Oakajee Industrial Estate
Structure Plan

Landscape Report

Prepared by:	HASSELL / STRATEGEN
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LANDCORP

Government of Western Australia
Department of State Development

HASSELL

EXECUTIVE SUMMARY

The Landscape Report aims to create an industrial estate that will integrate into the surrounding landscape and will have minimal negative visual impact. It will also allow for a productive but aesthetically pleasing buffer separating residential precincts from industrial land use.

Objectives

Key objectives behind the Landscape Report include the following:

- Minimising the impact of the industrial estate on the rural amenity of the neighbourhood.
- Ameliorating through landscaping and revegetation such impacts as may occur.
- Providing within the estate a visual ambience that is pleasing to visitors and that encourages pride amongst occupants in their working environment and in the presentation of their work sites.
- Planting vegetation that is suited to site conditions and is native to the local area.
- Creating a landscape design that has a distinct and memorable character and identity.
- Reinforcing the concept of ecological corridors by preserving and connecting pockets of remnant vegetation where it is possible to do so.
- Providing a landscape that complements biodiversity and natural area values.

Landscape Guidelines

Landscape guidelines are provided for areas and elements within the estate.

Major gateways are proposed at the northern and southern entries to the estate off North West Coastal Highway. These will be focal points for landscape treatment, creating a memorable entry experience that relates to the area's natural and/or cultural heritage.

Road and rail corridors will incorporate a 10-metre wide landscape strip on each side of the corridor. A grassed swale will receive drainage between the landscape strip and the road or railway line.

Service corridors will have a 10-metre wide planted landscape strip along either side, with a surface cover of dryland grass within the corridor and beneath landscape plantings except where access or services requirements demand a hard surface.

A hierarchy of streetscapes within development precincts will be defined by tree species selected for scale of road and width of verge available for landscaping. Three key road types are foreshadowed: entry avenues, major arterial roads and lesser internal roads.

Public open space will be provided within the two General Industry Areas to cater for staff recreation. Planting in these areas will use a mix of native and exotic species, offering shaded space and differing character zones.

Within industrial allotments landscaping should focus on screening unsightly areas and providing a visually appealing working environment. Species selection is to be consistent with landscaping in surrounding road reserves and public spaces.

Uniform fencing and signage standards are proposed to ensure consistency and high standards of presentation throughout the estate.

Visual Impact Assessment

A visual impact assessment was undertaken to assist in development of a strategy to manage the visual impacts of Industrial development. Computer photomontages of the estate were produced to assess the development. They provide a tool to help implement methods for reducing its impact.

Revegetation Areas

Areas of high ecological value or significance within the Buffer will be protected and may be improved as biodiversity offsets for future developments within the estate. Particular attention will focus on existing remnants, the two rivers and their tributaries, footslopes of the Moresby Range, and the estate perimeter.

Recreation

Opportunities for recreational improvements in the neighbourhood of the industrial estate include Coastal dune areas not otherwise required for industrial or port Infrastructure, and possible development of a campground by Buller River and a day-use facility at the Buller River mouth**.**

Plant Selection

Endemic species which reflect vegetation in the surrounding environment are preferred. These improve prospects of successful plant establishment and survival, reduce the need for irrigation, and contain long term maintenance needs.

Plant Establishment

Streetscapes and screening areas will be planted with tube or pot stock that can adapt to the local environment as they grow. Advanced stock may be used at entries for immediate impact. Seeding will complement planting where prospects of success are considered good and there is an objective to establish a wider diversity and/or a more dense cover of vegetation.

Maintenance

Maintenance of landscaped areas is essential to ensure survival of landscape treatments and a high standard of presentation.

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1.0 BACKGROUND

The landscape design vision for the Oakajee Industrial Estate (OIE) aims to create an accessible, visually attractive environment for the benefit of industry and its workers. Such a design will help minimise the impact of the industrial estate on the rural amenity of the area.

The estate is located on the coast 23 km north of Geraldton. It is bounded by the Coronation Beach Road to the north, the Buller River to the south, and the Moresby Ranges to the east. The OIE comprises a Strategic Industry Area (SIA) of 1,135 hectares with adjoining General Industry Areas (GIAs) to the east and south totalling approximately 196 hectares. A Coastal Zone to the west will contain the Port Area. The estate is surrounded by a Buffer of 4,072 hectares of farmland which includes some areas of remnant vegetation. This vegetation is generally located around tributaries or rocky outcrops which have not been cleared for agriculture.

The OIE site is relatively flat, providing a good basis for a large scale industrial area. The bulk of the OIE lies on a plateau elevated approximately 80 metres above the Indian Ocean and is set back approximately 1km from the coastline. Site topography provides an opportunity to utilise natural landform and ridge lines for vegetation buffers to minimise visual impacts of development.

The OIE will provide a platform for significant local and regional growth through the development of industry in the State's Mid-West. The integration of the industrial area with the Oakajee Port and connectivity with the City of Geraldton-Greenough and the Shire of Chapman Valley will be a key driver in development of associated road, rail and service infrastructure. This infrastructure will create significant changes to the visual character of the existing rural landscape and will require landscaping measures to reduce that impact.

2.0 OBJECTIVES

The Landscape Report aims to create an industrial estate that will integrate into the surrounding landscape without unacceptable visual impact. It will also allow for a productive but aesthetically pleasing Buffer separating residential development to the south from industrial land use within the SIA.

Major objectives behind the Landscape Report include the following:

- Minimising the impact of the industrial estate on the rural amenity of the neighbourhood.
- Ameliorating through landscaping and revegetation such impacts as may occur.
- Providing within the estate a visual ambience that is pleasing to visitors and that encourages pride amongst occupants in their working environment and in the presentation of their work sites.

- Planting vegetation that is suited to site conditions and is native to the local area.
- Creating a landscape design that has a distinct and memorable character and identity.
- Reinforcing the concept of ecological corridors by preserving and connecting pockets of remnant vegetation where it is possible to do so.
- Providing a landscape that complements biodiversity and natural area values.

Key elements in pursuit of these objectives include:

- Integrating pedestrian and cycle linkages, where appropriate.
- Maintaining productive commercial plantations, including existing sandalwood plantations, in the northern, eastern and southern buffer.
- Integrating water sensitive design throughout the site.
- Providing visual relief from industrial buildings through appropriate plant selection and placement.
- Retaining remnant natural vegetation around the perimeter of the SIA and within the Buffer for its ecological value and for the contribution it can make to screening.
- Maintaining the tree and shrub community already planted along the ridgeline that constitutes the eastern boundary of the SIA, to enhance the screening effect provided by this ridge.
- Reinforcing the concept of ecological corridors by planting ribbons of vegetation along drainage lines to connect pockets of remnant vegetation.
- Creating high quality planted streetscape environments along arterial roads, railways and service corridors.
- Developing landscaped entry statements at major points of access into the estate.
- Establishing development guidelines for industrial allotments which deal with such issues as layout, building form and aesthetics, and landscape plantings.
- Establishing robust management and maintenance standards for the estate.

3.0 PLANT ESTABLISHMENT GUIDELINES

3.1 Plant Establishment

Plant establishment for both landscaped and revegetation areas will be based on a combination of planting and seeding using species which are endemic or which are otherwise suited to the local environment.

Planting provides some certainty with respect to distribution and arrangement of plants in the landscape, but can lead to a slightly ‘artificial’ pattern of species mix. It can be difficult to achieve high germination rates with direct seeding, but where germination is satisfactory there is usually a more ‘natural’ look with the resulting species mix, stronger root systems and higher numbers of plants per unit area.

Streetscapes and screening areas will be planted to establish a consistent result and to provide screening vegetation and street trees in desired locations. Larger more

established stock will be selected for planting at the entry statements where irrigation can be supplied to help ensure survival. Seeding will complement planting where prospects of success are considered good and where there is an objective to establish a diverse understorey beneath planted trees and shrubs.

Keys to successful plant establishment through planting include:

- Ensuring selected species are suited to the local environment.
- Thorough site preparation before planting, including a high level of weed control.
- Use of hardened, healthy, vigorously growing seedlings, preferably grown from local provenance seed or vegetative material.
- Planting as soon as possible after the break of the wet season.
- Adequate follow-up maintenance.

Similar considerations apply to successful seeding, with the added proviso of appropriate seed treatment for hard-seeded species and the possibility of better results with autumn seeding, prior to the break of the wet season.

3.2 Site Preparation

Stock Exclusion
Livestock are destructive to native bushland if allowed unfettered access. Apart from the effects of grazing, the hard hooves of these animals compact soil and trample juvenile plants. Livestock can also act as vectors for weeds and diseases. Well constructed stock fencing should therefore be installed around intended landscaping and revegetation areas where grazing is occurring.

Erosion Control
Water erosion on slopes and wind erosion on exposed sandy soils can compromise revegetation efforts. Site preparation should take account of this risk, where present, by such measures as cultivation on the contour for sloping sites and retaining adequate surface cover (which may be dead plant material following spraying of weeds) on sites prone to wind erosion.

Deep Ripping
Deep ripping can break up compacted subsoil, improving root establishment of planted seedlings. Where deep ripping is undertaken, consideration should be given to the erosion risks mentioned above.

Control of Vermin
Rabbits can compromise revegetation efforts by grazing juvenile plants. Rabbits should be controlled through baiting and warren ripping if populations exist in proximity to revegetation areas. This should be carried out prior to planting or seeding, and should be repeated if numbers build up again.

Feral pigs are present, although they do not present the significant threat associated with rabbits. Should they become a problem, their numbers might be reduced by professional shooting or by trapping. Kangaroos can also damage revegetation if present in large numbers and/or if feed is limited. Culling may be warranted if numbers are excessive.

Insect Control
Application of an appropriate insecticide may be required immediately prior to seeding to control red-legged earth mite. A further application may follow seed germination, should there still be evidence of this pest. Seed itself may also require treatment with an insecticide to reduce ant predation.

Grasshoppers can be a problem in the spring and summer months. Minor infestations can be controlled by baiting, but little can be done to restrict damage by plague infestations which sometimes occur.

Termites can be a source of damage to developing and established trees. While treatment can be undertaken to destroy infestations in valued specimens, it is probably not practical to undertake treatment on a large scale.

Weed Control
Weed control is a critical component of landscaping and revegetation. If weeds are not suppressed adequately before and after seeding or planting, the likelihood of reaching revegetation targets will be significantly compromised.

For this purpose, seed set by weeds and grasses should be prevented in the period preceding seeding/planting by grazing or by application of a knock-down herbicide. Weed control should be undertaken over as long a period as possible, preferably up to two years prior to planting or seeding. The treatment should be sufficient to check growth while leaving sufficient dead cover on the surface to protect against wind erosion of the underlying soil through the dry and windy summer months.

A further herbicide application should be undertaken early in the wet season, after germination of weed and grass seeds but before planting/seeding.

In any areas where planting only is proposed, a combination of a residual and a non-residual herbicide may be applied for a more lasting result. Alternatively, scalping topsoil from planting rows may afford the necessary control, provided this does not leave significant areas of bare ground exposed to wind erosion through the summer months.

Weed control should be continued following landscaping and revegetation until native plants are well established and able to compete adequately.

Certain Declared Weeds, including skeleton weed, are found within the OIE. Where they occur, monitoring and treatment will be required consistent with W.A. Department of Agriculture protocols for dealing with Declared Weeds.

Dieback
Dieback disease may be present on site and if it becomes an evident issue then hygiene measures may be required. Care should be adopted in plant selection for locations where disease risk is highest, avoiding species which are highly susceptible, such as banksias.

3.3 Seeding and Planting

Seed and Plant Stock
Seed collection for more extensive revegetation efforts should ideally commence several years prior to any significant revegetation activity to build up an adequate seed store, with seed preferably collected from local vegetation communities.

Seed of many species will require heat or smoke treatment before sowing, to break dormancy and foster germination.

For planting, young, vigorous, healthy and hardened seedlings derived from local seed or plant stock are preferred. To ensure that such plants are available in the desired numbers and species, orders should be placed in the spring preceding planting.

Planting
Where intensive revegetation or screen planting is required, the most cost-effective approach will be to plant mechanically using a tree planter. The preferred planter will be one that windrows topsoil to either side and rips a deep planting furrow between these windrows. Seedlings are dropped into this furrow and press wheels compact the soil on either side of the planted seedlings.

On areas that are to be both planted and seeded, the two operations can be conducted simultaneously with a mechanical tree planter. Seedlings are dropped into a ripped furrow at the same time as seed is trickled onto the surface through trailing hoses fed by a rear-mounted seed box.

Hand planting will generally be more appropriate in sectors such as subdivision road frontages and entry statements, where more discrete planting is required and the emphasis is on landscape enhancement rather than bulk planting for screening or revegetation. In these cases, the seedling should be placed into loosened soil such that its potting medium is buried at least 30mm below the surface. The soil should then be compacted firmly around the seedling, creating a local depression to capture surface moisture.

On the pasture and cropping country of Oakajee, application of fertiliser to each seedling may not be warranted. Residual fertility in the soil from annual topdressings, combined with nitrogen provided by many years of lupin cover, should offer sufficient nutrition to the young seedlings. Irrigation of each seedling within 24 hours of planting is, however, beneficial, to settle it into the soil and to carry it through the first critical days after planting, should good rains not occur at the time.

Seeding
Where seeding is successful and the seed mix is relatively diverse, it can produce better results than planting alone, as the resulting vegetation is usually more diverse, has better structure with a range of understorey, mid- and upper storey plants, appears less ‘artificial’ (i.e. is not restricted to rows), and the establishing plants are likely to have better root development than planted stock. As such, direct seeding is particularly suitable for revegetation, but is may also have application in some landscaping situations where a more dense vegetation screen is sought.

Sites for direct seeding should be weed free. If hand broadcasting seed, the ground should be scarified to create niches for the seed. Machine seeders usually rip the soil ahead of the seeding mechanism. Some scalp the topsoil to reduce weed growth, while others form a mound into which seed is placed.

Seeding rates should be determined in consultation with local revegetation experts. Seed should be treated (e.g. scarification or smoke treatment) prior to sowing to break dormancy, and it can be mixed with a bulking agent such as brickies sand for better distribution across the sowing area.

Scheduling
The optimal time for planting is in early winter when sufficient rain has fallen to thoroughly moisten surface soil horizons and there is less likelihood of extended periods of dry weather. This generally means a June planting operation.

Plantings as late as August can survive, particularly if there is an extended wet season and/or reasonable summer rains. One cannot, however, depend on either of these factors, and the risk of drought stress and of plant loss in the following summer-autumn is increased with a late season planting.

In situations where seedlings are to be irrigated, planting time is not so critical.

It is preferable to conduct seeding earlier, in the autumn lead up to the winter break of rains when soil temperatures are higher (which promotes germination). Seeding can, however, be conducted in conjunction with winter planting if required.

Plant Selection
Species suggested for the site are listed in Appendix 1. They have been chosen with emphasis on endemic vegetation and on other natives which, whilst not endemic to the locality, are suited to the particular environment. They are species which:

- Present a variety of forms, colour and strata.
- Are hardy and tolerant of the local site conditions.
- Provide nesting and feeding habitat for a diversity of native fauna, including such endangered species as Carnaby's Black Cockatoo.
- Should establish without irrigation.
- Will require minimal ongoing maintenance.

Four key planting groups are described in the plant list to provide specific effects for different landscape environments. These four are:

- "Feature" plants for estate entries or other high profile areas.
- Plants which will provide a screening effect.
- Trees suited to entry avenues.
- Trees and shrubs for general street-side planting.

<u>Feature Species</u>

These will be used at the estate entries where they can assist in providing a memorable experience for visitors. A combination of trees, shrubs and groundcovers will be used,

bringing together species which are suited to the area and which complement each other in colour, form and texture.

Screening Species

Screen planting will be located in areas where it is desirable to significantly reduce visual intrusion of industrial or service facilities and structures. The screening vegetation will comprise a mix of trees and medium to tall shrubs with dense foliage that presents an effective and attractive visual barrier.

Entry Avenue Trees

Entry avenues will be defined by selected taller trees planted in a formal arrangement on either side of the road. They will complement the scale of the industrial development beyond and will create consistent visual street frontages.

Street Trees and Shrubs

Street trees and shrubs planted within the verge of estate roads will be arranged singly and in small clusters, avoiding 'artificial' patterns. The arrangement will be such that, if any fail to survive or must be removed to allow access to lots, this should not dramatically alter appearance and amenity of the streetscape.

Groundcover

All landscaped areas not planted to trees or shrubs or otherwise covered with non-plant material will be planted with dryland grass which is readily maintained by occasional slashing or mowing.

Maintenance and Monitoring

Consideration and planning should be given to maintenance of landscaping and revegetation for several years after initial seeding/planting. Key tasks are weed control, infill planting where plants have failed, and firebreak maintenance. Fences must be maintained and pests such as rabbits and insects controlled if at destructive levels.

Monitoring should occur on a regular basis to check progress and inform maintenance actions.

Maintenance of revegetation and landscaping is discussed in more detail in Section 9.

4.0 REVEGETATION

The Oakajee site has significant areas of remnant vegetation and LandCorp has already been active in protecting some of these remnants through fencing to exclude livestock. This protection will be extended to embrace further remnants within the site, while revegetation initiatives will improve and extend areas of remnant vegetation, particularly within the eastern buffer.

These revegetation initiatives will stem largely from future developments within the OIE for which biodiversity offsets are required. They are, as such, likely to be underwritten by

development proponents rather than by LandCorp, and will be subject to EPA endorsement. They will be guided by the findings of the Geraldton Regional Vegetation & Flora Survey, choosing species for each revegetation site consistent with the plant community originally found in that location and environment. Objectives for revegetation should include species richness and coverage targets to reflect the vegetation community that is to be established, as well as weed control targets to guide planning and monitoring.

The following areas are recommended as a focus for revegetation efforts:

- Existing remnants.
- The two rivers and their tributaries.
- Rocky outcrops.
- Footslopes of the Moresby Range.
- Estate perimeter.
- Heritage sites and amenity locations

Revegetation planning should take account of the vegetation community appropriate to each site, referencing the Geraldton Regional Vegetation and Flora Survey (Department of Planning 2010) for insights into appropriate species selection.

Existing Remnants
Revegetation can expand and add to the ecological value of existing remnants. In this respect, priority might attach to the following:

- High quality, viable remnant pockets.
- Remnants which form ecological linkages.
- Remnants containing significant flora (Priority flora or DRF)
- Vegetation within riparian zones, following or forming a buffer to drainage lines.
- Existing revegetation areas that will benefit from expansion or improvement.

Rivers and their Tributaries
Revegetation of riparian zones protects drainage lines from contaminated run-off and improves waterway ecology. Riparian areas often have higher habitat value due to the presence of water and the denser and taller vegetation which can grow along drainage lines. Fringing vegetation can also mitigate flooding by slowing water.

Revegetation along drainage lines at Oakajee – ideally for a width of 50 meters on either side – could form a basis for unbroken linkages between the vegetation of the coastal strip and the Moresby Range.

Rocky Outcrops
Rocky outcrops often have high habitat value and vegetation here can present interesting and mixed strata from base to summit due to variability in soil depth and patterns of drainage. They are difficult to revegetate due to the stony/skeletal nature of their soil, but revegetation can focus on pockets of deeper soils and around their base.

There are numerous rocky areas in the buffer east of North West Coastal Highway which already support remnant vegetation and/or which could be targeted for revegetation.

Footslopes of the Moresby Range
The Moresby Range Management Strategy (WAPC 2009) identifies areas within the Moresby Range that should be revegetated to protect its conservation values and provide benefits to local fauna. This includes the western foot slopes, some of which fall within the Buffer to the OIE. Revegetation in this area can link a number of remnant vegetation fragments, rocky outcrops and drainage corridors with the Moresby Range.

Ecological Corridors
Past use of land within the Buffer for farming has left fragmented areas of remnant native vegetation which might be linked by ecological corridors. Such corridors maintain connectivity across the landscape and limit the effects of habitat fragmentation. They benefit wildlife by allowing movement of fauna between vegetation remnants and beyond to larger conservation precincts such as the Moresby Range.

Potential ecological corridors identified on the Landscape Report include the following:

- The eastern ridgeline which forms the boundary to the SIA and which has already been revegetated.
- The perimeter of the industrial precincts where remnant vegetation combined with recent plantings already provides a continuous band of native vegetation.
- The footslopes of the Moresby Ranges.
- The Oakajee and Buller Rivers and their tributaries.

The corridors should ideally incorporate a minimum 100-metre width of native vegetation. For rivers and their tributaries, this will be a 50-metre band on either side of the river bed.

Heritage sites and amenity locations
Revegetation might be considered on or around heritage sites as well as at roadside lookouts to improve the amenity of these and provide a sense of place.

5.0 LANDSCAPE TREATMENTS FOR PUBLIC LANDS

Treatment of land within the Buffer has already begun to ensure landscape and screening vegetation is well established by the time industry moves onto the site. This was mentioned briefly at 4 above and is summarised below.

The ridge forming the eastern boundary to the SIA was planted in 1999 with a 100-metre wide band of trees and taller shrubs over a 4km length. This has established a substantial vegetation community on the highest and most evident portion of the Oakajee plateau and improves its amenity at the same time as offering substantial screening for viewing points to the east.

Planting of acacias and seeding amongst them of sandalwood occurred in 2008-10 on the northern and southern slopes of the Oakajee Valley, on slopes adjoining and to the south of the eastern GIA, and on slopes to the east and south of the southern GIA. This initiative adds to extensive remnants within the Oakajee Valley to provide a wide buffer surrounding the SIA and GIAs on the northern, eastern and southern sides, while

remnant vegetation of the limestone escarpment and coastal dunes affords a similar buffer in the west.

Further landscaping will apply to the following areas as the estate develops:

- Arterial Roads
- Subdivision roads
- Railway and service corridors
- Estate entries
- Public open space

5.1 Arterial Roads

Arterial roads will be located within wider infrastructure corridors comprising a central road reserve with a service corridor on either side. Plant introduction should occur at an early stage along either side of the intended alignments of these arterial roads. This will enhance the industrial landscape with ribbons of vegetation traversing the estate.

A 10-metre wide landscape strip planted to trees and shrubs is to be provided down each side of the road reserve (Figure 1). The landscape strips must be protected from disturbance by service installations, future road widening, or by any other development requirements which demand clearing of vegetation.

The verge between the landscape strip and the roadway might be formed as a shallow, non-irrigated grassed depression. It can then function as a drainage swale to accommodate road runoff. Scattered trees planted individually and in clumps within this verge will complement the screen planting in the landscape strip beyond and enhance the avenue effect.

The above planting should take account of AUSTROADS guidelines which suggest the following planting setbacks:

Speed of road (km/hr)	Setback distance (m)
60	4.5
70	5.5
80	5.5
90	6.5
100	9
110	10

At intersections, plantings must be set back further to meet sight line requirements on approach roads. Here, recommended sight distances are as follows:

Speed of road (km/hr)	Minimum sight distance (m)	Preferred sight distance (m)
60	105	160
70	130	220
80	170	300
90	210	400
100	250	500
110	290	500

Where site entries are required through the landscape strip, cross-overs a nominal 20-metres wide are suggested. This cross-over width can be increased where an owner can demonstrate a legitimate requirement for wider access (e.g. where wide loads are regularly taken to or from a site). A 45° setback of vegetation within the landscape strip at cross-overs can accommodate signage identifying the site occupant.

A dual-use path (DUP) network is proposed to encourage cycling and, in appropriate areas, pedestrians. This includes a DUP along one side of major arterial roads into and within the estate, connecting users to the highway, worksites within General Industry precincts, and areas of public open space in the latter.

DUPs should be designed in accordance with approved construction standards and should take account of requirements of potential users (refer to AUSTROADS Guide to Traffic Engineering Practice, Part 14: Bicycles).

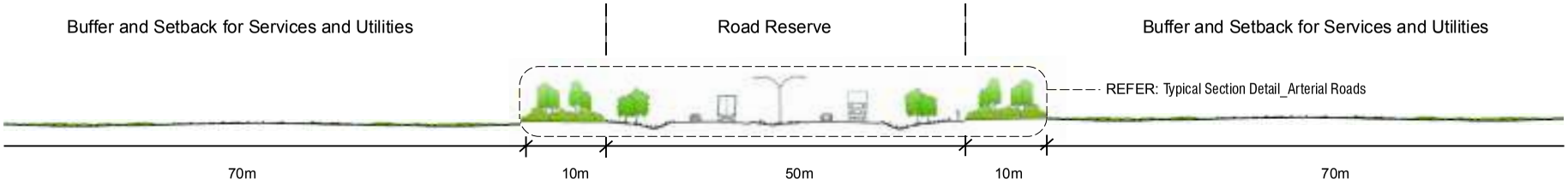
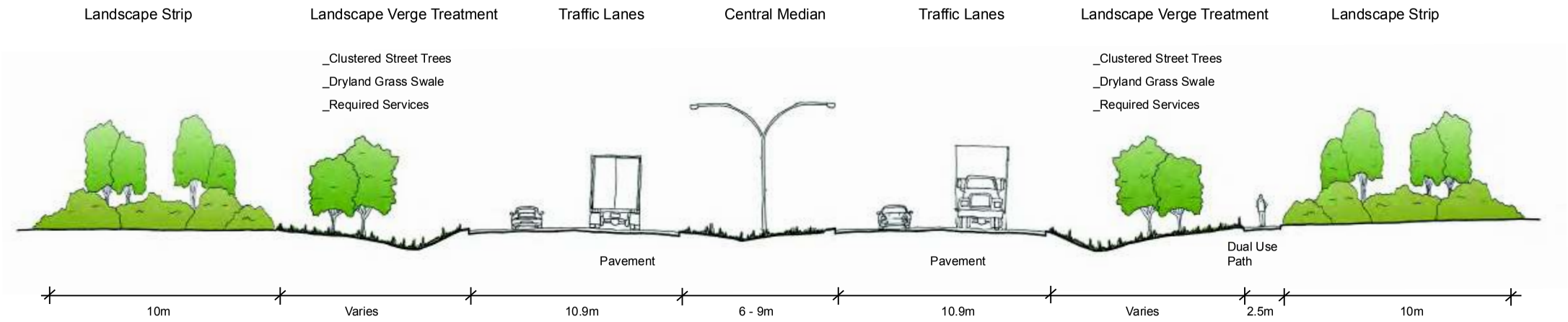


Figure 01_Typical Section_Arterial Roads



Typical Section Detail_Arterial Roads

HASSELL

Project Name
Oakajee Industrial Estate

Client
Landcorp

Drawing
Typical Section_Arterial Road

Date
25/01/11

5.2 Subdivision Roads

Strategic Industry Area
On subdivision roads within the SIA, the width of the grassed verge may be similar to or narrower than those on arterial roads, depending on needs. This verge will again be shaped into a grassed drainage swale and may have scattered individual trees or clumps of trees at planting setbacks to meet AUSTROADS guidelines.

Landscape strips beyond the verge will be 10-metres wide and will, as for arterial roads, be planted to trees and shrubs for a screening effect (Figure 2).

The DUP network mentioned at 5.1 will continue onto subdivision roads within the SIA.

General Industry Area
Within the GIAs, a more intensive subdivision density and higher land values make alienation of a wide strip for drainage and landscaping less acceptable. It is therefore proposed that roads here be kerbed, with a 10-metre wide grassed and planted strip adjoining them. The first 5 metres behind the kerb will contain a grassed road verge and formal street tree avenue. In appropriate areas of this precinct, on one side of the road this initial 5 metre verge will also incorporate a dual use path. The balance will be a landscape strip planted to trees and/or shrubs (Figure 3).

Commercial outlets within this precinct may require greater exposure to passing trade. It will therefore be important that plantings do not obscure the view of allotments behind. Plantings of taller (non-screening) trees in combination with low shrubs may therefore be appropriate in some areas to emphasise and enhance businesses behind, with the option for later introduction of greater bulk for screening if, as allotments are occupied, it emerges owners do not require significant public exposure. Alternatively, if an owner can demonstrate the need for greater exposure than original plantings allow and is prepared to replace these with lower-growing species and/or with more intensive treatments, this may be accepted, provided it does not clash with established landscape treatments in the general neighbourhood.

It is suggested that cross-overs through the landscape strip be no more than 10 metres wide unless a landowner can demonstrate a legitimate requirement for a wider entry. The greater importance of public exposure and advertising space for these allotments will be accommodated by permitting a 75° setback of the vegetation line in the landscape strip on either side of crossovers.

The DUP network mentioned at 5.1 will extend into appropriate areas of the General Industry precincts where greater use of such facility is likely, with a path down one side of each road alignment.

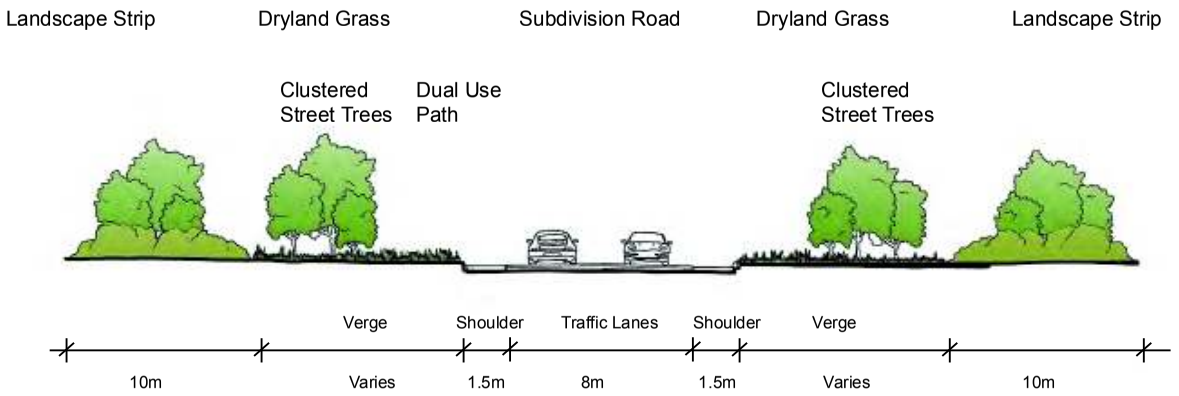


Figure 02_Typical Section_Subdivision Road_Strategic Industry

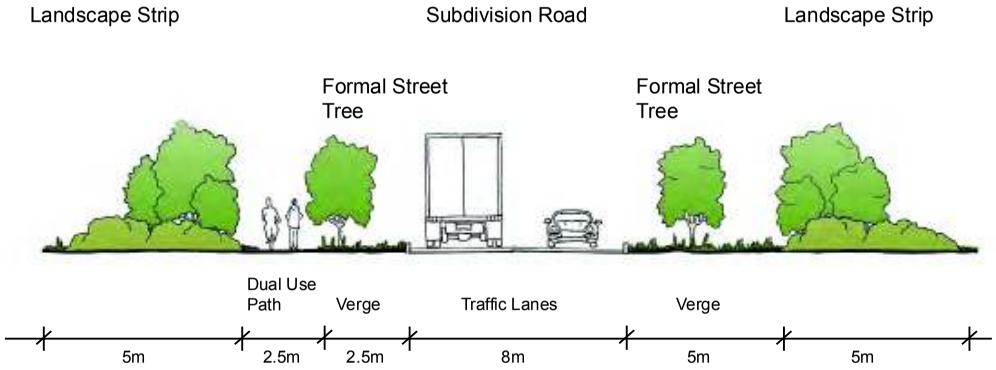


Figure 03_Typical Section_Subdivision Road_General Industry

HASSELL

Project Name
Oakajee Industrial Estate

Client
Landcorp

Drawing
Typical Section_Subdivision Roads

Scale
1: 200

Date
24/01/11

5.3 Railway and Service Corridors

Plant introduction should occur along either side of railway corridors and of any service corridors which are not otherwise part of the wider infrastructure corridors described at 5.1This will further enhance the industrial landscape with ribbons of vegetation, augmenting those along roadways through the estate. An exception may be made to such planting where fire control or visibility requirements preclude introduction of tree or shrub cover.

The approach to planting will be similar to that proposed for arterial roads. A 10-metre wide landscape strip is to be provided down each side of the railor service corridor. Trees and shrubs will be planted into these strips (Figures 4 and 5).

Drainage may be accommodated in a grassed swale formed between the landscape strip and the adjacent railway line or service corridor. Trees shall be planted in clusters to avoid an artificial appearance.

The groundcover treatment within the corridor and beneath landscape plantings will generally be dryland grass. Where corridor access or servicing requirements demand a hard surface, an appropriate hard stand should be provided.

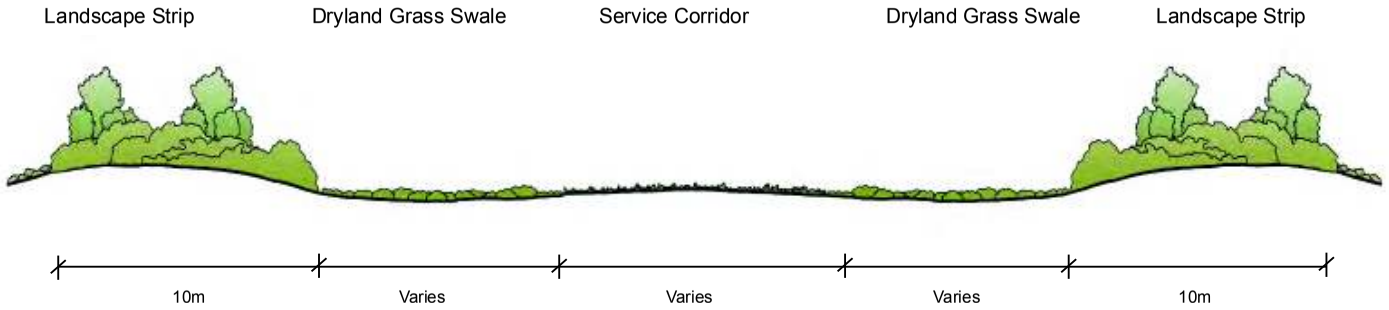


Figure 04_Typical Section_Service Corridor

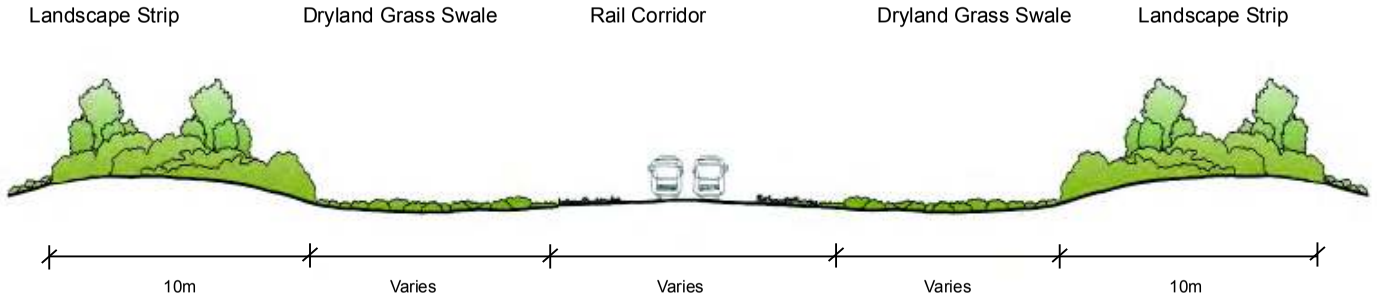


Figure 05_Typical Section_Northern Railway Corridor

HASSELL

Project Name
Oakajee Industrial Estate

Client
Landcorp

Drawing
Typical Section_ Railway and Service Corridor

Scale
1: 400

Date
24/01/11

5.4 Site Entries

There are two proposed entries to the industrial precincts of the estate, one in the south and one in the centre. These will define the gateways to the estate with signage and landscape treatments, providing a formal introduction that sets the theme for the landscaping and presentation of the estate beyond.

The two entries will initially be at-grade intersections with NWCH. In the long term, when traffic volumes warrant, the central entry will change to a grade-separated intersection, while the southern entry will relocate to a new alignment of NWCH and, at the same time, will become a grade-separated intersection. The design of the entry statements will allow for these future changes.

Features of the initial central entry will include the following:

- A landscape design that has a distinct character with which the community can identify.
- Integrated public art reflecting the natural environment and/or the local cultural heritage.
- Primary signage at the NWCH intersection signifying the entry to the estate, with secondary signage at the entry to the GIA and, beyond this again, at the entry to the SIA.
- Clusters of low native shrubs within a sweep of irrigated turf leading up to the above signs.
- Kerbing and formal street tree planting down each verge of an entry avenue, and a median strip planted to tall trees and groundcover/ understorey to add form and colour.
- Dual use path along each verge.
- Street lighting in the median.

Remnant vegetation within the NWCH reserve will offer an attractive backdrop to the entry. Selective tidying may be appropriate within this vegetation, pruning and removing dead branches and untidy growth on larger shrubs. This existing vegetation will also be enhanced by planting additional native shrubs that will add colour and interest**.**

Street trees selected for the entry avenue will complement the scale of the development and create attractive frontages allowing a view through to businesses within the GIA. The avenue will terminate where it enters the SIA, with road design and associated landscaping changing at this point to that described at 5.1 and illustrated in Figure 1.

When the central entry is altered from an at-grade to a grade-separated intersection, the section at and immediately west of NWCH will disappear under fill for a fly-over, so the primary entry signage will be relocated westwards to the point where the entry road drops to ground level. This will be at or near the GIA entry.

Figures 6 and 7 convey the general concept for the central estate entry described above. The initial southern entry will adopt a similar design to that described above, although landscape treatments may be less elaborate to allow for the fact the entire entry will ultimately be relocated when NWCH is realigned.

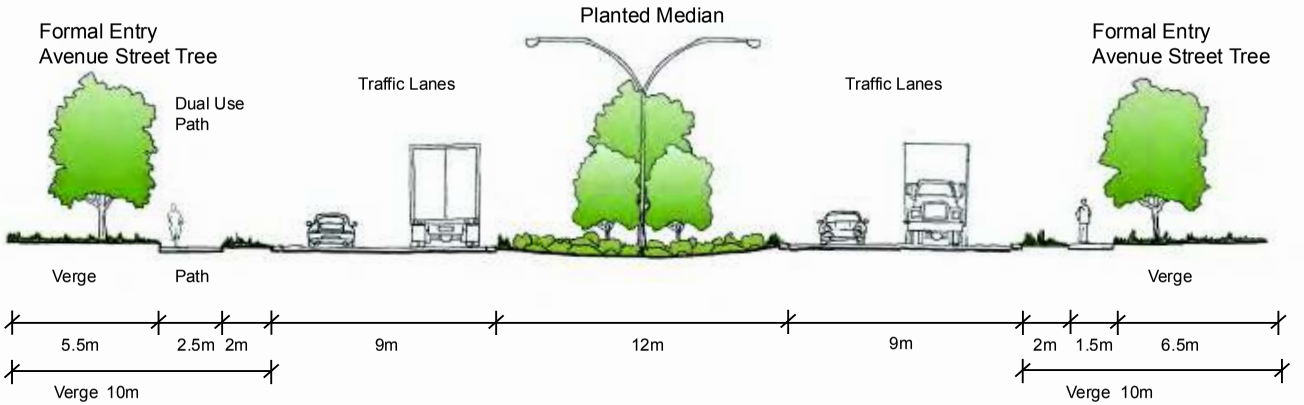


Figure 06_Typical Section_Entry Environment_ 1:200

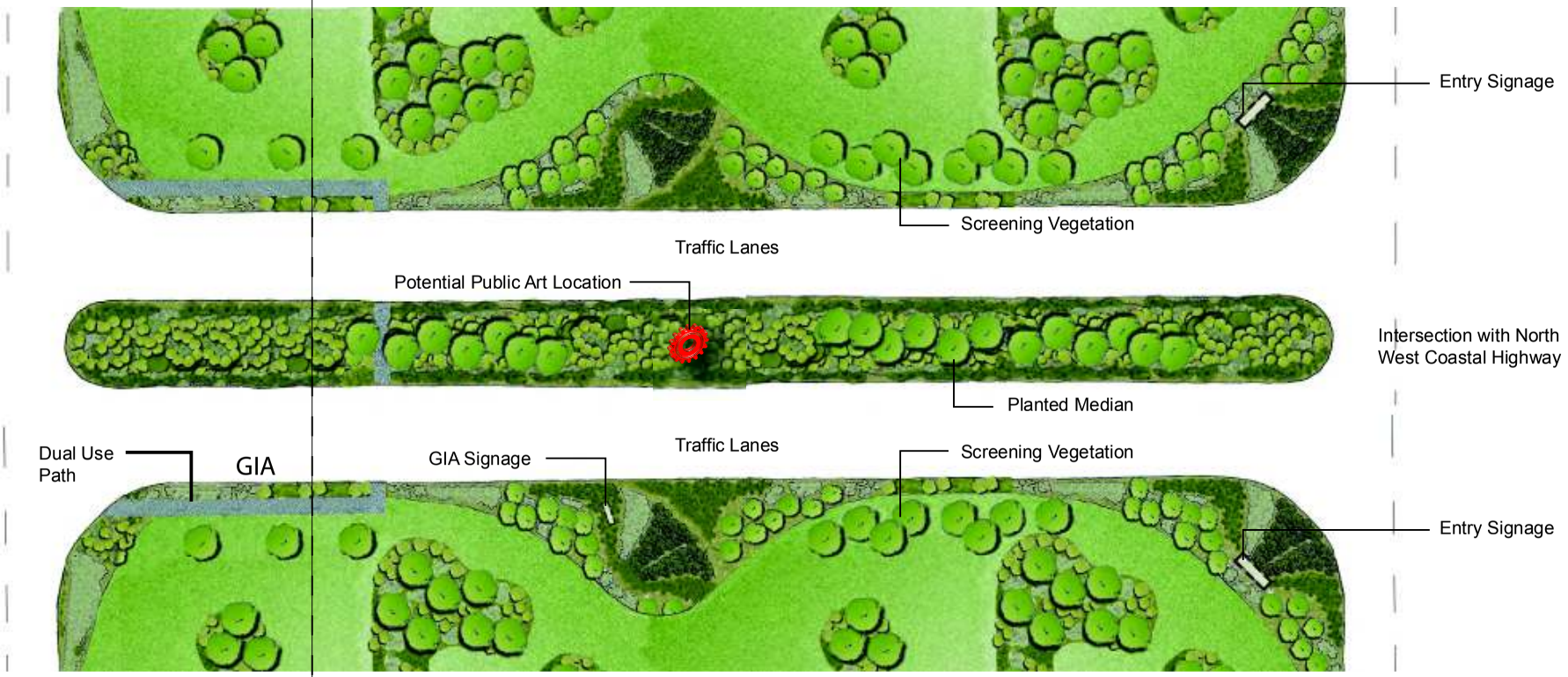


Figure 07_Typical Plan_Entry Environment

HASSELL

Project Name	Client	Drawing	Scale	Date
Oakajee Industrial Estate	Landcorp	Entry Environment	Varies	28/01/11

5.5 Public Open Space

Public open space within the GIAs offers social and environmental benefits. It can facilitate recreation, social interaction and leisure activities and can be a gathering point for workers.

Public open space should provide shaded and attractive settings, be well lit and furnished with pathways, tables and benches, and perhaps ultimately with facilities such as barbecues and shelters if usage warrants. It could also be a site that can receive drainage from within the immediate area that it is located.

Planting in areas of public open space will use a mix of both local and exotic species that are known for their performance and adaptability. The use of ornamental species within these areas may allow creation of differing character zones.

6.0 TREATMENTS FOR INDUSTRIAL ALLOTMENTS

Within industrial allotments which will eventually be developed, site layout, building design and landscape plantings should be adopted with the objective of maintaining the standard of visual presentation set in public areas of the OIE. To this end, planting and other aesthetic treatments will be required within each site. These should seek to provide a pleasant working environment and to complement the landscape presentation developed on neighbouring road frontages and other areas of the public domain.

Each allotment owner will be required to have a landscape plan approved by the Estate Manager as a precondition of development. These plans are to incorporate landscaping treatments consistent with - or at least not clashing with - landscape treatments on neighbouring public land. In addition, to the extent that is practical, some consideration should be given to aesthetic objectives in the design and finish of buildings and plant components.

While each development will be unique and will have its own needs and potentialities for landscaping and presentation, some general concepts for landscaping of different sizes and types of industry are presented below.

6.1 Strategic Industry Area

Much of the industry within this precinct will be large processing plants, which are not easily screened from public view. Conscious attention in plant layout, design and surface finishes, augmented by a formal landscaping programme in and around the finished plant, can do much to improve its presentation to those viewing it from the outside. It can also create a more appealing environment for employees working within the plant.

Perimeter Planting

Establishing a band of trees and taller shrubs around the perimeter of plants within the Strategic Industry precinct will provide an attractive buffer between each plant and its neighbour. If there is a fire risk within the plant, a perimeter road immediately inside this planted buffer can serve as a firebreak and general access way.

Landscape strips proposed at 5.2 can offer necessary screening and landscape enhancement at the front boundary, helping to soften the visual impact of buildings that are located close to this boundary. Building setback will vary according to lot size and the nature of the industry, its buildings and other structures.

Administration Buildings
As the focal point for site management and the point of entry of visitors and customers, administration buildings usually have the most intensive landscaping of any area within a plant site. Irrigation is often provided to the landscaped areas surrounding an administration building and therefore these areas provide the opportunity for irrigated turf, beds of low shrubs or annuals, and/or arrangements of larger shrubs and trees to enhance the presentation of the buildings.

Process Areas
In the construction of larger buildings and process elements within the operational area of a plant, careful selection of colours and textures can soften their visual impact and enhance their overall appearance. Subject to safety and fire control considerations, planting of trees and shrubs around and amongst process buildings, pipework, tanks and other structural elements might also be considered. This can break up harsh lines, improve overall appearance, and provide a more pleasant working environment.

Particular attention should focus on crib rooms and site offices, providing more intensive landscape treatments around these because of their frequent use by workers and visitors. This may in some cases include provision of limited areas of shaded lawn where workers can relax during crib breaks.

Contractors' Yards / Storage Areas
Careful positioning of such facilities as contractors' yards, storage bays, materials handling yards, stockpiles and lay-down areas can enhance the general presentation of an industrial site and assist sound housekeeping, so that a tidy appearance is maintained. Such areas should, where practical, be screened or remote from public areas, particularly public roads. Thus they are preferably located towards the centre or rear of an industrial site rather than near boundaries where they are more evident to visitors and the passing public. Mounding and planting can assist in screening them from view, and in improving their often stark or untidy appearance.

Carparks
Carparks for employees and visitors should be located with consideration to;

- accessibility to works areas and/or administration buildings.
- security of parked vehicles (requiring adequate visibility).
- aesthetics (requiring an element of screening and landscape planting).

Planting around carparks should be designed not only to improve the appearance but also for the practical purpose of providing shade for cars. It should not be limited to carpark perimeters but might also occur in islands and medians separating groups of parking bays.

Areas for Future Plant Expansion
Open ground within a plant site that may be scheduled for future expansion should ideally be planted to shrubs to provide cover until it is required for plant expansion. This will enhance its appearance and reduce any risk of the area becoming a source of wind-blown dust. Unplanted strips may be required within them as firebreaks.

Drainage and Water Efficient Design
Water efficient design should be sought at all times, selecting native species with a low water requirement, and adopting such measures as direction of clean stormwater onto vegetated and landscaped areas rather than disposing it in soak wells.

For large areas of pavement such as car park surfaces, efficient natural drainage can be achieved by having intermittent grassed or planted drainage swales across the slope of the pavement and around its perimeter, rather than having kerbing directing drainage to soak wells. Alternatively, drainage trenches may be excavated across the pavement and backfilled with loose gravel, remaining unsealed on the surface so that they present a trafficable gravel strip intersecting the otherwise sealed pavement.

If large quantities of clean drainage are to be accommodated within the plant site and the vegetated beds and drainage swales suggested above are insufficient to cope with this, dedicated drainage sumps may be provided as surface basins. These can be permanent or intermittent wetlands revegetated with appropriate trees and understorey, or maintained as mown grass depressions which accommodate runoff during storm events but otherwise remain dry and accessible for most of the year.

6.2 General Industry Areas

For the GIAs, similar principles apply to those outlined above for the SIA, qualified by the smaller size of lots and of buildings and structures within them.

Building Location and Design
In locating and designing buildings on allotments in the General Industry precinct, consideration should be given to such aspects as:

- Visual presentation and appeal.
- Market or corporate image.
- Safety and security.
- Access and egress.

Buildings located towards the front of the block, if visible from the street, should be designed to "address" that street, giving consideration to both general impressions from the roadway and at the point of entry. The main entrance to such buildings should be well signalled in the design. Where an office or sales building adjoins a larger warehouse or factory building, the form and location of the former may be used to reduce the visual impact of the latter.

Carparks
Car parking would normally be located at the front of the site, near the administration building and behind the landscape strip of the road reserve. Landscape and shade plantings are appropriate around the carpark.

Storage Areas
Storage yards and lay-down areas should preferably be located out of site of the road, behind buildings. As previously indicated for industries in the Strategic Industry precinct, mounding and planting can be used to assist in screening these areas from view and in improving their often stark or untidy appearance.

Fencing
Security fencing may encompass the carpark as well as the premises behind and any storage yards beyond. It is, however, preferable that fencing be restricted to the back and/or side of the main building, enclosing storage yards only.

Landscape Planting
Landscaping efforts should focus particularly on the administration buildings. Here intensive treatments such as irrigated turf and/or garden beds with low shrubs, groundcovers or flowering annuals may be appropriate for optimum presentation to customers and visitors. Behind these buildings, as space and design permit, lower key landscape plantings can be appropriate to screen unattractive elements from neighbouring lots and/or to enhance the general presentation and working environment around site buildings and yards.

Some flexibility should be exercised in dealing with the landscape strip fronting general industry allotments. This will be developed initially to the design indicated in Section 5.2. If, however, occupants can demonstrate a need for greater exposure to passing custom and therefore requires a display area towards the front of the site, they may present a plan for alternative treatment of the landscape strip that secures that exposure. Provided such plan is still satisfactory from an aesthetic standpoint, the estate manager may permit the owner to implement his landscaping proposals within the landscape strip.

6.3 Mitigation of Light Spill

The Oakajee Industrial Estate will require external artificial lighting for both construction and operational activities. These light sources could cause light spill that may be viewed from the surrounding residential areas to the south and east of the site. The light related impacts which will require mitigation include;

- Sky glow: the upward spill of light into the sky which can cause a glowing effect
- Light spill: the unwanted spillage of light onto adjacent areas such as nearby residential developments.
- Glare: the uncomfortable brightness of the light source against a dark background causing a nuisance to residents and a hazard to road users.

Design Recommendations
To avoid excessive light pollution, lighting treatments throughout the estate including those for the industrial allotments should be designed using current best practice and technology. Key Lighting design recommendations include;

- Select luminaries that minimise upward waste light and stray light.
- Select light poles that are high enough to minimise upcast angles of luminaries but low enough to limit spill light.
- Locate lighting appropriately by adhering to all relevant and appropriate standards to avoid unacceptable levels of artificial lighting,
- industrial allotments should include a landscape screening to reduce the impacts of any lighting installed.

Mitigation measures
The potential effects resulting from glare and light spill on surrounding residential developments can be minimised by implementing the following mitigation measures;

- Avoid poorly sighted lights on the boundary of the estate.
- Positioning lights appropriately to avoid poorly directed lighting.
- Use appropriate shields to avoid light spilling upwards.
- Low level bollard lights can provide an alternative to taller columns along pedestrian routes within industrial allotments.
- Restriction of running hours by limiting usage to an as-needed basis.
- Where practicable, switch off lights when not required for safety, security
- Limiting roads directly facing any existing nearby residential properties.
- Signage should be carefully illuminated in order to minimise glare.
- Landscape buffers to further reduce the impact of vehicle headlights.

Landscape Strategy
The Landscape design provides screening buffers which will to assist in mitigating the amount of lit surface area, and reducing the potential effects of light spill associated with artificial lighting. In addition to other mitigation measures it is recommended that where possible existing vegetation is retained to assist in providing a landscape screen to the development. Together with the retention of a significant extent of existing vegetation further screening is proposed within the estate and on the boundaries of the Overall Development. Landscape buffers surrounding the industrial allotments will assist in confining and screening many of the visible illuminated areas and the extent of light spill.

7.0 FENCING AND SIGNAGE

Fencing
Fencing is an integral part of industrial development in delineating areas and boundaries, and for security purposes. Fencing location, style and height should where possible be integrated with the building form. Fencing should be unobtrusive, and should relate to the character of the streetscape. Uniform guidelines are proposed to ensure consistency of the fence treatment throughout the estate. Standards for fencing should embrace both fences which serve as barriers to traffic or for ornamental purposes, and the more elaborate fencing required for security purposes.

Security fencing should generally be restricted to side and rear boundaries, with front fencing restricted to a practical minimum. Where security fencing is required to a street frontage, the fence line will be behind the landscape strip, so that additional planting should not be necessary to screen it and thereby soften its impact.

For security fencing, 1.8-metre black P.V.C.-coated chain-link should be regarded as a minimum standard. Higher fences with barbed wire topping may be considered where they are essential to security, subject to prior approval by estate management.

Pine post or pine post and rail fences are preferred where security is not an issue but a restraint is required to vehicle access. Around areas of public open space, a more attractive presentation is achieved by dispensing with fences altogether. Post or post and

rail fencing should only be used in such situations if illegal vehicle access is otherwise probable.

Signage
The signage policy within the estate should ensure that all public signs have a consistent design in order to provide clear direction for people to navigate their way around the estate. This policy should guard against overuse or untidy clusters of signs that can become visually intrusive.

The same signage design might also be adapted for the entry to each business or plant site, with an estate logo and an industry name plate as the basis. There should be some flexibility to permit individual businesses to install signage to their own corporate design, although this should still be compatible with the immediate landscaped surrounds in respect of size, colour and design, and should meet the approval of estate management.

Within the above context, the following general criteria might apply to signs on private allotments:

- Sign location should be considered in the site and building design process, rather than installing signs arbitrarily on a finished site or building.
- Signs should be of constant form, lettering, type and colour on any one site.
- Signs at site entries should be located within the vegetation setbacks proposed for plant entries.
- No flags, banners, bunting or similar temporary displays or signs should be permitted on road frontages or at plant entries.

8.0 RECREATIONAL OPPORTUNITIES

The development of the Oakajee Port and OIE will bring more people into the region and tourist facilities and recreational opportunities will need to be managed to provide for the increased population. There are a limited number of existing or potential recreation and tourism destinations in the neighbourhood of the OIE offering activities that can be enjoyed by both tourists and locals.

Two significant nodes are Coronation Beach and Buller River mouth. The former offers an established campground while the latter is proposed in the Shire of Chapman Valley Coastal Management Strategy as a site for a day use facility and a campground.
At the same time access to the southern section of the Oakajee coastline (Buller River to the “bombies”) is to be maintained, with the existing 4WD track accessing this area to be widened to make it safer for users.

The Moresby Range to the east is a conservation reserve which also affords opportunities for visitation, and for possible future walk trails and a lookout or lookouts which would offer a commanding view over Oakajee and the coast beyond.

9.0 VISUAL IMPACT ASSESSMENT

The focus of the Visual Impact Assessment was to establish likely changes to the landscape and visual character of the Oakajee area and to assist development of a strategy to manage visual impacts of the proposed industrial development.

The site was traversed, establishing the existing landscape character and the visual catchment of the study area. Areas of visual impact surrounding the site were determined for assessment including:

- Views from North West Coastal Highway.
- Views from neighbouring residential precincts.
- Direct views into the site.

The assessment involved analysis of the surrounding site context through both desktop analysis and field verification, examining view points and potential visual impacts. Seven key viewsheds were identified for assessment:

1. Drummond Cove residential precinct approximately 3.5km south of the Southern GIA.
2. Park Falls residential precinct approximately 2.0km south-east of the Southern GIA.
3. North West Coastal Highway directly east of the Eastern GIA.
4. The hard rock quarry site on North West Coastal Highway about 3.0km north of the SIA.
5. Nanson-Howatharra Road providing an open elevated view about 5.5km north-east of the SIA.
6. Whitepeak Road Location A providing an open elevated view about 2.0km east of the Southern GIA.
7. Whitepeak Road Location B providing an open elevated view about 3.0km east of the Southern GIA.

A computer model was prepared incorporating existing site topography and hypothetical industrial buildings to 30m in height with chimneys from 60 to 100 metres tall. These were located within the Strategic Industry precinct and both General Industry precincts. Floor levels selected for these structures correspond to existing site topography, with the following average floor levels adopted:

- RL 85 in the west of the SIA.
- RL 90 in the east of the SIA.
- RL 85 in the north of the SIA.
- RL 75 in the south of the SIA.
- RL 100 in the northern GIA.
- RL 60 in the southern GIA.

Computer photomontage images of the proposed industrial area were produced to help assess development in the existing landscape context. These images provide a useful tool to help evaluate the development and its visual impact. The resulting images are presented in Appendix II.

Findings included the following:

1. Drummond Cove Residential precinct – impact on existing views should be minor, with the southern boundary of the development area removed 3.5km to the North and partially screened by terrain and by existing vegetation on and above the coastal escarpment.
2. Park Falls Residential precinct – industrial structures will be evident in the background from the elevated viewing area of Park Falls, ameliorated somewhat by perimeter vegetation in the south and east. The visual impact will be modest, allowing for the 2 km separation between the closest viewing areas and the southern boundary of the development area.
3. North West Coastal Highway – the Oakajee ridgeline and ridgeline planting provides a significant screen which largely hides the industrial precincts and future structures within them from passing traffic on the highway to the East.
4. Hard rock quarry site – views from the highway by the quarry are softened by distance to the industrial precincts and by intervening terrain and vegetation. Taller buildings and chimney stacks will be partially visible.
5. Nanson-Howatharra Road – there is a clear elevated view towards the industrial precincts from this road west of the Moresby Range. While Industrial structures will be visible, the 5.5km distance from the industrial precincts means their visual impact will be minor.
6. Whitepeak Road location A– the view towards the industrial precincts is elevated and open providing views to many of the industrial buildings from this location. Many of the taller buildings will be visible from this location however the natural landform and screening vegetation help to ameliorate these impacts. The nearest buildings are more than 2.0km from this location resulting in background views of the industry.
7. Whitepeak Road location B– there is a clear elevated view towards the industrial precincts from this location. While the taller buildings and chimney stacks will be partially visible, the contour of the landscape within the industrial areas helps to conceal many of the structures. This will be further ameliorated by perimeter vegetation in the south and east. The nearest buildings are more than 3.0km from this location resulting in background views of the industry.

Strategies for screening and revegetation within the Landscape Report will help mitigate the visual impacts as follows:

- Infill planting by North West Coastal highway in areas with direct views into the estate where existing vegetation is sparse.
- Landscape and screen planting within the estate itself to provide visual relief from industrial structures.
- Planting of screening vegetation may be considered close to roadways or residential precincts with exposed views into the estate if potential benefits are evident and sufficient.

This visual impact assessment is supported by a viewshed analysis prepared as part of the *Oakajee Landscaping Strategy* (Quilty Environmental,1993). The Quilty Environmental (1993) viewshed analysis and images have been included as an addendum to this report.

10.0 MAINTENANCE

Maintenance of landscaped areas is essential to ensure survival of landscape treatments and a high standard of presentation at all times. It is important to establish robust and durable management standards with a view to minimising on-going long-term landscape maintenance. Partnerships with local authorities and other stakeholders will be important to ensure that standards of maintenance are maintained. The maintenance will embrace both a short term intensive effort on newly developed areas, and ongoing input of lesser intensity for all areas of established landscaping.

10.1 Short Term Maintenance

Short term follow-up over the first two to three years on initial landscape and revegetation plantings will encompass such aspects as fencing maintenance, weed, insect and rabbit control, possible selective watering in the first summer, fire prevention, and replacement of any substantial plant losses.

Fencing

Fences around planted and seeded areas must be kept in good repair at all times. Sheep straying into a plantation in the first or second year can do substantial damage, whilst cattle may damage developing trees and shrubs up to three or four years of age, depending on rate of growth of the plants.

Weed Control

Rank weed growth can develop in the spring following planting or seeding. If fertiliser is applied with seed or seedlings, the weeds may be stimulated by the consequent improved soil fertility. If the problem is serious or the area is a key one in terms of landscape amenity, slashing and/or application of a selective herbicide should be considered. A grass-specific herbicide can generally be applied to control grasses with little risk to seedling trees and shrubs.

Slashing should, be carried out amongst planted seedlings at least annually (and preferably twice per year) if significant lupin, grass or weed regrowth is occurring. These plants will otherwise compete vigorously with the developing tree and shrub seedlings. They will also present a fire hazard if left as dry standing vegetation through the summer months. Particular attention should also be paid to a number of Declared Weeds and noxious weeds growing on the sand plain and around its margins. A lookout must be maintained for infestations of these not only in planted and seeded areas but also in areas of the buffer that may be locked up from grazing or cropping. Particular concerns in this regard are skeleton weed, doublegee, Mexican poppy, Paterson's curse, saffron thistle, thornapple, African boxthorn and Geraldton carnation weed, all of which have been noted on the site.

As planted trees and shrubs grow in size, they should begin to out-compete weeds in their vicinity. At that stage, if it is desired to establish a more diverse understorey, seeding of a selection of the endemic shrubs listed in Appendix I might be considered.

Watering

Irrigation of planted areas will only occur around the planted entry environments because of both initial establishment cost and subsequent maintenance costs. Careful species selection, use of quality seedling stock, and application of the various site preparation measures as discussed in section 3.2, will enhance survival prospects of non-irrigated

seedlings through the first summer. If, however, conditions in the initial summer are severe, losses to drought stress may still be substantial. These can be reduced by hand watering each plant with 5 to 10 litres every two to three weeks through the hottest months. Such an operation is expensive and the cost must be balanced against the alternative of replanting any areas where losses are high.

Insects
Insect attack can damage young seedlings. Spraying of insecticide may be warranted if there are serious infestations of such pests as sawfly, leaf miner, black beetle, Rutherglen bug or red legged earth mite in the first two to three years. Baiting may be required if grasshoppers prove a threat.

Rabbits
After initial baiting, rabbit numbers can recover to pest proportions if periodic follow-up baiting is not carried out.

Fire Control
Fire can be a serious hazard to young seedlings in locations adjoining natural scrub or in areas of rank grass and weed growth. Depending on fire intensity, it may be several years before seedlings will tolerate a burn. Accordingly, control of rank grass and weed growth and removal of dead vegetation around planted areas is desirable. Slashing between planted rows should occur at least once per annum, in late spring, as recommended previously. Firebreaks should also be established and maintained around any extensive planted or seeded areas until adjoining ground is occupied and developed.

Replanting / Reseeding
Planted and seeded areas should be checked in the autumn following initial planting/seeding to determine whether there are any sites where establishment has been poor and infill planting/ seeding is warranted.

10.2 Long Term Maintenance

In the longer term, continuing maintenance will be required along landscaped road reserves, service and rail corridors, on other public lands improved by landscape plantings, and within treated areas of private allotments. This continuing maintenance will include:

- Slashing or mowing to control weed and grass growth along road frontages and on other public areas, and between rows in landscape/screen plantations. Slashing frequency will depend on location and seasonal conditions, with more regular slashing (perhaps three to six times per annum) of public road frontages, public open space, estate entries, and the more visible sections of service corridors. Controlled grazing is an alternative to slashing. This might be permitted in plantations once trees and shrubs have reached a size that will tolerate livestock foraging. Slashing or grazing might cease in a plantation area if and when tree and shrub growth reaches such a size that it is out-competing weed and grass regrowth.
- Regular mowing of any irrigated turf.
- Whipper-snipping around trees and shrubs to complement slashing/mowing in areas of intensive landscaping, or where presentation is more critical (e.g. site entries).

- Re-establishment at least annually (by slashing, herbicide application or cultivation) of firebreaks between landscaped areas and vacant land, and around buffer zone vegetation. Note that cultivated firebreaks are not appropriate on sandy soils if these are exposed to wind erosion.
- Periodic removal of dead or dying vegetation and pruning of any substantial dead branches which may be unsightly or which present a safety hazard.
- Rubbish clean-up along road frontages as necessary (usually when mowing or slashing).
- Maintenance of reticulation in areas of irrigated landscaping, with routine checking of same on at least a monthly basis through the dry November-April period.
- Baiting for rabbits in any areas which are seriously infested by this pest, at least until extensive areas of vacant land is occupied.
- Control of Declared Weeds consistent with Department of Agriculture protocols, and of noxious weeds as needed. This will apply particularly to ungrazed and uncropped areas of the buffer zone and to any large parcels of vacant land within the estate.

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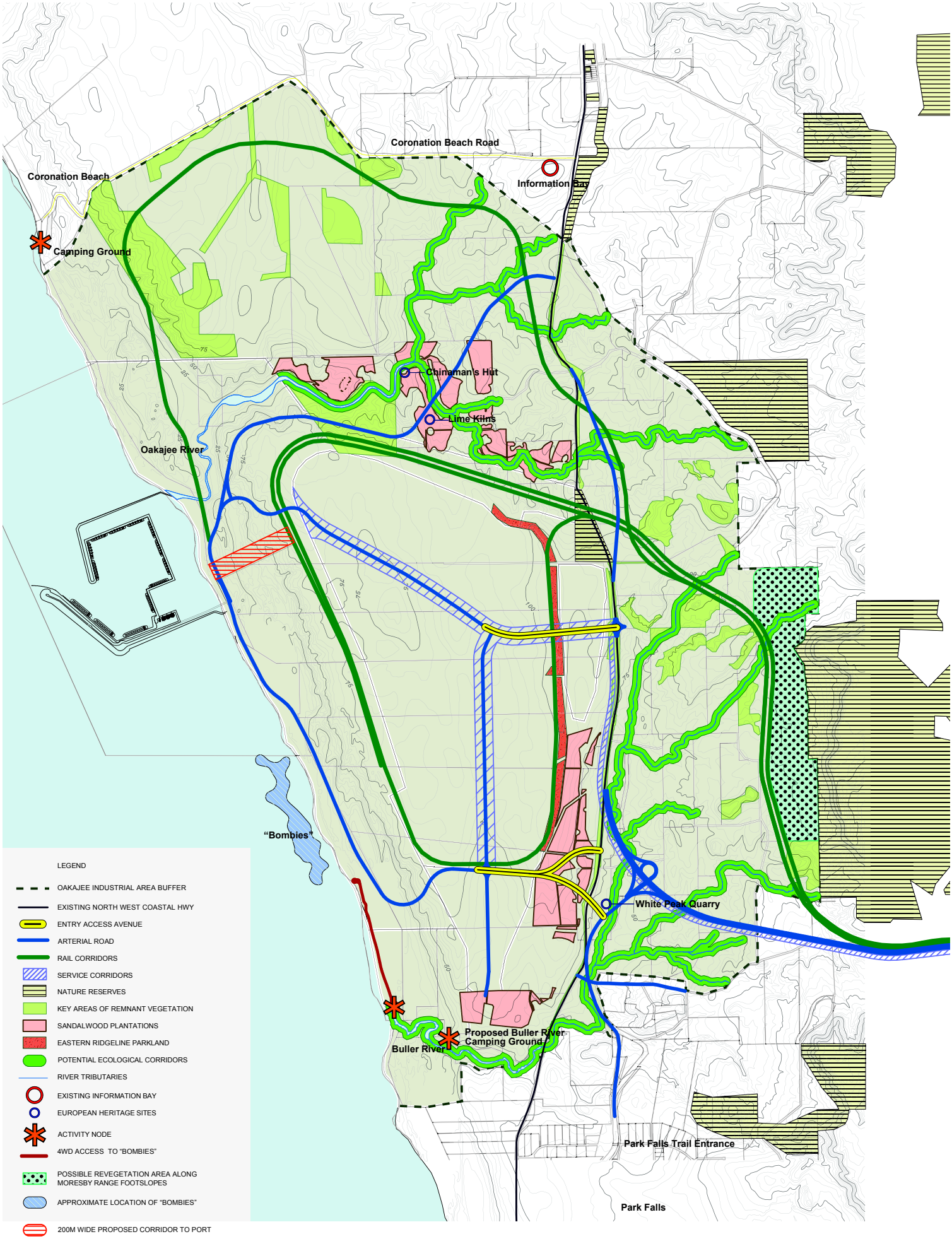


HASSELL

Project Name	Client	Drawing	Scale	Date
Oakajee Industrial Estate	Landcorp	Figure 08_ Landscape Master Plan	NTS@A1	24/01/11

APPENDIX I

APPENDIX I: SPECIES FOR LANDSCAPING WITHIN THE OAKAJEE SITE

The species lists contained within the appendix are a guide to species proposed for landscape and revegetation work at Oakajee. The selection of species for inclusion on the list considered such parameters as;

- Endemic to the area
- Structural position, height, habit and form,
- Amenity value (e.g. flower colour, foliage),
- Screening suitability,
- Hardiness, how well the species has grown in existing plantings on site, and suitability to site soil types,
- Ease of propagation and likelihood of nurseries being able to grow, and
- Suitability for direct seeding, including seed cost.

The overall species list (Broad Species List) was based on work by Strategen to identify species which were most suited to meeting the objectives of the Landscape Master Plan. The list includes a wide variety of species which, while suitable for the landscape design, cannot all be assured of success. The Narrow Species List includes the 32 most reliable species which, based on past experience within Oakajee itself and the broader area, are believed to offer the best prospects of success.

The two lists draw principally on native species, with particular emphasis on species occurring naturally at Oakajee and in the neighbouring area which display characteristics that should allow them to establish in the harsh environment of the site. Also included are a number of native species not endemic to this area but which have nonetheless proven their ability to establish under environmental conditions similar to those of the Oakajee site. They are not exhaustive lists, and other proven landscaping and revegetation species might be added to achieve various effects in different locations.

The lists are a guide. It must be recognised that, in the harsh environment of Oakajee, with its freely draining and infertile soils and its exposure to high winds and summer drought, there will be a degree of trial and error in seeking to establish trees and shrubs. Experience gained in initial years will permit progressive refinement of plant selections.

For a more wide ranging list, particularly for revegetation as distinct from landscaping purposes, the Geraldton Regional Vegetation and Flora Survey should also be consulted.

Species name	Common name	Strata	Habit	Height (m) (NL = see narrow list) blue = in Gero	Grown from seed	Comments	Difficulty of Propagation (NL = see narrow list) all species seed unless stated	Suitable for direct seeding.	Suit soil/terrain
Acacia acuminata	Jam	Upper and mid storey	Shrub or tree, Fl. yellow, Jul–Oct.	1–7(–12) m high NL	Yes	Good on gravels and heavier soils, but also doing particularly well in current ridge plantings	NL	NL	NL
Acacia ligulata	Umbrella Bush	Mid storey	Dense, rounded or infundibular shrub or tree,	1–4(–6) m high NL		bright yellow flowers in season	NL	NL	NL
Acacia rostellifera	Summer-scented Wattle	Upper and mid storey	Dense shrub or tree	1–6 m high NL	Yes	Doing well in current plantings, though dies back and can become straggly when older. Suckers	NL	NL	NL
Acacia spathulifolia		Mid storey	Dense, spreading shrub	0.5–3m high 1.5-3m	Yes	bright yellow flowers in season, lush green foliage, long lived	Easy	yes	Neutral & alkaline sands
Acacia tetragonophylla	Kurara	Mid storey	Much-branched, spreading, straggly, prickly shrub or tree	1.4–5 m high 2-3m	Yes	bright yellow flowers in season, does particularly well on gravels and red soils, but also doing very well amongst current ridge plantings	Easy	yes	Best on Gravel
Acacia xanthina	White stemed wattle	Upper and mid storey	Dense shrub or tree	1–4 m high 2.5-5m	Yes	Doing well in current ridge plantings, but can die back and get straggly as it gets older	Easy	yes	Best on Alkaline sands
Allocasuarina campestris		Understorey	Dioecious or monoecious shrub	1–3 m 2-3m	Yes	Difficult to propagate. Grows in clumps	Need frankia innoculant, seedlings die easily	no	Gravel and neutral sands
Allocasuarina huegeliana	Rock sheoak	Mid storey	Dioecious tree	4–10 m NL	Yes	Doing well in current ridge plantings	NL	NL	NL
Alyogyne hakeifolia	Native hibiscus	lower storey	Erect, slender or spreading sh	1–3 m high 2-3m	TBC	Purple flower. Best on alkaline sands. Attractive but must be planted in clumps.	Slow to germinate in temps over 25C	NL	Alkaline or neutral sands
Atriplex nummularia	Old Man Saltbush	Upper & mid storey	Shrub	2-3m	Yes	Reliable shrub, fast growing	Easy	yes	Salt tolerant, wind hardy, suitable all soils except gravel.
Banksia attenuata		Upper storey	Round shrub to ground	2.5m high	Yes	Yellow flower	High temperatures in summer rot seed. Seed collection/processing slow	no	Neutral sands
Banksia nivea	Honeypot dryandra	ground cover/low shrubs	Shrub	0.15–1.5 m high	Yes		High temperatures in summer rot seed. Seed collection/processing slow. Will be difficult to find local seed.	no	Neutral sands and gravel
Banksia prionotes	Acorn Banksia	Upper and mid storey	Non-lignotuberous tree or shrub	to 10 m high 3-4.5m	Yes	Big flowers, good screeing, Iconic plant	High temperatures in summer rot seed. Seed collection/processing slow	no	Neutral sands best
Banksia sessilis	Parrot Bush	Understorey	Prickly shrub or tree	0.5–5m 2.5-3.5m	Yes	Yellow flowers	High temperatures in summer causes seed to rot.	no	Best on alkaline sands

Callistemon phoeniceus	Fiery Bottlebrush	Upper & mid storey	Upright Shrub	2-3,5m	Yes	Reliable hardy species. Showy bottlebrush	Easy	no	All but grows small on gravel. Semi salt tolerant
Calothamnus blepharospermus		lower storey	Shrub	0.3–3 m high. NL	Yes	Red orange flower; doing well in current plantings	NL	NL	NL
Calothamnus quadrifidus subsp. homalophyllus	Red Clawflower/1/2 sided Bottlebrush	Upper storey	Open Shrub	1.5-3m	Yes	Red flower - hardy species	Easy	no	Neutral sands
Casuarina obesa	Swamp Sheoak	Upper and mid storey	Dioecious tree	1.5–10 m high NL	Yes	Doing reasonably well amongst current ridge plantings	NL	NL	NL
Dodonaea inaquifolia		Mid storey	Erect shrub or tree. Fl. yellow, green, brown, Apr–May/Aug–Sep	0.7–5 m high NL	Likely		NL	NL	NL
Dianella revoluta	Blueberry Lily	lower storey	Rhizomatous, perennial, herb	0.3–1.5 m high NL	Yes	Very tough species well suited to the area, but seed must be fresh to propagate successfully	NL	NL	NL
Eucalyptus arachnaea	Black-stemmed Mallee	Mid storey	Mallee or tree	1.5–10(–15) m high 2-5m	Yes	particularly good on breakways and gravelly soils	Easy	no	Best on Gravel
Eucalyptus blaxellii		Mid storey	Mallee	1–4 m high 2.5-4m	Yes	priority 4 species, worth trying for seeding purposes	Easy	no	Best on neutral sands and gravel
Eucalyptus eremophila		Upper storey	Mallee or tree, bark smooth. Fl. cream, yellow, pink, Aug–Dec.	2–8 m high	Yes		NL	NL	NL
Eucalyptus eudesmioides	Malallie	Upper and mid storey	Mallee or tree	2–8m 3-5m	Yes	Sandplain mallee well suited to sandy soils	Easy	no	Best on neutral sands
Eucalyptus foecunda	Narrow-leaved red mallee	Upper and mid storey	Mallee or tree (occasionally). Bark smooth above with rough flaky bark at base, grey over pale copper. Flowers white, cream, Aug/Jan–Feb	to 5 m high, 3.5 -5m	Yes		Easy	no	Best on neutral sands
Eucalyptus gomphocephala	Tuart	Upper storey	Tree, bark rough, box-type. Fl. white, Jan–Apr	10–40 m high, NL	Yes	Susceptible to dry extra hot weather stress when mature.	NL	no	NL
Eucalypytus jucunda	Yuna Mallee	Mid and upper storey	Mallee or tree (sometimes), bark rough on the trunk, smooth above. Fl. yellow, Jan–Apr.	1-8 m high NL	Yes		NL	no	NL
Eucalyptus leucoxylon	Yellow Gum	Mid and upper storey	Mallee or tree. Bark at base usually coarse, loose, fibrous with most of trunk or stems smooth and yellowish	To 25 m high NL	Yes	Not endemic - South Australia	NL	no	NL
Eucalyptus obtusiflora	Dongara Mallee	Mid storey	Mallee	5 m high 4-5m	Yes		Easy	no	Best on neutral and alkaline sands
Eucalyptus oldfieldii	Oldfield's Mallee	Mid storey	Sprawling, spreading mallee or tree,	2–6 m high 3-5m	Yes	Best on neutral sands	Easy	no	Best on neutral sands
Eucalyptus oraria	Ooragmandee	Mid and upper storey	Mallee or tree, bark smooth, tree form may have rough butt.	1-15 m high 3-5m	Yes		NL	no	NL

Grevillea argyrophylla	Silvery-leaved Grevillea	Understorey	Small tree or shrub	1–6 m high 2-3m	TBC	Excellent on alkaline sands	Smoke treat. Hot weather can slow germination	no	Neutral to alkaline sands and limestone
Grevillea biternata		Lower to mid storey	Prickly shrub, . Fl. white, yellow, Mar–Sep	0.3–1.8 m high NL	TBC		NL	NL	NL
Grevillea candelabroides		Mid storey	Non-lignotuberous shrub, Fl. cream, white, Apr/Aug–Jan.	1.2–4 m high. NL	TBC	Showy white flowers	NL	NL	NL
Grevillea eriostachya	Flame Grevillea	Mid storey	Small, lignotuberous shrub	1–5 m high NL	TBC	Best on neutral sands	NL	NL	NL
Grevillea leucopteris	White Plume Grevillea	Mid storey	Spreading, bushy shrub	1–4 m high NL	TBC	learge white flower heads; best on neutral to alkaline sands	NL	NL	NL
Grevillea pinaster				NL		Good on breakaways and neutral sands. Difficult to secure seeds	NL	NL	NL
Hakea bucculenta	Red Pokers	Upper storey	Round dense shrub	2-3m	Yes	Windhardy, showy	Easy.-medium. Needs 25-30 C to germ regularly	yes	Neutral sands
Hakea francisiana	Emu Tree	Mid storey	Non-lignotuberous shrub or tree	3–8 m high NL	TBC	Very attractive shrub. Best on sands and loams	Hot weather can slow germination	NL	Gravel and neutral sands
Hakea lissocarpha	Honey Bush	Understorey	Erect to sprawling, pungent,	0.4–1.5 NL	Yes	Good survivor. A local sandplain species.	Hot weather can slow germination. Seed collection needs to be timely.	NL	Sandplain and gravel
Melaleuca cardiophylla	Tangling Melaleuca	Upper and mid storey	Erect to spreading shrub,	0.4–2 m high, to 3 m wide 2.5-3m	Yes	green dense foliage; well suited to the area. Excellent on ridge plantings	Easy	yes	Neutral and alkaline sands
Melaleuca eleuterostachya		Mid storey	Erect shrub or tree,	0.5–3 m high NL	Yes	Good upright drought tolerant plant; doing well amongst current plantings	NL	no	NL
Melaleuca huegelii	Chenille Honeymyrtle	lower storey	Shrub or tree	0.5–5 m high 2-3.5m	Yes	Particularly good on limestone soils	Easy	no	Neutral and alkaline sands
Melaleuca lateriflora	Gorada	Mid storey	Shrub or tree,	1–8 m high NL	Yes		NL	NL	NL
Melaleuca megacephala		lower storey	Erect shrub	0.5–3 m high NL	Yes	suited to gravels, but may get stressed on deep sands	NL	NL	NL
Melaleuca uncinata	Broom Bush	Mid storey	Shrub or tree	0.5–5 m high NL	Yes	Good species for the area; doing well in current plantings	NL	NL	NL
Pittosporum phylliraeoides	Weeping Pittosporum	Mid and upper storey	Tree or shrub, Fl. white, cream, yellow, Jun–Oct.	0.6–8 m high NL	Yes	Slow growing	NL	NL	NL
Rhagodia preissii		Lower storey	Shrub	0.5–4 m high NL	TBC	Excellent and vigorous low growing shrub; will often colonise naturally	NL	NL	NL
Senna charlesiana	Fork leaf Cassia	Upper and mid storey	Round shrub	1-2.5m	Yes	Stunning hardy shrub. Buttercup flowers	Easy (BWT)	yes	Acid to neutral sands and gravel.
Verticordia monadelpha	Pink Woolly Featherflower	Ground cover/low shrubs	Shrub	0.3–2 m high NL	TBC	bright pink/red flowers; difficult to propagate and grow	NL	NL	NL

Species name	Common name	Strata	Habit	Height (m)	Grown from seed	Comments
Acacia acuminata	Jam	Upper and mid storey	Shrub or tree, Fl. yellow, Jul–Oct.	1–7(–12) m high	Yes	Good on gravels and heavier soils, but also doing particularly well in current ridge plantings. All purpose.
Acacia ligulata	Umbrella Bush	Mid storey	Dense, rounded or infundibular shrub or tree,	1–4(–6) m high		Bright yellow flowers in season. Al purpose.
Acacia rostellifera	Summer-scented Wattle	Upper and mid storey	Dense shrub or tree	1–6 m	Yes	Doing well in current plantings, though dies back and can become straggly when older. Suckers. Screening and revegetation.
Allocasuarina huegeliana	Rock sheoak	Mid storey	Dioecious tree	4–10 m	Yes	Doing well in current ridge plantings. Screening and revegetation.
Calothamnus blepharospermus		Lower storey	Shrub	0.3–3 m high.	Yes	Red flower; doing well in current plantings. Amenity and screening.
Casuarina obesa	Swamp Sheoak	Upper and mid storey	Dioecious tree	1.5–10 m high	Yes	Doing reasonably well amongst current ridge plantings. Screening and revegetation.
Chamelaucium uncinatum	Geraldton Wax	Mid storey	Erect shrub	0.5–4 m high	Yes	Unless pruned, tends to become straggly as it gets older. Amenity.
Dodonaea inaquifolia		Mid storey	Erect shrub or tree. Fl. yellow, green, brown, Apr–May/Aug–Sep	0.7–5 m high	Likely	Screening and amenity.
Dianella revoluta	Blueberry Lily	lower storey	Rhizomatous, perennial, herb	0.3–1.5 m high	Yes	Very tough species well suited to the area, but seed must be fresh to propagate successfully. Amenity and revegetation.
Eucalyptus eremophila		Upper storey	Mallee or tree, bark smooth. Fl. cream, yellow, pink, Aug–Dec.	2–8 m high	Yes	Amenity and screening.
Eucalyptus foecunda	Narrow-leaved red mallee	Upper and mid storey	Mallee or tree (occasionally). Bark smooth above with rough flaky bark at base, grey over pale copper. Flowers white, cream, Aug/Jan–Feb	to 5 m high,	Yes	All purpose.

Eucalyptus gomphocephala	Tuart	Upper storey	Tree, bark rough, box-type. Fl. white, Jan–Apr	10–40 m high,	Yes	Amenity and revegetation.
Eucalypytus jucunda	Yuna Mallee	Mid and upper storey	Mallee or tree (sometimes), bark rough on the trunk, smooth above. Fl. yellow, Jan–Apr.	1-8 m high	Yes	Amenity and revegetation.
Eucalyptus leucoxylon	Yellow Gum	Mid and upper storey	Mallee or tree. Bark at base usually coarse, loose, fibrous with most of trunk or stems smooth and yellowish	To 25 m high	Yes	Not endemic - South Australia. Amenity.
Eucalyptus obtusiflora	Dongara Mallee	Mid storey	Mallee	5 m high	Yes	All purpose.
Eucalyptus oraria	Ooragmandee	Mid and upper storey	Mallee or tree, bark smooth, tree form may have rough butt.	1-15 m high	Yes	All purpose.
Grevillea biternata		Lower to mid storey	Prickly shrub, . Fl. white, yellow, Mar–Sep	0.3–1.8 m high	TBC	Screening and amenity.
Grevillea candelabroides		Mid storey	Non-lignotuberous shrub, Fl. cream, white, Apr/Aug–Jan.	1.2–4 m high.	TBC	Showy white flowers. Screening and amenity
Grevillea eriostachya	Flame Grevillea	Mid storey	Small, lignotuberous shrub	1–5 m high	TBC	Best on neutral sands. Revegetation.
Grevillea leucopteris	White Plume Grevillea	Mid storey	Spreading, bushy shrub	1–4 m high	TBC	Large white flower heads; best on neutral to alkaline sands. Screening and amenity.
Grevillea pinaster						Good on breakaways and neutral sands. Difficult to secure seeds. Screening and amenity.
Hakea pycnoneura		Mid storey	Rounded shrub, Fl. cream, pink, May–Aug.	2–3 m high	TBC	Screening and revegetation.
Melaleuca eleuterostachya		Mid storey	Erect shrub or tree,	0.5–3 m high	Yes	Good upright drought tolerant plant; doing well amongst current plantings. Alll purpose.
Melaleuca huegelii	Chenille Honeymyrtle	lower storey	Shrub or tree	0.5–5 m high	Yes	Particularly good on limestone soils. All
Melaleuca lanceolata	Rottnest Teatree	Mid storey	Shrub or tree	1–8 m high	Yes	Good tough species, performing best in lower areas. All purpose.
Melaleuca lateriflora	Gorada	Mid storey	Shrub or tree,	1–8 m high	Yes	Screening and revegetation.
Melaleuca megacephala		lower storey	Erect shrub	0.5–3 m high	Yes	Suited to gravels, but may get stressed on deep sands. Screening and revegetation.

Melaleuca uncinata	Broom Bush	Mid storey	Shrub or tree	0.5–5 m high	Yes	Good species for the area; doing well in current plantings. Screenning and revegetation.
Pittosporum phylliraeoides	Weeping Pittosporum	Mid and upper storey	Tree or shrub, Fl. white, cream, yellow, Jun–Oct.	0.6–8 m high	Yes	Amenity and revegetation.
Rhagodia preissii		Lower storey	Shrub	0.5–4 m high	TBC	Excellent and vigorous low growing shrub; will often colonise naturally. Revegetation.
Santalum acuminatum	Quandong	Mid storey	Tree		Yes	Difficult to propagate, though might establish by spreading seed amongst established host plants. Amenity and revegetation.
Verticordia monadelpha	Pink Woolly Featherflower	Ground cover/low shrubs	Shrub	0.3–2 m high	TBC	Bright pink/red flowers; difficult to propagate and grow. Amenity.

APPENDIX II

APPENDIX II: VISUAL IMPACT ASSESSMENT
PHOTOMONTAGE IMAGES

HASSELL

Project Name	Client	Drawing	Scale	Date
Oakajee Industrial Estate	Landcorp	Photomontage Viewing Locations	NTS@A1	03/04/12

3.5 kms from industry

1. Existing

2. Industry

HASSELL

Project Name
Oakajee Industrial Estate

Client
Landcorp

Drawing
1. Drummond Cove Residential Development

Scale
NTS

Date
30/11/10

2 kms from industry

1. Existing

2. Industry

HASSELL

Project Name
Oakajee Industrial Estate

Client
Landcorp

Drawing
2. Park Falls Residential Development

Scale
NTS

Date
30/11/10

500m from industry

1. Existing

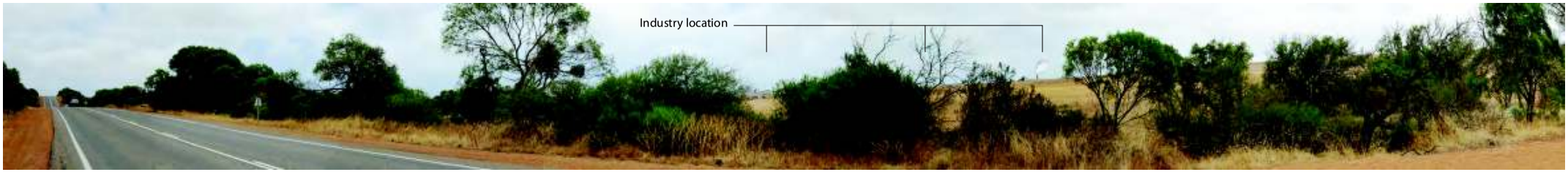
2. Industry

HASSELL

Project Name	Client	Drawing	Scale	Date
Oakajee Industrial Estate	Landcorp	3. North West Coastal Highway	NTS	30/11/10

3 kms from industry

1. Existing



2. Industry

5.5 kms from industry

1. Existing

2. Industry

2 kms from industry

1. Existing

2. Industry

HASSELL

Project Name
Oakajee Industrial Estate

Client
Landcorp

Drawing
6. Whitepeak Road Location A.

Scale
NTS

Date
03/04/12

3.0 kms from industry

1. Existing

2. Industry

HASSELL

Project Name	Client	Drawing	Scale	Date
Oakajee Industrial Estate	Landcorp	7. Whitepeak Road Location B.	NTS	03/04/12

APPENDIX III: OAKAJEE LANDSCAPING STRATEGY QUILTY ENVIRONMENTAL (JUNE 1993) SECTION 4.1 VIEWSHED ANALYSIS

4.1 Viewshed Analysis

To assess the likely visual impact of future industrial development within the park and the effectiveness of planting in key areas on this impact, a viewshed analysis has been carried out.

Twelve key viewing points were selected in the neighbourhood around the park (figure 1). Location of these included:

* The nearest major residential precinct, Drummond Cove.

* The nearest residences that have a commanding view over the site (the Kruize home in the southern buffer and the Cleminson home one kilometre east of the northern end of

the core).

* Hobby farm and farming residences on high ground to the east, south-east and north-east of the site which have panoramic views over same.

Photographs were taken from each of these points looking towards the park for incorporation into a computer-generated terrain model of the site.

Topographic information for the exercise was provided on computer disc by the Department of Land Administration. This data was incorporated into KEAYS software to create a three-dimensional ground model.

The ground model was entered into AUTOCAD and hypothetical industrial buildings with chimneys 60 and 100 metres tall (by comparison, the chimneys at the Narngulu synthetic rutile plant are 48 and 56 metres high) were created within this. The resulting model was transferred into PERSONAL VISUALISER for interpretation, positioning the camera at each photo point for final rendering.

Industrial buildings and chimneys within the model were located in the two swales within the heavy industrial core, with support industry buildings to the east, as proposed in the Structure Plan developed by Gutteridge Haskins & Davey (figures 2 and 3).

Mean floor levels selected for these industrial premises were at:

- RL 85 in the western swale,
- RL 90 in the northern end of the eastern swale,
- RL 85 in the southern end of the eastern swale, and
- RL 100 in the support industry precinct.

These are conservative assumptions, being

- 20 metres above the lowest contour for the western swale,
- 5 metres above the lowest contour for the two sectors of the eastern swale where the terrain is more level, and
- 5 metres above the lowest contour for the support industry precinct where the terrain is likewise more level.

The visual buffer provided by the terrain which rises to a peak of RL 100 on the central ridge and RL 105 on the eastern ridge was enhanced by introducing into the model a 15-metre high tree screen along these ridges.

Views of the hypothetical industries from the twelve vantage points are presented in figures 4 to 15.

These indicate a view from the Kruize property towards the site of a landscape dominated by industrial buildings. For the other eleven photo locations, however, they indicate a lesser impact, with the view dominated by chimney stacks at a distance of several kilometres.

For travellers on public roads - and particularly on the North-West Coastal Highway - there will be only occasional views of the site in which chimney stacks will again be the dominant (and possibly the only) development features which are visible. Indeed, for most of its length between the Buller and Oakajee Rivers, the North-West Coastal Highway is unlikely to afford any view of the site or of industry within it. Along this road industry is likely to be seen only from high points north of Oakajee River and from one high point immediately south of Buller River.

From the most commanding viewing point in Drummond Cove - a lookout above the beach within the new residential estate - the model indicates a distant view (6 to 10 kilometres removed) of chimney stacks. Most residences here are, however, unlikely to have any view of industry because of their lower elevation and the surrounding vegetation.

The view from the ocean front at Geraldton was not modelled as it is a similar perspective to that from Drummond Cove, but at a greater distance (a further 11 kilometres). Thus it will again be a view in which chimney stacks are the dominant, and possibly the only development feature, with their visibility less distinct because of the 17 to 21-kilometre separation.

From the beach adjacent to the site the upper portion of stacks in the nearest (western) swale are likely to be visible from points where higher dunal terrain in the foreground does not screen them.

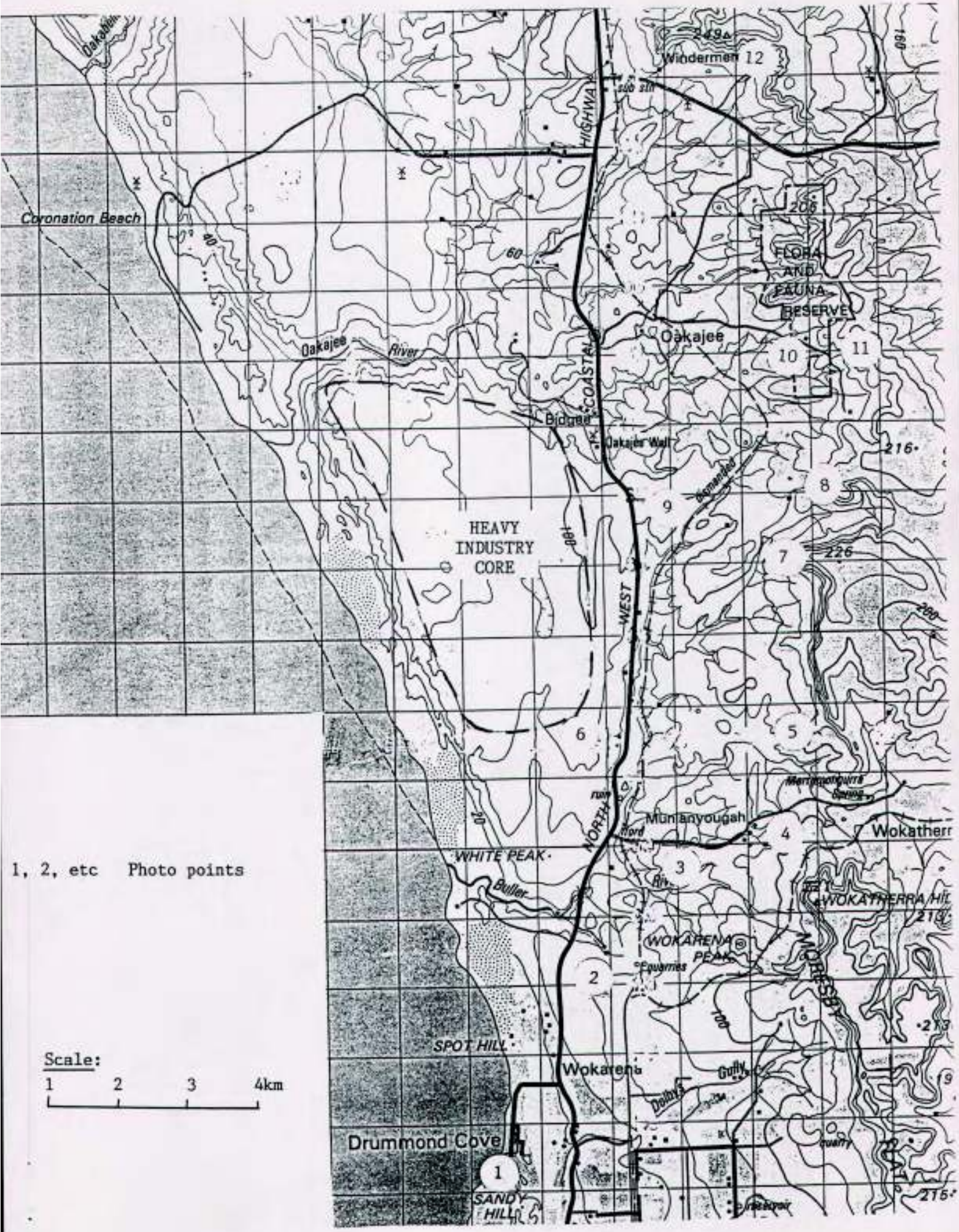
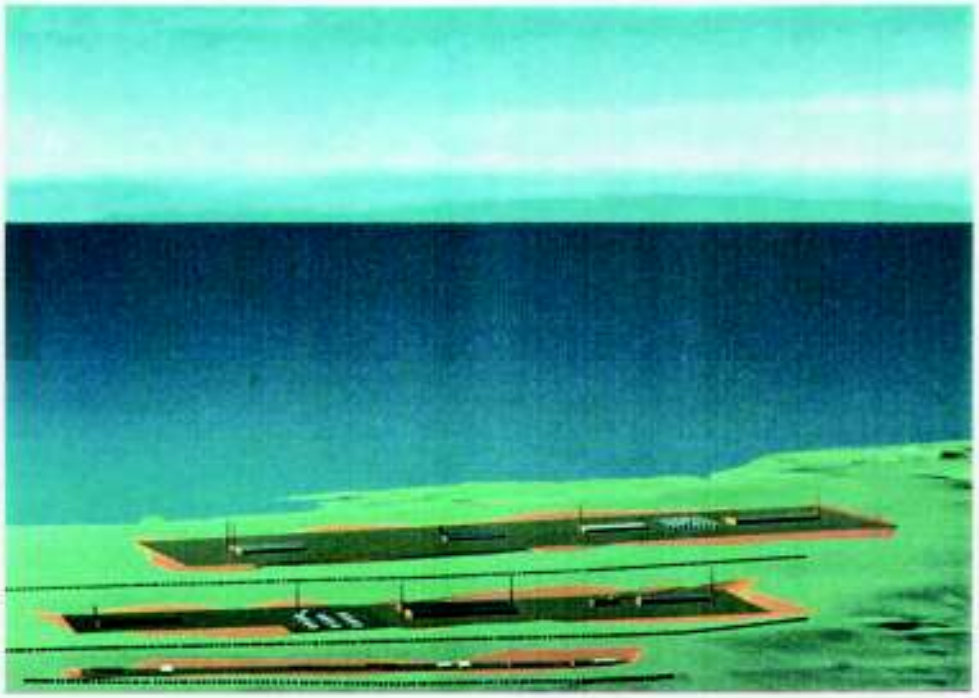


Figure 1: Photo points for viewshed analysis



Figures 2 & 3: Computer model showing hypothetical industry from east (above) and from south (below)

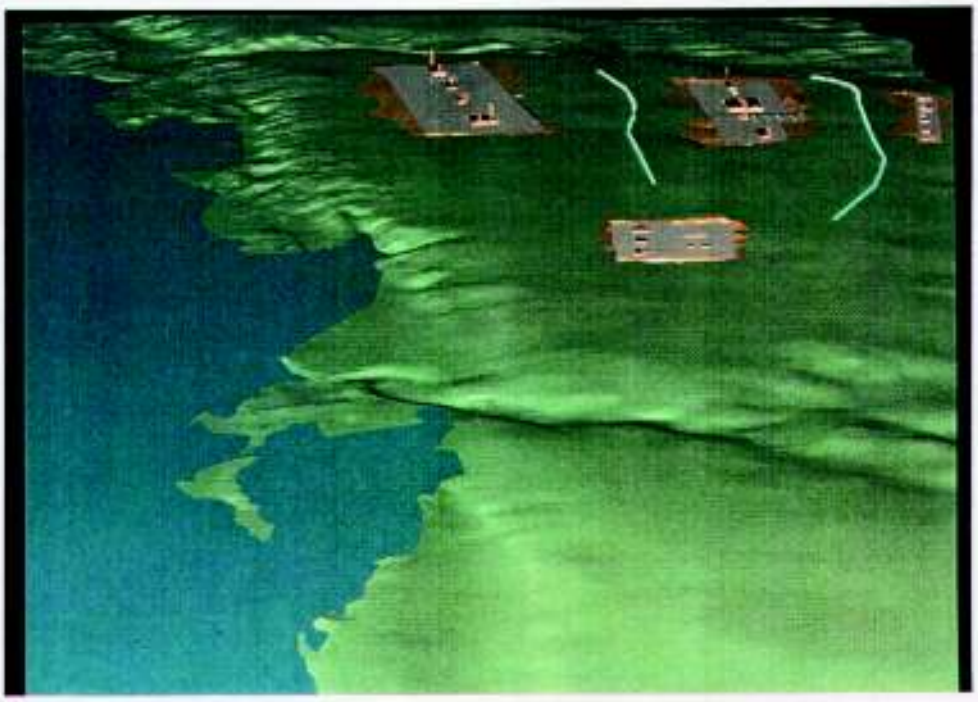


Figure 4: Photo point 1 - Drummond Cove

Figure 5: Photo point 2 - Wokarena Road

Figure 6: Photo point 3 - Enoka property

Figure 7: Photo point 4 - Vinton

Figure 8: Photo point 5 - Monaghan property

Figure 9: Photo point 6 - Kruize property

Figure 10: Photo point 7 - Snell property

Figure 11: Photo point 8 - Halton property

Figure 12: Photo point 9 - Cleminson property

Figure 13: Photo point 10 - Davidson property

Figure 14: Photo point 11 - Wilson property

Figure 15: Photo point 12 - Royce property