

Oakajee Industrial Estate Structure Plan

Sustainability Report

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Version No: 7
Version Date: 08 March 2012
Status: Final



Revision	Details	Date	Amended By
00	Original	16/08/2010	ESC
01	Review	16/08/2010	DG, MMc
01	Edit	24/09/2010	AP
02	Draft	27/09/2010	ESC, MMc
02	Review	13/10/2010	MMc
03	Review	18/11/2010	DG
04	Edit	26/11/2010	MMc
05	Review and Edit	19/01/2011	MMc
06	Final Edit	25/01/2011	MMc
07	Final	08/03/2012	KLF

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Acknowledgements

The sustainability initiatives and recommendations set out in this report build upon Western Australian structure planning examples and published references on sustainability, specifically:

- Western Australian State Sustainability Strategy, 2003
- City of Geraldton-Greenough Sustainability Programmes, 2010
- Western Australian State Heavy Industry Policy, 1998
- Perth Region Natural Resource Management (NRM) Guidelines for Industrial Development, 2010
- LandCorp's Elements of Sustainability, 2009.

An initial set of sustainability objectives for the Oakajee Industrial Estate (OIE) were developed in collaboration with the Project Team. These were then reviewed and revised in collaboration with LandCorp and the Planning Consultant.

The Project Team included:

- Client – LandCorp
- External Project Manager – John Quilty
- Planning Consultancy – RPS
- Engineering Consultancy – GHD
- Environmental Consultancy – Parsons Brinckerhoff (PB)
- Landscape Design Consultancy – Hassell & Strategen in partnership
- Sustainability Consultancy – PB, Ferart Design and Professor Peter Newman - Director of Sustainability at the Curtin University Sustainability Policy (CUSP) Institute.

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Executive Summary

The Oakajee Industrial Estate (OIE) is located 23 kilometres north of Geraldton in the Mid West Region of Western Australia. As a result of site rezoning in July 2004, there is a requirement to prepare a Structure Plan to guide the long-term development of the industrial estate to support value adding industries and related activities.

LandCorp commissioned Parsons Brinckerhoff (PB) in mid 2009 as sustainability consultant on the Structure Plan project team. The sustainability consultancy was delivered by PB in partnership with Ferart Design, with strategic advice from the Curtin University Sustainability Policy (CUSP) Institute. PB coordinated the project, and worked collaboratively with Ferart Design (a Geraldton based consultancy) to integrate regional considerations and develop sustainability and industrial ecology recommendations.

This Sustainability Report has influenced all other disciplines involved in the development of the Structure Plan. This influence is reflected in the sustainability aspects incorporated into the technical reports related to industrial ecology, engineering, environment, landscape and water management. In this context, the Sustainability Report has set the sustainability agenda for the Structure Plan. Implementation of a much broader sustainability agenda will occur when the estate begins to develop.

The Sustainability Report for the Structure Plan is based on the key themes of:

- industrial ecology
- renewable energy and carbon management
- community
- environment
- regional development.

These themes present a range of opportunities and constraints for the Structure Plan and provide a foundation to create a progressive industrial estate that employs industrial ecology and sustainability principles.

The recommendations put forward in this report include a number of sustainability initiatives with the potential to create an innovative industrial estate with sufficient flexibility to adapt to future challenges like resource, energy, water and climate change constraints.

Ongoing and future sustainability initiatives include:

- **Creating a strategy for industrial ecology** – this has been prepared as a separate technical report for the Structure Plan.
- **Developing an industry attraction strategy** – this may provide an opportunity to target specific industries to assist in realising efficiencies through industrial ecology. This strategy will need to identify and leverage the comparative advantages the OIE has over other industrial estates around the world and investigate incentives that could be offered.
- **Actively managing the estate's carbon profile** – this will have to be primarily driven by industry and involves measures to support improved carbon efficiency, renewable energy and carbon sequestration opportunities.
- **Facilitating the generation and storage of onsite renewable energy sources** – this includes wind power, wave power and sea water pumped-storage hydro-electricity.
- **Protecting, managing and incorporating heritage values** – this has been progressed through European heritage surveys and an Aboriginal Heritage Management Plan.
- **Protecting, enhancing and incorporating natural values** – this is being progressed through the Environmental Review Report and the Landscape Report which include measures to conserve natural assets and an environmental management framework for the estate manager and future proponents.
- **Stimulating regional economic development opportunities** – this will be achieved through the implementation of the Regional Investment Plan being developed by the Mid West Development Commission. There is an opportunity for this work to be informed by the Industry Ecology Strategy, further enhancing industry attraction.

These sustainability initiatives provide the basis for development of a highly competitive and widely recognised industrial estate that emphasises flexibility, innovation and the ability to adapt to the challenges, current and future, facing the Mid West Region.

1. Introduction

1.1 Report Structure

This report has been divided into five sections:

- Introduction
- Methodology – describes our approach and summarises some of the theory applied to consideration of sustainability at the OIE
- Sustainable Industrial Planning and Development Opportunities – sets out recommendations within five sustainability themes
 - industrial ecology
 - renewable energy
 - community
 - environment
 - regional development
- Further work – looks ahead to what will be required to implement the OIE Structure Plan to create a sustainable and internationally competitive industrial estate
- Conclusions

1.2 Background

Located in the Shire of Chapman Valley, the OIE site was identified in the mid 1970s due to its development potential as a heavy industrial estate. In 1995, the Geraldton Region Plan Review Industry and Port Sites Study (ERM Mitchell McCotter, 1995) confirmed the conclusions of previous site investigations, and recommended reservation of land at Oakajee for a major industrial site and deep water port. The study acknowledged that Oakajee offered the only opportunity in the Mid West Region for an industrial site linked directly to a deep water port.

The site was rezoned in June 2004 through Scheme Amendment 18 to the Shire of Chapman Valley's Town Planning Scheme No 1. The scheme amendment requires the preparation and adoption of a Structure Plan to guide industrial land use activities at the site. This Sustainability Report is a key input into the development of the Structure Plan.

The Oakajee site is well suited to the development of heavy industry due to a range of physical and environmental advantages including:

- minimal environmental constraints with largely cleared, relatively flat topography
- internally drained with deep sandy soils and groundwater at depth

- established buffer based on contemporary modelling of air quality, risk and noise and largely owned by the State Government
- opportunities for enhancement of environmental and social values through vegetation protection, landscaping and revegetation, and managed recreational activities.

Oakajee Port and Rail (OPR) are proposing to develop the first stage of the port and rail infrastructure requirements, which will greatly assist in attracting industry to the OIE. At the time of preparing this report, OPR were in the final stages of seeking environmental approvals to facilitate the start of construction in 2012.

1.3 Purpose

The purpose of this study is to identify opportunities to achieve sustainability outcomes through the OIE Structure Plan.

1.4 Objectives

The objectives for this study were to:

Objective 1 - Identify sustainability opportunities and constraints with relevance to the OIE Structure Plan.

Objective 2 - Identify industrial ecology principles to inform the development of the OIE Structure Plan.

Objective 3 - Integrate sustainability initiatives into the OIE Structure Plan.

1.5 Relationship to Current Policies

The following policy documents underpin the findings of this study. It is relevant to note that the other technical studies undertaken as part of the Structure Plan will all contribute toward the achievement of a sustainable OIE.

1.5.1 Western Australian State Sustainability Strategy

This state level policy identifies 42 priority areas for action. Those areas that are relevant to industrial development within a regional Western Australian context are listed below, with a comment on how they have been captured within the Structure Plan.

Recommendation	Comment
Eco-efficiency and industrial ecology	Addressed through the Industrial Ecology Strategy
Sustainable energy	Addressed through renewable energy recommendations of this Sustainability Report
Responding to climate change	Addressed through the Industrial Ecology Strategy and renewable energy recommendations of this Sustainability Report

Maintaining our biodiversity	Addressed through Landscape and Environmental Review Reports
Conserving cultural heritage, landscape and 'creating a sense of place'	Addressed through European Heritage surveys, the Aboriginal Heritage Management Plan and Landscape Report
Promoting sound stable competitive industry	Addressed through the Industrial Ecology Strategy, Governance Framework and proposed Industry Attraction Strategy

1.5.2 City of Geraldton-Greenough Sustainability Programmes

The City of Geraldton-Greenough Sustainability Programmes include the following initiatives, which are directly relevant to the OIE Structure Plan (City of Geraldton-Greenough, 2010). These have been addressed as follows:

Recommendation	Comment
Natural Resource Management (NRM) and Biodiversity	Addressed through the Environmental Review and Landscape Reports
Energy	Addressed through the renewable energy recommendations of this Sustainability Report
Climate Change	Addressed through the Industrial Ecology Strategy and renewable energy recommendations of this Sustainability Report
Coastal	Addressed through the Shire of Chapman Valley Coastal Management Strategy and the Environmental Review Report
Wellbeing	Addressed through visual amenity and recreation recommendations in the Landscape Report

1.5.3 Western Australian State Heavy Industry Policy (SHIP)

This policy identifies the State Government's position on the identification of suitable heavy industrial land, its acquisition, including buffer zones and ongoing roles and expectations of the State and industry. Of specific relevance to sustainability are the following policy areas and responses:

Policy area	Comment
Conserve natural environments;	Addressed through Landscape and Environmental Review Reports
Socially acceptable with adequate buffers	Addressed through Landscape and Environmental Review Reports

Industry synergies	Addressed through the Industrial Ecology Strategy
Industry Advisory Boards with Community Committees	This Sustainability Report includes discussion on governance, with implementation to progress as the OIE develops
Ongoing workforce education and training	Addressed through regional economic development recommendations in this Sustainability Report

1.5.4 NRM Guidelines for Industrial Development

The NRM (2010) guidelines, prepared for the Perth Region, relate to general industrial estates, however the key objectives of structure planning are also directly applicable to the OIE.

These include:

Recommendation	Comment
Ecological integration, preservation and rehabilitation	Addressed through Landscape and Environmental Review Reports
Minimise energy use and greenhouse gas emissions	Addressed through the Industrial Ecology Strategy and renewable energy recommendations in this Sustainability Report
Maximise opportunities for efficient use, reuse and recycling of water and appropriate management of stormwater	Addressed through the Industrial Ecology Strategy, District Water Management Strategy and the Engineering Services Report
Promote use of renewable resources for energy generation and construction of infrastructure	Addressed through the Industrial Ecology Strategy and renewable energy recommendations in this Sustainability Report
Maximise opportunities for efficient storage, reuse and recycling of waste;	Addressed through the Industrial Ecology Strategy and the Engineering Services Report
Incorporate technological capability, efficiency and pollution prevention into the provision of services and infrastructure	Addressed through the Industrial Ecology Strategy and Engineering Services Report
Build product/by-product demand/supply chain and social/employment relationships with surrounding community and networks.	To be progressed in the development phase of the OIE

1.5.5 LandCorp's Elements of Sustainability

The LandCorp Sustainability Framework reflects the increased priority ascribed to sustainability and has become part of LandCorp's overarching development strategy. This framework sets out four main elements (outlined below) that require attention in each LandCorp project.

Theme	Comment
Community Wellbeing	Addressed through visual amenity and recreation recommendations in the Landscape Report and Regional Development recommendations in this Sustainability Report
Environmental Leadership	Addressed through the Environmental Review Report
Economic Health	Addressed through the Industrial Ecology Strategy and Regional Development recommendations in this Sustainability Report
Design Excellence	Addressed through the Engineering Services Report, Integrated Transport Strategy, Industrial Ecology Strategy and Landscape Report

1.6 OIE Sustainability Journey

The sustainability journey for the OIE began with site selection studies which identified Oakajee as suitable for a deep water port and heavy industrial estate. The journey continued in 2004, when the area was rezoned and land uses were designated based on physical and environmental characteristics.

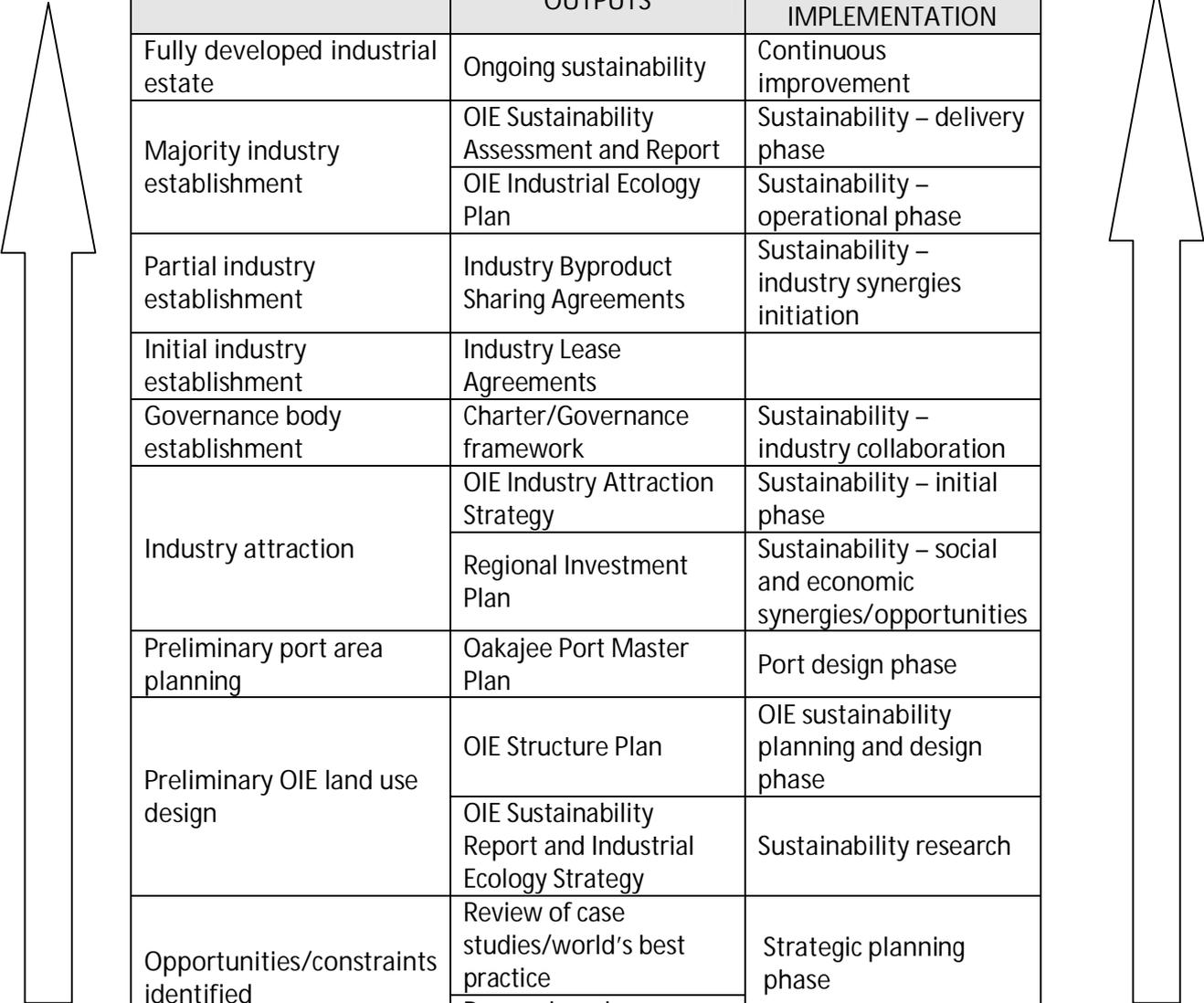
The Structure Plan which has been prepared forms another part of this journey and provides a planning framework. It is a guide for development and will assist in realising sustainability opportunities by ensuring sufficient infrastructure corridors are available and that land is designated for its best use.

Other plans, which will be or are already integrated with the Structure Plan, are the Draft Oakajee Port Master Plan, Regional Investment Plan and Industry Attraction Strategy. These planning documents all have an important part to play in the future economic and social development of the Mid West Region.

The tangible benefits of the identified sustainability initiatives will begin with the OIE's development. At this time, synergies between industries will be realised, the transmission infrastructure will be in place for renewable energy schemes and social benefits will start to become a reality. Industries will need to take the lead role in sustainability and industrial ecology initiatives. These industries will form an integral part of the governance body and will be champions for sustainability. Other industries will be attracted to the OIE due to the efficiencies available.

As the estate develops further sustainability opportunities will emerge and be implemented. Industries will benchmark themselves and undertake sustainability assessments to determine their performance against identified targets and performance indicators. This will enable the OIE to compare its sustainability achievements with other industrial estates around the world and determine progress toward achieving the ultimate goal of a sustainable industrial estate.

The table below provides an overview of the sustainability journey for the OIE based on key milestones and outputs.



KEY ESTATE MILESTONES	OUTPUTS	SUSTAINABILITY IMPLEMENTATION	
Fully developed industrial estate	Ongoing sustainability	Continuous improvement	
Majority industry establishment	OIE Sustainability Assessment and Report	Sustainability – delivery phase	
	OIE Industrial Ecology Plan	Sustainability – operational phase	
Partial industry establishment	Industry Byproduct Sharing Agreements	Sustainability – industry synergies initiation	
Initial industry establishment	Industry Lease Agreements		
Governance body establishment	Charter/Governance framework	Sustainability – industry collaboration	
Industry attraction	OIE Industry Attraction Strategy	Sustainability – initial phase	
	Regional Investment Plan	Sustainability – social and economic synergies/opportunities	
Preliminary port area planning	Oakajee Port Master Plan	Port design phase	
Preliminary OIE land use design	OIE Structure Plan	OIE sustainability planning and design phase	
	OIE Sustainability Report and Industrial Ecology Strategy	Sustainability research	
Opportunities/constraints identified	Review of case studies/world's best practice	Strategic planning phase	
	Research and investigation		
Oakajee industrial zoning	Scheme Amendment 18	Preliminary planning phase	
OIE DEVELOPMENT	Oakajee site selection	Port and heavy industry site investigations	SUSTAINABILITY JOURNEY

1.7 OIE in a Sustainability Context

The sustainability context of the OIE is dependent upon its connections at international, national, state, district and local levels as outlined below. Further information on these connections and linkages is provided in the Structure Plan.

International

The ultimate port development at Oakajee will cater for 'Cape' and 'Panamax' class vessels and will be instrumental in enhancing linkages between the Mid West and international destinations. The deep water port and supporting infrastructure is critical to realising the potential of a number of resource sector projects in the Mid West region as it will link the OIE to key international markets.

National and State

The port is expected to facilitate connections between the Mid West, state and national destinations. The Structure Plan will integrate key road initiatives such as the Geraldton Bypass and various upgrades to North West Coastal Highway (NWCH). The Bypass and NWCH are important in terms of connecting the OIE with the broader state and national heavy haulage road network. The proposed Oakajee Narngulu Infrastructure Corridor (ONIC) and the rail corridor linking Jack Hills and Weld Range could potentially link the OIE with the state and national rail network.

District and Local

A key component of the Structure Plan is integration with the proposed ONIC. The ONIC will be instrumental in linking the OIE and port with Narngulu and Geraldton to the south. The ONIC will also be important in linking the OIE with the Port of Geraldton until a land-backed Panamax berth is available at Oakajee. Connecting OIE with Narngulu, via an integrated service corridor, is a key initiative of the Geraldton Region Plan.

At a local level, industry within the OIE will be linked to each other, the port, utilities, road and rail via infrastructure and service corridors. The two main infrastructure corridors servicing the Strategic Industry Area will have a width of 210 metres ensuring the efficient transport of products, by-products, utilities and materials can be achieved even when the industrial estate is at full capacity. The extra wide corridors also provide flexibility in servicing arrangements and future-proof the estate by enabling it to accommodate processing or technology advances over time.

The OIE Estate Manager (LandCorp) will be actively engaged in providing a leadership role regarding the development of the industrial estate. But it is important to consider sustainability in the wider context of national, state, district and local, and not confine it to the boundaries of the OIE. This increased scope highlights issues that will influence the sustainability outcomes for the OIE.

In this wider context sustainability is strongly influenced by Government policy and administrative decisions, particularly in the following areas.

Transport networks:

- location and operation of the OPR rail line and facilities
- links to state and national rail
- development of the ONIC and specifically the bypass road within it.

Port operations:

- Geraldton Port Authority's Oakajee Port Master Plan and the availability of a land-backed Panamax berth on the southern breakwater or access to the Port of Geraldton for this purpose
- the timing of development for the Oakajee Northern Breakwater.

Other industrial areas:

- the future development of the Narngulu Industrial Estate and industrial development elsewhere in the state, nation and world
- the pressure to relocate industrial activity outside Fremantle and Perth.

Energy:

- the timing of construction of the 132kV transmission line to Oakajee and the possibility of a gas fired power plant
- provision of a 330kV transmission line from Eneabba to Moonyoonooka and to Oakajee
- the introduction of a carbon tax
- the capacity in the network for large scale renewable energy projects
- legislative/administrative barriers to other energy suppliers entering the market.

Water:

- the Oakajee desalination plant being owned by OPR or independently operated
- the availability and quality of water supply at Casuarina and the potential competing uses for water
- legislative/administrative barriers to other water suppliers entering the market.

Human community:

- providing a liveable community and housing, for both the construction and operational workforce
- ensuring that the presence of these additional people enriches and improves the quality of the regional community

- enhancing education and employment opportunities for the people who live in the region and creating benefits and lasting value for the local economy as a result of the OIE development.

Resolving these issues will require work across traditional boundaries and the integration of planning activities. It is beyond the scope of the structure planning process to indicate how these issues might be resolved or who should be responsible for their resolution.

The OIE Structure Plan is being prepared in the context of an approvals process for other key infrastructure projects related to port, rail and servicing. These projects have a significant bearing on the future development of the OIE and the ability to contribute toward sustainability outcomes for the region. The projects are listed below, with a brief outline of their status.

- OPR Rail Development Public Environmental Review – the public review period closed on 30 August 2010, with the Environmental Protection Authority (EPA) Report and decision by the Environment Minister pending.
- OPR Terrestrial Port Development Public Environmental Review – the public review period closed on 30 August 2010, with the EPA Report and decision by the Environment Minister pending.
- ONIC – the alignment for the service corridor connecting Oakajee to Narngulu is being finalised and is expected to be referred to the EPA in mid-2011 to determine the level of assessment.
- Oakajee Port Master Plan – is being prepared by the Geraldton Port Authority (GPA) and is expected to be finalised in 2011.

Although these projects are subject to a separate approvals processes, the outcomes will influence the OIE Structure Plan and sustainability outcomes for the Mid West Region.

2. Methodology

This report represents the findings of a review and assessment of identified opportunities and constraints for the Oakajee site. It compares these to published policies, both state and local, while referencing recognised peer reviewed work to determine international best practice.

The methodology was based on a collaborative approach aimed at influencing sustainability outcomes through integration with the various disciplines involved in the preparation of the Structure Plan.

2.1 Review of Best Practice Sustainable Industrial Development

The 2010 State of the World report (WorldWatch Institute, 2010) states that all global ecosystems and the services they provide are in decline, non-renewable natural resources are becoming increasingly scarce and that demand for these services and resources is growing. This finding is confirmed in various reports prepared by the United Nations Environment Programme (UNEP) and the Commonwealth Science and Industrial Research Organisation (CSIRO).

In the context of industrial development, these converging trends suggest that in the coming decades international industrial competitiveness will be increasingly linked to sustainability performance. Furthermore, due to the accelerating demand for these resources and services from large developing countries the need to position industry as globally competitive through effective planning and design is increasingly important.

Sustainable industrial development will play a key role in the efficient use of resources today and into the future. Achieving sustainable performance outcomes in a cost-effective manner will dictate how well local and regional resources are harnessed to support local economies and maintain competitiveness.

This sustainability study literature review focuses on industrial ecology as the main opportunity to address these challenges. Environmental management will also be important, however, it does not have the same direct ability to manage the future costs of doing business as an effective industrial ecology strategy, nor does it have the potential to contribute as broadly to the future sustainability of the region.

Part of this review included the Kwinana Industrial Area, located in the Perth Metropolitan Region. This Western Australian example has delivered world's best industrial ecology performance in conditions most similar to the Mid West (van Beers, Bossilkov, & van Berkel, 2005) through industrial ecology activities involving 47 energy, materials and water synergies.

Kwinana was not pre-planned, which means the synergies and efficiencies gained required significant retrofitting. There is an opportunity for the OIE to reduce or avoid retrofitting costs through effective planning and clustering of synergistic industries as proposed in the Industrial Ecology Strategy.

The Master Plan for the Khalifa Port and Industrial Zone in Abu Dhabi (United Arab Emirates) is an example of industry planning standards by a comparable industrial estate. This planning document points to the importance of clustering industries based on their inputs and outputs and potential synergies. The advanced delineation of industry clusters also points to a marketing strategy that will offer the potential for materials, water and energy efficiencies to attract industry.

The Gippsland Water Factory in Victoria is another project which supports the advantages of an industrial ecology approach. In particular, this project demonstrates the benefit of harnessing regional economic, social and natural resources. This project effectively created a regional industrial estate by linking a number of water users through a water recycling plant. This solution improved water security for the Gippsland region, while offering the potential to recover additional water for reuse through developing further stages should climatic conditions or demand for water require it.

Both Kwinana and Gippsland Water Factory provide evidence that planning for industrial ecology delivers a return on investment when it is oriented toward harnessing regional resources more effectively and efficiently.

A range of academic literature was also reviewed to understand where emerging practices are influencing industry. The literature points to the need for industrial ecology strategies to be tailored to regional characteristics, while understanding that future international competitiveness is linked to how effectively local and regional energy, materials, water and human resources can be used to improve the overall competitiveness of an industrial estate and its individual industries.

2.2 Site Analysis

The site analysis was informed by a desktop review of available information (local and regional) and a site visit. The Sustainability Consultants also participated in numerous OIE Structure Plan project team meetings and community consultation events involving a number of stakeholders from Geraldton and Perth.

Oakajee is currently farmland used for cropping and grazing. It was selected by the State Government in 1992 as a site for future processing industry and a deep water port. Over the ensuing years, the State Government acquired and rezoned approximately 6,400ha of land for industrial purposes and buffer.

The OIE extends from Coronation Beach Road in the north to Buller River in the south, to the Moresby Ranges in the east and to the coastline in the west. The main industrial areas, incorporating the Strategic Industry Area (SIA) and General Industry Areas (GIAs), are ideally located on an elevated plateau 70 to 100 metres above sea level.

The OIE is 23 kilometres north and downwind of Geraldton, reducing the risk of airborne pollution affecting residential areas. With the prevailing winds out of the south west, the opportunity to harness wind power is available, particularly as the north of the buffer has already been granted local planning approval for a wind farm.

The site is within easy commuting distance from Geraldton and is 420 kilometres north of Perth. The site is readily accessible from the sea and from the interior by road. Plans are underway to build a railway link to iron ore mines in the east and a deep water port to allow access to overseas markets. Transport logistics are expected to play a key role in attracting industries to the site.

As the OIE site was previously used for agriculture, much of the native vegetation has been removed. The few remaining sections of bushland mainly associated with the Oakajee and Buller rivers, Coastal Area and buffer have the highest conservation value and/or potential for restoration. The remainder of the site is cleared and well suited for industrial development, provided sound environmental management practices are implemented. Further information is provided in the Environmental Review Report included as a technical appendix in the Structure Plan.

The Mid West Region is forecast by the CSIRO to receive less rainfall in coming decades, similar to the entire south west of Western Australia. This may require securing alternative water supply options, such as seawater desalination or water recycling in the future, rather than relying upon traditional groundwater resources as the main water supply. Current plans suggest that it will be likely that the OIE will need to access potable water supplies drawn from alternative groundwater sources some 50 and 70 kilometres inland. The Department of Water is still evaluating Casuarina to determine potential sustainable yields, but the two sources may prove sufficient to meet short to medium term demands.

The OIE is currently not sufficiently serviced by the South West Integrated System (SWIS) electricity network. Some electricity is available from the network, but at levels insufficient to meet demands associated with industrial development.

As a major future contributor to the Mid West economy, the OIE has already become a significant regional stakeholder and features strongly in the future planning of the region. In combination with other potential major regional projects, such as the Australian Square Kilometre Array (ASKAP) and expanded investment in the resources sector, the OIE is expected to become part of the next wave of economic development in the region, providing jobs and business opportunities for current and future residents.

The social benefits, related to the development of the OIE and the other major resource and infrastructure projects in the region, have the potential to be significant. Community infrastructure including health, housing and education will need to be upgraded and/or expanded to support population increases and the growing workforce required to meet construction and operational employment demands.

Heritage considerations also feature in the development of the OIE, particularly the identification and protection of European and Aboriginal heritage values. There has been considerable consultation undertaken and work completed in the development of an Aboriginal Heritage Management Plan and European Heritage Reports.

2.3 Opportunities and Constraints

An opportunities and constraints analysis was undertaken to determine the early direction for the structure planning process. Each discipline contributed a succinct analysis of the opportunities and constraints associated with their area of expertise. As sustainability transcends individual disciplines, this approach provided a robust and collaborative basis for developing an integrated sustainability approach for the OIE.

2.4 Workshops

The Sustainability Consultancy conducted an Industrial Ecology Workshop with the planning, environmental, project management and engineering consultants to determine how best to apply industrial ecology principles to the OIE development. The output from this workshop was a generalised layout of the site and criteria for locating industry within the OIE. This is discussed in the Industrial Ecology Strategy.

Community workshops and meetings with a range of stakeholders also informed the sustainability work during the preparation of the Structure Plan.

2.5 Key Themes

Through the opportunities and constraints analysis, consultation and workshops, a number of key themes were identified including:

- industrial ecology
- renewable energy and carbon management
- community
- environment
- regional development

Many other themes were considered, including water, climate change and heritage and these have been consolidated into the themes identified above. For example, addressing water and climate change within the boundaries of an industrial estate is largely a question of planning which is informed by industrial ecology principles.

The following section will explore these themes in greater detail.

3. Sustainable Industrial Planning and Development Opportunities

Sustainability, defined as value creation, is achieved when a project returns net-positive economic, social and environmental (the triple-bottom-line) value to its local and regional catchments.

Relatively few regulatory or ecological constraints were identified for the development of the Oakajee site into an industrial estate. This is due to the previously cleared state of the land through many years of agricultural use, the prevailing winds and distance from Geraldton, mitigating many environmental and community health issues. The site provides an opportunity to demonstrate local and regional sustainability through creation of an industrial development that brings benefits to the region.

Considering the relevant policy guidance (refer to Section 1.5) in conjunction with the site's opportunities and constraints five key themes emerged as most applicable to the sustainable development of the OIE.

- industrial ecology
- renewable energy and carbon management
- community
- environment
- regional development

Initiatives related to these themes are identified in this section and have been incorporated into the Structure Plan and its supporting technical documents or have been recommended for further action closer to or during the development phase of the OIE.

3.1 Industrial Ecology

The Industrial Ecology Strategy will guide the layout of the OIE and demonstrate how linking industries enables them to integrate their industrial processes and realise efficiencies and synergies through sharing by-products. This improves the economics and efficiency of the individual industries and the OIE as a whole. Industrial ecology is vital to the long term sustainability and international competitiveness of the OIE and consequently a separate strategy has been developed to address this issue in detail.

Critical to the Industrial Ecology Strategy is ensuring the opportunity to maximise resource reuse is underpinned by preserving appropriate infrastructure corridors, thereby creating the greatest flexibility for industries as they establish in the OIE.

Industrial ecology principles, have informed the Structure Plan in the following ways:

- size and location of infrastructure and service corridors
- preferred location of industry clusters

- forecast utility demands and gaps in regional infrastructure
- criteria for future land allocation
- sharing of by-products and a by-product storage in the buffer
- a multi-product rail line connecting OIE to the region
- well located water and energy factories to service heavy industry.

These and other principles and recommendations are included in a separate Industrial Ecology Strategy, which forms a technical appendix in the Structure Plan.

3.1.1 Recommendations

Develop an Industry Attraction Strategy to appeal to a diversity of industry types that will contribute to industrial ecology synergies and competitive advantages by:

- differentiating the Oakajee Brand by promoting the OIE, regional development opportunities and industrial ecology efficiencies and synergies
- developing sustainability performance targets for: industrial ecology, environment, engineering, landscape, and heritage to clearly communicate assessment priorities to proponents
- working across government to actively market the industrial ecology aspirations of the OIE to prospective industries to secure an anchor tenant
- working across government to market OIE to prospective tenants that offer industrial ecology synergies which further improve the competitive position of the OIE
- guiding the ongoing marketing, development and administration of OIE.

3.2 Renewable Energy and Carbon Management

The need for renewable energy and reduced carbon emissions are well established issues that need to be considered as part of any sustainable development.

The Australian Government has set in place a strategy to reduce carbon pollution, and transform the economy, as the means of securing Australia's energy and economic future. Australia is on target to meet its Kyoto Protocol commitment to slow carbon pollution to 108% of 1990 levels.

The Government has also set a goal of reducing emissions to 25% below 2000 levels by 2020, provided that a global agreement can be reached that would protect the Australian economy. This includes setting an absolute target of between 5% and 15% reductions below 2000 levels by 2020.

As part of this, the Australian Government has identified a three pillar strategy:

- mitigation – to reduce Australia’s greenhouse gas emissions
- adaptation – to adapt to the climate change we cannot avoid
- global solution – to help shape a collective international response.

Future commitments are currently the subject of a Parliamentary committee enquiry, and will be announced as agreements are reached.

These and future commitments may lead to the establishment of a price on carbon, which would significantly influence the development of renewable energy and enhance the overall sustainability of the OIE.

As identified in the City of Geraldton-Greenough sustainability programs, the region has significant wind, solar and wave assets. This is particularly true for Oakajee and provides an opportunity to develop a cleaner, greener and more energy efficient industrial development.

A range of renewable energy opportunities are summarised in the table below. Further discussion is provided in subsequent sections on those technologies that have been investigated and have greatest potential to be feasible. To facilitate the establishment of these technologies within the OIE, suitable locations have been identified within the Structure Plan where applicable.

LandCorp has an ongoing role in facilitating opportunities with prospective proponents for the establishment of renewable energy facilities to support the industrial estate. This includes seeking expressions of interest from renewable energy technology providers, when appropriate transmission infrastructure is in place or likely to be in place and when the network has capacity for renewable generation. The proposed Industry Attraction Strategy (refer to 3.1.1) will also consider measures to attract renewable energy proponents and technologies to the estate.

Renewable technology	Energy	Viability for the OIE
Wind turbines		Highly prospective site in the northern buffer already has planning approval for turbines. Other opportunities along coastal escarpment.
Wave power		Comparatively high energy coast makes the area highly prospective for wave energy, however, the current technology may not be structurally strong enough to handle the level of energy reached during storm events. Wave power has significant synergies with the proposed desalination plant as it could supply high pressure sea water to a membrane/reverse osmosis plant.
Solar Photovoltaics		Potential for powering buildings, however the dustiness of the site makes it unsuitable for large scale applications.

Solar thermal heat	The dustiness of the site makes it unsuitable for large scale solar thermal electricity generation applications, however there may be opportunities to supply heated water into an Energy Factory provided sufficient flat areas for collectors are available.
Geo-thermal electricity	Opportunities exist within the region however the technology needs to be further developed. Large scale renewable thermal electrical generation requires the construction of the SWIS to stabilise the power supply to the region.
Solar-thermal electricity	Opportunities exist offsite and there are projects proposed within the region. Large scale renewable thermal electrical generation requires the construction of the SWIS to stabilise the power supply to the region.
Cropping/biomass	Insufficient area within the buffer for growing mallee and other tree-related biomass for combustion to make energy, however, the management of the OIE may be able to link into regional biomass projects to deliver sequestration credits to the OIE.
Soil sequestration	Insufficient area within the buffer for soil sequestration to be relevant in comparison with the size of operation of the OIE, the management of the OIE may be able to link into regional soil sequestration projects to deliver sequestration credits to the OIE.
Biogas	There may be some opportunities to generate biogas as part of the Organic Waste Water Treatment Facility.
Sea water pump-storage hydroelectricity	Link wave and wind energy to pump sea water to an elevated storage area in the northern buffer zone then allow this water to flow back to the ocean through a hydroelectric turbine. This could be used as a means of storing surplus renewable energy for use as base load power in an isolated network.

The establishment of renewable energy schemes would be dependent on the connection to the South West Integrated Scheme (SWIS), capacity in the network, power demands and market factors. Financial incentives provided by state and federal governments, grid connection and renewable energy targets, will also influence investment in this sector.

3.2.1 Wind

Planning approval has already been granted for wind turbines to be located in the section of the buffer north of the Oakajee River. Recent wind modelling has determined the maximum capacity of the proposed wind farm at Oakajee is approximately 84MW or 270GWh. (PB¹, 2010).

The Structure Plan has identified the proposed locations of wind turbines running north to south along the western ridgeline of the coastal escarpment, in addition to those locations proposed in the northern buffer. These locations are based on the optimum wind modelling scenarios (PB¹, 2010).

3.2.2 Wave

The coast and the harbor breakwater are prospective areas for wave power generation.

Wave energy can be used to generate electricity or can be used to pump high pressure water for use in:

- desalination to produce potable water
- lifting sea water to a storage dam at an elevation of 80 metres, on top of the escarpment, as part of a hydro-electric scheme to generate peak load power (refer to Section 3.2.4).

As part of the structure planning process, a study into the potential renewable energy from swell waves was investigated. This desktop assessment estimated the power output at 10.8MW at 95% availability based on a site with 19kW/m wave energies available (RPS, 2010).

3.2.3 Carbon Management

The Structure Plan has attempted to facilitate the management of carbon into the future by encouraging efficiencies. This has been done by identifying infrastructure corridors that provide excellent transport linkages and will allow for the sharing of by-products between industries, therefore, reducing waste. The facilitation of renewable energy projects at the OIE is where LandCorp as the Estate Manager can have the most influence in managing carbon. Through the identification of appropriate sites for renewable energy projects, it is hoped that proponents can be attracted to the OIE when suitable transmission infrastructure is in place.

Opportunities exist to offset carbon emissions through carbon sequestration. One such opportunity has already been realised with 250 hectares of sandalwood planted within the buffer. Although the amount of carbon sequestered by plantations of this size is relatively small, other opportunities for sequestration through the various revegetation activities within the buffer will be encouraged in accordance with the Landscape Report.

3.2.4 Sea Water Pump-Storage Hydro Electricity

This is a concept where renewable energy, such as wind or wave energy, is used to pump sea water to an elevation above sea level and store this in a specially constructed dam. The resulting energy can be used to supplement energy supplies at peak times when the energy source is reduced or not available. This enables the capture of

renewable energy as a peak load power supply when connected to the regional power network grid.

Pre-feasibility desktop assessment of this indicates there is potential to store up to 100MW of energy using a 600 metre x 1,000 metre storage dam with a 10 metre working head (PB², 2010). The predicted losses through pumping and storage will be about 25% of wind capacity, with the proposed dam storing a base load power of 202GWh.

Based solely on return on investment, this is an expensive way to generate electricity. However by using wave technology, rather than wind turbines to pump water, this may become more economically attractive. Further assessment of the hydro electric pump-storage concept is required based on Net Present Value (NPV) and taking into account variable prices for carbon and the value of ancillary services in a grid connected environment.

The Structure Plan has identified a significant parcel of land (approximately 100 hectares) in the northern buffer for this concept.

3.2.5 Regional Renewable Energy Programs

The potential of the Mid West for renewable energy production is reflected in the existing or proposed projects including:

- Collgar – 250 MW wind farm
- Mumbida – 55 MW wind farm
- Greenough River Solar Farm – recently announced 10 MW solar array with potential to expand to a 40 MW facility.

In addition, the Department of Mines and Petroleum has identified geothermal tenements throughout Western Australia, including in the Mid West Region. Further assessment of the feasibility of providing geothermal power to the OIE is required to determine if this is an economically viable energy source.

The existing and proposed renewable energy projects will require connection to the SWIS via a 330 KV backbone to augment the transmission capacity of the Mid West.

3.2.6 Recommendation

Establish renewable energy projects by facilitating opportunities at the OIE through the proposed Industry Attraction Strategy and by seeking expressions of interest from proponents when transmission infrastructure and capacity within the network are available.

3.3 Community

The OIE will become a major facility in the Mid West Region and its influence will extend well beyond its boundaries. The OIE has the potential to further diversify the local economy and generate thousands of jobs. Estimates of direct employment provided by GHD (refer to Appendix C in the Industrial Ecology Strategy) indicate that the SIA and

GIAs are likely to generate 3,015 and 1,840 jobs respectively, with a further 1,358 and 200 jobs in the buffer and coastal zone respectively under a fully developed scenario. With job creation and an increasing population, it must be acknowledged that there will be added pressure to both hard and soft infrastructure.

LandCorp as the Estate Manager will need to work alongside state and local government bodies to establish where the demands for infrastructure are, how they will be met and investment priorities. LandCorp, the Department of State Development and other stakeholders will also need to determine what new industries will be required to invest in infrastructure to ensure that the employees they attract to the area will not negatively impact on the community but will instead bring added benefits.

In order to be successful, the OIE will have to be globally competitive and reflect the “can do” attitude of the Mid West community. The OIE should be something the community is proud of and should not be hidden from view. Instead, views should be softened by appropriate landscaping.

An essential part of the future success of the OIE is ongoing engagement with the community. The transition towards a sustainable industrial estate can only be achieved by ensuring that the OIE is developed in a manner that respects its heritage, connects its people, creates visually appealing landscapes that soften infrastructure, supports recreational activities and provides training and employment opportunities for the community.

3.3.1 Heritage

Through effective planning, Aboriginal and European Heritage will be respected and integrated into the OIE. Heritage management is addressed in the European Heritage Report and the Aboriginal Heritage Management Plan attached to the Structure Plan.

3.3.2 Connecting People

The mobility needs of the workforce are important, particularly with changing transport modes in the future. When justified by users, there may be a requirement for mass transit links between Oakajee and Geraldton including dedicated routes for buses.

Transport infrastructure for walking and cycling will offer additional opportunities to connect the workers within the OIE and to gain access to the urban developments to the south and into Geraldton. The provision of cycling and pedestrian paths within the road and service corridors will provide flexibility to accommodate these future requirements.

3.3.3 Recreational Activities

The coast adjoining the Oakajee site has been a favourite fishing and windsurfing site for many years. The Coronation Beach camping area is the main established facility in the area and there is a proposal to establish an informal camping ground adjacent to the Buller River, a few hundred metres from the river mouth.

The use of the coast is guided by the Shire of Chapman Valley Coastal Management Strategy. The Strategy recognises that much of the coast will be alienated by port and industrial uses and recommends regarding controlled access to coastal recreational

sites to the south of the port are progressing. Given that the coastal area will be ultimately transferred to the Geraldton Port Authority (GPA), final decisions on access to much of the coastline reside with that body.

3.4 Environment

The environmental factors associated with the OIE were assessed by the EPA in 1997 (Bulletin 848), with the EPA recommendations incorporated in Scheme Amendment 18 (Shire of Chapman Valley, 2001) and the Environmental Review (Quilty Environmental, 2000) documentation developed to facilitate the rezoning of the site for industrial uses.

The dominant environmental features in the study area include the Oakajee and Buller rivers to the north and south of the SIA respectively, coastal vegetation to the west of the SIA, and scattered remnant vegetation and watercourses in the buffer which extends north to Coronation Beach Road and east to the Moresby Ranges.

The environmental factors associated with the Structure Plan include flora and fauna, surface water and groundwater, liquid and solid waste, dust and particulates, noise and risk. The key environmental factors potentially or directly impacted by the land use activities proposed in the Structure Plan include:

- loss of remnant vegetation and related fauna habitat
- surface water and ground water quality and quantity (including possible treated wastewater irrigation/infiltration)
- dust
- noise.

These impacts will be adequately managed through a range of environmental management measures, included in the Environmental Review Report (a separate technical appendix in the Structure Plan) and, typically applied to industrial developments through the environmental approvals and licensing process.

3.4.1 Flora and Fauna

Of the combined 1,330 hectares associated with the SIA and GIAs, 97 hectares (or 7%) contains remnant near coastal and sand plain vegetation that will require clearing to accommodate industrial uses. The near coastal and sand plain remnant vegetation contains a number of priority listed flora species and locally significant fauna species. However the adjacent coastal area to the west and buffer to the north and east of the SIA contain the majority of the flora and fauna species which are recognised for their regional conservation significance. Portions of these areas are subject to a separate environmental approvals process associated with the OPR Terrestrial Port and Rail Public Environmental Reviews (PERs).

3.4.2 Hydrology

The SIA and GIAs are located on permeable deep sands and as a consequence drain internally, with stormwater infiltration recharging the underlying aquifer which is at a depth ranging between 10 metres and 60 metres below ground level. Management of surface drainage associated with future developments will aim to maintain or improve the water

quality infiltrating into groundwater. This is addressed in a separate District Water Management Strategy (DWMS) report prepared for the Structure Plan. Industrial ecology synergies to manage and reuse water are likely to achieve further efficiencies, which will become increasingly important as water sources become less reliable due to trends in reduced rainfall and a drying climate.

Groundwater movement is predominantly towards the coast, with sub-surface discharge to the marine environment substantially restricted to an approximate 500 metre wide front in the south west of the SIA. A granite aquaclude located along the western boundary of the SIA restricts discharge north and south of this front.

The water quality of the underlying groundwater is brackish to saline. Stygofauna have been identified in 3 bores within or bordering the SIA, however a qualitative risk assessment has determined that industrial land use will have negligible impact on stygofauna species recorded within the SIA, providing groundwater quality and quantity is maintained.

3.4.3 Solid and Liquid Wastes

It will be the responsibility of proponent industries to manage their own solid and liquid wastes, with solid wastes likely to be disposed primarily in off-site licensed landfills, and with disposal of liquid wastes subject to prior treatment and control of subsequent disposal through a licensing process. Industrial ecology synergies to reuse materials will be an important part of reducing wastes going to landfill.

3.4.4 Air Emissions

The exposure of the SIA and GIAs to prevailing south-easterly to south-westerly winds will demand stringent dust controls to ensure dust levels are managed within designated limits. The SIA could also be impacted by dust coming from iron ore stockpiles proposed to be located immediately to the west.

A combination of noise, air emissions and risk modelling served to define the OIE buffer, with noise the prime determinant of the buffer boundary. Air quality, noise and risk impacts associated with future developments within the industrial precincts and throughout the OIE will have to comply with EPA for noise, air emissions and risk criteria at the buffer boundary.

3.4.5 Environmental Management

Management measures related to the environmental features of the OIE have been identified in the Environmental Review Report and consolidated into an environmental management framework, which includes timeframes and responsibilities for implementation. The environmental management framework will guide environmental activities which are the responsibility of the Estate Manager (LandCorp) and will assist future proponents of major industrial developments in determining requirements to meet industrial estate standards for water, air, risk and noise impacts.

Measures to improve the local environment, through rehabilitation and revegetation, will form a key management focus for activities in the buffer and provide the opportunities to establish biodiversity offsets.

3.4.6 Recommendations

Improve Ecosystem Function by maximising integration of the OIE with the surrounding environment (coastal area and Buller River and Oakajee River catchments) in pursuit of net-benefit environmental outcomes. The ecosystem improvements, including the following actions, will be achieved through the implementation of recommendations in the Environmental Review Report and Landscape Report.

- Work with the Geraldton Port Authority and proponents to protect and, where appropriate, restore dune-scapes and coastal vegetation.
- Protect and/or enhance natural features of the landscape and areas of biodiversity to deliver greater environmental returns to the region (e.g. rehabilitating drainage and river channels).

3.5 Regional Development

The OIE is much more than an industrial estate – it is an opportunity to position the Mid West for the future. Provision of critical services and infrastructure, connection of rail, port and freight road networks will all add to the diversification of the regional economy.

The Mid West Development Commission (MWDC) is in the process of preparing an Investment Plan to identify regional priorities for Royalties for Regions and Infrastructure Australia funding. The Investment Plan will include a community support package based on feedback from stakeholders and the community. LandCorp has put forward a range of OIE-related infrastructure issues for consideration, including power supply, water resources, transport links and land-backed port support facilities. The MWDC Investment Plan is expected to be completed by February 2011.

3.5.1 Transport

As described in Guidelines for Industrial Development (NRM 2010), one of the primary objectives for successful industrial areas is to maximise transport networks. Transport infrastructure is critical to this region's development and has been the subject of significant investment over the last decade. The primary use of OIE's transport corridors will be freight access – by road and by rail. The OIE is in a strong position to influence regional infrastructure development to support the flow of goods and services through the estate.

The upgrade of and alignment changes to the North West Coastal Highway combined with the development of the Bypass Road via the ONIC will provide for an efficient transport network. Together they will provide the opportunity to leverage the synergies that exist between the OIE, Namgulu Industrial Estate, the Port of Geraldton and the Airport.

3.5.2 Services

Significant infrastructure will be required to establish the OIE. The ONIC has been identified as the main service and infrastructure corridor for rail, road, water,

communications and slurry pipelines. An existing easement for a gas lateral from the Dampier to Bunbury Pipeline is in place. The Engineering Services Report which forms part of the Structure Plan provides details on the services currently available to the site, what services will be required as the OIE develops and what the options are to meet these forecast demands.

3.5.3 Education and Training

OIE industries may benefit from a central facility which can be used for ongoing training of their staff and various research and development purposes. The current expectation is that OIE training needs will be integrated into the Geraldton Knowledge Precinct. Shared research or infrastructure opportunities may also exist with the ASKAP project. There is also an opportunity to develop a dedicated Indigenous Training Centre that could support local Indigenous communities and maximise their participation in the economic opportunities created by OIE and other major projects in the region.

There is additional potential to identify synergies with the proposed City Centre Technology Precinct, which seeks to leverage existing health and education infrastructure to attract additional high technology development. Other education initiatives underway or proposed include a regional university and the Department of Education and Training (DET) Indigenous Training Centre. All of these educational and tertiary study facilities will assist in training the local population in the skills required by industry.

The Estate Manager (LandCorp) will be working with the education and training institutions to address skills and training support requirements for the SIA and GIAs.

3.5.4 Recommendations

Stimulate Regional Development by maximising the integration of the OIE with the Mid West's natural economic advantages and development plans through the following initiatives:

- exploring how the other projects in the region might present shared education opportunities which could benefit the OIE and its industries
- working with regional and state education and training authorities to align OIE training and research programmes with regional education industry development plans, including the Geraldton Knowledge Precinct
- investigating the role of the Estate Manager (LandCorp) in encouraging Indigenous training and employment.
- Work alongside State and Local Government bodies to establish where the demands for infrastructure are, how they will be met and what the investment priorities are.
- The Estate Manager (LandCorp), the Department of State Development and other stakeholders will also need to determine what investment new industries will be required to make towards infrastructure to ensure that the employees they attract to the area will not negatively impact on the community but will instead bring added benefits.

4. Further Work

4.1 Governance

Sustainability will need to be supported by innovation and appropriate governance structures and processes aimed at:

- identifying social, economic and environmental risks and opportunities
- integrating these findings to determine sustainability priorities
- adapting these priorities to ensure they remain relevant for the foreseeable period of the OIE lifecycle
- focussing innovation on delivering sustainable outcomes in these priority areas, as the basis for developing competitive advantages.

Delivering innovation will be essential to the achievement of sustainability outcomes and requires a collaborative process, involving key stakeholders at each of the above stages. Innovations can be strategic, cultural, location based, structural and/or technical. Innovations often lead to improved performance in other aspects and can deliver business returns and other sustainability improvements.

Managing the innovation process is the core governance challenge for delivering business and other sustainability performance returns. In Western Australia, the Kwinana Industries Council, as the innovator informing the development of government policies related to industry synergies, has shown how this can be achieved. The Council's results have been widely recognised, both from a sustainability perspective, and from a more traditional economic perspective.

The Western Australian policy document, which sets out how industrial estates should be governed, is the 1998 State Heavy Industry Policy (SHIP). Other references related to governance are outlined in the Western Australian State Sustainability Strategy 2003 and the more recent Perth Region NRM Guidelines for Industrial Development 2010, developed in partnership with the Western Australian and Commonwealth Governments.

The SHIP addresses the following elements (Government of Western Australia, 1998):

- land for heavy industry
- assessment and approvals procedures
- buffer areas for heavy industry
- infrastructure for heavy industry
- energy for heavy industry

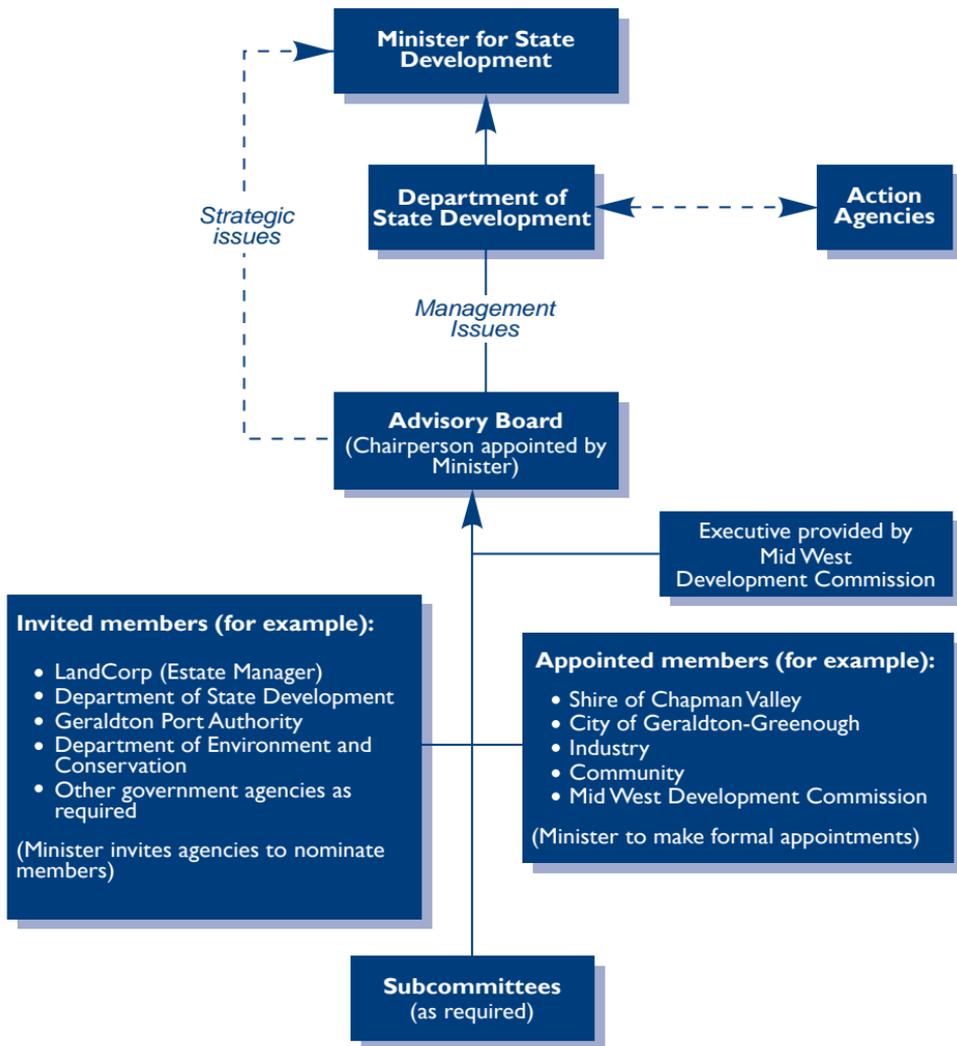
- incentives for heavy industry
- land tenure for heavy industry
- management of strategic industry areas
- education and training for heavy industry.

Section 8 of the SHIP is concerned with the management of strategic industry areas. The key elements of this management structure include policies on:

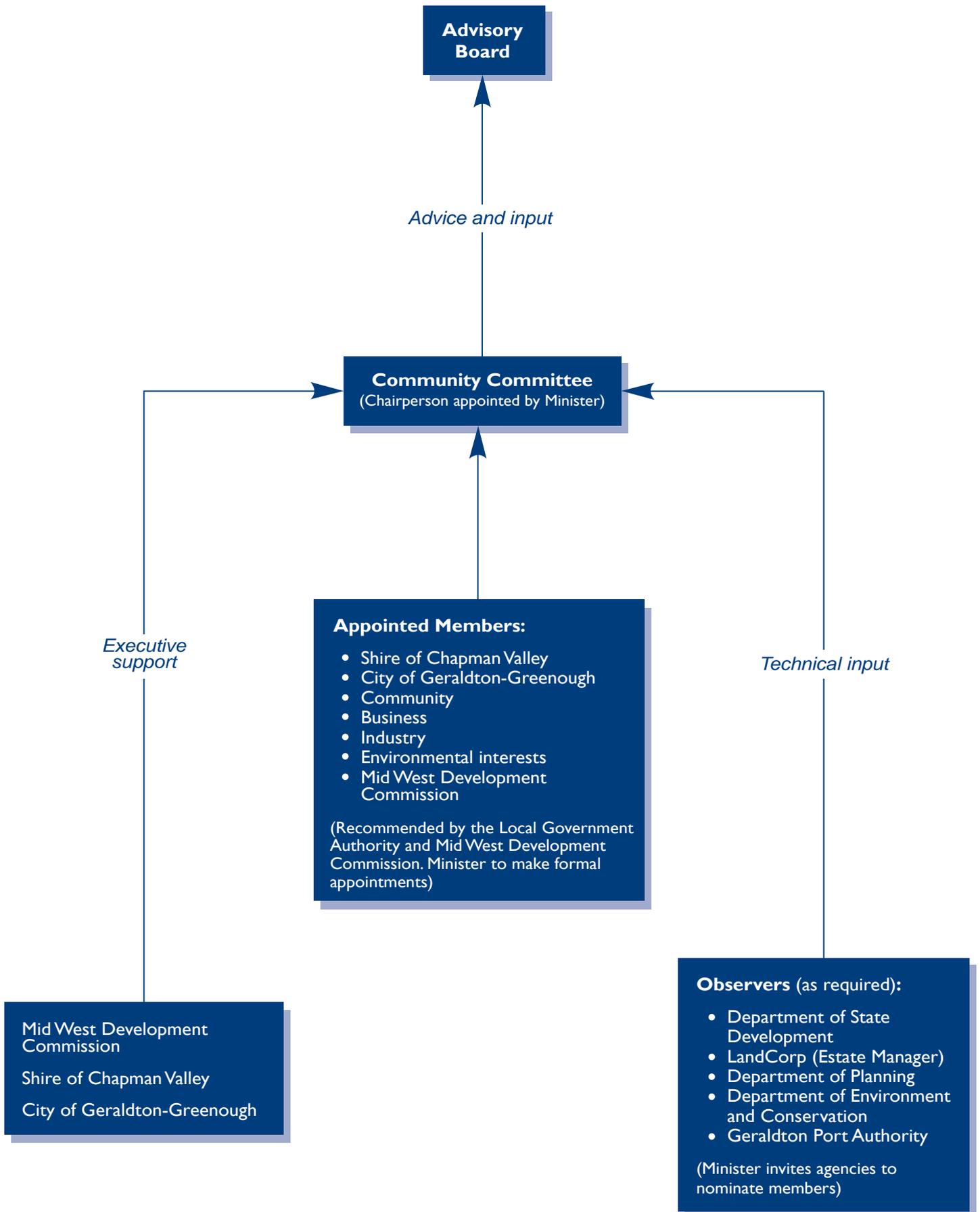
- efficient management
- Advisory Boards
- community involvement
- the role of government agencies
- inter-departmental coordinating bodies.

The following diagrams show the proposed Management Structure and Community Committee Structure and have been developed for the Oakajee Industrial Estate based on the SHIP governance model.

PROPOSED MANAGEMENT STRUCTURE FOR THE OAKAJEE INDUSTRIAL ESTATE



COMMUNITY COMMITTEE STRUCTURE



As derived from State Heavy Industry Policy 1998

The Kwinana Industry Council (KIC) is the best and most current example of an effective governance framework. The KIC lists the following as its primary goals:

- to promote a positive image of Kwinana industries
- to work towards the long-term viability of Kwinana industry
- to coordinate a range of intra-industry activities including water quality, air quality, monitoring and emergency management
- to highlight the contribution Kwinana industry makes to community
- to liaise effectively with local communities, Government and Government agencies.

There are also good examples of industry led structures aimed at generating pooled funding to undertake a range of social investment initiatives that benefit the community.

The Draft Gladstone Region Social Infrastructure – Voluntary Industry Contributions Framework is one such example. Established for the Gladstone Region in Queensland, under the framework and voluntary scheme, industry contributions are pooled and allocated to areas of need to support improved social infrastructure investment outcomes. The funds are allocated through a foundation that is supported by a trust fund, and overseen by a consultative board of stakeholders and industries. It is expected that the funds will be used to make a real difference to people living and working in the region (Queensland Government, 2010).

The Western Australian Government has developed the Lead Agency Framework (Government of Western Australia, 2009) and is progressing streamlined planning and approvals through the Heavy Use Industrial Land Strategy within Industrial Estates (Government of Western Australia, 2010). Between them, these initiatives set out a strategy to improve the approvals system by creating a single point of interface with Government for industry proponents and a system of land-based approvals for industrial estates. Oakajee is identified as a key focus of both initiatives.

LandCorp will retain tenure of OIE, on behalf of the Western Australian Government. As the Estate Manager, LandCorp will be responsible for allocating land, according to the Structure Plan and the Industrial Ecology Strategy.

4.1.1 Recommendations

Establish relevant governance structures for the ongoing management of the OIE with the Estate Manager and the Department of State Development to develop Terms of Reference with a focus on sustainability and innovation. The strategy will be to draw upon existing guidelines, policies, structures, approvals reform initiatives, industrial ecology and best practice sustainability innovation strategies to realise competitive advantage.

Develop an Industry Attraction Strategy for attracting a diversity of industry types to contribute to industrial ecology synergies and competitive advantages (refer also to the industrial ecology recommendations, Section 3.1).

4.2 Implementation

4.2.1 Structure Planning

The successful integration of sustainability initiatives identified in this report will be largely dependent upon the implementation of the Structure Plan as the key guiding document for the development of the OIE. The OIE Structure Plan provides a framework for the Estate Manager (LandCorp) and proponents to pursue a range of sustainability initiatives such as:

- possible locations for renewable energy facilities: pump-storage hydro, wind and wave power
- an integrated transport system, including freight rail, connecting a future port with Narngulu and the broader freight network
- sites for possible ecological restoration and carbon sequestration
- opportunities for industrial ecology through:
 - clustering of industries to share resources
 - integrated infrastructure corridors allowing for efficient transfer of materials
 - potential waste recycling sites in proximity to industry.

The roles of the proponents, the Estate Manager and planning agencies in the implementation of sustainability initiatives are outlined below.

4.2.2 Proponents

Ultimately, it will be the role of proponents to implement sustainability initiatives and deliver sustainability outcomes in partnership with the Estate Manager, planning agencies and other stakeholders. The OIE Structure Plan has been designed to maximise the potential for sustainability initiatives to evolve and to progress toward continuous improvement as outlined in the sustainability journey (refer to section 1.6).

4.2.3 Planning Agencies

The Shire of Chapman Valley and Western Australian Planning Commission (WAPC) will be responsible for assessing applications for subdivision and development within the OIE. The EPA will also play a key assessment and regulation role through the referral and environmental impact assessment process. The Shire and WAPC have the capacity to assess applications in accordance with the OIE Structure Plan.

The OIE Structure Plan will not mandate or require proponents or the Estate Manager to specifically meet or address sustainability performance criteria such as carbon emission

targets or industrial ecology requirements. Given the large scale of industrial developments and uncertainty over the types of industries envisaged for the SIA, it is not practicable at this stage for the OIE Structure Plan to set performance standards related to sustainability.

4.2.4 Estate Manager (LandCorp)

The Estate Manager will be responsible for granting leases to future proponents of heavy industry. Among other considerations, the Estate Manager will have the ability to consider the 'sustainability' characteristics of proponents and projects. Where possible, the allocation of land will be consistent with the recommendations outlined in the Industrial Ecology Strategy to enable 'clustering' of industries and maximise the sharing of energy, water and by-products as the basis for creating competitive advantage.

The Estate Manager and the Department of State Development will use the 1998 State Heavy Industry Policy as a guide for developing the governance structure of OIE.

4.2.5 Department of State Development

The Department of State Development with the Estate Manager (LandCorp) will be responsible for industry attraction and negotiation with proponents. The Department of State Development also has a much broader mandate and responsibilities for ensuring that the OIE and related infrastructure projects are coordinated and successfully delivered as an integrated program. Key infrastructure projects currently in their development phase include the OPR port and rail project, Oakajee Port Master Plan and the ONIC project.

4.2.6 Collaboration

There is a significant opportunity for all stakeholders to collaborate to drive the sustainability innovation process set out in the governance section. The KIC has demonstrated the advantages of this approach, through the multiple efficiencies and synergies it has realised. OIE has an opportunity to take this further, as the estate has been planned with industrial ecology and other sustainability derived competitive advantages in mind.

As industries establish, other industries would be targeted through the Industry Attraction Strategy to deliver synergies based on existing inputs and outputs.

5. Conclusions

The future success of the OIE depends on driving efficiencies through industrial ecology processes and other sustainability initiatives discussed above. The Structure Plan has incorporated sustainability initiatives consistent with best practice approaches for the establishment of sustainable industrial estates, particularly in regards to the industrial ecology aspects.

The implementation of the Structure Plan and the governance framework to support the development of the OIE provides a foundation for the implementation of sustainability outcomes that have the ability to place OIE at the forefront of industrial developments around the world.

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Related Oakajee Industrial Estate Structure Plan Studies:

- Environmental Review Report – Parsons Brinckerhoff
- Aboriginal Heritage Management Plan
- European Heritage Surveys
- Engineering Report – GHD
- Landscape Report – Hassell / Strategen
- PB₁ 2010 Report – Wind Farm Study – Parsons Brinckerhoff
- PB₂ 2010 Report – Pump Storage Hydro Study – Parsons Brinckerhoff
- Wave Energy Review – RPS