useable outdoor space. The area will be largely hardscape, with seating and shade provided for people to gather, meet for lunch, sit down away from their workplaces and be outdoors. It is located on a high use intersection that site will be visible and easy to locate for people within the site.

The activity centre will provide a pedestrian orientated environment and include a range of amenities such as benches, rubbish bins, bike racks and shelter.

Planting within the activity zone will;

- Reinforce the significant nature of the communal location by providing strong colourful planting clusters. The planting can also assist with legibility of the spaces and ensuring they are identifiable to the passing vehicle or pedestrian.
- Provide both sunshine and shade with consideration given to passive solar principles allowing summer shade and winter sun where appropriate.
- Not impede pedestrian flow, safety or sightlines.
- Provide a suitable character to reinforce the development's market positioning and the local context.

4.3 Landscape Areas - Stormwater Treatment / Drainage

As there is no statutory requirement for allocation of land as public open space (POS) within an industrial area, the provision for open space in Area 2 is largely linked to multiple use opportunities. Within this site, the opportunity to provide an allocation of open space exists where that land is required to transfer, store and treat storm water that is captured within the site. The location of the three proposed areas for this is shown in Figure 1. These open space areas, as well as providing a drainage function, provide amenity for passive and unorganised active recreation and links to the cycle and pedestrian networks.

Stormwater management

The objectives and guidelines of the stormwater management for the areas have been prescribed and are outlined within the HVWRP Water Management Strategy (RPS, 2007) under section 9.4.

Some of the design criteria and guideline commitments that are directly relevant to the landscape treatment within the site and that are outlined in the water management strategy include the following items;

Roadside Stormwater Collection – Bioretention Swales

With the requirement to retain stormwater on-site the use of bio-retention swales will play an important role in streetscape designs. The placement of these swales will provide not only a viable drainage function but also a variety of ecological links and rehabilitation opportunities. It is the intent that planting within the bioretention swales is to predominantly consist of endemic species with a variety of tree, shrub, groundcover, reed and sedge species, with shrub planting on the banks to provide stabilisation and native reed and sedge planting along the base of the swale to enhance nutrient uptake.

Stormwater Storage – Bioretention Basins

The low lying nature of some areas of the site and the need to contain all stormwater on-site provides the opportunity to create a number of multiple use drainage areas within the POS's and Drainage Reserve.

The use of both bio-filtration and retention basins - a mixture of both dry basin drainage and low-lying seasonal damp areas, will enable larger areas of open space to remain dry during the winter months thereby increasing the amount of usable open space available. Drainage areas provided will be multi-use landscaped basins, serving a recreational and amenity function. The Basins within Neighbourhood POS areas will have turf to enable multiple use and ease of maintenance.

Drainage Area Management & Maintenance

The management & maintenance of the drainage basins and surrounds will be undertaken to enhance ecological processes and functions, enhance the "Degraded' vegetation values and protect these areas from current and potential future impacts arising from adjacent land uses. Within these areas, the management & maintenance measures should include:

- Retain all indigenous remnant vegetation where possible.
- Minimise significant earthworks (cut or fill) undertaken.
- Avoid the use of fertiliser and chemical applications within the wetland or buffer, or in areas adjacent to the wetland. An exception for the application of chemicals is the use of herbicides to control weed species.
- Implement the *LWMS for Area No.2 Lat 32* (RPS 2011) and subsequent Urban Water Management Plans.
- Revegetate using local endemic species, or native species appropriate to the soil and hydrological conditions.
- Soil testing for water retention and nutrients, to determine if further irrigation and/or nutrient application is required.
- Monitoring of revegetation areas and planted areas within open space areas.
- Replanting in both conservation and open space areas where necessary.
- Change to planting regime or design of garden beds depending upon initial success planting.
- Weed and pest control when necessary.

The implementation of the management measures will largely be accommodated at the subdivision and development stages, when civil construction and landscaping occur.

The possible recommended commercially available plant species suitable to these areas include:

BOTANICAL NAME	COMMON NAME	SIZE	ORIGIN
TREES			
Casuarina cunninghamiana	River Sheoak		Australia
Eucalyptus rudis	WA Flooded Gum		WA Native
Melaleuca lanceolata	Rottnest Island Tea Tree		WA Native
Melaleuca preissiana	Stout Paperbark		WA Native
Melaleuca rhaphiophylla	Swamp Paperbark		Endemic
SHRUBS			
Apium prostratum	Sea Celery	0.05-1(h) x 0.2-0.5(w)	Endemic
Halosarcia pergranulata	-	0.2-0.4(h) x 0.5-1(w)	Endemic
Lobelia alata	Angled Lobelia	0.05-0.5(h) x 1.5-2(w)	Endemic
Suaeda australis	Seablite	0.1-.09(h) x 0.2-0.5(w)	Endemic
Wilsonia backhousei	Narrow-Leaved Wilsonia	0.2-1(h)	Endemic
REEDS AND SEDGES			
Baumea articulata	Jointed Twig Rush		Endemic
Baumea juncea	Bare Twig Rush		Endemic
Gahnia trifida	Coast Saw-Sedge		Endemic
Isolepis cernua	-		Endemic
Isolepis nodosa	Knotted Clubrush		WA Native
Juncus kraussii	Sea Rush		Endemic
Juncus pallidus	Pale Rush		WA Native
Lepidosperma gladiatum	Coastal Sword Sedge		Endemic

Species to be confirmed after design has been undertaken and in coordination with the local authority.

4.4 Social/ Pedestrian / Cycle Links

Cycle and pedestrian networks will be co-ordinated across the design disciplines to ensure a well connected & legible hierarchy of pathways is developed.

Links to networks within Beeliar Regional park to provide connectivity into the wider context.

4.5 Lot Based Landscaping including Landscape Buffers

Developer incentives and community education will assist in the implementation of sustainable lot based landscaping. Landscaping to the verge areas in front of all lots will be undertaken at Subdivision Stage by the Developer to ensure a uniform and quality streetscape is achieved, with landowners being required to continue the reticulation and maintenance of these verge areas along with their own landscaped lot areas. Lot landscaping is to be developed through design guidelines .The main principles of the lot based landscaping will be;

- Existing vegetation onsite is to be maintained and preserved where ever possible. This included shrubs, individual trees and groups of trees.
- Use of locally indigenous plant stock
- All stormwater is to be detained and treated within the individual lots

- An emphasis is placed on developing landscape areas that have regard for water conservation (reduced water use). Native species, chosen from the list below, are well suited to local habitat conditions and should form the basis of landscape designs
- Proposed plantings must be appropriate to the circumstances of the site and should promote the character of the area. Plant species should not be introduced that have the potential to become a weed species.
- Landscape buffers are to be used to provide landscape and environmental amenity, limit or control views away from or into unsightly or sensitive areas and to accommodate level differences between areas. An early development of these buffers will assist in ensuring the success of these buffers allowing the buffers time to mature and perform their required function as soon as possible.

5.0 STREETSCAPE TYPOLOGIES

There are several road types proposed throughout the Area 2 site. Each of these streetscape typologies have their own scale and vegetation structure and are designed respond to the scale and use of the road network.

The proposed streetscape treatment also ensures consideration has been given to Planning Policy 1.3 Landscaping, which outlines the requirements of landscaping within the site including;

- Provide interest and contribute to the sense of place and the Redevelopment Area and the precincts within;
- Provide shade for pedestrian movement within the Redevelopment Area;
- Assist in breaking the extent of built form either side of streets, particularly in precincts where limited landscaping is expected to occur in the private domain due to anticipated use of land.

A list of plants to be used in each of the streetscape typologies is included below. The street tree species selection is largely WA native plants as there has been a commitment made to using 90% WA native plants in all streetscapes as part of the Latitude 32 Sustainability Benchmarks.

Road corridors in the Area 2 site will either be under the control of the local authority, City of Cockburn, Town of Kwinana or Main Roads Western Australia (MRWA). MRWA and City of Cockburn have separate policies guiding the planning and installation of vegetation to roadside verge areas at the design stage. The City of Cockburn considers projects on individual merits and streetscape design will need to be discussed with them at design stage.

MRWA policies on vegetation within its road reserves are set out in *MRWA Document No. 6707/022 Vegetation Placement within the Road Reserve* (2003).

5.1 Major Roads Surrounding the Development (outside of Area 2)

The Site is bounded on the west by Rockingham Road, which is proposed to be widened in the future. This road currently takes heavy haulage, commercial and domestic traffic and is proposed to be upgraded to take higher volumes of traffic.

The proposed road reserve area currently has some large stands of vegetation within the reserve; however these will be removed during the road widening. Additional planting that is proposed along this road after construction should be in keeping with the overall landscape themes of the Area 2 site.

5.2 Internal Distributor Road

The Area 2 LSP shows one major north-south link and one major east-west link.

The east west link commences at the future Rockingham / Fremantle Highway and runs into, across and out of the development site. This road will be highly visible and provide the major legible access link through the site.

The major north south link will provide access from the areas north of the site through the development site and south to Rowley Road and beyond.

Landscape planting will be very important along the reserves as a major component of green space within the development. The proposed soft planting will perform the following functions;

- Reinforce the significant nature of this road by creating a strong visual avenue
- Not impeding traffic flow, safety or sightlines
- Provide a suitable character to reinforce the development's positioning and the local area

- Provide treatment to storm water. Refer Section 4.3 Landscape Areas - Stormwater Treatment / Drainage

The landscape treatment to these verges will be subject to approval by City of Cockburn and the Town of Kwinana, who will be responsible for long term ongoing maintenance. The design of the landscape treatment will need to be agreed with them at detail design stage.

An indicative landscape treatment to these road reserves is shown in Figure 7.

5.3 Local Road / Local Distributor Roads (20m – 25m road reserve)

The site has roads designed to provide access to individual lots. While they are less significant in terms of the areas they are accessing, the roads are scaled to allow for use by large industrial vehicles, incorporating road reserves of between 20 - 25m,.

The landscape treatment of these road verges will be a reflection of the scale of the reserves as well as the lower level of significance that the roads have in terms of site legibility.

As such it is proposed that planting to these roads will perform the following functions;

- Be of a smaller pedestrian friendly scale where appropriate.
- Provide passive solar principles allowing summer shade and winter sun.
- Not impede traffic flow, safety or sightlines.
- Provide treatment to storm water.

5.4 Streetscape & POS Planting – Species List

To be updated after design has been undertaken

TREES			
Agonis flexuosa	WA Peppermint Tree		WA Native
Allocasuarina equisitifloia			WA Native
Callistemon 'Kings Park Special'			WA Native
Corymbia calophylla	Marri		WA Native
Eucalyptus gomphocephala	Tuart		Endemic
Eucalyptus ficifolia	Red Flowering Gum		WA Native
Eucalyptus decipiens			WA Native
Eucalyptus foecunda			WA Native
Jacaranda mimosifolia	Jacaranda		Exotic/Historical Significance
Melaleuca rhapiophylla	Swamp Paperbark		
Pyrus calleryanna	Callery Pear		-
Pyrus nivalis	Snow Pear		-
Sapium sebiferum	Chinese Tallow		-
FEATURE TREES			
Macrozamia riedlei	Zamia Palm		Endemic
Xanthorrhoea preissi	Grass Tree		Endemic
SHRUBS			
Acacia truncate		1.5-2.5m high	WA Native
Agonis flexuousa ' nana'		1.5-2.5m high	WA Native
Anigozanthus flavidus Red	Tall Red Kangaroo Paw	1.5-2m high	WA Native
Anigozanthus flavidus Yellow	Tall Yellow Kangaroo Paw	1.5-2m high	WA Native
Anigozanthus 'Bush Pearl'	Bush Pearl Kangaroo Paw	0.3-1m high	WA Native
Banksia nivea (syn Dryandra nivea)		0.5-1.5m high	WA Native
Beaufortia aestiva 'Summer Flame'		0.5-1.5m high	WA Native
Conostylis aculeata	Prickly Conostylis	0.06-.05m high	Endemic
Conostylis candicans	Grey Cottonheads	0.05-0.4m high	Endemic
Callistemon 'Endeavor'		1.5-2.5m high	-
Callistemon 'Great balls of Fire'		2.5m+ high	-
Calothamnus quadrifidus	One Sided Bottle Brush	1.5-2.5m high	WA Native
Callistemon 'Little John'		0.5-1.5m high	-
Centella asiatica		0.5-1.5m high	-
Dianella caerulea	Paroo Lily	0.2-1(h)x0.3-2.5(w)	-
Dianella revoluta	Flax lily	0.2-1(h)x0.3-2.5(w)	WA Native
Eremophila glabra		2.5m+ high	WA Native
Eremophilaglabra Kalbarri Carpet'		0.5-1.5m high	WA Native
Ficinia nodosa		0.5-1.5m high	WA Native
Grevillea "Carpet Crawl'		0.5-1.5m high	-
Grevillea 'Bronze Rambler'		0.5-1.5m high	-
Grevillea 'Sea Spray'		0.5-1.5m high	-
Grevillea ' Bon Fire'		1.5-2.5m high	-
Grevillea preissii	Spider Net Grevillea	1.5-2.5m high	WA Native
Grevillea 'Gin Gin Gem'	Gin Gin Gem	0.5-1.5m high	WA Native
Grevillea 'Superb'		2.5m+ high	-
Grevillea hookeriana		1.5-2.5m high	-
Hardenbergia comptoniana	Native Wisteria	0.5-1.5m high	WA Native
Hardenbergia 'Pink Spray'		0.5-1.5m high	WA Native
Hibbertia hypericoides	Yellow Buttercups	0.5-1.5m high	WA Native
Hibbertia racemosa	Stalked Guinea Flower	0.1-0.75m high	Endemic
Hibbertia cuneformis		1.5-2.5m high	WA Native
Lepidosperma gladiatum		0.5-1.5m high	WA Native
Melaleuca incana 'Nana'		0.5-1.5m high	WA Native

Melaleuca 'Little penta'		0.5-1.5m high	WA Native
Melaleuca huegelii	Chenille Honey Myrtle	1.5-2.5m high	WA Native
Melaleuca nesophila		2.5m+ high	WA Native
Melaleuca laterita		2.5m+ high	WA Native
Melaleuca lanceolata		2.5m+ high	WA Native
Olearia 'Little Smokie'		0.5-1.5m high	WA Native
Olearia axillaris		2.5m+ high	WA Native
Orthrosanthus laxus nana	Dwarf Morning Iris	0.2(h)x0.2(w)	WA Native
Patersonia occidentalis	Purple Flag	0.5-1(h)x0.3-0.4(w)	WA Native
Rhagodia baccata subsp. Baccata		0.5-1.5m high	WA Native
Rhodanthe chlorocephalavarrosea		0.5m high	WA Native
Rhodanthe chlorocephalavarsplendida		0.5m high	WA Native
Scaevola crassifolia 'Flat Fred'		0.5m high	WA Native
Scaevola nitida 'Sapphire Skies'	Sapphire Skies	1.5(h)x1.5(w)	WA Native
Scaevola albida 'Super Clusters'	Supper Clusters	0.3(h)x2(w)	WA Native
Scaevola anchusifolia		0.5-1.5m high	WA Native
Scaevola thesioides		0.5-1.5m high	WA Native
Scaevola 'Pink Perfection'		0.5-1.5m high	WA Native
Spyridium globosum		2.5m+ high	WA Native
Templetonia retusa	Cockies Tongue	2.5m+ high	WA Native
Thryptomene baeckeacea (prostrate)		0.5-1.5m high	WA Native
Trachymene coerulea		0.5-1.5m high	WA Native
Westringia fruiticosa prostrate		0.5-1.5m high	WA Native
Westringia dwarf 'Wild River'	Wild River	1(h)x1(w)	-

6.0 RESOURCE EXTRACTION LANDSCAPE REHABILITATION

Limestone and sand resource extraction will take place across a portion of the Latitude 32 site prior to these areas being utilised for industrial purposes. As past quarry activities in the area have shown, without a mandatory requirement for post quarry landscape rehabilitation, a number of quarries have been left without any rehabilitation works undertaken at the end of the quarry life. As such, it is important to ensure that all areas over which resource extraction occurs are rehabilitated where required to enable these quarry areas to become part of the Latitude 32 landscape and not a long term visual or safety issue.

In June 2004, URS produced a report, *HVWRP Quarry Landscape Draft Report*, outlining the issues and setting out a list of 10 draft development conditions that it recommended the Department for Planning and Infrastructure include on all quarry development approvals. These recommendations are a useful guide for the resource extraction industry and should continue to be part of the conditions of resource extraction within Latitude 32.

The report also recommends a Landform Restoration and Revegetation Plan is to be developed for the Hope Valley Wattleup Redevelopment Area. It has been previously established in the URS *HVWRP Quarry Landscape Draft Report* (2004) that all areas subjected to limestone extraction should also be the subject of post-operational rehabilitation to ensure the integration of the mining site into the surrounding landscape and the minimisation of any long term landscape visual impact on the surrounding areas. It is therefore necessary for all areas of limestone extraction to undergo landscape rehabilitation and that the ongoing rehabilitation is continued after the quarry operations have been completed and is maintained and monitored to ensure its ongoing success.

The proposed limestone extraction levels and proposed road levels have been assessed together to create an understanding and assessment of the final gradients that will be experienced across the site in different areas. While there are some areas of quarry extraction that are relatively small, it is important that all quarry owners are required to ensure that once mining is finished, their land undergoes rehabilitation. The areas that will require rehabilitation however are able to be limited to those that will remain as landscape buffer, such as those areas adjacent to roads which are to be part of the Latitude 32 transport network. A majority of areas will be utilised as industrial land and therefore will not require rehabilitation. The aim of the rehabilitation is try to ensure the post operative quarry landform that is to remain as part of the site, is rehabilitated in a way and to a standard that it becomes linked to and part of the surrounding Latitude 32 landscape and the greater surrounding landscape rather than remaining as a significant level change with little chance of integration of revegetation.

7.0 MAINTENANCE AND MANAGEMENT

The maintenance management element applies to all open space areas and is proposed to apply during the two-year developer maintenance period, however will also provide the basis for a review of maintenance requirements for the City during the scheduled handover, to assist in assessing and reducing the likely future maintenance costs.

Maintenance typically includes:

- Monitoring of revegetation areas and planted areas within open space areas.
- Replanting in both conservation and open space areas where necessary.
- Change to planting regime or design of garden beds depending upon initial success planting.
- Weed and pest control when necessary.
- Re-mulching of garden beds.
- Pruning of trees and shrubs, including the removal of hazardous limbs and diseased trees.
- Soil testing for water retention and nutrients, to determine if further irrigation and/or nutrient application is required.
- Mowing and re-seeding of turfed areas.
- Monitoring of irrigation and application of water, in line with measures outlined in Section 7.
- Repair and replacement of public art and furniture due to theft, vandalism and general wear and tear.

The maintenance minimisation review and asset management plan undertaken to support the handover of open space area maintenance will include:

- Review of all materials to ensure fitness for purpose and lifespan requirement.
- Review of the area of planting versus turf areas.
- Review of plant and turf species and their specific growth habits and requirements.
- Monitoring of groundwater quality and levels.
- Review of irrigation materials and standards.
- Implementation of sustainability and water wise principles to enable the reduction of ongoing costs through removal of some short term landscape establishment assets.
- Review of all structural design to ensure fitness for purpose and lifespan.

The implementation of the maintenance management regime will largely be accommodated following the establishment of the open space areas during subdivision, with most actions occurring as a part of the two-year developer maintenance period, and then continued under the on-going maintenance by the City of Cockburn.

8.0 REFERENCES

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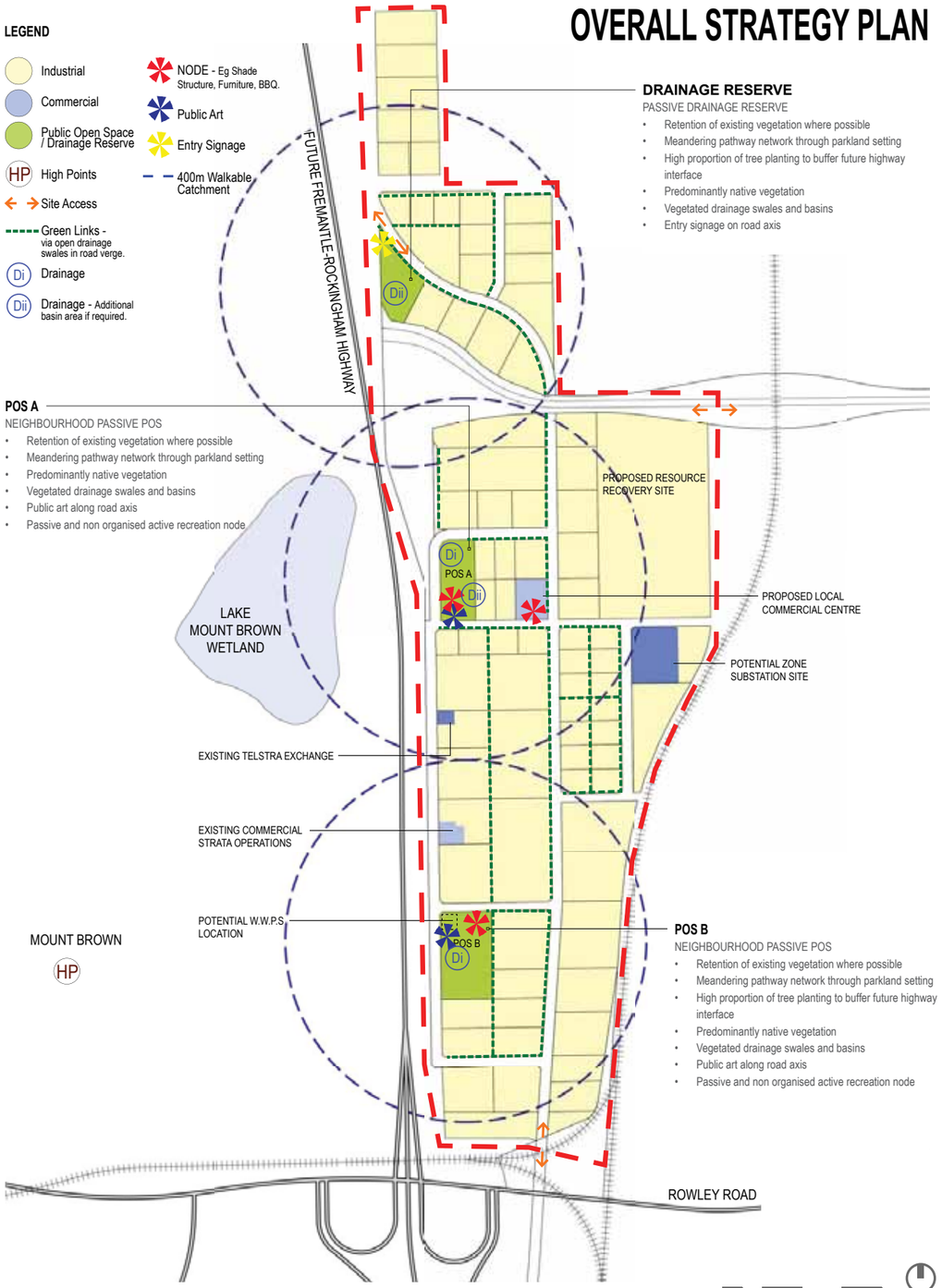
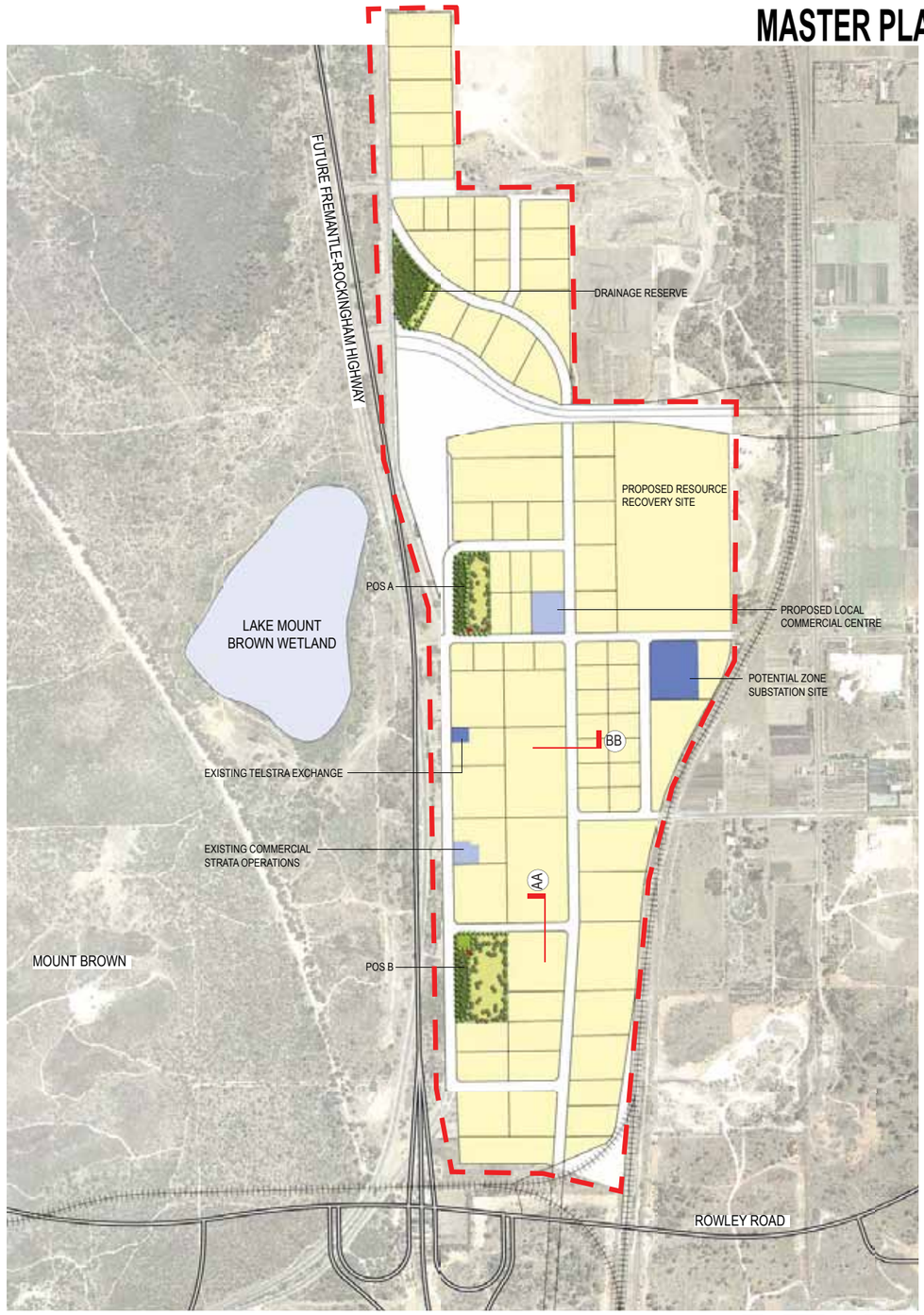
9.0 FIGURES

OVERALL STRATEGY PLAN



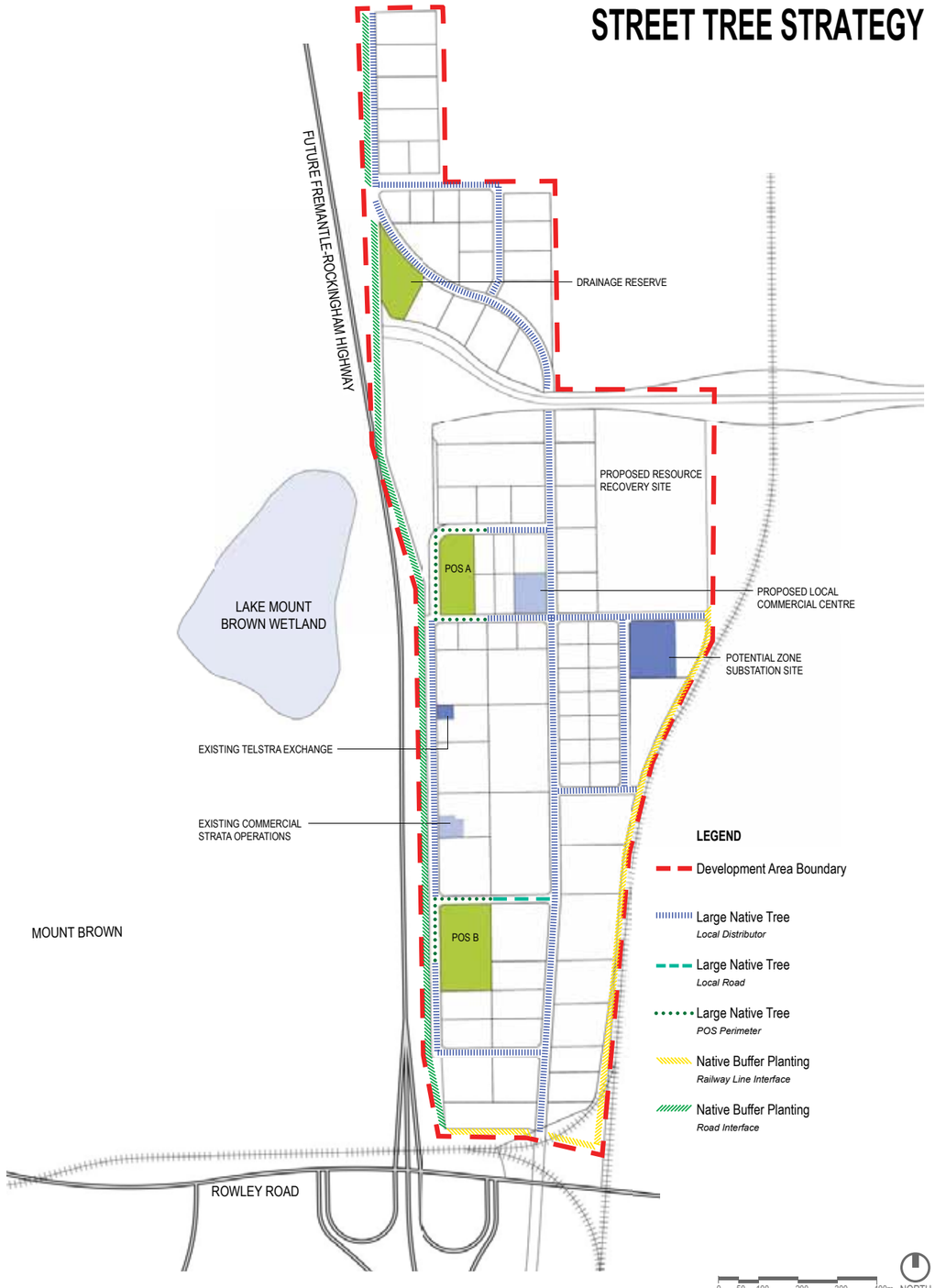
AREA No. 2 LOCAL STRUCTURE PLAN
LATITUDE 32, WA
NOVEMBER 2011

MASTER PLAN



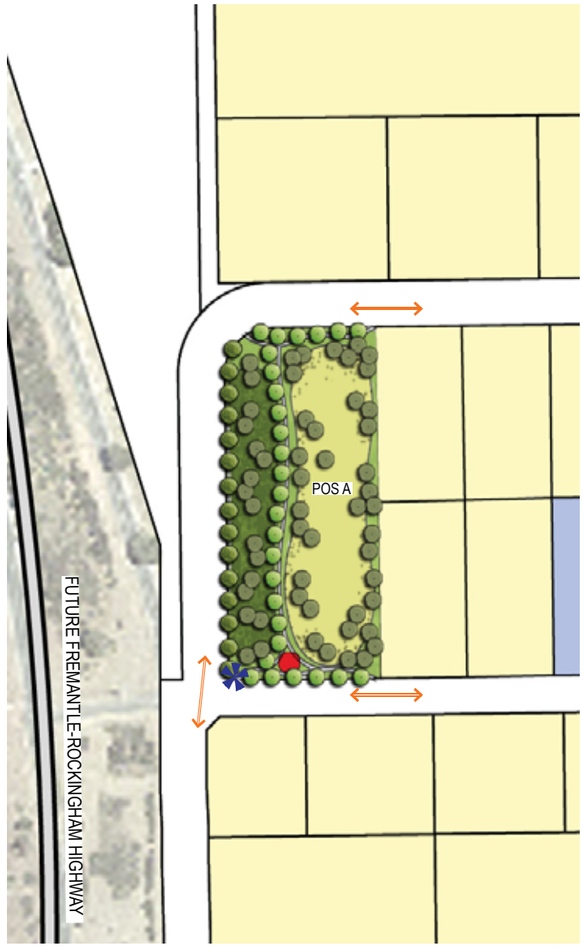
AREA No. 2 LOCAL STRUCTURE PLAN
LATITUDE 32, WA
NOVEMBER 2011

STREET TREE STRATEGY



AREA No. 2 LOCAL STRUCTURE PLAN
LATITUDE 32, WA
NOVEMBER 2011

POS A



LEGEND
- Industrial Lot
- Irrigated Turf (minimised where possible)
- Planting
- Vegetated Bio-retention basin / Drainage swale
- Passive Paved Node - Eg Shade Structure, Furniture, BBQ.
- Path Network
- Native Trees
- Link to Footpath Network
- Public Art

CONCEPT
- Provide passive recreation areas for local workers.
- Link POS paths into the broader development path network.
- Public art along road axis

FUNCTIONS/MATERIALS
- Bio-retention (drainage function)
- Path network.
- Copses of native trees and shrubs.
- Local materials used where possible.
- Shelter and picnic facilities.

PLANT STRATEGY
- Native planting to recreate former revegetation communities.
- Retain trees where existing ground level is maintained
- All planting to have low fertiliser requirements
- Planting to be zoned according to water requirements

DRAINAGE

Catchment Area - 49.26 hectares
- 1:10 Volume 1,133 m3
- 1:100 Volume 11,184 m3

ENVIRONMENTAL RESPONSE
- Waterwise plant strategy
- Water zoning
- Controlled fertilisation
- Native planting
- Limited turf

IRRIGATION STRATEGY
- All lawn areas shall be irrigated
- New planting will be irrigated for establishment
- Retained bushland to remain un-irrigated
- Some unirrigated planting where appropriate.

KEY PLAN

AREA No. 2 LOCAL STRUCTURE PLAN
LATITUDE 32, WA
NOVEMBER 2011

POS B

LEGEND
- Industrial Lot
- Irrigated Turf (minimised where possible)
- Planting
- Vegetated Bio-retention basin / Drainage swale
- Passive Paved Node - Eg Shade Structure, Furniture, BBQ.
- Potential W.W.P.S Location.
- Path Network
- Native Trees
- Link to Footpath Network
- Public Art

CONCEPT
- Provide passive recreation areas for local workers.
- Link POS paths into the broader development path network.

FUNCTIONS/MATERIALS
- Bio-retention (drainage function)
- Path network.
- Copses of native trees and shrubs.
- Local materials used where possible.
- Shelter and picnic facilities.

PLANT STRATEGY
- Native planting to recreate former revegetation communities.
- Retain trees where existing ground level is maintained
- All planting to have low fertiliser requirements
- Planting to be zoned according to water requirements

DRAINAGE

Catchment Area - 36.32 hectares
- 1:10 Volume 1,631 m3
- 1:100 Volume 10,002 m3

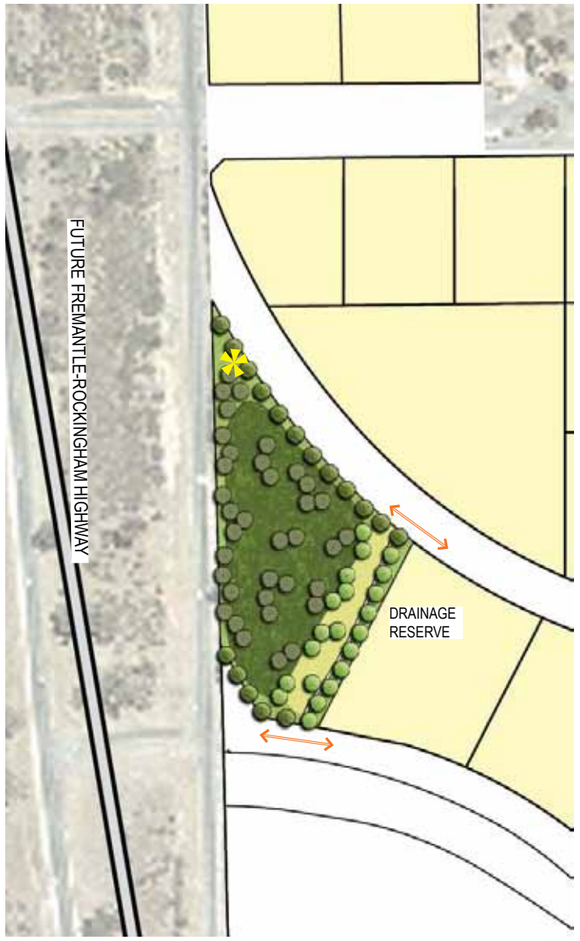
ENVIRONMENTAL RESPONSE
- Waterwise plant strategy
- Water zoning
- Controlled fertilisation
- Native planting
- Limited turf

IRRIGATION STRATEGY
- All lawn areas shall be irrigated
- New planting will be irrigated for establishment
- Retained bushland to remain un-irrigated
- Some unirrigated planting where appropriate.

KEY PLAN

AREA No. 2 LOCAL STRUCTURE PLAN
LATITUDE 32, WA
NOVEMBER 2011

DRAINAGE RESERVE



LEGEND
- Industrial Lot
- Irrigated Turf (minimised where possible)
- Planting
- Vegetated Bio-retention basin / Drainage swale
- Passive Paved Node - Eg Shade Structure, Furniture, BBQ.
- Path Network
- Native Trees
- Link to Footpath Network
- Entry Signage

CONCEPT
- Provide passive recreation areas for local workers.
- Link POS paths into the broader development path network.
- Prominent signage on entry road axis
- High proportion of tree planting to buffer future highway interface

FUNCTIONS/MATERIALS
- Bio-retention (drainage function)
- Path network.
- Copses of native trees and shrubs.
- Local materials used where possible.

PLANT STRATEGY
- Native planting to recreate former revegetation communities.
- Retain trees where existing ground level is maintained
- All planting to have low fertiliser requirements
- Planting to be zoned according to water requirements

DRAINAGE

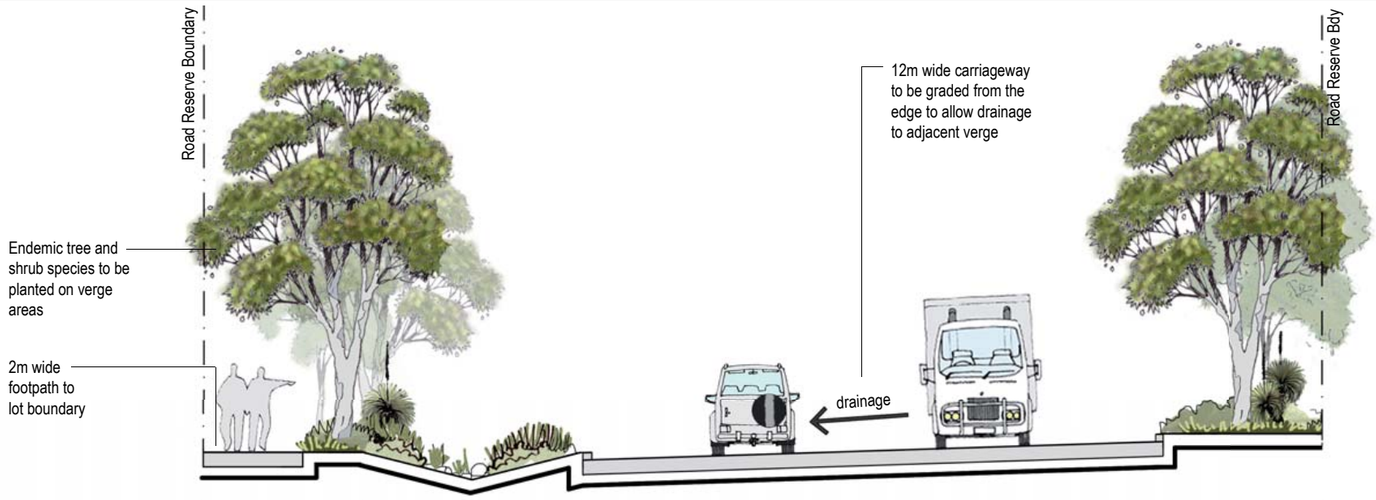
Catchment Area - 22.8 hectares
- 1:10 Volume 1,345 m3
- 1:100 Volume 6,795 m3

ENVIRONMENTAL RESPONSE
- Waterwise plant strategy
- Water zoning
- Controlled fertilisation
- Native planting
- Limited turf

IRRIGATION STRATEGY
- All lawn areas shall be irrigated
- New planting will be irrigated for establishment
- Retained bushland to remain un-irrigated
- Some unirrigated planting where appropriate.

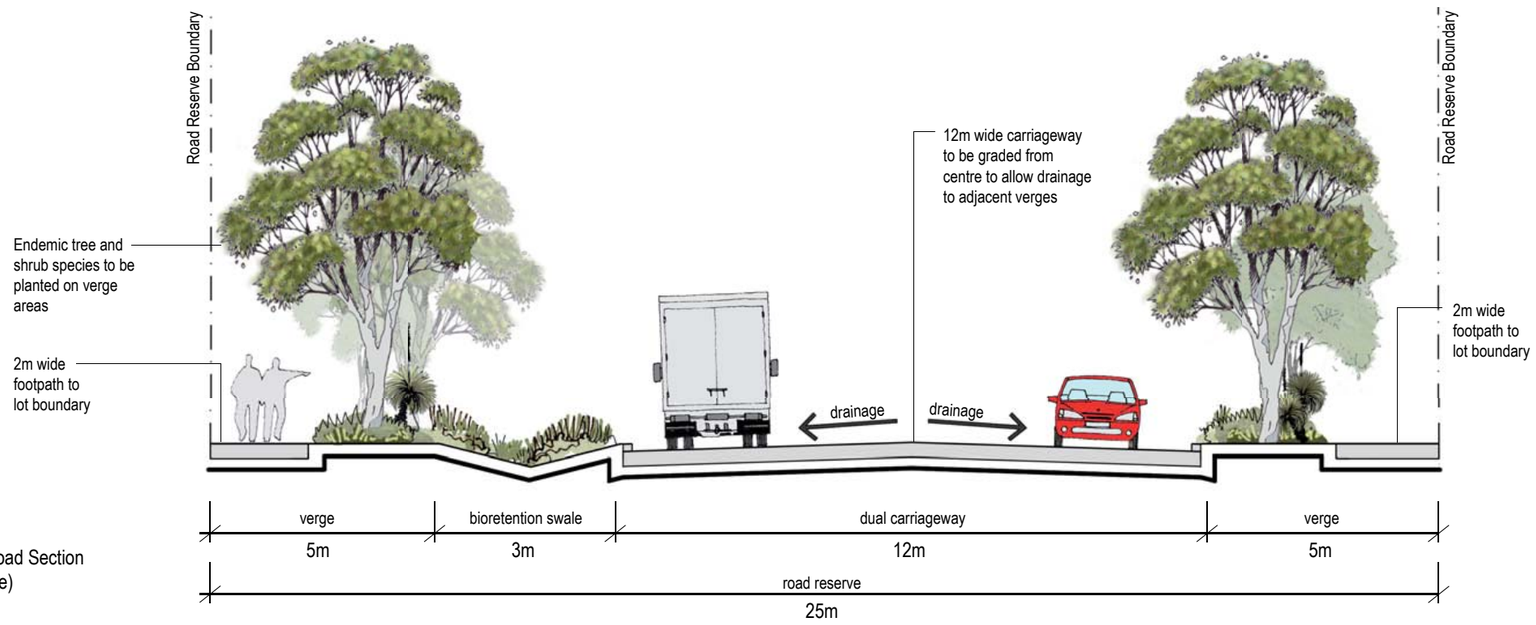
KEY PLAN

AREA No. 2 LOCAL STRUCTURE PLAN
LATITUDE 32, WA
NOVEMBER 2011



SECTION AA
Local Road Section
(20m Road Reserve)

Scale: 1:150 @ A3



SECTION BB
Local Distributor Road Section
(25m Road Reserve)

Scale: 1:150 @ A3

AREA No. 2 LOCAL STRUCTURE PLAN - STREETSCAPE TYPOLOGIES **DRAFT**
LATITUDE 32, WA

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