

Oakajee Industrial Estate - Concept Shire of Chapman Valley

LandCorp

**Advice to the Minister for the Environment from the Environmental
Protection Authority under Section 16(e) of the *Environmental
Protection Act 1986***

**(This is not an assessment of the Environmental Protection Authority
under Part IV of the *Environmental Protection Act 1986*.)**

**Environmental Protection Authority
Perth, Western Australia
Bulletin 848
April 1997**

ISBN. 0 7309 8025 1
ISSN. 1030 - 0120

Summary

LandCorp has prepared a concept plan for the development of an industrial estate as part of a strategic review of industrial land for the Mid West Region. The Government has requested early advice on the environmental matters associated with the industrial estate concept to assist in detailed planning for the region. To facilitate the process of regional planning, the Minister for the Environment has sought the EPA's advice on the industrial estate concept, pursuant to Section 16(e) of the *Environmental Protection Act (1986)*.

The report provides the Environmental Protection Authority's (EPA) environmental advice to the Minister for the Environment regarding a concept to establish a Heavy Industrial Estate at Oakajee (23 km north of Geraldton), as detailed in LandCorp's Public Environmental Review (PER) of May 1994, and subsequent documentation.

This report considers the industrial estate concept, environmental factors likely to be important, additional aspects of the proposal and environmental management and procedures.

• **Factors**

The EPA, in formulating its view recognises that, at this stage, it is only dealing with a strategic concept. Based upon the information available and recognising the additional studies undertaken as a consequence of earlier consideration of this site, the EPA has identified the following important environmental factors:

- (a) rare and priority flora and vegetation communities;
- (b) surface water;
- (c) groundwater;
- (d) liquid and solid wastes;
- (e) gaseous emissions;
- (f) dust and particulate emissions;
- (g) noise and vibration;
- (h) public health and safety;
- (i) heritage; and
- (j) visual impact.

The EPA also considers that other issues that need to be considered are as follows:

- (a) regional planning;
- (b) port; and
- (c) fishing.

• **Management and Studies**

Against each of these environmental factors a set of environmental objectives have been established. Considerable attention has been paid to environmental management if the proposal is to be implemented. This includes the development and implementation of environmental management systems and standards both for the estate and for individual industries wishing to establish within the estate, and integration with any associated port facility.

- **Advice to the Minister for the Environment**

The EPA has made a number of recommendations for management of the industrial estate, and identified further studies, as outlined in Sections 3 and 5 of this Report. If these measures are implemented, and subject to study results, implementation of the industrial estate concept can be managed to proceed without significant environmental effects.

This advice considers the potential impacts of the development of an industrial estate at Oakajee in isolation. The EPA cannot forecast what type of specific industries are likely to be established in the estate. The combined impact of possible industries, associated port facilities, infrastructure requirements including rail development and matters relating to the siting and operation of quarries to provide raw materials to allow implementation of the project to proceed, will require further evaluation.

It is the EPA's view that the provision of infrastructure support for the industrial estate concept should be considered through separate referral under section 38 of the Act, or as a function of the consideration of the Scheme Amendment that will precede implementation.

This Scheme Amendment should also consider the status of the buffer proposed.

Recommendations to the Minister for the Environment

Recommendation 1

That the Minister for the Environment notes the environmental factors, the EPA's objective for each factor as set out in Section 3 of this report and the studies suggested to gain further information.

Recommendation 2

That the Minister for the Environment notes the EPA's advice on meeting EPA objectives for the important environmental factors, environmental management considerations and suggested studies.

Recommendation 3

That the Minister for the Environment notes that the provision of infrastructure requirements to the Oakajee Industrial Estate Concept area has not been considered in this advice, and that such matters will be referred to the EPA for consideration as either formal referrals or Scheme Amendments under Part IV of the *Environmental Protection Act*.

Recommendation 4

That the Minister for the Environment notes that industries with the potential to impact on the environment and wishing to establish in the Oakajee Industrial Estate Concept area would be subject to assessment under Part IV of the *Environmental Protection Act*.

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1. Introduction

LandCorp has referred a concept plan for the proposed Oakajee Industrial Estate as part of a strategic review of industrial land for the Mid West Region. The Government has requested early advice on the environmental matters associated with the Oakajee Industrial Estate concept plan to assist in detailed planning for the proposal and to assist the process of planning for the region. The Minister for the Environment has sought the EPA's advice on the Oakajee Industrial Estate concept, pursuant to Section 16(e) of the *Environmental Protection Act 1986* (the Act).

This advice is provided with the expectation that, should industrial estate concept at Oakajee be implemented, it will:

- allow earlier definition of environmental issues;
- increase the level of certainty for subsequent proposals undergoing environmental impact assessment;
- reduce time delays within the environmental assessment process; and
- ensure consistency in the EPA's decision making,

without compromising and more likely enhancing the protection of the environment.

1.1 Definition of Section 16(e)

Section 16(e) of the *Environmental Protection Act 1986* in relation to the functions of the Environmental Protection Authority (EPA) enables the Minister for the Environment to receive advice on environmental matters referred to the Authority.

The Minister, by letter to the Chairman of the EPA dated July 23 1996, has requested environmental advice on the concept of an industrial in the Oakajee locality north of Geraldton. The Minister has similarly sought advice on a concept plan for a deepwater port to service the LandCorp industrial estate. That advice is being prepared separately from this report.

1.2 The PER Report

The Oakajee Industrial Park, Geraldton (LandCorp. 1994) was originally assessed at the level of Public Environmental Review (PER) under Part IV of the *Environmental Protection Act 1986*.

Pending a request for a report on certain further aspects of the proposal by the then Minister for the Environment, a decision was made to suspend the initial report until the EPA had further reported on that additional information.

Accordingly the formal assessment for an industrial estate at Oakajee, although complete, was suspended. The then Minister for the Environment decided to release the report (EPA 1994) in the form of a document stamped "suspended" for the information of the public.

Following on from the Supreme Court decision of 27 April 1995 (number 1879 of 1994), it was determined that planning proposals could not be assessed formally under Part IV of the Act because it was not a "proposal" within the meaning of section 38 of the Act. As it was concluded that the Oakajee Industrial Park assessment fell outside this definition, the formal assessment could not be completed and was formally withdrawn.

1.3 Limitations of the report

Information gathered for the earlier formal assessment (LandCorp 1994), comments received from both public and Government agencies during the public participation, and the results of subsequent studies undertaken at the request of the Minister for the Environment have been considered in the preparation of this advice. This report is based upon the information available at the time of writing.

The advice to the Minister for the Environment provided in this report is prepared pursuant to Section 16(e) of the *Environmental Protection Act 1986*. Under no circumstances should this advice be considered as a formal assessment of a proposal under Part IV of the *Environmental Protection Act 1986*. The EPA reserves the right to assess formally under that Part any proposal for a specific port in the Oakajee locality.

1.4 Definitions

The following explicit definitions are used in this Report:

"Estate Manager"	-	For the purpose of this report, it has been assumed that the proposed industrial estate will be managed by a "Estate Manager", which be either a statutory authority or a corporate authority to be determined by Government. Until the appointment and/or incorporation of such a body, this role will be assumed by LandCorp.
"Oakajee Park Advisory Board"	-	For the purpose of this report, it has been assumed that an Advisory Board, comprising representatives from State and Local Government, industry, local residents, and other appropriate organisations will be established to guide development of the industrial park.
"Industry Management Body"	-	For the purpose of this report, it has been assumed that an industry management board, comprising a representative from each of the industries within the park will be established to, amongst other responsibilities, formulate and implement operational policy for the industrial park, monitor industry in the park and undertake cumulative impact assessments consistent with the concept plan and subsequent requirements.
"Proponent"	-	In relation to a proposal, means person who or which is nominated under section 38 of the Act as being responsible for the proposal, or public authority on which the responsibility for the proposal is imposed under another written law.
"Proposal"	-	means project, plan, programme, policy, operation, undertaking or development or change in land use, or amendment of any of the foregoing, but does not include scheme.
"Estate Area"	-	The estate area is assumed for the purposes of this advice to cover the region between the Buller and Oakajee Rivers, the coast to the west and North West Coastal Highway to the East (see Figure 2).

Environmental Management System	-	<p>The Environmental Management System (EMS) is the environmental management plans and procedures required to implement the proposal. Environmental management principles, such as those adopted in the voluntary interim Australian Standards ISO 14000 series, should be adopted with appropriate monitoring and auditing to ensure compliance.</p> <p>The environmental management plans and environmental management procedures should adopt quality assurance principles such as those adopted in Australian Standard ISO 9000 series.)</p>
Environmental Management Plan	-	<p>A plan which documents all the environmental plans, management and commitments. The EMP forms part of the EMS.</p>

2. The industrial site concept plan

The Western Australian government has indicated support for a major iron based industry to be located within an industrial estate at Oakajee, 23 kms north of Geraldton (Figure 1, Appendix 1), and has requested that strategic concept plans for this prospect be developed. A steel mill of this kind proposed by An Feng Kingstream Resources was to be established at Narngulu east of Geraldton but more recently the government has argued for the development to be located as part of a future Oakajee Industrial Estate, which has been proposed by LandCorp, approximately 23km north of Geraldton (Appendix 1: Figures 1 and 2). The primary purpose of this estate is to cater for heavy industrial development in the Mid West region.

The preparation of this Concept Plan is consistent with the report of the Geraldton Region Plan Review Taskforce (1996) which identified the need to develop additional industrial land in the Region generally, and to urgently conclude investigations on the Oakajee Industrial Estate.

LandCorp is an Authority of the Western Australian Government, established in part to identify and provide appropriately located and serviced industrial and commercial land.

LandCorp, in association with other Government agencies, will be responsible for the planning and development of the estate comprising approximately 1000ha at Oakajee by LandCorp as an industrial estate, together with a further allocation of approximately 2200 ha to serve as a buffer zone.

Industries that are anticipated to establish within the Estate include a range of downstream processing plants for locally and distant sourced minerals and agricultural products. A listing of these industries is provided in an appendix to the referral document (LandCorp. 1994).

Port development and wastewater treatment facilities, together with infrastructure requirements such as road and rail transport have not been considered as part of the present advice. The development of an adjacent port facility at Oakajee is currently subject to separate consideration by the EPA.

The referral document proposes the establishment of an Oakajee Park Advisory Board which would be responsible for the formulation, implementation and reporting to Government of the heavy industrial estate. The Board would be made up of representatives from State government agencies, community representatives and other appropriate agencies.

An Industry Management Body is also proposed to be established when industry begins to be located within the estate. This body would formulate and implement operational policy,

consistent with the concept plan, and would monitor and report on industry performance and its cumulative impacts.

Industries establishing within the estate would need to obtain all necessary environmental and other approvals before development can commence. They would also be required to adhere to rules and regulations set down by the park's Advisory Board.

3. Environmental factors likely to be important

3.1 Important environmental factors

In the EPA's opinion and having regard for the views of the public and government agency comments indicated in Appendix 1 and 2 respectively and other relevant information, the following are the environmental factors likely to be of importance in the development of an industrial estate at Oakajee:

- (a) rare and priority flora and vegetation communities;
- (b) surface water;
- (c) groundwater;
- (d) liquid and solid wastes;
- (e) gaseous emissions;
- (f) dust and particulate emissions;
- (g) noise and vibration;
- (h) public health and safety;
- (i) heritage; and
- (j) visual impact.

These important environmental factors are discussed in Sections 3.2 to 3.11 of this report, and are summarised in Table 1.

The environmental factors which require further investigation are identified. It should be noted that this assessment is not of individual proposals but of the Concept Plan as a whole. The focus is not, therefore, on the direct impacts associated with individual industrial development proposals or infrastructure proposals such as the provision of road and rail transport. These would be considered separately under section 38 of the *Environmental Protection Act 1986*, or during the Planning Scheme amendment stage.

3.2 Rare and priority flora and vegetation communities

Aspects of rare and priority flora and vegetation communities

The site of the proposed industrial estate has been extensively cleared for agricultural purposes including grazing and cereal cropping. Vegetation has been retained around the perimeter only, and the clearing, combined with high winds experienced in the area, has resulted in significant soil degradation and erosion (Figure 3).

A flora and fauna assessment of the site was commissioned by LandCorp (Dames & Moore, 1993a). One of the aims of this assessment was to identify any rare or priority flora on the proposed site. Although rare and priority species were identified in the greater region, none were identified from within the subject area.

An objective of the National Strategy for the Conservation of Australia's Biological Diversity (ANZECC 1996) is to ensure that effective measures are in place to retain and manage native vegetation, including controls on clearing.

In May 1995 the Western Australian State Government adopted the Remnant Vegetation Policy which discourages clearing where total remnant vegetation within a local government authority or sub-catchment is less than 20%. This policy is implemented under the *Soil and Land Conservation Act 1945* by the Commissioner for Soil and Land Conservation.

Public submissions detailed several concerns relating to the manner in which the flora and fauna study of the Oakajee area was carried out, specifically the short duration and limited areal extent of the surveys carried out for the purpose of this referral.

The proponent's referral document (LandCorp 1994) stated that should future site development involve disturbing remnant native bushland, another survey will be required in the spring to look for declared rare flora or other priority species not apparent during the reported survey.

The Department of Conservation and Land Management suggested that spring studies for rare flora should be conducted prior to the clearing of remnant vegetation.

Consideration

The area considered for assessment of this environmental factor is the Estate Area (see Section 1.4, Figure 2). The area lies within the Geraldton Sandplain Biogeographic Region (Thackway and Cresswell 1995).

With respect to this environmental factor, the EPA's objective, is to protect declared rare and priority flora consistent with the provisions of the *Wildlife Conservation Act 1950*, and to maintain the abundance, diversity, geographic distribution and productivity of locally present vegetation communities.

Although LandCorp has made no formal commitment with respect to rare and priority flora nor the preservation of vegetation communities, the referral document indicated that, apart from the possible clearing of up to 50 ha in the north-west corner of the site, there should be no significant impact on flora. The EPA considers that for a proposed core area of 1000 ha and no specific industries identified to this time, it should be possible to avoid the loss of remnant vegetation.

LandCorp further indicated that if the need for clearing is identified, any such action will be preceded by a spring survey for the possible presence of gazetted rare and significant flora, and will prescribe appropriate protection if such flora is found.

The conclusion that can be drawn from the preliminary site assessments carried out is that it seems unlikely that significant flora and vegetation communities, and probably fauna, occur in the area. Industrial development in the north western portion of the site (identified for high risk industries) will impact on local remnant vegetation, although this is unlikely to be significant on a regional scale, and could be avoided given the early stage in development of the Industrial Estate, if implemented.

The EPA notes:

1. that there are no significant vegetation communities and that no rare and priority flora were identified;
2. the undertakings made by LandCorp; and
3. the requirements under the *Soil and Land Conservation Act, 1945*.

In considering aspects of the rare and priority flora vegetation communities at this locality, any future proposal should take account of, but not be limited to, the following:

Studies required by Estate Manager/proponent:

1. prior to the removal of any remnant vegetation, the Estate Manager or proponent should undertake a spring survey for rare and priority flora .

Should the above occur, it is likely that implementation of the industrial estate concept plan is capable of being managed so as not to compromise the EPA's objective with regard to rare and priority flora and vegetation communities.

3.3 Surface water

Aspects of surface water

Some surface run-off is inevitable within plant sites where the sandy soils are covered with impervious materials (buildings, bitumen pavement, etc). All stormwater run-off from these areas will need to be captured by providing appropriate bunding and collection systems, and managed appropriately.

The region around the proposed site is dissected by the Buller and Oakajee Rivers, although the site itself features internal drainage. Water samples taken from both these rivers over a period of twenty years indicated that the stream water is consistently saline, with TDS typically in the range 3,000 to 10,000mg/L.

Within the industrial site itself there are three internal catchments (LandCorp 1994, Fig 10). To the west of these, surface drainage is towards the coast, while to the north, east and south drainage is towards either the Oakajee or the Buller River, with both subsequently draining into the ocean. The high permeability of the soils covering the proposed site offers little protection against stormwater soakage, surface water run-off, and irrigated wastewater entering the drainage system.

Water quality (including stormwater) which leaves the site should meet the Australian and New Zealand Environment and Conservation Council (ANZECC) (1992) and Draft Western Australia Guidelines for Fresh and Marine Waters (EPA, 1993).

LandCorp has made the following management commitments:

- individual industries will be required to develop monitoring programmes for surface run-off and terrestrial water quality; and
- the Industry Management Body will design and implement a monitoring programme sufficient to determine baseline water quality and subsequent changes as a consequence of the establishment of industry at the site.

The then Water Authority of Western Australia strongly recommended that uncontaminated stormwater (road, carpark and roof drainage) be kept separate from process streams (other than clean cooling waters) and from waste collection systems serving loading/storage areas involving toxic or hazardous goods, and be discharged direct to soakage.

Public submissions expressed concern about how activities within the industrial estate could result in the contamination of surface water features such as the Buller and Oakajee Rivers, with consequent impacts on the marine environment.

Consideration

The area considered for assessment of this environmental factor is the estate area (see Section 1.4, Figure 2), the adjacent Oakajee and Buller Rivers and adjacent nearshore marine areas.

Surface and wastewaters must be managed and if necessary treated prior to discharge to the environment.

With respect to this environmental factor, the EPA's objective is to maintain or improve the quality of surface water to meet the requirements of the ANZECC (1992) and draft Western Australian Water Quality Guidelines for Fresh and Marine Waters (EPA 1993).

The EPA notes:

1. the high permeability and hydrology of the subject land;
2. the requirement by any industry wishing to establish at the site to refer the project to the EPA pursuant to Part IV of the Act;
3. the commitments made by LandCorp to establish an Advisory Board and Industry Management Body; and
4. the requirement for industries of a prescribed nature to apply for and if appropriate be issued an operating licence subject to acceptable continuing performance.

In considering aspects of surface waters, any future proposal should take account of, but not be limited to, the following:

Studies required by Proponents:

1. prior to any industry (with the potential to pollute surface water) being given approval, the proponent must demonstrate that its operation will not have a significant impact on surface water. Appropriate management and monitoring will be required.

Should the above occur, it is likely that implementation of the industrial estate concept plan is capable of being managed so as not to compromise the EPA's objective with regard to surface water.

3.4 Groundwater

Aspects of groundwater

Uncontrolled discharge of contaminated stormwater and wastewater leakage have the potential to impact on groundwater quality. There are currently no groundwater users located on the proposed site, and no evidence of contamination.

Groundwater flow beneath the proposed Oakajee Industrial Estate has previously been investigated by Jim Davies & Associates (1993a & b) for the preparation of the referral document (LandCorp 1994). Further hydrogeological work was undertaken by Rockwater (1996a & b) in response to concerns raised in public submissions about the possibility that the Tamala limestone formation beneath the proposed site may provide preferential groundwater flow through karstic cavities, thus allowing contaminants to reach the coastline and subsequently enter the marine environment.

An outcome of the hydrogeological studies undertaken has been to identify the permeabilities of sediment and underlying limestone groups at the site. Optimum sites for the location of specific

industry types and monitoring sites have been recommended. Paleochannels were not identified in hydrogeological studies undertaken.

The conclusion drawn in the Rockwater report, that the proposed industrial area at Oakajee has a lower risk of causing contamination of the ocean via groundwater than many other coastal locations in southern Western Australia, was supported by the Water and Rivers Commission.

Water quality (including stormwater) which has the potential to infiltrate into the groundwater should meet appropriate criteria as identified in ANZECC (1992) and Draft Western Australia Guidelines for Fresh and Marine Waters (EPA, 1993).

LandCorp has made a number of commitments including:

- collecting initial baseline data on groundwater quality and the marine environment with this role to be assumed by the Industry Management Body as industries begin to locate within the park;
- ensuring that monitoring programs are acceptable to the EPA and other relevant licensing authorities (Water Corporation, DOME, etc); and
- reporting the results on a regular basis to the above agencies and to the Industry Management Body.

Reservations on the initial review of the quality and extent of hydrogeological information was expressed in both public and government agency submissions on the initial referral document. These concerns have been addressed through subsequent detailed studies.

Consideration

The area considered for assessment of this environmental factor is the Estate Area (see Section 1.4, Figure 2), and adjacent nearshore marine areas.

The EPA's objective in regard to this environmental factor is to maintain or improve groundwater quality and meet the requirements of ANZECC (1992) and the draft Western Australian Water Quality Guidelines for Fresh and Marine Waters (EPA 1993).

The EPA endorses the view that the proponents of industries wishing to establish within the proposed estate in the future will also need to develop and implement suitable groundwater monitoring programmes, cognisant of those already undertaken and as a function of the potential of that industry to pollute groundwater.

The EPA cannot forecast what type of specific industries are likely to establish in the estate, and accordingly cannot pre-empt their potential groundwater impacts. Whilst poor implementation of the proposal is likely to lead to some local lowering of water quality, this possibility must be considered in the context of the existing water quality and likely uses.

The EPA notes:

1. the hydrogeology of the subject land;
2. the requirement by any industry wishing to establish at the site to refer the project to the EPA pursuant to Part IV of the Act;
3. the commitments made by LandCorp to establish an Advisory Board and Industry Management Body; and
4. the requirement for industries of a prescribed nature to apply for and if appropriate be issued an operating licence subject to acceptable continuing performance.

In considering aspects of surface waters, any future proposal should take account of, but not be limited to, the following:

Required by Estate Manager:

1. implementing, auditing and reporting on management commitments for baseline groundwater monitoring prior to industry establishing within the estate;

Required by Estate Manager/Industry Management Body:

2. developing and implementing on-going groundwater monitoring programme for the cumulative impacts of the industrial estate; and

Required by Proponents:

3. industries will be required to develop individual environmental monitoring programmes, where there is potential to pollute groundwater, with appropriate mitigation procedures identified.

Should the above occur, it is likely that implementation of the industrial estate concept plan is capable of being managed so as not to compromise the EPA's objective with regard to groundwater.

3.5 Liquid and solid wastes

Aspects of liquid and solid wastes

The information provided in Section 3.4 on groundwater is also relevant to this factor.

The type of wastes that may be generated on the site are described in the referral document (LandCorp 1994).

Disposal of liquid and solid wastes on site via any mechanism has the potential to pollute groundwater and to a lesser extent surface waters. A key environmental consideration will be the safe disposal of such materials.

Disposal of untreated wastes on site is not anticipated due to the nature of the underlying sediments. The discharge of effluent to the ocean is not part of this proposal.

The referral document indicates that each industry will be responsible for the management of wastes generated, although depending on the industries eventually accommodated, a centralised wastewater treatment facility may be considered.

Where solid waste cannot be recycled or treated on-site, the estate manager has indicated a preference to remove it to an industrial landfill. In this respect options may include a facility at Meru, near Narngulu, operated by the Geraldton and Greenough Regional Council (GGRC), or industrial waste treatment facilities outside the region.

Government departments consulted indicated a general acceptance of waste disposal options presented, with the exception of sewage disposal on site. The EPA endorses the indicated view in support of treatment and re-use of wastes, with an integrated approach to all waste disposal.

The then WAWA also noted that the concept of solar evaporation requires that significant areas of land be set aside, and the probable use of synthetic liners (clays not being present on site).

Public submissions identified potential harmful effects of liquid waste disposal on the nearshore environment as a major concern.

Statutory requirements for controlling disposal of wastes are included in Part V of the Act, and the *Health Act (19 11)* .

Consideration

The area considered for assessment of this environmental factor is the heavy industry core. This is the area within which wastes will require treatment and possible disposal.

The EPA's objective in regard to this environmental factor is to ensure wastes are contained and isolated from ground and surface waters, and that discharges meet the requirements of ANZECC (1992) and Draft Western Australia Guidelines for Fresh and Marine Waters (EPA, 1993).

The EPA cannot forecast what type of specific industries are likely to establish in the Oakajee Estate Concept area, and accordingly predict liquid and solid waste disposal requirements.

In considering the impact of the land use, the EPA is aware of undertakings made by LandCorp to the effect that any constituted Oakajee Park Advisory Board and industry management body will encourage efficient use of wastewaters by industries through the adoption of recycling policies and liaison with local farmers through the Department of Agriculture WA regarding opportunities for disposal by irrigation.

The EPA considers that the disposal of liquid waste on site via any mechanism (evaporation ponds or irrigation), if poorly managed, has the potential to pollute surface water and groundwater. Whilst LandCorp has noted the option of off-site disposal of liquid waste (Forrestdale wastewater treatment plant and other landfills), this issue remains largely unresolved and would represent a considerable financial commitment.

In relation to solid waste disposal, the EPA considers that all solid wastes should be disposed of outside the proposed estate or at approved landfills with strict adherence to the requirements of appropriate regulations and guidelines.

The EPA notes:

1. the hydrogeology of the subject land;
2. the requirement by any industry wishing to establish at the site to refer the project to the EPA pursuant to Part IV of the Act;
3. the commitments made by LandCorp to establish an Oakajee Park Advisory Board and Industry Management Body; and
4. the requirement for industries of a prescribed nature to apply for and if appropriate be issued an operating licence subject to acceptable continuing performance.

In considering aspects of liquid and solid waste disposal, any future proposal should take account of, but not be limited to, the following:

Required by Estate Manager/Industry Management Body:

1. a liquid waste management strategy should be considered for the industrial estate, for those industries requiring this method of disposal; and

Required by Proponents

2. for each individual industry requiring solid and liquid waste disposal, resolution of this issue will be required prior to it establishing on the site.

Should the above occur, it is likely that implementation of the industrial estate concept plan is capable of being managed so as not to compromise the EPA's objective with regard to liquid and solid wastes.

3.6 Gaseous emissions

Aspects of gaseous emissions

The land proposed for the Industrial Estate can accommodate a substantial buffer, having agricultural lands to the north, south and east, and the ocean to the west.

Air quality investigations have previously been carried out by Steedman Science and Engineering (1993). The modelling which was carried out was based on a number of hypothetical emission sources discharging sulphur dioxide (one of the common industrial emissions) at levels equivalent to half the current sulphur dioxide output from Kwinana industry.

The EPA endorses a prescriptive approach to determine acceptable impacts from airborne discharges. Adoption of this approach requires simplifications and assumptions. In accordance with the "precautionary principle", such simplifications and assumptions are biased towards a conservative outcome.

Further, in assessing the acceptability of emissions to the atmosphere, the EPA uses four complementary criteria:

- preventing pollution;
- minimising discharges;
- adoption of continuous improvement; and
- agreed emission levels and ground level criteria,

in its consideration.

The National Health and Medical Research Council (NHMRC 1985) remains the primary reference for ambient atmospheric quality, pending the finalisation of a National Environmental Pollution Measure (NEPM) for air quality that will specify air quality goals for key pollutants. However in both the NHMRC and proposed NEPM measures, the criteria relate to human health and cannot be related to deleterious impacts on agricultural and horticultural plants.

Air quality criteria from stationary sources, as modified from time to time, are available from the Department of Environmental Protection.

Australia is a signatory to the 1992 United Nations Framework Convention on Climate Change. That Convention seeks "developed nations" - which Australia is deemed to be - to stabilise its greenhouse gas emissions (based upon the year 1990) by the year 2000, and to reduce emissions progressively thereafter.

The air quality modelling undertaken for the Concept Plan area indicated that:

- the site demonstrates good atmospheric dispersion characteristics and can accommodate industries discharging a range of gaseous emissions similar to those discharged at Kwinana;
- wider spacings between stacks reduce the ambient concentrations of emissions in the surrounding atmosphere;
- taller stacks reduce ambient concentrations better than short stacks. Dispersion patterns from them are such that they require a larger buffer zone in an arc from NNE to ESE than in other directions; and

- how stacks are arranged relative to one another is important in limiting ambient concentrations, with a SW-NE alignment (approximately perpendicular to the coast) being worst case as it maximises ambient concentrations.

LandCorp made several commitments pertaining to gaseous emissions including:

- baseline data on air quality will be collected by LandCorp, with this role to be assumed by the Industry Management Body as industries begin to locate within the estate;
- once industry development commences, a cumulative impact monitoring programme will be designed and implemented by the Industry Management Body, inclusive of all important potential impacts upon the local environment;
- individual industries will be required to develop environmental monitoring programmes for stack emissions, to the satisfaction of the EPA and other relevant licensing authorities; and
- these results will be reported on a regular basis to appropriate agencies and the Industry Management Body.

A DEP review of the modelling data indicated that with respect to gaseous emissions, the proposal would be acceptable subject to the requirement that each industry locating within the heavy industrial estate be formally assessed.

Public submissions expressed concern about how gaseous emissions from the Concept area could result in nearby residents experiencing health and respiratory problems, particularly those living to the north and east of the site. Further concerns related to assumptions made for the assessment .

Consideration

The area considered for assessment of this environmental factor is the Estate Area (see Section 1.4, Figure 2), and surrounding areas including residences and beaches.

The EPA's objective in regard to this environmental factor is to ensure that gaseous emissions, including greenhouse gases and odours, both individually and cumulatively conform to agreed standards and do not cause an environmental or human health problem in the area surrounding the industrial estate.

In considering the impacts of this land use, the EPA is conscious of the need for industries located within the proposed site to ensure that gaseous emissions do not cause an environmental or human health problem in the area surrounding the site. A comprehensive meteorological data set is critical in enhancing the validity of atmospheric modelling undertaken for the purpose of predicting environmental impacts.

Whilst such a proposal will always provide the potential for local concentrations of harmful air emissions to occasionally exceed EPA standards in areas outside the buffer zone, with appropriate management of each industry and the securing of a properly sized buffer zone, such excursions should be rare.

The EPA notes:

1. the location of the site, wind strength, direction and prevailing meteorology;
2. the results of indicative atmospheric modelling undertaken for the site;

3. the conservative approach to gaseous emissions through the establishment of an appropriate buffer zone;
4. the requirement by any industry wishing to establish at the site to refer the project to the EPA pursuant to Part IV of the Act;
5. the commitments made by LandCorp to establish an Advisory Board and Industry Management Body; and
6. the requirement for industries of a prescribed nature to apply for and if appropriate be issued an operating licence subject to acceptable continuing performance.

In considering aspects of gaseous emissions, any future proposal should take account of, but not be limited to, the following:

Required by Estate Manager:

1. prior to implementation of the concept, an airspeed monitoring programme be designed and implemented which will monitor air quality parameters outside the industrial park, including impacts on vegetation, and that it be utilised to secure an adequate buffer around the proposed site;

Required by Estate Manager/Industry Management Body:

2. design and implement cumulative impacts monitoring sufficient to protect the environment and human health;

Required by Proponents:

3. monitor and report on air emissions from individual plants; and
4. determine and report on the individual industry contribution to greenhouse gas emissions according to the voluntary C21 "Greenhouse Challenge" programme for the estimation, reporting and auditing of emissions.

Should the above occur, it is likely that implementation of the industrial estate concept plan is capable of being managed so as not to compromise the EPA's objective with regard to gaseous emissions.

3.7 Dust and particulate emissions

Aspects of dust and particulate emissions

Particulate matter may result from construction activities undertaken at the proposed industrial estate during construction, and as a consequence of on-going operations.

The concept area is located on the coast with little adjacent urban development. A number of semi rural dwellings occur to the south and east. The suburb of Drummond Cove occurs 6 km to the south (see Figure 2), and generally the direction of prevailing winds is not to dust sensitive areas.

The concept area consists of sandy soils in a low to medium rainfall area.

The WA Environmental Protection Policy (Atmospheric Wastes) Kwinana (EPA 1992a) specifies an ambient dust limit (averaged over 24 hours) for land used predominantly for residential and rural purposes (Area C) of 150µg/m³ with a standard (a concentration which is desirable not to exceed) of 90µg/m³. Dust guidelines have been developed for and applied to development sites through Part V of the Act (DEP 1996).

The dispersion characteristics demonstrated by modelling reported in LandCorp (1994) indicate that there was adequate capacity within the site to accommodate particulate emissions from emission sources from the assumed range of industries likely to be located in this proposed estate. Notwithstanding the above, industries emitting dusts must adopt appropriate pollution control technology to meet both EPA requirements and industry best practice.

In considering the potential for impacts attributable to this land use change, LandCorp have made several commitments, specifically that:

- baseline data on air quality will be collected in the first instance by LandCorp, with this role to be assumed by the Industry Management Body as industries begin to locate within the estate;
- should implementation of the concept proceed, a cumulative impact monitoring programme addressing dust and particulate emissions will be designed and implemented by the Industry Management Body;
- individual industries will be required to develop environmental monitoring programmes for dust and particulate emissions, to the satisfaction of the EPA; and
- these results will be reported on a regular basis to appropriate agencies and the Industry Management Body.

Public submissions expressed concern about how dust emanating from the heavy industrial estate, could impact upon the health and quality of lifestyle of nearby residents.

The DEP indicated that with respect to dust and particulate emissions, the proposal would be acceptable subject to the requirement that each industry locating within the heavy industrial estate adopt appropriate pollution control technology.

Consideration

The area considered for assessment of this environmental factor is the Estate Area (see Section 1.4, Figure 2), and surrounding areas including residences and beaches.

The EPA's objective in regard to this environmental factor is to protect the surrounding land users such that dust and particulate emissions will not adversely impact upon their welfare and amenity or cause health problems and that they meet Department of Environmental Protection (DEP) Guidelines for Land development sites and impacts on air quality guidelines (DEP 1996), and Environmental Protection (Kwinana) (Atmospheric Wastes) Policy 1992.

Whilst the poor implementation of this concept plan would lead to dust fall beyond the industrial core, it is likely that this could be managed to meet reasonable expectations through the application of best management practices and enforcement of statutory requirements.

The EPA notes:

1. the location of the site, nature of underlying soils and prevailing wind direction and strengths;
2. the conservative approach to dust nuisance through the establishment of an appropriate buffer zone;
3. the results of dispersion modelling undertaken for the site;
4. the requirement by any industry wishing to establish at the site to refer the project to the EPA pursuant to Part IV of the Act;

5. the commitments made by LandCorp to establish an Advisory Board and Industry Management Body; and
6. the requirement for industries of a prescribed nature to apply for and if appropriate be issued an operating licence subject to acceptable continuing performance.

In considering aspects of dust , any future proposal should take account of, but not be limited to, the following:

Required by Estate Manager/Industry Management Body:

1. prior to implementation, the estate manager or industry management body will be required to establish baseline data and undertake monitoring of cumulative emissions; and

Required by Proponents:

2. individual industries will be required to develop and implement monitoring programmes for stack and fugitive emissions.

Should the above occur, it is likely that implementation of the industrial estate concept plan is capable of being managed so as not to compromise the EPA's objective with regard to dust.

3.8 Noise and vibration

Aspects of noise and vibration

Oakajee is situated in a rural environment with low background noise levels. The most significant noise is presently from traffic along the North-West Coastal Highway. Where this is not a dominant influence, it is likely that night-time background noise levels under calm weather conditions are between 28 and 33dB(A).

Noise levels for projects within Western Australia are subject to the Noise Abatement (Neighbourhood Annoyance) Regulations 1979, which are at present the prescribed standard for noise under the Act . New Environmental Protection (Noise) Regulations are likely to be in force in the event that implementation of this industrial estate proceeds.

The maximum allowable noise levels during the most sensitive time for residences around the proposed industrial estate would be in the range 35 to 40dB(A), dependent on additional adjustment for tonal components.

In considering the more conservative proposed Environmental Protection (Noise) Regulations, more stringent noise criteria will be applied to proponents wishing to establish at the site.

Dames & Moore carried out a noise impact appraisal of Oakajee (Dames & Moore, 1993b). Further studies, as yet unreported, are being undertaken at the request of the DEP and will be used as input into the acquisition of an appropriate buffer area for the industrial estate.

The earlier study identified optimum locations for the placement of specific industries within the concept area, and further recommended that specific industries seeking to locate at Oakajee in the future should be required to conduct their own project-specific noise assessments as part of the environmental approvals process.

The provision of transport infrastructure to the proposed industrial estate will add to the noise impact.

The EPA notes the commitment made by LandCorp to collect baseline data on noise levels, with this role to be assumed by the Industry Management Body as industries begin to locate within the estate.

Public submissions indicated concern that noise emissions emanating from the proposed site would impact upon the amenity of areas currently used for recreational purposes, such as Coronation Beach and other beaches in proximity to the site.

Consideration

The area considered for assessment of this environmental factor is the Estate area (see Section 1.4, Figure 2), and surrounding areas including residences and beaches.

The EPA's objective in regard to this environmental factor is to protect the amenity of nearby residents from noise and vibration impacts by ensuring that noise and vibration meet the criteria in the Noise Abatement (Neighbourhood Annoyance) Regulations 1979 and the proposed Environmental Protection (Noise) Regulations when promulgated.

Whilst poor implementation of the concept is likely to lead to occasional loss of amenity in adjacent noise sensitive premises under worst case sound propagation conditions, the magnitude and return period of this impact can be reduced by the selection of an adequately sized buffer, strategic placement of proposed industries within the industrial core and the application of appropriate noise abatement technologies.

The EPA notes:

1. the location of the site, wind strength, direction and prevailing meteorology;
2. the conservative approach to noise and vibration through the establishment of an appropriate buffer zone;
3. the results of the noise modelling undertaken on behalf of LandCorp;
4. the requirement by any industry wishing to establish at the site to refer the project to the EPA pursuant to Part IV of the Act;
5. the commitments made by LandCorp to establish an Advisory Board and Industry Management Body; and
6. the requirement for industries of a prescribed nature to apply for and if appropriate be issued an operating licence subject to acceptable continuing performance.

In considering aspects of noise and vibration, any future proposal should take account of, but not be limited to, the following:

Required by Estate Manager:

1. additional noise emission modelling should be undertaken by the Estate Manager as input to the identification of and acquisition of the estate buffer;

Required by Estate Manager/Industry Management Body:

2. a programme of monitoring be developed and implemented by the Estate Manager/Industry Management Body to assess cumulative noise impacts;

Required by Proponents:

3. noise from the new railway linking the industrial estate needs to be assessed by the proponent; and
4. transport infrastructure including road, rail and bulk conveyors will need to be assessed by the proponent for each industry locating in the estate and using that mode of transport.

Should the above occur, it is likely that implementation of the industrial estate concept plan is capable of being managed so as not to compromise the EPA's objective with regard to noise and vibration.

3.9 Public health and safety

Aspects of public health and safety

The EPA has established management principles and acceptable criteria for off-site individual fatality risk (EPA, 1992b and 1992c) for new industrial developments with a potentially hazardous nature.

Although the EPA has not yet established any criteria for societal risk, it recognises the need to develop these criteria in the near future.

LandCorp, in its referral document, stated that as a location for heavy industry, Oakajee should be capable of accommodating those industries classed as hazardous in terms of their operating processes. A risks and hazards appraisal was undertaken by Dames & Moore (Dames & Moore, 1993b) to determine whether the site could accommodate such industries.

The results of the risks and hazards assessment were measured against EPA criteria relating to residential precincts (Environmental Protection Authority, 1992b). Based on these criterion, suitable zones were indicated for high, medium and low risk industries within the Concept area. This information can be used by LandCorp and the Oakajee Park Advisory Board as a planning tool to enable suitable location of individual industries.

Risk assessment will be required for specific industries of a hazardous nature wishing to establish in the industrial core. If the concept plan is implemented, ongoing safety will be maintained through management of operations of high risk industries in accordance with statutory requirements by the Department of Minerals and Energy.

LandCorp's referral document also indicated that these risk assessments by individual industries will be complemented by ongoing cumulative risk assessments by the Department of Minerals and Energy (DOME). This will provide the basis to ensure that both individual and cumulative impacts are contained within EPA criteria.

The EPA notes the commitments made by LandCorp to facilitate cumulative risk assessment.

The EPA also recognises that the modelling used to establish a buffer zone to protect residents against risk was conservative, and hence has an extra public safety factor built in.

Public submissions indicated concern that risks associated with the proposed site would place restrictions on the recreational use of Coronation Beach and other beaches in close proximity to the site. Concern was also expressed about the potential impacts of risks and hazards on the surrounding residents, tourism, and the rock lobster industry.

Consideration

The area considered for assessment of this environmental factor is the Estate Area (see Section 1.4, Figure 2), and surrounding areas including residences and beaches.

The EPA's objective in regard to this environmental factor is to ensure that public risk associated with implementation of the Concept are as low as is reasonably achievable and in compliance with the criteria detailed in EPA Bulletins 611 and 627. If the concept plan is implemented, societal risk evaluations should be undertaken for each hazardous industry seeking involvement. The assessment should follow the guidelines described in the report "Public risk criteria for the Kwinana area" which was prepared by Technica Pty Ltd in 1990 for the EPA, or as modified from time to time.

In considering the impact of the proposed change in land use the EPA recognises that most heavy industrial estates generate some level of public risk. The EPA cannot forecast what type of specific industries are likely to establish in the estate. It is therefore conjecture to predict the levels of risk which may be associated with those industries. However, the EPA has set down criteria for risks and hazards (Environmental Protection Authority, 1992b) to protect surrounding residents and to ensure that industries do not significantly impact on each other.

The EPA notes:

1. the comparative study of individual risk presented by LandCorp;
2. the conservative approach to risk minimisation through the establishment of an appropriate buffer zone;
3. the requirement by any industry wishing to establish at the site to refer the project to the EPA pursuant to Part IV of the Act; and
4. the statutory requirement for hazardous industry to comply with the requirements of the Department of Minerals and Energy.

In considering aspects of public health and safety, any future proposal should take account of, but not be limited to, the following:

Required by Estate Manager/Industry Management Body:

1. on-going programme for the determination of cumulative risk be developed and implemented by the Estate Manager/Industry Management Body;

Required by Proponents:

2. a risk and hazard analysis will be required by the EPA for each new industry which has potential to generate risk, when it is proposed; and
3. an assessment of societal risk following accepted guidelines.

Should the above occur, it is likely that implementation of the industrial estate concept plan is capable of being managed so as not to compromise the EPA's objective with regard to public health and safety.

3.10 Heritage

Aspects of heritage

Both an ethnographic survey of the general locality and an archaeological survey of the site and adjoining land to the north of the Oakajee River have been carried out (Tamora, 1993; Bavin 1993).

The ethnographic investigation did not indicate sites of religious or mythological concern, however did reveal historical hunting, fishing and camping grounds on the adjoining coast.

Recent further studies have been undertaken in view of the possible deepwater port adjacent to the Oakajee Industrial Estate site (Tamora, 1996 and Quartermaine Consultants, 1997). These related specifically to areas onshore from the port to a distance of 1 km inland and comprise in part the western buffer and western extremity of the Industrial Estate

The Aboriginal Affairs Department (AAD) has considered the latter Reports which relate to that area of remaining natural vegetation and limestone escarpment, and has advised that a number of issues need to be addressed prior to development in the area. This advice remains applicable for the Industry core, specifically that:

- wider consultation with some Aboriginal communities in the area be sought:
- monitoring of a number of areas for burials and sub surface remains, during construction activities; and
- consultation with the AAD to ensure compliance with the Aboriginal Heritage Act .

With respect to European history, only two specific sites of some significance are known. The heritage value of these sites will need to be assessed prior to activities being undertaken by which may be disturbed.

Consideration

The area considered for assessment of this environmental factor is the Estate Area (see Section 1.4, Figure 2).

With respect to this environmental factor, the EPA's objective is to comply with statutory requirements in relation to areas of cultural and historical significance.

Notwithstanding the results of previous surveys, if implementation of the concept proceeds, specific sites will need further investigation from an Aboriginal heritage perspective, and information in this context should be provided directly to the Aboriginal Affairs Department.

The EPA notes the need for any future port development to comply with relevant statutory requirements for significant sites.

In considering aspects of heritage, any future proposal should consider, but not be limited to, consultation with the AAD on Aboriginal heritage matters, including:

Required by Proponents:

1. prior to implementation, the proponent will undertake a detailed ethnographic survey of the proposed site.

Should the above occur, it is likely that implementation of the industrial estate concept plan is capable of being managed so as not to compromise the EPA's objective with regard to Aboriginal and European heritage.

3.11 Visual impact

Aspects of visual impact

Atmospheric emission points of process gas streams from potential industries identified as possible for the Concept area will likely feature high stack designs.

A landscaping study (Quilty Environmental 1993) examined the likely visual impact of the industrial park on the neighbourhood, as well as strategies for reducing this impact.

The study incorporated a viewshed analysis which modelled likely future views of the Industrial Estate from a range of vantage points to the north, east and south. These included agricultural/horticultural holdings along the slopes of the Moresby Range, and between these slopes and the North-West Coastal Highway, and a coastal lookout within the recent Drummond Cove subdivision.

The analysis demonstrated that the site terrain affords good screening, with a north-south ridge through the centre of the site and another down its eastern boundary.

Landscape screening may provide a supplement to the impacts on the terrain.

Public submissions expressed concern about the visual impact of the proposed estate, potential port facility and associated transport corridors, on tourism and the general recreational amenity of the Oakajee region and surrounding areas.

Advice received from the DEP suggests that the viewshed analysis of the proposed heavy industrial site is inadequate in terms of accurately describing its potential impact on the visual amenity and aesthetics of the Oakajee region, and supported public concerns with respect to the ability of the proponent to establish suitably high vegetation to screen the Industrial Estate concept area.

Consideration

The area considered for assessment of this environmental factor is the Estate Area (see Section 1.4, Figure 2), and nearby residences from which the industrial estate is visible.

The EPA's objective in regard to this environmental factor is to ensure the visual amenity of the area is not unduly affected by implementation of the Concept plan.

The EPA notes the commitment made by the proponent to implement a landscaping strategy which will commence once the site is approved and secured by government.

The EPA notes that in considering the visual nature and terrain of the land use proposed at the Oakajee site, LandCorp has identified strategies to reduce impacts.

Whilst, if implemented, the concept is likely to detract from the existing rural amenity of the area, information presented supports the assertion that the site affords good screening potential.

The EPA notes:

1. the natural topography of the industrial estate area; and
2. the commitments made by LandCorp to undertake landscape screening.

In considering aspects of visual impact, any future proposal should take account of, but not be limited to, the following:

Required by Estate Manager

1. the estate manager will develop and implement strategies for site screening; and

Required by Proponents

2. individual industries will be required to undertake a smoke plume view shed analysis.

4. Other Issues

4.1 Regional Planning

Aspects of Regional Planning

In early 1995, the then Minister for the Environment directed the EPA to more fully assess aspects of the Oakajee Industrial Estate plan under consideration with regard to the two following matters:

- the potential for groundwater pollution, particularly the transport of contaminants to the marine environment from industrial development in the proposed industrial estate;
- the relationship of the Oakajee Industrial Estate and the regional plan review, particularly future port development.

The matter of the hydrogeological investigations of the industrial site was addressed under Section 3.4 of this report. Based on the supplementary information provided through the Rockwater Hydrogeological Studies (1996a & 1996b) it has been concluded that the site has a low potential for pollution of the marine environment via groundwater.

In relation to regional planning, the Western Australian Planning Commission is currently undertaking a review of the Geraldton Region Plan. As input into this process, a Taskforce was established in 1995 to undertake a review of industry and port sites for the Mid West Region. The Report of the Geraldton Region Plan Review Taskforce (1996) identified that there was a need to develop additional industrial land in the region, in the short to medium term. The Study also made a number of specific recommendations relevant to industry land and port sites in the Oakajee locality, particularly that:

- investigations on the Oakajee Industrial Estate should be urgently completed so that a decision can be made on whether the area is suitable for an industrial estate;
- investigations on the potential for a port to be developed at Oakajee should be completed as soon as possible.

The *Geraldton Region Plan Review: Industry and Port Sites Study* (1996) noted that Oakajee provides the only option for the provision of a combined deepwater port and heavy industrial estate within the region.

As a result of the recommendations of the Geraldton Region Plan Review Taskforce, Government agencies are undertaking a range of investigations to provide information for the regional planning process. In relation to industrial land, the EPA is aware that the potential to expand the existing Narngulu Industrial Estate and the identification of a potential new site east of Narngulu are also options being examined. The EPA has not reviewed either of the two latter options, but is completing the review of the Oakajee site in accordance with the above recommendations.

Consideration

In relation to the Oakajee Industrial Estate, the investigations for this site have been completed and this report forms the EPA's review and advice to the Minister for the Environment, under Section 16(e) of the Environmental Protection Act. This report concludes that implementation of the Oakajee Industrial Estate Concept Plan is capable of being managed to meet the EPA's objectives for this review.

With respect to the potential for development of a deepwater port in the locality of Oakajee, the Minister should note that a proposal for a deepwater port has been referred to the EPA for

separate assessment. Advice on whether the port proposal can meet the EPA's environmental objectives will be provided in the port assessment report.

4.2 Port

Aspects of Port Facilities

The Oakajee Industrial Estate is located north of Geraldton and immediately adjacent to the coast, in the locality of Oakajee. LandCorp did not formally propose the development of a port to service the industrial estate in the Oakajee referral document, however, submissions to the EPA expressed concern that it was highly probable a port would be required and developed at some later stage.

Public concerns included the potential impact port development could have on the marine environment and the fishing and rock lobster industries.

A formal proposal for a port development has now been referred to the EPA for assessment. The concerns about the potential impact on the marine environment and rock lobster fishing industry will be addressed during that assessment.

Consideration

The Minister for the Environment should note that the EPA has received a formal referral of a proposal to develop a deepwater port at Oakajee. Potential impacts associated with port development at that locality will be addressed in the port assessment and advice provided to the Minister for the Environment.

4.3 Fishing

Aspects of Fishing

The marine environment adjacent to the proposed Oakajee Industrial Estate provides a range of beneficial uses for the local community, particularly fishing and rock lobster fishing.

Submissions from members of the community raised concerns about the potential for industrial development on the Oakajee estate to impact negatively on the marine environment and the fishing and rock lobster fishing industries. Concerns centred around the potential for contaminated groundwater to impact on the marine environment, via possible preferential pathways in the Tamala limestone beneath the proposed site. This issue is addressed in Section 3.4. However, the results of the hydrogeological investigation undertaken by Rockwater Consultants (1996a and b) of the Oakajee site indicated that the potential for contaminated groundwater to enter the marine environment would be low. Furthermore, there will be a requirement for each new industry locating in the industrial estate to monitor groundwater and also an overall groundwater monitoring program for the Estate is recommended in this report.

The Oakajee referral document has indicated that there is no proposal for ocean disposal of liquid wastes. The potential impacts of liquid waste management must be considered and each new industry proposing to locate at the Estate, and requiring liquid waste disposal, will be required to resolve the issue prior to establishing in the Estate. Each new industry locating in the Estate is also likely to require separate assessment by the EPA.

Furthermore, in relation to surface water management, each industry locating in the industrial estate will also be required to manage surface water runoff.

Community submissions also expressed concern about the potential impacts on the marine environment from the development and operation of a port at Oakajee. The EPA notes that a proposal for a deepwater port at Oakajee has been referred to the EPA. The potential impacts

on the marine environment and the Western Rock Lobster will be addressed in detail in that assessment.

Consideration

The EPA notes:

1. the result of the detailed groundwater investigations carried out;
2. the requirement by any industry wishing to establish at the site to refer the project to the EPA pursuant to Part IV of the Act;
3. the commitments made by LandCorp to establish an Advisory Board and Industry Management Body; and
4. the requirement for industries of a prescribed nature to apply for and if appropriate be issued an operating licence subject to acceptable continuing performance.

It is likely that implementation of the industrial estate concept plan is capable of being managed so as not to compromise the EPA's objective with regard to the protection of recreational fisheries.

With respect to the potential impacts of a port development on the marine environment, the Minister for the Environment should note that a proposal for a deepwater port at Oakajee has been referred to the EPA. The potential impacts on the marine environment and the Western Rock Lobster will be addressed in detail in that assessment and advice provided to the Minister accordingly.

5. Environmental management and related studies

LandCorp in its referral document identified a management structure to be put in place for the industrial estate if implemented. The management structure is described in Section 5.2 below.

LandCorp will undertake the role of the Estate Manager until such a body is formally designated.

In their referral document, LandCorp made a number of commitments with regards to the management of the Industrial Estate if implemented (LandCorp 1994 Appendix III). These commitments relate to a wider range of issues than those reflected in the relevant factors presented in this advice.

Management commitments which specifically relate to the relevant factors referred to in this advice are provided in section 5.3 below. Additional studies to:

- enhance the knowledge base(input data) for subsequent proposals; and
 - confirm assumptions made for the provision of this advice
- are also included.

5.1 Environmental Management Plan

The EPA is of the opinion that initially LandCorp, and subsequently the Estate Manager/Industrial Management Body should prepare, review, implement and report on an overall Environmental Management Plan for the Concept Plan area. This plan should document all the environmental strategies, programmes and commitments in this section and forms part of a more extensive Environmental Management System which describes the procedures to implement the proposal.

Proponents for industries that are accommodated in the Concept Plan area should prepare and implement Environmental Management Plans and procedures to ensure EPA objectives are met.

5.2 Suggested Environmental and related Studies/Actions

The responsibilities and structure for environmental management in the Concept Plan area will differ for the concept development, construction and operational phases of the estate. Consequently the roles of LandCorp, the Estate Manager and Industry Management Body will vary according to these phases.

Concept Development Phase

LandCorp retains responsibility for the development of the Concept up to implementation, at which time the Estate Management is likely to be in place.

Suggested studies to be undertaken by the Estate Manager.

Additional studies, to be initiated prior to the implementation of the concept by the Estate manager should include, but not be limited to:

Rare and priority flora

1. prior to the removal of any remnant vegetation, the estate manager or proponent undertake a spring survey for rare and priority flora;

Groundwater

2. to implement and audit and report on management commitments for baseline groundwater monitoring prior to industry establishing within the estate;
3. on-going groundwater monitoring programme for the cumulative impacts of the industrial estate to be developed and implemented;

Liquid and solid waste

4. a liquid waste management strategy should be considered for the industrial estate, for those industries requiring this method of disposal;

Gaseous emissions

5. prior to implementation of the concept, an airshed monitoring programme be designed and implemented which will monitor air quality parameters outside the industrial park, including impacts on vegetation, and that it be utilised to secure an adequate buffer around the proposed site;
6. design and implement cumulative impacts monitoring sufficient to protect the environment and human health;

Dust and particulate emissions

7. prior to implementation, the estate manager or industry management body will be required to establish baseline data and undertake monitoring of cumulative emissions;

Noise and vibration

8. additional noise emission modelling should be undertaken by the estate manager as input to the identification of and acquisition of the estate buffer;
9. a programme of monitoring be developed and implemented by the Estate Manager/Industry Management Body to assess cumulative noise impacts;

Public safety

10. on-going programme for the determination of cumulative risk be developed and implemented by the Estate Manager/Industry Management Body; and

Visual impact

11. the estate manager will develop and implement strategies for site screening.

Construction Phase

The Estate Manager will be responsible for site development works, including the coordination of estate servicing.

Suggested studies to be undertaken by the Industry Management Body:

Additional studies required to be undertaken by the Industry Management Body prior to or during implementation of the concept and in consultation with the Estate Manager should include, but not be limited to:

Groundwater

1. on-going groundwater monitoring programme for the cumulative impacts of the industrial estate to be developed and implemented;

Liquid and solid waste

2. a liquid waste management strategy should be considered for the industrial estate, for those industries requiring this method of disposal;

Gaseous emissions

3. design and implement cumulative impacts monitoring sufficient to protect the environment and human health;

Dust and particulate emissions

4. prior to implementation, the estate manager or industry management body will be required to establish baseline data and undertake monitoring of cumulative emissions;

Noise and vibration

5. a programme of monitoring be developed and implemented by the Estate Manager/Industry Management Body to assess cumulative noise impacts; and

Public safety

6. on-going programme for the determination of cumulative risk be developed and implemented by the Estate Manager/Industry Management Body.

Operation Phase

Each industry will be responsible for gaining relevant approvals from agencies for their operations and these procedures will be the principle mechanism by which environmental management is imposed. The Estate Management Body will be responsible for the overall coordination of environmental management of the Concept Plan area.

Suggested studies to be undertaken by the Proponent of each industry

Additional studies required by the Proponent should include, but not be limited to:

Rare and priority flora

1. prior to the removal of any remnant vegetation, the estate manager or proponent undertake a spring survey for rare and priority flora;

Surface water

2. prior to any industry (with the potential to pollute surface water) being given approval, it must demonstrate that its operation will not have a significant impact on surface water. Appropriate management and monitoring will be required;

Groundwater

3. industries will be required to develop individual environmental monitoring programmes, where there is potential to pollute groundwater, with appropriate mitigation procedures identified;

Liquid and solid waste

4. for each individual industry requiring solid and liquid waste disposal, resolution of this issue will be required prior to it establishing on the site;

Gaseous emissions

5. monitor and report on air emissions from individual plants;
6. determine and report on the individual industry contribution to greenhouse gas emissions according to the voluntary C21 "Greenhouse Challenge" programme for the estimation, reporting and auditing of emissions;

Dust and particulate emissions

7. individual industries will be required to develop and implement monitoring programmes for stack and fugitive emissions;

Noise and vibration

8. noise from the new railway linking the industrial estate needs to be assessed by the proponent;
9. transport infrastructure including road, rail and bulk conveyors will need to be assessed by the proponent for each industry locating in the estate and using that mode of transport;

Public health and safety

10. a risk and hazard analysis will be required by the EPA for each new industry which has potential to generate risk, when it is proposed;
11. an assessment of societal risk following accepted guidelines;

Heritage

12. prior to implementation, the proponent will undertake a detailed ethnographic survey of the proposed site; and

Visual impact

13. individual industries would be required to undertake a smoke plume view shed analysis.

5.3 Environmental Management System

Estate Manager and proponent plans should adopt environmental management principles (such as those adopted in the voluntary interim Australian Standards ISO 14001 and 14004) with appropriate monitoring and auditing to ensure compliance with any conditions of approval.

5.4 Other Matters

Buffers

A number of these studies relate to the identification of an adequate buffer to mitigate environmental impacts. The conservative approach to the management of a number of identified factors in this advice rely on the establishment of an appropriate buffer zone.

The EPA endorses the view of LandCorp that this buffer zone needs to be formally recognised and designated in planning provision for the estate.

Communication (with Proponents and community on estate management)

The EPA considers that effective communication between the Estate Manager, Proponents and the community is an important element of modern and well managed industrial estates. The EPA considers that it would be appropriate for the Estate Manager and the Industry Management Body to establish mechanisms for providing information and liaison with potential Proponents and the community on significant environmental aspects associated with estate.

Decommissioning (Proponents/Estate Manager)

Proponents intending to cease operations of established industries within the proposed estate should be required to carry out satisfactory decommissioning of their respective projects, removal of installations and appropriate rehabilitation of the relevant sites and their environs.

At least six months prior to decommissioning, Proponents should prepare a decommissioning and rehabilitation plan.

The Estate Manager should ensure that Proponents intending to decommission their projects do prepare a decommissioning and rehabilitation plan, and that they implement it accordingly.

Infrastructure provision

Port and port access development, wastewater treatment facilities, issues related to the provision of water and power supply (gas and electricity), together with transport infrastructure requirements such as road, rail and conveyor transport have not been considered as part of the present advice. The provision of basic building and site development materials and social infrastructure are similarly beyond the scope of this advice.

The environmental consequences of the unregulated provision of this infrastructure has the potential to exceed those attributable to the implementation of the industrial estate proper.

The development of an adjacent port facility at Oakajee is currently subject to separate consideration by the EPA.

It is the EPA's view that the provision of infrastructure support for the industrial estate concept should be considered through separate referral under section 38 of the Act, or as a function of the consideration of the Scheme Amendment that will precede implementation.

This Scheme Amendment should also consider the status of the buffer proposed.

The EPA is further of the view that a goal of Government in relation to the development of the Oakajee Industrial Estate Concept is to limit the impact of infrastructure corridors to the industrial site. This can best be achieved by multi-use corridors, including the provision for separation from sensitive land uses, which can in themselves be afforded recognition through planning amendment.

6. Advice to the Minister for the Environment

The EPA offers the following advice:

Recommendation 1

That the Minister for the Environment notes the environmental factors, the EPA's objective for each factor as set out in Section 3 of this report and the studies suggested to gain further information.

Recommendation 2

That the Minister for the Environment notes the EPA's advice on meeting EPA objectives for the important environmental factors, environmental management considerations and suggested studies.

Recommendation 3

That the Minister for the Environment notes that the provision of infrastructure requirements to the Oakajee Industrial Estate Concept area has not been considered in this advice, and that such matters will be referred to the EPA for consideration as either formal referrals or Scheme Amendments under Part IV of the *Environmental Protection Act*.

Recommendation 4

That the Minister for the Environment notes that industries with the potential to impact on the environment and wishing to establish in the Oakajee Industrial Estate Concept area would be subject to assessment under Part IV of the *Environmental Protection Act*.

TABLE 1: RELEVANT FACTORS, EPA OBJECTIVES, MANAGEMENT COMMITMENTS & ADVICE TO THE MINISTER

RELEVANT FACTOR	RELEVANT AREA	EPA OBJECTIVES	CONCEPT PLAN CHARACTERISTICS	MANAGEMENT COMMITMENTS	ADVICE TO MINISTER ON EPA OBJECTIVES AND ENVIRONMENTAL MANAGEMENT
Rare and priority flora.	The Estate area comprising the region between the Buller and Oakajee Rivers, the coast to the west and North West Coastal Highway to the East (see Figure 2).	<ul style="list-style-type: none"> To protect rare and priority flora, consistent with the provisions of the <i>Wildlife Conservation Act 1950</i>. to maintain the abundance, diversity, geographic distribution and productivity of locally present vegetation communities. 	<p>No declared rare flora was recorded on the site during site visit for preparation of the PER.</p>	No formal commitment made by the proponent.	<p>Implementation of the concept plan is unlikely to compromise the EPA's objective to protect Rare and Priority Flora provided that:</p> <p>Estate Manager/Proponents:</p> <p>A Spring survey for rare flora is to be conducted prior to clearing of remnant vegetation.</p>
Surface water.	The Estate area (comprising the region between the Buller and Oakajee Rivers, the coast to the west and North West Coastal Highway to the East), the adjacent Oakajee and Buller Rivers and adjacent nearshore marine areas.	To maintain or improve the quality of surface water to meet the requirements of ANZECC 1992 and the draft Western Australian Water Quality Guidelines for Fresh and Marine Waters (EPA 1993).	<p>Site bounded by the Buller and Oakajee Rivers. Stream water is consistently saline, TDS range 3,000 to 10,000 mg/L.</p> <p>Within the industrial site there are three internally draining catchments.</p> <p>Stormwater will be managed.</p>	Individual industries will be required to develop monitoring programs for surface run-off and terrestrial water quality, and that the Industry Management Body will design a cumulative impact monitoring program for the heavy industrial estate. This body will take over the baseline monitoring established by the proponent, and will receive the results of monitoring carried out by individual industries.	<p>The impact on surface water quality due to stormwater run-off is unlikely to compromise the EPA's objective provided that:</p> <p>Proponents:</p> <p>Prior to any industry (with the potential to pollute surface water) being given approval it must demonstrate that its operation will not have a significant impact on surface water. Appropriate management and monitoring will be required.</p>
Groundwater.	The Estate area (comprising the region between the Buller and Oakajee Rivers, the coast to the west and North West Coastal Highway to the East, see Figure 2), and adjacent nearshore marine areas.	The EPA's objective in regard to this environmental factor is to maintain or improve groundwater quality and meet the requirements of ANZECC (1992) and the draft Western Australian Water Quality Guidelines for Fresh and Marine Waters (EPA 1993).	<ul style="list-style-type: none"> Groundwater resources are limited by high salinities and low yields. Salinities range from 1000 to 3000 mg/L TDS. Groundwater which occurs within the local Quindalup Dunes, Tamala Limestone and the granulites is believed to be unconfined and recharged locally by direct rainfall. Groundwater flow is generally from east to west. Depth to water table varies from 10 to 50m. Rockwater Hydrogeological Investigation concluded that the Tamala limestone beneath the Oakajee does not contain karstic flow channels connecting the site to the marine environment. The investigation concluded that the Oakajee industrial area has lower risk of causing ocean contamination via groundwater than many other coastal locations in southern Western Australia. The investigations identified areas where monitoring bores, and if required recovery bores, could be located. 	Collect baseline data on groundwater quality and the marine environment, with this role to be assumed by the Industry Management body as industries begin to locate within the park. This monitoring program will be initiated prior to commencement of industrial operations. Individual industries will be required to develop environmental monitoring programs, with particular attention paid to groundwater.	<p>Implementation of the concept plan is unlikely to compromise the EPA's objective for groundwater quality subject to:</p> <p>Estate Manager:</p> <p>To implement, audit and report on management commitments for baseline groundwater monitoring prior to industry establishing within the estate.</p> <p>Estate Manager/Industry Management Body:</p> <p>On-going groundwater monitoring programme for industrial estate to be developed and implemented.</p> <p>Proponents:</p> <p>Industries with the potential to pollute groundwater will be required to develop individual groundwater monitoring programmes, .</p>
Liquid and solid waste disposal.	The heavy industry core	Wastes are contained and isolated from ground and surface waters, and that discharges meet the requirements of ANZECC (1992) and Draft Western Australia Guidelines for Fresh and Marine Waters (EPA, 1993).	<p>Various options for liquid and solid waste disposal discussed:</p> <ul style="list-style-type: none"> re-use within industrial process; disposal on land by irrigation; disposal on land by evaporation; removal to an industrial waste disposal facility. individual, small scale sanitary landfills; centralised landfill in park for all occupants; & landfill located at Meru for non-hazardous wastes. <p>Discharge of effluent to the ocean is not part of the proposal.</p> <p>For hazardous wastes, disposal at Meru, if developed for that purpose, or transport to a designated disposal site, eg: Mt Walton.</p>	<p>The Advisory Board and the Industry Management Body will encourage efficient use of waste water by industries by:</p> <ul style="list-style-type: none"> recycling same within their own or another industry's process, where practical, and/or liaising with the Department of Agriculture and local farmers regarding opportunities for disposal by irrigation. <p>The Advisory Board and the Industry Management Body will also encourage industries to seek productive uses of their solid wastes, where practical.</p> <p>Should industry or a Government agency at any time seek to discharge effluent into the ocean or to draw cooling water from it, they will be subject to full environmental assessment at that time. This will include investigating impacts on the marine environment.</p>	<p>Implementation of the concept plan appears unlikely to compromise the EPA's objective subject to:</p> <p>Estate Manager / Industry Management Body:</p> <p>A liquid waste management strategy should be developed for the Industrial Park, for those industries requiring this method of disposal.</p> <p>Proponents:</p> <p>For each individual industry requiring liquid and solid waste disposal, resolution of issue will be required prior to it establishing on site.</p>
Gaseous emissions.	The Estate area (comprising the region between the Buller and Oakajee Rivers, the coast to the west and North West Coastal Highway to the East, see Figure 2), and surrounding areas including residences and beaches.	To ensure that gaseous emissions, including greenhouse gases and odours both individually and cumulatively, conform to agreed standards and do not cause an environmental or human health problem in the area surrounding the industrial estate.	Modelling carried out on a number of hypothetical emission sources discharging sulphur dioxide. Model results assessed against the Kwinana EPP for Air Emissions.	<p>Baseline data on air quality will be collected by LandCorp, with this role to be assumed by the Industry Management Body as industries begin to locate in the estate.</p> <p>Once industry development commences, a cumulative impact monitoring programme will be designed by the Industry Management Body and will include air quality. This body will also take over the baseline monitoring established by LandCorp, and will receive the results of monitoring carried out by individual industries.</p> <p>Individual industries will be required to develop environmental monitoring programmes for stack emissions, and these programmes must be acceptable to the EPA and other relevant licensing authorities, with results reported on a regular basis to the same and the Industry Management Body.</p>	<p>Implementation of the concept plan appears unlikely to compromise the EPA's objective subject to:</p> <p>Estate Manager:</p> <p>Establish an airshed monitoring program, which will monitor air quality parameters outside the industrial estate, including vegetation effects and secure an adequate buffer around the proposed site, prior to any industry establishing within the estate.</p> <p>Estate Manager/Industry Management Body:</p> <p>Develop and implement cumulative impacts monitoring</p> <p>Proponents:</p> <ul style="list-style-type: none"> monitor and report on air emissions from individual plants determine and report on individual industry contributions to Greenhouse gas emissions

RELEVANT FACTOR	RELEVANT AREA	EPA OBJECTIVES	CONCEPT PLAN CHARACTERISTICS	MANAGEMENT COMMITMENTS	ADVICE TO MINISTER ON EPA OBJECTIVES AND ENVIRONMENTAL MANAGEMENT
Dust and particulate emissions.	The Estate area (comprising the region between the Buller and Oakajee Rivers, the coast to the west and North West Coastal Highway to the East, see Figure 2), and surrounding areas including residences and beaches.	To protect the surrounding land users such that dust emissions will not adversely impact upon their welfare and amenity or cause health problems and meet EPA Guidelines for the Assessment and Control of Dust and Windborne Material from Land Development Sites, Environmental Protection Policy (Atmospheric Wastes) (Kwinana).	Industries that may introduce dust into the atmosphere must meet EPA standards for particulate. Industries emitting dust must adopt appropriate pollution control technology,	Baseline data on air quality will be collected by LandCorp, with this role to be assumed by the Industry Management Body as industries begin to locate within the estate. Once industry development commences, a cumulative impact monitoring programme will be designed by the Industry Management Body and will include air quality. This body will also take over the baseline monitoring established by LandCorp, and will receive the results of monitoring carried out by individual industries. Individual industries will be required to develop environmental monitoring programmes for stack emissions, and that these monitoring programmes must be acceptable to the EPA and other relevant licensing authorities, with results reported on a regular basis to the same and to the Industry Management Body.	Implementation of the concept plan appears unlikely to compromise the EPA's objective subject to: Estate Manager/Industry Management Body: Establish baseline data and undertake monitoring of cumulative emissions. Proponents: Individual industries will be required to develop monitoring programs for stack emissions.
Noise and vibration.	The Estate area (comprising the region between the Buller and Oakajee Rivers, the coast to the west and North West Coastal Highway to the East, see Figure 2), and surrounding areas including residences and beaches.	To protect the amenity of nearby residents from noise and vibration impacts by ensuring that noise and vibration meet the criteria in the Noise Abatement (Neighbourhood Annoyance) Regulations 1979 and the proposed Environmental Protection (Noise) Regulations (when promulgated).	Oakajee located within a rural environment with low background noise levels. Night-time background noise levels under calm conditions are between 28 and 33 dB(A). There may be some potential noise impacts on rural properties south and east of the Brand Highway. Noise from transport corridors needs to be investigated further.	The proponent will collect baseline data on noise levels, with this role to be assumed by the Industry Management Body as industries begin to locate within the estate. This monitoring program will be initiated prior to commencement of industrial operations. It will provide a basis for assessing possible future impacts of industry. Once industry development commences, a cumulative impact monitoring program will be designed by the Industry Management Body.	Implementation of the concept plan appears unlikely to compromise the EPA's objective subject to: Estate Manager: Additional noise emission modelling should be undertaken as input to the acquisition of the buffer. This modelling should also consider noise impacts on recreational beach users. Additional noise emission modelling should be undertaken to assess the noise impacts along the transport corridor(s) to the industrial estate. Estate Manager/Industry Management Body: Cumulative noise impacts to be monitored. Proponents: • Noise from the new rail linking the industrial estate to be assessed. Rail transport noise will require to be assessed for each industry locating in the Estate and using this mode of transport. • Transport infrastructure including road, rail and bulk conveyors will need to be assessed by the proponent for each industry locating in the estate and using that mode of transport.
Public health and safety.	Rivers, the coast to the west and North West Coastal Highway to the East, see Figure 2), and surrounding areas including residences and beaches.	• To ensure that risk is as low as reasonably achievable and complies with acceptable standards, and meets criteria in EPA Bulletins 611 and 627.	Risk and hazard assessment under taken - risk "footprints" overlain on site. Assessed against EPA criteria.	The proponent will facilitate cumulative risk assessment being conducted by DOME as each new industry which has risks associated with its operations seeks to locate within the estate, in order to ensure that cumulative risk impacts meet EPA criteria, and that as industry establishes within the estate, the Park Advisory Board will develop a site specific emergency response plan for the entire estate.	Implementation of the concept plan appears unlikely to compromise the EPA's objective subject to: Estate Manager/Industry Management Body: Ongoing cumulative risk assessment will be developed and implemented. Proponents: • A risk and hazard assessment for each new industry which has the potential to generate risk will be required. • an assessment of societal risk following accepted guidelines
Heritage	The Estate area comprising the region between the Buller and Oakajee Rivers, the coast to the west and North West Coastal Highway to the East (see Figure 2).	To comply with statutory requirements in relation to areas of cultural and historical significance.	Coastal ethnographic and archaeological site surveys are being finalised for the general locality.	Industrial estate development has the potential to disturb significant sites.	At this strategic stage, it is likely that implementation of the estate concept plan is capable of being managed so as not to compromise the EPA's objective with regard to heritage. Any proposal which represents the implementation of the Industrial Estate Concept would be expected to comply with relevant statutory requirements for significant sites and implement a Heritage Management Plan.
Visual	The industrial site, buffer zone and surrounding area including nearby residences.	To ensure that the visual amenity of the Oakajee region is not unduly affected by the development of the proposed heavy industrial estate.	Landscaping study examined likely visual impacts. Viewshed analysis undertaken. Site terrain affords good screening from aspects.	The proponent will implement a landscaping strategy which will commence once the site is approved and secured by government.	Implementation of the concept plan appears unlikely to compromise the EPA's objective subject to: Estate Manager: To develop appropriate landscaping to screen the site. Proponents: Individual industries would be required to undertake a smoke plume view shed analysis.

TABLE 1 (cont.): RELEVANT FACTORS, EPA OBJECTIVES, MANAGEMENT COMMITMENTS AND ADVICE TO THE MINISTER

Appendix 1

Figures

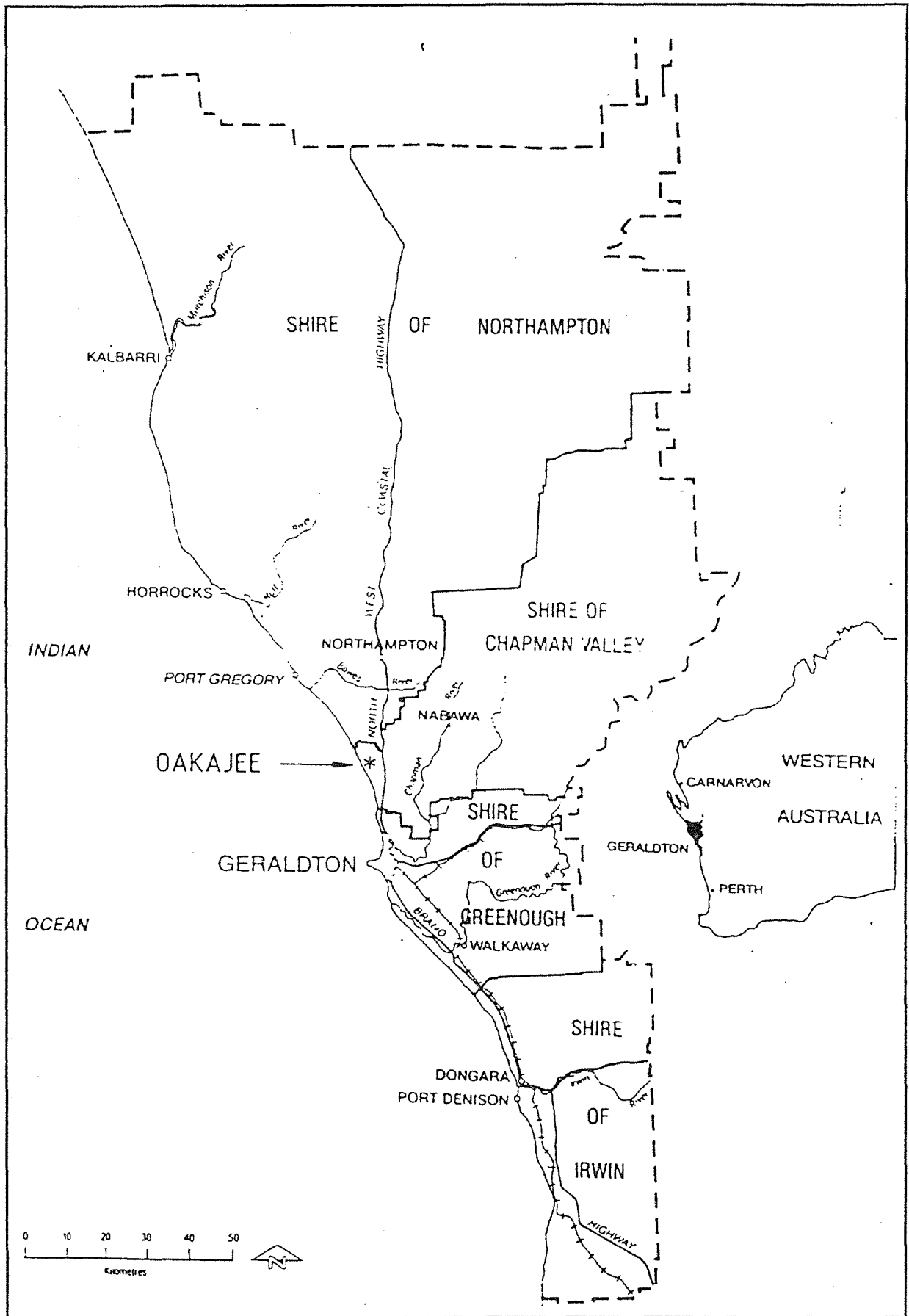


Figure 1. Regional location map - Oakajee Heavy Industrial Estate. (Modified from Geraldton Region Plan Review Taskforce 1996.)

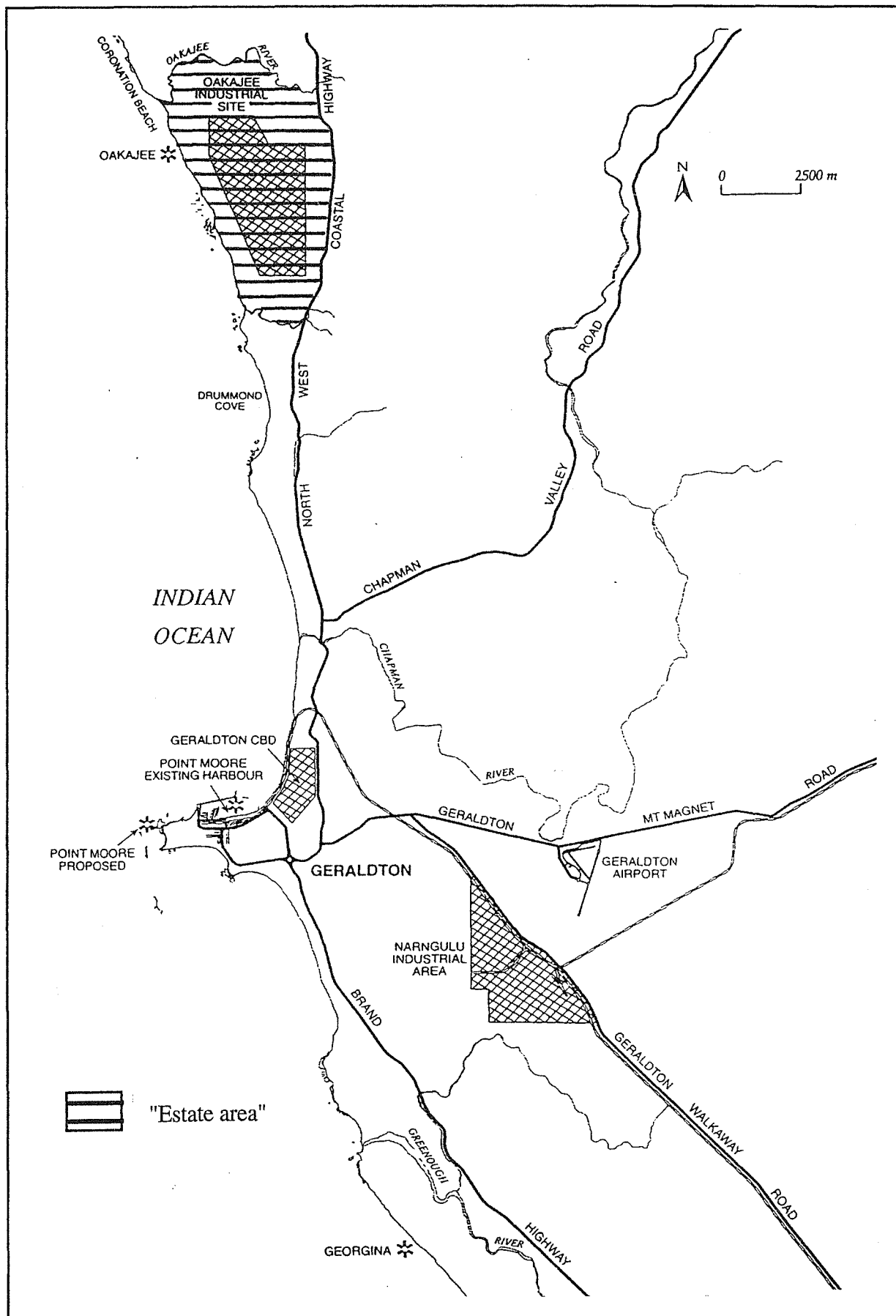


Figure 2. Location map - Oakajee heavy industrial estate. (Modified from LandCorp 1994)

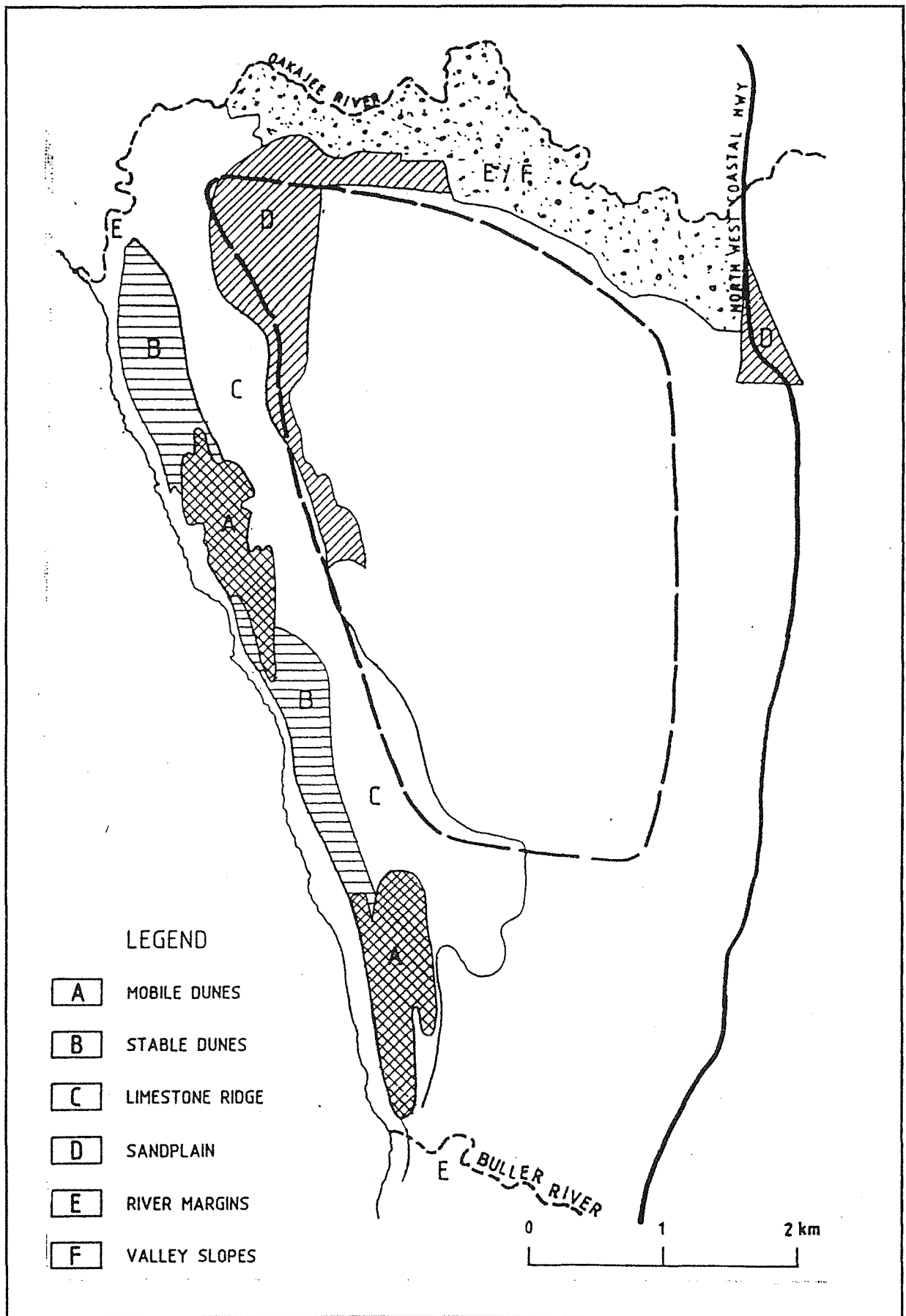


Figure 3. Oakajee Industrial Estate Concept area - Remnant Vegetation (Source: Figure 19 from LandCorp 1994)

Appendix 2

List of organisations and individuals who made submissions

Organisations:

1. Water Authority of Western Australia
2. The Health Department of Western Australia
3. Department of Planning & Urban Development
4. City of Geraldton
5. Shire of Chapman Valley
6. Department of Minerals & Energy
7. Fisheries Department of Western Australia
8. Conservation Council of WA
9. Drummond's Cove Progress Association
10. Friends of Batavia Coast

Appendix 2 (continued)

Individuals

1. Mr/Mrs/Ms R&B Dransfield
2. Miss N Benson
3. Miss C Hobby
4. Miss J Franklin
5. Mr S Matthews
6. Mr/Mrs/Ms A R Ayling
7. Mr G Jones
8. Mr G Battilana
9. Mr G Raymond
10. Air Commodore D W Hitchins
11. Mr T Overstone
12. Ms N Stuart
13. Ms L True
14. Mr/Mrs/Ms M Molloy
15. Ms C Eckersley
16. Ms S Fenner
17. Mr J Hancock
18. Ms M Ferrana
19. Mr D Poulton
20. Mr N Curtis
21. Ms M Webber
22. Mr R Hancock
23. Ms M Molloy
24. Mr & Mrs Armitage
25. Ms P Molloy
26. Miss M Musson
27. Mr R Teakle
28. Mr B Ayling
29. Ms G Horwood
30. Ms T Weatherall
31. Mr G Howard
32. Mr/Mrs/Ms J M Collins
33. Mr R Shenn
34. Mr/Mrs/Ms S Fraser
35. Mr S Duda
36. Mr G Sinclair
37. Mr A Dowling
38. Ms K Bischoff
39. Mr J M Collins
40. Mr C Bulluss
41. Ms T Los
42. Mr I Northcote
43. Mr M Royce
44. To Whom it May Concern, The Resident
45. Mr J Laverack
46. Mr/Mrs/Ms J Dillon
47. To Whom it May Concern, The Resident
48. Mr/Mrs/Ms C M Speed
49. Mr G Barrett
50. Ms M Molloy
51. Mr/Mrs/Ms R Meder
52. Mr J Best (Snr)
53. Mr/Mrs J & L Johnston
54. Mr A J Eckersley
55. Mr L Wilson
56. Ms R Rudd
57. Ms K Shelton
58. Ms G Ingham
59. Ms P Horner
60. Mr F Vinton
61. Dr R Hart
62. Mr A Hyde
63. Mr D Colling
64. Mr J Rowe
65. Mr/Mrs/Ms V Vesnaver
66. Ms D Chesson
67. Mr/Mrs C & R Teakle
68. Mr/Mrs/Ms R Blanke
69. Mr G Burrows
70. Mr M Hatch
71. Cr D Dawson
72. Ms B Burchell
73. Mr J Orlando
74. Ms K Hunt
75. Ms M Forrest
76. Mr B Ralph
77. Mr/Mrs A Armitage
78. Mr J Casey
79. Ms D Drage
80. Mrs J Saunders
81. Ms R Hunt
82. To Whom It May Concern, The Residents
83. 85. Mr D Perham
84. Mr/Mrs R & D Weller
85. Ms Fiebelkorn
86. Mrs M Pidgeon
87. Mr R Speed
88. Mr D Booth
89. Ms D Perham
90. Ms T Travers
91. Mr/Mrs/Ms M Buckee
92. Mr/Mrs/Ms M Thomas
93. Mr/Mrs/Ms J Buckee
94. Mrs D Moustaka
95. Ms D Gallaher
96. Mr/Mrs K & R C Cleminson
97. Mr/Mrs K & R C Cleminson
98. Mr I Morris
99. Ms D Bentley
100. Mrs D Allan

Individuals (continued)

101. Dr N Keely
102. Ms G Perham
103. Mr M Hatch
104. Mrs D M Taylor
105. Ms J Horne
106. Mr M Stahli
107. Mr S Cope
108. Mr/Mrs R Casey
109. Mr S Johnston
110. Mr R Webb
111. Mr M Young
112. Ms H Partel
113. Mr W J Alford
114. Mr J Russell
115. Mrs G Brownrigg
116. Mr R Waller
117. Mr W Tacey
118. Ms T Johnston
119. Mr/Mrs X Barsalou
120. Mr/Mrs/Ms H Vardy
121. Mr M Glazier
122. Mr J Phillips
123. Mr G Hillwood
124. Ms Thomas
125. Mr R McKay
126. Mr S Johnston
127. Mrs J Johnston
128. Ms R McGowan
129. Mr G Hill
130. Mr A Young
131. Mr R Blundell
132. Mr H Wass
133. Dr P Terren
134. Mr J Purchase
135. Ms J Lowe
136. Mr M Holtz
137. Mrs D Moustaka
138. Mrs M Pidgeon
139. Mr/Mrs/Ms J Buckee
140. Ms D Drage
141. Ms C Morgan
142. Mr I Northcote
143. Mr M Royce
144. Mr/Mrs R A Lennard
145. Ms T Los
146. Mr C Bulluss
147. Ms M Baumgarten
148. Mr G Croasdale
149. Mr B Blechynden
150. Mrs H Croasdale
151. Mrs D Tavakoli
152. Mrs D Martin

Appendix 3

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