Sustainable development and the Kwinana Industrial Area

Position Paper

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The Environmental Protection Authority (EPA) has produced this position paper in order to emphasise its long term, consistent environmental protection strategy for the Kwinana Industrial Area, and to reinforce the environmental protection standards that are required of industry.

This is timely in view of continuing debate concerning expansion of the industrial capacity and efficiency of the Kwinana Industrial Area. The issues to which these standards related include protection of the Cockburn Sound marine environment, protection of the System 6 areas, air quality, groundwater quality, and environmental risks and hazards.

Air quality in the Kwinana area has been an issue of particular concern for many years. The EPA has developed a strategy for controlling sulphur dioxide emissions from industries, involving:

- maintenance of a buffer zone between industries and residential development;
- limiting emissions from each industrial source so that the total concentration in the air does not exceed acceptable limits; and
- monitoring both the industrial emissions and the environmental concentrations to enable ongoing management of air quality.

The strategy has been given effect through an Environmental Protection Policy (EPP), associated regulations and conditions on the licences of Kwinana industries.

The Towards Optimising Kwinana report, produced by the Kwinana Industries Coordinating Committee, suggests several options to overcome the perceived constraint placed on further industrial development by the current full allocation of sulphur dioxide emissions limits. The EPA strongly rejects the options of relaxing environmental standards, altering the buffer zone boundary and removing emissions limits; the last of these would greatly inhibit the EPA's ability to ensure acceptable air quality. The other options are either already part of the EPA's strategy or are worthy of discussion in the broader context of industrial development in Western Australia.

It is not apparent to the EPA that air quality (specifically sulphur dioxide) is severely constraining development in the Kwinana Industrial Area, since the EPP enables this issue to be managed on an ongoing basis. Actual emissions from Kwinana industries (as opposed to allocations of allowable emissions) are currently well below the levels which would cause environmental limits to be exceeded. This fact, coupled with the anticipated reduction of emissions over time associated with technological improvements, should provide the opportunity for judicious expansion of industry.

At a broader level, the EPA also believes that significant improvements in overall environmental performance can be achieved by shifting the focus from end-of-pipe pollution control measures to adoption of preventative pollution strategies that minimise or eliminate pollution at the source. Compliance with ambient environmental objectives should not preclude industry from identifying and applying pollution prevention strategies such as cleaner production and waste minimisation.

Most developed countries have embraced pollution prevention philosophies, policies and practices. They are consistent with the principles of ecologically sustainable development and best practice environmental management and can also result in economic benefits for industry. Industry, government and the community will need to work together to develop and implement realistic pollution prevention programmes and goals.

The EPA believes that, with adherence to the well established environmental protection standards currently in place, together with pursuit by industry of all practical opportunities for pollution prevention, the overall environmental performance of the existing Kwinana Industrial Area could be lifted to accommodate an increase in overall industrial capacity.

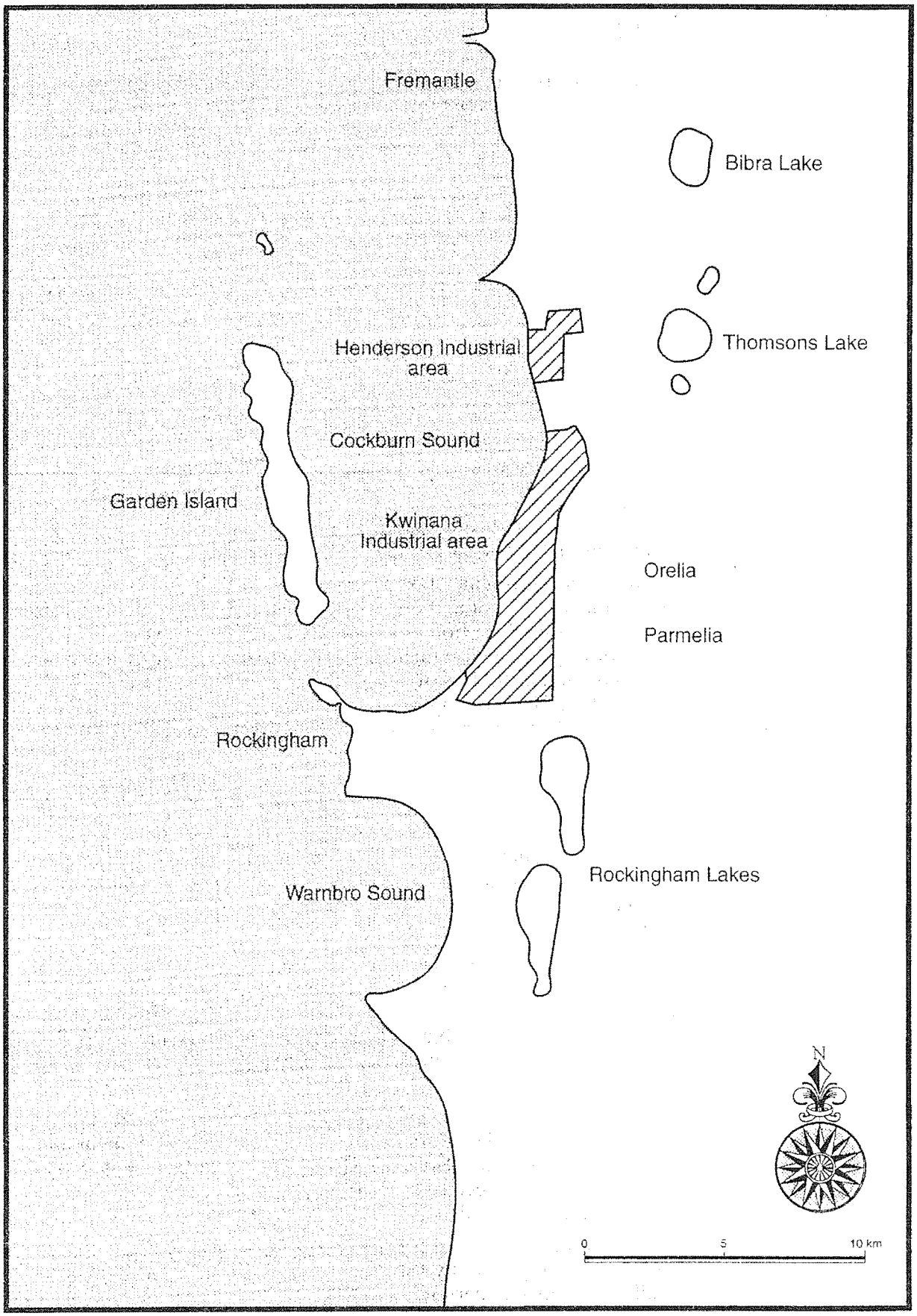

Figure 1: Location - Kwinana Industrial Area.

1. Introduction

The Kwinana Industrial Area (KIA) is the most important heavy industrial site in the state, and the Environmental Protection Authority (EPA) recognises its critical importance to the state economy. While the site has many good features from a transportation, communications and employment point of view, it has always been recognised that important environmental considerations should be taken into account in the operations of industry within KIA because of its proximity to the Perth metropolitan area, and in any change to the land use configuration or functions within the KIA.

The environmental issues associated with KIA of concern to the EPA involve air pollution, groundwater contamination, pollution prevention, waste minimisation, waste disposal, impact on the Cockburn Sound marine environment, protection of nature reserves and parkland within or near KIA, and environmental risks and hazards. Of these, sulphur dioxide air pollution and the degradation of the Cockburn Sound marine environment have been subject to considerable pollution control efforts by the EPA.

The EPA believes that the future development and management of activities in the Kwinana area should at all times incorporate the principles of Ecologically Sustainable Development. This is necessary to ensure the Kwinana Industrial Area has an environmental management record acceptable to all, and pollution control strategies that are consistent with international, national and local expectations for the environment protection performance of major industrial areas.

The purpose of this paper is to document the EPA's long term, consistent strategy position concerning sustainable development of the Kwinana Industrial Area, and to provide a response to the most recent thoughts on the KIA's future, as put forward in the document entitled 'Towards Optimising Kwinana' (Kwinana Industries Co-ordination Committee, August 1993).

2.Background: Environmental Protection and the Kwinana Industrial Area

Deliberations over the environmental performance of KIA and specific industries has occurred since the establishment of the EPA.

The Coogee Air Pollution Study (1974) was the first significant report on air pollution. It identified the unsuitability of land adjacent and to the north of KIA for urban development, due to air pollution, and it foreshadowed the need for the Kwinana Air Modelling Study (KAMS) to better understand the air pollution characteristics on a broad scale. This led to the production of The Kwinana Air Modelling Study (Report 10) by the (then) Department of Conservation and Environment in 1982.

Also in the 1970s the EPA undertook extensive investigation into the markedly declining environmental condition of Cockburn Sound, and produced the report entitled "Cockburn Sound Environment Study : 1976-1979". In addition the Conservation Through Reserves Committee 'System 6' study identified various land and coastal environments of particular conservation value within, and near to, KIA.

In November 1986 the Kwinana Pollution Control Unit was established specifically to manage the impacts of regional heavy and related industry on the environment of Kwinana and surrounding areas. Since that time considerable emphasis has been placed upon the development and enforcement of Works Approval and Licence conditions as required under Part V of the Environmental Protection Act, as well as the development of the *Environmental Protection (Kwinana) (Atmospheric Waste) Policy 1992* and resultant Regulations.

In addition to these actions, over the last two decades there has been a sequence of major planning studies aimed at maximising the efficiency of the KIA area itself, and to guide

surrounding land use change. These studies have included the South West Corridor Structure Plan(s) (1970s), the Planning for the Future of the Perth Metropolitan Region report (1988) and the subsequent Metroplan (1990), the Kwinana Regional Strategy (1988), Southern Metropolitan Coastal Waters Study (current), and now Towards Optimising Kwinana (1993). The EPA has made significant contributions to the majority of these various studies, and has repeatedly drawn attention to the major environmental issues and the need for consistency in environmental management strategies for dealing with them.

3. EPA advice on industrial development

In response to Planning for the Future of the Perth Metropolitan Region (Corridor Review Group, 1988) the EPA made the following general observations (EPA, Bulletin 404, 1989) concerning industrial development, that:

> "From the environmental viewpoint, the objective for regional industrial planning should be twofold:
>
> - initially, to identify and allocate areas suitable for industrial development taking into account the biophysical effects of such development and the excluding effects industry has in terms of other uses; and
>
> - secondly, to designate an appropriate 'buffer' surrounding areas designated for industry, or any other form of noxious or environmentally impacting activity.
>
> The intention of the buffer is to both protect the industrial area from constraining land uses, and to protect other areas beyond the buffer from the adverse 'spillover' effects from the industrial activities. The buffer area could be used to accommodate land uses unlikely to be adversely affected by the spillovers from industrial area and unlikely to exert any adverse impacts upon the surrounding environment. Buffer areas (ie the land-take required) should be provided within designated industrial zones and should be borne as a direct cost of industrial land development."

It is also important to add that, in the context of complex land use decision making, buffers around major industrial areas such as Kwinana must be largely fixed and consistent, if land use uncertainty and heavy penalties to non-industrial activities and investments are to be avoided. The EPA believes all other options of good practice (pollution prevention, waste minimisation, emission control, etc) should be used to the full, and that industrial design and management not be based on the maximum buffer zone attainable.

The EPA also presented **Principles of Industrial Location; Management and Control** (EPA, Bulletins 257 and 404), as follows:

Principles for Location of Industry

1. Industry which has the potential for adverse impacts on people or on the environment should only be located where its impacts can be assimilated or controlled. This may be achieved by siting within a properly designated and managed 'industrial zone', the beneficial use of which is recognised by the community as industrial. In certain instances this may necessitate a remote location.

2. An 'industrial zone' should contain only industry, and should also be separated from residential areas by an appropriate buffer zone.

3. The environmental impacts of industry should be restricted to the 'industrial zone' and 'buffer zone'. Excursions of excessive impacts beyond the buffer zone should be rare, and should only result from atypical events (either within the industrial plant or of the environment).

4. Land use in the 'buffer zone' should be such that it does not impact adversely on residential areas.

5. Land use in the 'buffer zone' should be sufficiently resilient to withstand impacts from the 'industrial zone'.

6. The location of particular industries within an industrial zone should be such that impacts on other industries fall within prescribed standards for environmental risk and ongoing environmental impact.

Principles of Project Approval

7. Each new project with the potential for significant environmental impacts, or amendment to any existing project that would increase its environmental impact, should be subject to environmental impact assessment.

8. It is the responsibility of the proponent to demonstrate that any proposal will not impose more than an acceptable level of risk or impact to the environment or to the health and well being of the community.

9. A proposed new industry, or alteration to an existing industry should be designed to ensure that its environmental performance is appropriate to the prescribed standards for the zone in which it is proposed or located, and for its particular location within that zone.

10. Any new industry, or alteration to an existing industry should have adequate management procedures to control performance to specified levels for both the regular operation and for contingency events.

11. Whenever a new project is assessed, consideration should also be given to the cumulative impact with existing industries in the region.

Principles of Environmental Management by Industry

12. New industry should be constructed such that it satisfies both the conditions set at project approval, as well as the general requirements of the zone's beneficial uses.

13. The operation of any industry should be managed such that it satisfies both the conditions set at project approval, as well as the general requirements of the zone's beneficial use.

14. Industry should conduct periodic reviews to ensure that it retains the ongoing capacity to control performance to specified levels for both regular operation and for contingency events. Such reviews should be subject to assessment of their environmental acceptability.

Principles of Monitoring and Regulation

15. Each industry should monitor its environmental impacts to ensure that they do not exceed the standards set for the beneficial use of the area impacted.

16. Industry should be required to advise Government of the likely environmental consequences as soon as practicable after the occurrence of any unforeseen event such as an accidental discharge.

17. Standards of performance should be enforced such that beneficial use criteria are met.

All these principles apply to individual industries within the KIA, and to the KIA overall. In combination these principles underscore the necessity for comprehensive forward planning of heavy industrial areas to minimise the likelihood or occurrence of land use conflicts later on.

The next section of this position paper addresses the issue of pollution prevention, cleaner production and waste minimisation, which was not specifically covered in the EPA's earlier statements of principles, but which the EPA now considers essential to achieving sustainable industrial development.

4. Pollution prevention

4.1 Overview of the international and national scene

Introduction

There is increasing world-wide recognition that significant improvements in environmental performance cannot be achieved by concentrating exclusively on end-of-pipe or top-of-stack discharges.

One of the consequences of this recognition has been that industry and government are gaining a greater appreciation of the need to work together to explore opportunities to prevent pollution throughout the entire manufacturing or industrial process by the implementation of cleaner production/waste minimisation strategies . This can include:

- substitution of less toxic raw materials;
- industrial symbiosis (one industry using another's waste as raw material);
- on-site re-cycling or re-use of waste streams;
- co-generation of power by using waste heat;
- cleaner process technologies and process modification;
- environmentally-friendly product design;
- energy-efficient technologies; and
- waste treatment.

Most developed countries have already embraced cleaner production/waste minimisation philosophies and support the UN Environmental Program in its efforts to influence industry globally. Furthermore, the principles and practices of pollution prevention are entirely consistent with the Best Practice Environmental Management approach advocated by the Australian Manufacturing Council in their 1992 report.

Definitions

The US EPA defines pollution prevention as *'the use of materials, processes or practices that reduce or eliminate the creation of pollutants or waste at the source'*. The Commonwealth Environment Protection Agency (CEPA) definition of cleaner production is very similar to this.

4.2 International policies and programmes

United Nations Conference on Environment and Development - Agenda 21

One of the main themes of Agenda 21 emphasised the greater use of environmentally sound technology that uses resources more efficiently and generates low levels of waste or no waste at all. The following interrelated and mutually-supportive programmes were suggested:

- Minimising wastes;
- Waste reuse and recycling; and
- Waste disposal and treatment.

The UN Environmental Program incorporates a Clean Production programme and in conjunction with the Victorian EPA, organised the first Cleaner Production Conference for the Asia-Pacific Region in February 1992.

OECD

The OECD has completed a major assessment on pollution prevention and its Environmental Committee is giving high priority action to waste minimisation strategies.

Europe

The North Atlantic Treaty Organisation NATO, which has a non-military Committee on Challenges of Modern Society, is involved in a pilot study called 'Pollution Prevention Strategies for Sustainable Development', in which 14 countries are participating in an information exchange programme on pollution prevention policy, education and technology.

The European Community has designed some of its rules and programmes around pollution prevention. Individual countries have developed their own initiatives in developing pollution prevention programmes. For example, the Netherlands has the National Environmental Policy Plan and has also initiated the PRISMA (PRISMA = Industrial Successes with Pollution Prevention) project, aimed at proving that pollution prevention concepts, management and technology could be implemented successfully in Dutch companies. Denmark and the Netherlands are undertaking an extensive study of life-cycle accounting applied to a host of commercial and consumer products. The German Federal Environment Agency, through its Waste Act, empowers the German government to exert its influence on waste generation prior to the production and use of products.

North America

Canada has a 'Green Plan' which expouses the principles of pollution prevention, while the US passed the Pollution Prevention Act in 1990. The Act states as national policy that; *'pollution should be prevented or reduced at the source whenever feasible; pollution that cannot be prevented should be recycled in an environmentally safe manner whenever feasible; and disposal or other release into the environment should be employed only as a last resort and should be conducted in an environmentally safe manner'.*

The US EPA in its Pollution Prevention Policy Statement (1989) and Pollution Prevention Strategy (1991), has established and clarified its position on pollution prevention by stating that pollution prevention should be the approach of first choice in dealing with environmental problems. The US Congress and the US EPA have assigned pollution prevention as one of the agency's top priorities for the 1990s. This fundamental shift in priorities, from a situation where 99% of federal and state environmental spending is devoted to controlling pollution after waste is generated, to a preventative approach, was also emphasised recently by the new administrator of the US EPA, Carol Browner in her 1993 Earth Day speech.

New Zealand

Through its Resource Management Act and waste management policy, the New Zealand government has set an operating framework for business. Adoption of the concept of cleaner production is seen as the cornerstone for implementation of those policies.

4.3 National and state policies and programmes

From a national perspective, the Commonwealth has developed a national Waste Minimisation and Recycling Strategy which identifies the necessary steps, actions and information to manage waste minimisation and recycling. CEPA is vigorously promoting cleaner production throughout Australia via various mechanisms, including workshops, industry-specific seminars and cleaner production demonstrations.

The Victorian EPA has a Cleaner Production Program which has been marketing the concepts and benefits of cleaner production and waste minimisation to Victorian industry since the mid 1980s. The Victorian government has also established the Centre for Cleaner Production with a board of management drawn from industry, academia and government and has formulated an Industrial Waste Management Policy (Waste Minimisation) under its Environmental Protection Act. The policy's prime objective is *'to reduce potential hazards to human health and to the environment posed by industrial wastes, by ensuring that the generation of such wastes is minimised'.*

According to CEPA, in so far as the concepts and management of cleaner production and waste minimisation are concerned, WA is at much the same philosophical and implementation stage as Queensland and Tasmania with NSW somewhere between Victoria and WA.

4.4 Acceptance by industry

The US EPA in its 'Pollution Prevention 1991: Progress on Reducing Industrial Pollutants', has reported on goals, programmes, environmental accomplishments and financial savings of pollution prevention programmes for 24 major companies. For example:

- Amoco, through its 'Waste Minimisation Program' has reduced its hazardous waste by 86%, saving the firm $50 million between 1983 and 1988;
- Chevron, through its 'Save Money and Reduce Toxics' programme has reduced hazardous waste by 60% during 1987 - 1990, saving the organisation $10 million and ;
- From 1976 - 1988, 3M saved $300 million and achieved a reduction of 1.4 billion gallons of waste water emissions and a 5% reduction in pollution per unit of production.

Financial savings from application of pollution prevention strategies and technologies are not limited to large multinational organisations. Since 1989 the US EPA has supported a project with various state Universities to carry out waste minimisation assessments of local small to medium manufacturing facilities.

The results of these studies clearly indicated that investment in cleaner production and waste minimisation can produce not only significant environmental gains, but also economic benefits for the company. In a summary of those assessments reported by Freeman et al (Ref 1), the pay-back period for all waste minimisation investments was less than one year and in many cases substantially less than one year Furthermore in some cases the initial investment cost was zero.

The US Chemical Manufacturing Association has adopted a voluntary code that provides a framework for reducing waste generation and releases to the environment. It is the view of some authors of papers in this field that more can (and inevitably must) be done (Ref 1).

The New Zealand Ministry for the Environment produced its case studies of cleaner production (Ref 2) in collaboration with industry in recognition of the need to document examples where implementation of cleaner production principles and practices have resulted in environmental benefits and economic gains for the firm.

According to the Chairman of the Victorian EPA (pers comm), cleaner production programmes involving demonstration projects, interest-free loans to industry to implement clean technologies and co-operative waste audits have drawn strong support from industry and are well accepted.

In Western Australia, the EPA and the Chamber of Commerce and Industry are cooperating in the development of Cleaner Production Workshops which are to be held in May 1994. These workshops will build on similar collaborative workshops to be conducted by CEPA in April 1994.

Both series of workshops in Perth and appropriate regional centres, will provide an opportunity for industry and government to work together to market the concepts and environmental and economic benefits of cleaner production.

4.5 The EPA's view on pollution prevention and the application of ambient environmental objectives

The EPA maintains the view that industry should be managing its emissions so that it complies with relevant environmental standards, policies or conditions imposed through the Environmental Protection Act (Parts III, IV, V).

Notwithstanding this, the Environmental Protection Authority and the Western Australian community expect industry to take all reasonable and practicable measures to minimise or prevent the discharge of waste into the environment.

This principle is embodied in the Environmental Protection Act (1986) Section 51, and is entirely consistent with accelerating national and international moves toward preventing or minimising pollution at the source, rather than developing programmes and legislative measures that focus on end-of-pipe or top-of-stack controls.

The existence of and general compliance with prescribed environmental standards and limits within an industrial estate, should not of itself preclude industry from embarking on a staged and continuous implementation of preventative environmental strategies, such as cleaner production and waste minimisation. The reduction in the level of pollutants discharged as a consequence of the application of such strategies may allow the entry of new industries into the estate.

There are numerous international and national examples where industry has realised substantial economic benefits from implementation of cleaner production and waste minimisation principles and practices.

A 1992 report by the Australian Manufacturing Council, "The Environmental Challenge: Best Practice Environmental Management", contends that continuous improvement in all aspects of an industry's activities, including adoption of cleaner technologies, raw material substitution and on-site recycling and re-use, is the means by which industry will move toward sustainability and enhanced local and international competitiveness.

It is the EPA's view that Pollution Prevention Plans should be developed by industries in the Kwinana industrial area which could serve as best practice models for future and existing industrial developments. Several industries are already developing Waste Minimisation Plans and are to be commended for their initiative.

The EPA will discuss with industry and other key stakeholders how these plans might be developed. Pollution prevention is one of the central tenets of ecologically sustainable development and the EPA believes that pollution prevention philosophies and objectives will guide its policy making, decisions and programmes in the years ahead.

The "Towards Optimising Kwinana" report provides an excellent opportunity for industry, in collaboration with government, to pursue the development of pollution prevention programmes rather than seek to modify buffer zones or accepted ambient levels of pollutants as a means of expanding the Kwinana industrial area.

5. Kwinana industrial area: Specific environmental issues

5.1 Cockburn Sound marine environment issues

The protected coastal waters off the southern metropolitan coastline of Perth are utilised intensively for industrial, commercial and recreational purposes. The activities of the Kwinana Industrial Area are significant amongst these. The following is a summarised explanation of the environmental changes to Cockburn Sound in response to the pressures upon it, and the EPA's principal concerns. Any future plans for the Kwinana Industrial Area should take into full account the condition of the Cockburn Sound and the need to restore and protect this marine environment.

Over the last 40 years, wastes have been routinely discharged into Cockburn Sound and, to a lesser extent, Owen Anchorage. During the 1960s and 1970s, extensive algal blooms occurred as a result of these discharges (DCE, 1979). These blooms, in turn, reduced light availability to the benthic plant communities resulting in a major, virtually irreversible loss of seagrass meadows in the Sound. The nutrients in these discharges, particularly nitrogen, were identified as the primary cause of the algal blooms. In addition, a range of heavy metals and other toxic substances in these discharges contaminated sediments and biota in some areas. Other activities, including the mining of limesands, resulted in the direct loss of seagrass meadows.

Seagrasses, a dominant marine plant found along the Perth metropolitan coastline, provide substrata for diverse assemblages of small plants and animals, habitat and nursery areas for fish and invertebrates, a means of trapping and binding sediments, and a medium for storing and recycling nutrients. Seagrass meadows are therefore highly significant to the maintenance of environmental quality of the Cockburn Sound marine environment.

Following the recommendations of the Cockburn Sound Environmental Study (DCE, 1979), the discharge of nutrients and toxic contaminants into these waters decreased substantially during the early to mid-1980s. A long-term monitoring programme was established to assess the ecosystem response to these management measures and included a 14-week survey of the water quality of Cockburn Sound and Owen Anchorage during summer every two to three years.

The Southern Metropolitan Coastal Waters Study 1991-1994 (SMCWS) is currently being undertaken by the EPA with the objective of developing a comprehensive environmental management strategy for Cockburn Sound and its surrounding waters. The marine biological resources of the study area are being mapped and an accurate map of the main habitats is being constructed. An inventory of past, present as well as projected future inputs of contaminants to these waters has been completed. The input of heavy metals and nutrients into Cockburn Sound has decreased markedly over the past decade. Discharge from industrial point sources has decreased significantly since the late 1970s, and groundwater inputs will contribute a significant proportion of the total contaminant load to Cockburn Sound in the future.

Heavy metal and hydrocarbon contamination of sediments and mussels is considerably lower than during the late 1970s, reflecting the reductions in the discharge of these materials to the waters of Cockburn Sound and Owen Anchorage. Pesticide contamination of sediments and mussels was extremely low throughout the study area. In contrast, tributyl tin contamination was widespread and, considering the toxicity of this substance to some marine animals, is cause for concern. Similarly, a significant shift in the phytoplankton species composition has been observed. The causes and implications of this shift are currently unknown.

The cumulative environmental impacts on Cockburn Sound which have resulted from the combined pressures to which it has been subjected have been severe. Evidence available to the EPA at this time indicates that the loss of Posidonia seagrass meadows in Cockburn Sound is irreversible. Several other aspects of environmental quality in the Sound (such as the water quality and levels of some contaminants in marine biota and sediments) have greatly improved as a result of a sustained reduction in point discharges of contaminants into the Sound. However, as noted above, there is need for continued vigilance, as the ecosystem of the Sound is in a delicate state of balance.

The sheltered waters of Cockburn Sound are the focus of recreational activities in this area and with the rapid spread of urban development in the southern metropolitan area, these activities are likely to increase. These waters are also being used increasingly for marine-based commercial activities such as mussel farming. As the demand for multi-purpose use of these waters increases, so also does the need for sound environmental management. This situation brings into strong focus the need ensuring the long term sustainability of the Cockburn Sound marine environment.

In the context of the above, the EPA has the following prime concerns for the maintenance of environmental quality of Cockburn Sound:

- continued reduction in contaminant levels in biota and sediments; maintenance of water quality;
- prevention of further loss of seagrass; and
- maintenance of subtidal bank, beach and foreshore stability.

The EPA will consider any plan for Kwinana in the context of existing and proposed future uses, and their combined (or cumulative) environmental impacts. The information required to evaluate any proposals from this perspective will be available at the conclusion of the Southern Metropolitan Coastal Waters Study in late 1994.

5.2 Terrestrial environments: System 6 nominated areas

The System 6 study identified 108 areas in the Perth metropolitan region that were considered to have regional conservation/recreation and/or landscape values and made recommendations to Government for their protection and management, which endorsed the System 6 study in 1984. Two major System 6 areas are associated with KIA.

The two System 6 areas, M91 - Reserve A24306, Coogee and M92 - Cockburn Wetlands, Western Chain, form a continuous naturally vegetated link which includes the coast through to the inland wetland system. Such links have been lost throughout most of the metropolitan region and hence those that remain are considered important for ecological, educational and scientific purposes and should be retained. The landscape and plant community contained in the coastal Reserve A24306 (M91) is not found in any other location near Perth and as such has special conservation value in its own right. The area identified as M92 contains both high dunes and wetlands with several vegetation complexes represented, including Melaleuca communities, Banksia woodlands, Tuart forest, Wattle thickets and heath lands. There are a number of less common plants found in the area including priority listed species under the CALM Act, and there is the Southern Brown Bandicoot which is also listed as rare and endangered.

The regional significance of the conservation and recreation values of this System 6 area (M92) has also been recognised by the Planning system through its inclusion in the core reservation area for the Beeliar Regional Park. There is a high level of public interest and expectation in regard to this regional park and therefore any excisions to increase the industrial area will cause a great deal of controversy and are unlikely to be accepted by the community as a whole.

The Environmental Protection Authority considers that the retention and implementation of the System 6 recommendations are its prime objective for regional conservation.

5.3 Risk issues

General Principles

The Environmental Charter for Western Australia states, amongst other things, that "Western Australians should live in areas safe from industrial risks." This concept is applicable to the whole state.

All proposals for major industrial projects are required to go through the environmental impact assessment process, in which all significant environmental issues are considered. The EPA has formulated criteria for levels of acceptable risk for different land uses, which are used in environmental impact assessment. These criteria are applicable throughout the the state. For any given land use, eg residential housing, the relevant criterion is applicable to all housing. No residential housing is regarded by the EPA as 'second class', by substituting a higher level of acceptable risk at that location.

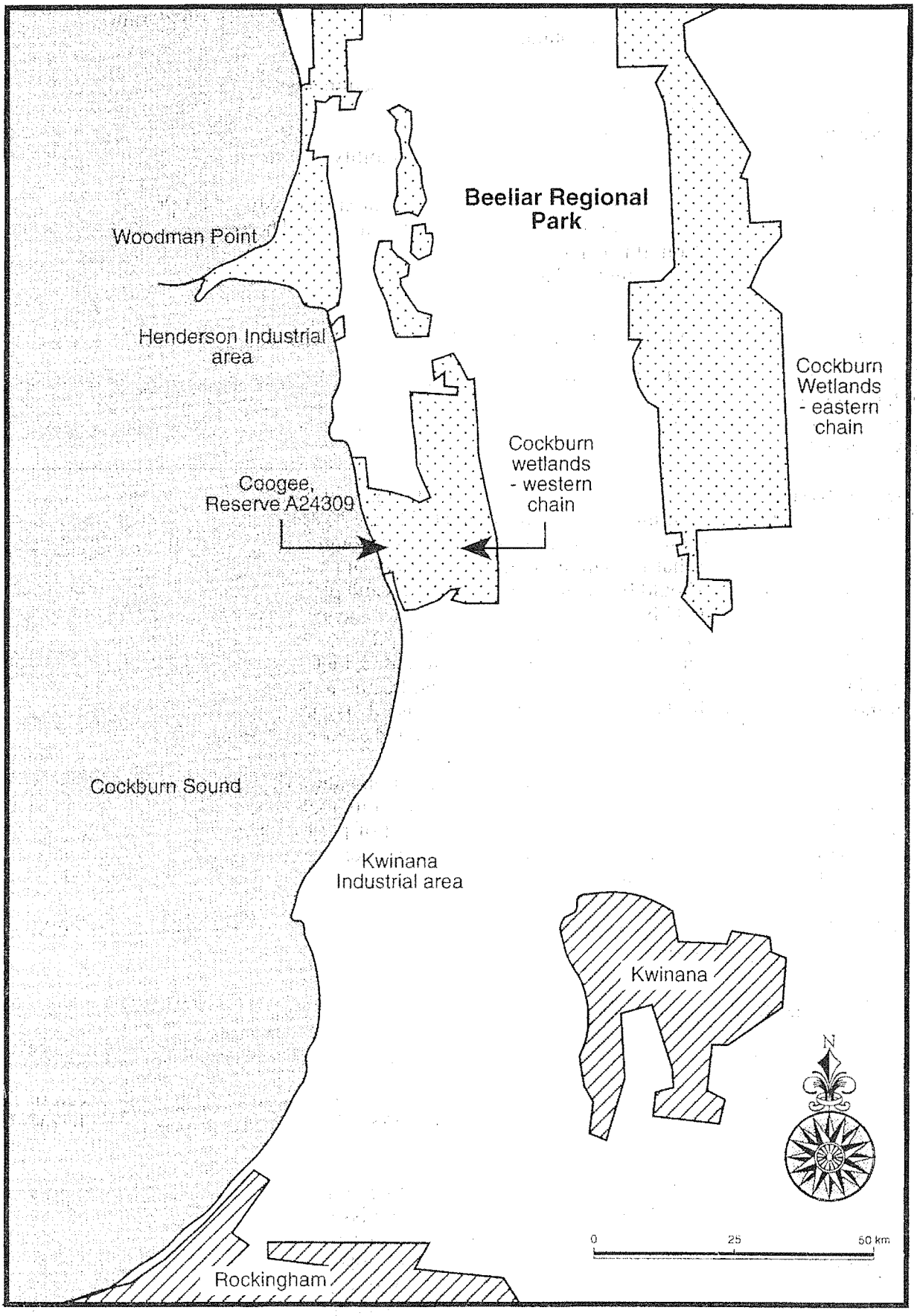

Figure 2: System 6 Areas.

For existing industry, the criteria are regarded as targets, which industry should achieve over a period of time through agreed risk reduction plans. The criteria are also applicable to cumulative risk from all hazardous industries in an industrial area, as well as the risk from individual plants.

In carrying out environmental impact assessments, the EPA is able to assess the impact of proposed industry on the local environment and on nearby residents. The planning system regulates proposals (eg residential housing) which in themselves do not have any significant environmental impacts, but may be impacted upon by existing, proposed or potential industry. Such developments, incompatible with industry, have the potential to affect and restrict industrial development.

Thus a combination of the environmental protection and planning systems can be, and is, used to simultaneously protect the quality of the environment for local residents, and to protect existing industry and industrial estates generally, from the unwarranted encroachment of housing.

For any hazardous industry, however safe, there is always a level of 'residual risk', which can be managed through the development and maintenance of effective emergency response plans. These plans should not only protect the on-site workforce, plant and equipment, but also neighbouring industry and local residents.

The Kwinana Situation

All hazardous industries built in Kwinana since 1985 have provided a preliminary risk assessment to the EPA as part of the environmental impact assessment process. Every individual proposal has met the EPA's risk criteria.

The EPA's assessments of those proposals have reflected the need to ensure that properly conducted follow-up hazard control studies are carried out, and the results then incorporated into plant design. The development of hazard control plans, which refer not only to plant design requirements, but operational procedures and on-going safety audits are also required. In all of these matters, the EPA has always worked very closely with the Department of Minerals and Energy, which has significant expertise in the area. In the past few years, the significance of the role of the Department of Minerals and Energy has increased markedly, and that trend is expected to continue.

In 1987, the Department of Resources Development commissioned a study of the cumulative effects of risk for the whole of the Kwinana industrial area. The study showed that the industrial area also met the EPA's (then single) risk criterion. For every new hazardous industry proposal, the cumulative study was updated, and again, in every case, the criterion was met. In 1991, the study was reviewed to take account of risk data for 'as-built plants' (which are usually better than the preliminary data considered at the environmental assessment stage), and to eliminate some proposals which had been included in the updates, but never built. Again, the complete industrial area met EPA's criteria.

In 1992, the State Planning Commission released a draft statement of planning policy covering the buffer zone for the Kwinana industrial area. The intent of the draft policy is to avoid developments (eg residential, commercial and community) which could prejudice existing and future industry. The finalisation of that policy is awaiting the outcomes of a societal risk study for the Kwinana area commissioned by the Department of Resources Development. When finalised, the statement of planning policy will be a significant step in preserving the buffer zone from inappropriate development.

Since 1986, the EPA has recognised the need for regional emergency response planning in the Kwinana area. The State government has carried out a significant amount of background work for the proposed Kwinana Integrated Emergency Management System (KIEMS), which would take into account mutual aid amongst industries, the linkages with community based emergency

plans, and community warning systems. Recently, the major hazardous industries in Kwinana have established a mutual aid scheme, known as Kwinana Industries Mutual Aid (KIMA), which represents a significant step forward in emergency planning.

In the final analysis, while the probability of a major industrial accident at Kwinana is extremely small given the level of management and expertise employed, nevertheless should an accident ever occur due to either human error, human deliberation, or technical failure, the worst case scenario is that there is and always will be potential for an accident of catastrophic proportions. The EPA stresses the need for industry to continue to abide by the risk assessment criteria relating to operations in the Kwinana industrial area, and to maintain an integrated crisis response capacity in case the need should ever arise.

5.4 Groundwater pollution

One of the most significant ways identified whereby industrial development can impact upon the natural and human environment is pollution of groundwater by the disposal of industrial waste, fertilisers used in market gardening, the disposal of solid and liquid domestic waste and animal manures, and over-extraction leading to migration of the salt-water interface.

Groundwater becomes contaminated when foreign substances are allowed to infiltrate the soils and reach the underlying groundwater body. The most severe groundwater contamination problems in industrial areas, including Kwinana, are due to point-sources from specific industries. The contamination results from spills and leakages on industrial sites, and from seepage from waste disposal lagoons.

Contamination reaching the water table usually has a higher density than the natural groundwater, and so tends to sink to the bottom of the aquifer. The contamination then moves with the groundwater forming groundwater contamination plumes which can be compared to smoke plumes. As the plume moves away from the pollution source, its strength is diminished due to dilution and a number of other physical, chemical and biological processes. In the Kwinana area, contamination plumes generally move with the groundwater, at rates of 10 to 50 metres in a westerly direction per year towards Cockburn Sound.

There are several large contaminated groundwater plumes within the greater Kwinana area resulting from industrial activities. The contaminants currently within the groundwater include ammonium sulphate, sodium hydroxide (caustic), hydrocarbons, and herbicides (2,4 5-T, and 2, 4-D and chlorinated phenols). Many of the existing pollution plumes are the result of previous waste disposal methods.

The EPA's first priority is to prevent groundwater pollution from impacting adversely on Cockburn Sound.

Management control of the various contaminated groundwater areas is achieved via EPA licences for each industry. It is via these licences that various conditions are established under which each company must operate. Industry is to be required to undertake whatever strategies are deemed necessary in order to prevent groundwater pollution.

Consistent with the EPA's strategy of protecting groundwater is a principle that does not support the use of groundwater regimes as mediums for the receival of industrial effluents or for the treatment of injected effluent.

The EPA's strategy with respect to groundwater protection in industrial areas is to initiate and encourage long term disposal strategies which will not only ameliorate current pollution problems but will also prevent similar pollution episodes occurring in the future. Such strategies should include liquid effluent recycling programmes, waste minimisation (eg Alcoa's dry stacking of residue), and recovery programmes (eg BP's hydrocarbon recovery).

5.5 Air quality issues

Background

The most significant air quality issue to have arisen at Kwinana is the impact of sulphur dioxide. In the late 1970s, total emissions of sulphur dioxide, due primarily to the combustion or processing of heavy fuel oil, reached 300 tonnes per day. In the year 1979, the combined sulphur dioxide emissions of Kwinana industry caused the National Health and Medical Research Council (NHMRC) goal for sulphur dioxide, 700 micrograms per cubic metre (ug/m^3), to be exceeded 143 times in the township of Wattleup. This was probably the worst sulphur dioxide air pollution problem seen in Australia outside of Mt Isa and Kalgoorlie.

The arrival of North West Shelf natural gas in 1984 vastly improved the air quality around Kwinana. BP Refinery installed a sulphur recovery unit in 1989, further reducing the potential for high levels of sulphur dioxide in the environment.

However, the rising price of gas has led some industries to revert to sulphurous fuels or to consider doing so. The Environmental Protection (Kwinana) (Atmospheric Wastes) Policy 1992 (hereafter "EPP") for air quality at Kwinana was introduced in 1992 to avoid recurrence of the pollution problem.

The Environmental Protection Authority has no hesitation in stating that the sulphur dioxide pollution problems in the Kwinana area in previous years have been unacceptable and that it expects industry to carry the cost of controlling the ambient concentrations of sulphur dioxide and other industrial wastes to acceptable levels, as occurs elsewhere throughout Australia and the developed world. The Environmental Protection Authority and the Western Australian community expect industries to take all reasonable and practicable measures to minimise and, if possible, prevent the discharge into the environment of industrial wastes in accordance with the requirements of the Environmental Protection Act (1986).

The Kwinana Air Modelling Study (1982) recommended that a buffer zone be established between Industry and areas of further urban expansion. The EPP defines the boundaries of the buffer zone (called Area B) and sets sulphur dioxide objectives which are less stringent than those for Area C (rural/residential). The Environmental Protection Authority has consistently recommended, and will continue to recommend, that rezoning for urban development should not occur within the buffer zone. This recommendation has been accommodated within the Kwinana Region Strategy (1988).

Environmental Protection Policy for air quality

The 'Environmental Protection Policy (Kwinana) (Atmospheric Wastes) 1992' was approved by the Minister for Environment on 17 July 1992 by order published in the Government Gazette of that date. In brief, the EPP:

- identifies the area covered by the policy and three regions (industrial, buffer zone and rural/residential) within that area;
- establishes through associated regulations the air quality objectives for sulphur dioxide and particulates (with the opportunity for other pollutants to be added at later dates);
- allows the EPA to establish a procedure for determining and applying limits on the emissions from each industrial source so that the cumulative impact of all these emissions does not exceed the air quality objectives; and
- requires the industries to monitor pollutant levels at various locations in the environment (additional to the EPA's ongoing monitoring programme) and also to monitor emissions from the various industrial sources so that the achievement of policy objectives can be both verified and enforced.

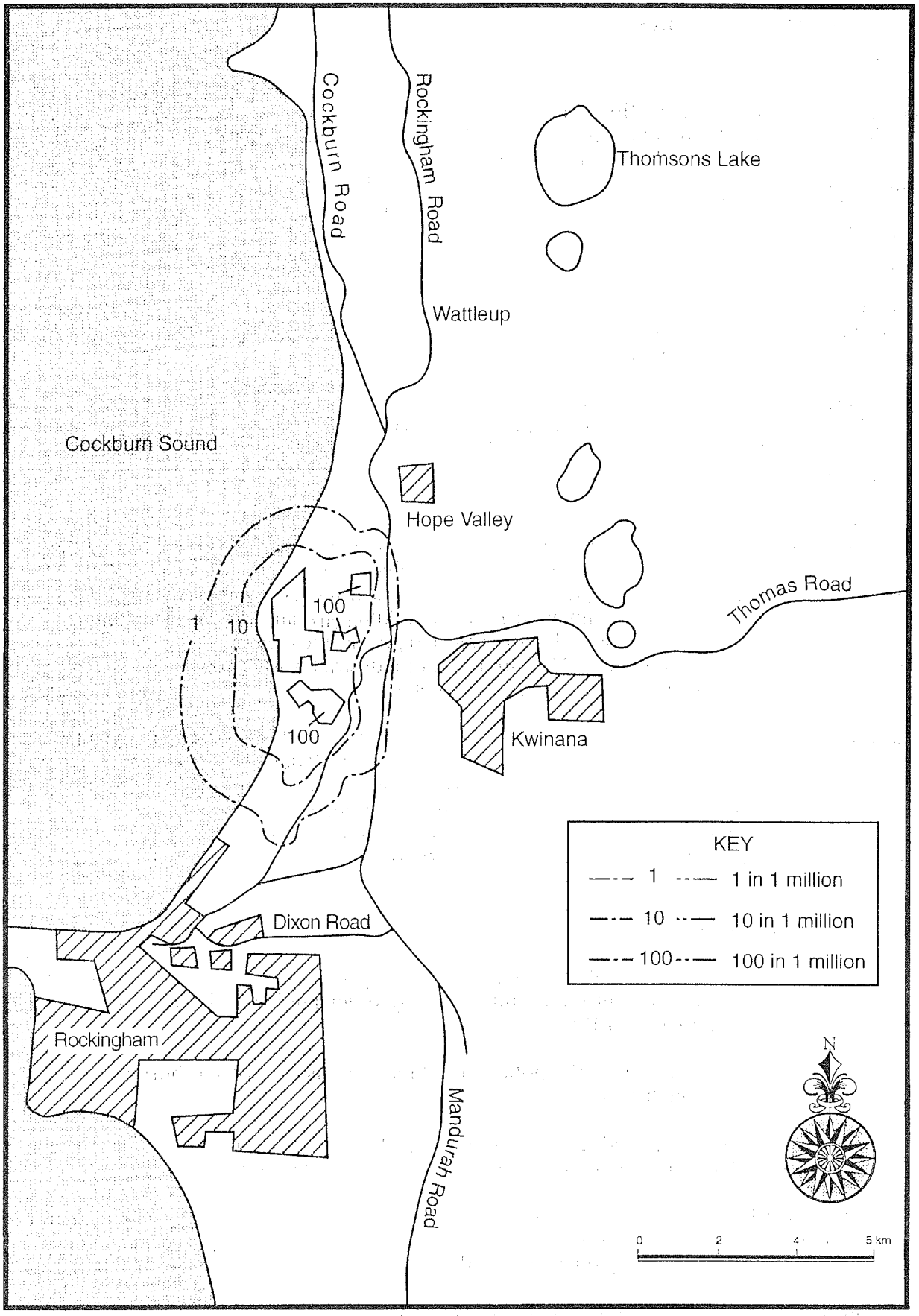

Figure 3: 1991 update, Kwinana Cumulative Risk Study.

The Environmental Protection Authority intends to proceed to assess other atmospheric wastes, such as oxides of nitrogen and odours, emanating from Kwinana Industries and, where these are (or have the potential to become) significant, to manage these under the provisions of the EPP. The EPP allows considerable flexibility in the management of specific types of atmospheric waste, ranging from the comprehensive treatment given to sulphur dioxide (emissions limits, source and ambient monitoring) through to simple requirements of good engineering and operating practice with minimal ambient monitoring. In each case there needs to be a determination of acceptable environmental objectives (standards and limits) which involves consultation with all affected parties. The EPA has identified odours as a class of atmospheric waste requiring management as a matter of priority.

In the course of discussions on the EPP in 1991, the Environmental Protection Authority agreed with Kwinana industries to forego its preference to reserve space in the air for emissions from new sources (thereby allowing existing industries to fully utilise the capacity of the air up to the levels set under the EPP) on the understanding that these industries would reduce emissions as necessary to allow the introduction of new industries.

Issues associated with air quality and the requirements placed on industry through the Kwinana EPP are very important, and this section should be read in conjunction with Sub-Section 6.1 'Air Quality, EPP Requirements and Buffer Zone', which immediately follows.

6. Comment on the 'Towards Optimising Kwinana' report

This section includes specific comment relating to the content of Towards Optimising Kwinana (TOK) report which was released by the Kwinana Industries Coordinating Committee in 1993 for public review and comment.

Before moving to specific issues in the following sections, a general deficiency of the report and its recommendations is that it does not appear to have been formulated in the context of a comprehensive state strategy for industrial development. When considering locational options for industry, a broader geographic perspective is vital in the EPA's view.

The following Section 6.1 should be read in conjunction with 5.4, above.

6.1 Air quality, EPP requirements and buffer zones

The Towards Optimising Kwinana report briefly acknowledges the advantage to existing industries of being allowed to maximise their emissions at present, but then proceeds to represent this full utilisation as a major development constraint for the Kwinana area. The report uses the cost implications to industry of this air space being recovered to accommodate new industries to justify a platform for a review of options to overcome the constraint. The EPA finds both a contradiction and an economic bias in this line of reasoning.

The Environmental Protection Authority considers that the future development of industries with sulphur dioxide emissions is not severely constrained at Kwinana because:

the emissions allocations of existing industries can be reduced as originally agreed; and

- there is opportunity to restructure some of the emissions limits proposed by Kwinana industries which will allow other emissions to be introduced without affecting the approved operations of existing industries, or the objectives of the EPP.

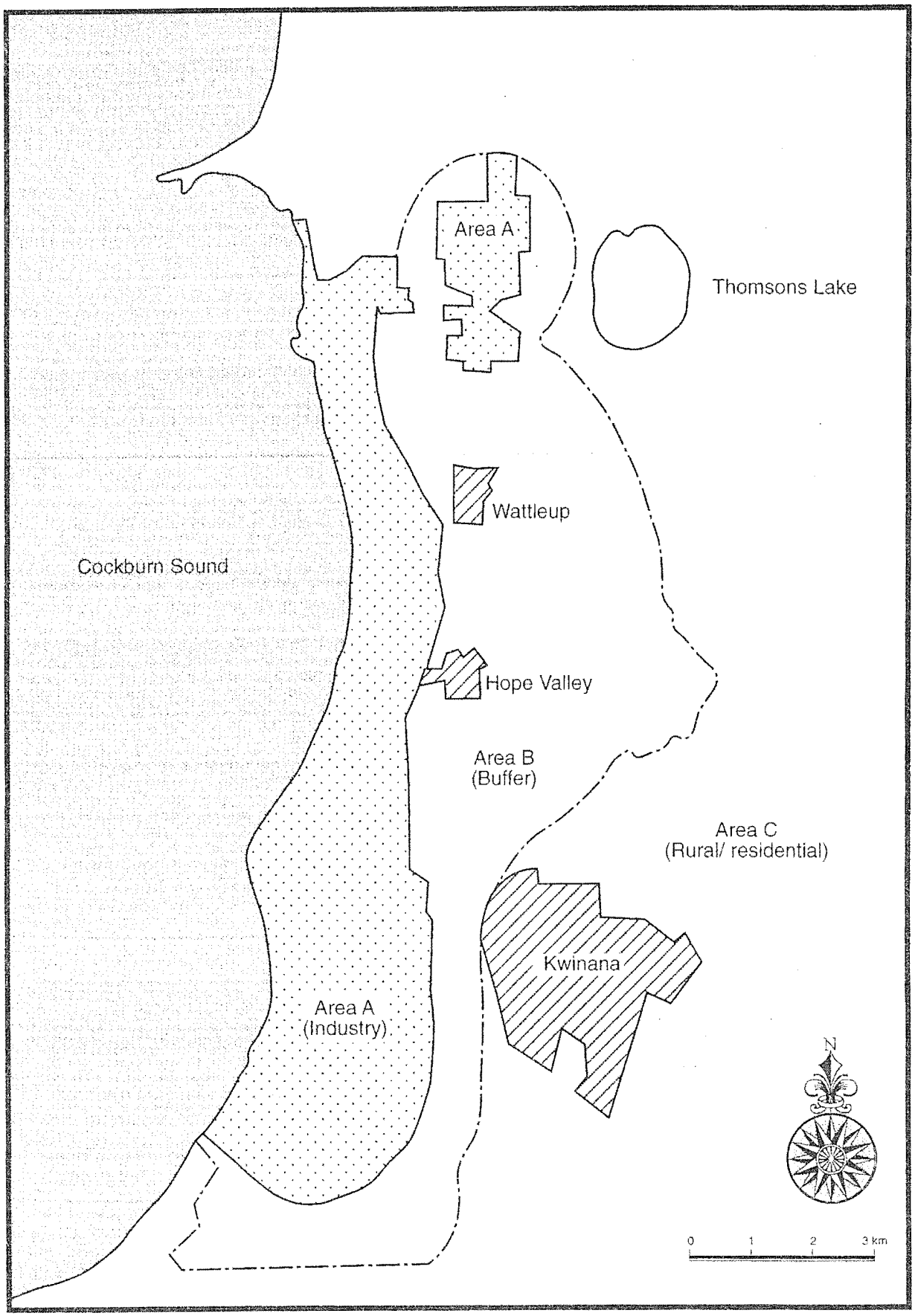

Figure 4: Portion of policy area showing buffer.

The report presents several options to overcome the perceived constraint, stating that these can be used "without compromising air quality in the Kwinana Airshed". For the sake of clarity and to emphasis the EPA's position, the report's suggestions are discussed below.

Buffer zone

The TOK report raises the option of realigning the buffer zone boundary (expanding the buffer zone) in order to overcome perceived air quality constraints.

The buffer zone is a **long term planning measure** to protect residential areas from industrial emissions and risk whilst also protecting the strategically important industrial area from encroaching residential development. Buffer zones are designed to control infrequent, uncontrolled and unwanted emissions originating from core industry area(s). Buffer areas are not a residual resource available to industry to accommodate increased intensity of use of industrial areas within them. Nor are their standards readily available, (if at all), to be changed to accommodate increased industrial activity in core areas within them.

The Environmental Protection Authority therefore opposes the expansion or contraction of buffer zones in response to development pressures on either side.

Air Quality Objectives

The Towards Optimising Kwinana report suggests that relaxing ambient standards and limits for sulphur dioxide is an option to enhance industrial development opportunities.

The EPP defines the terms "standard" and "limit" as follows:

- "standard" means the concentration of atmospheric waste which it is desirable not to exceed; and
- "limit" means the concentration of atmospheric waste which shall not be exceeded.

The selected standards and limits for the regions within the Policy Area are listed in Table 1.

Table 1. Sulphur dioxide standards and limits (micrograms per cubic metre) for the Policy Area for specified averaging periods

REGION	1-HOUR	24-HOUR	ANNUAL
AREA A			
standard	700	200	60
limit	1400	365	80
AREA B			
standard	500	150	50
limit	1000	200	60
AREA C			
standard	350	125	50
limit	700	200	60

The limit adopted for Area C (rural/residential) is the National Health and Medical Research Council (NHMRC) goal (700 ug/m^3). The NHMRC has qualified its goal with a statement

which reads "Caution: Levels set in this air quality goal may not be low enough to prevent health effects from this pollutant in the most sensitive members of the population."
The standard for Area C is 350 ug/m3, which is derived from the World Health Organisation (WHO) goal. The WHO stated that this level should not be exceeded, whereas the procedures under the EPP allow this standard to be exceeded up to 9 times per year, which is designed to ensure that the limit of 700 will not be exceeded once.

Under normal circumstances, the above standards and limits would apply uniformly to residential areas beyond the boundaries of industrial installations. At Kwinana, there are residential areas (Wattleup, Hope Valley) in the buffer zone defined by the policy, within which the standard and limit are 500 and 1000 ug/m^3 respectively. This is a lower level of protection than is generally offered in residential areas elsewhere around Australia with the exception of Kalgoorlie and Mt Isa.

The suggestion that standards be relaxed hardly qualifies as an option which could be used "without compromising air quality in the Kwinana Airshed". The Environmental Protection Authority rejects entirely this means of accommodating additional emissions. The Environmental Protection Authority notes that this option of reducing the stringency of the limits and standards for sulphur dioxide is the quoted preference of Kwinana industries in general.

Pollution Control Strategy Underlying the Environmental Protection Policy

The pollution control strategy embodied within the EPP is explained in EPA Bulletin 644. In brief, the EPA has concluded after much investigation that, in the context of an industry complex like Kwinana containing several industries operating independently, the only practicable means of controlling the total environmental concentrations of industrial emissions like sulphur dioxide is to directly control, via licensed limits, the emissions from each significant industrial source (chimney or group of chimneys). Simply requiring each industry to comply with environmental (ambient) objectives for sulphur dioxide, without setting emission limits, is not practicable. The network of monitoring stations needed to provide adequate surveillance of sulphur dioxide concentrations throughout the surrounding districts would be prohibitively expensive. Individual industries would be hard pressed to know how to manage their emissions so as to control the ground level concentrations caused by themselves, let alone the concentration resulting from the combined emissions of many independent industries. Correspondingly, if an exceedance of the objectives were to be measured in the environment, the EPA's task of proving beyond reasonable doubt that one or more industries were contributors would be near impossible.

Consequently, the strategy entails using the best available means (a computer model) to calculate emissions limits for all industrial sources such that, in the opinion of the Chief Executive Officer of the EPA, the ambient objectives will not be exceeded. Monitoring of emissions, ambient concentrations (at representative locations) and meteorological conditions will provide a set of data which will be used to check and, as necessary, refine the computer model and the emissions limits.

The TOK report includes an option entitled "Removal of emissions limits" (see TOK report pages 5-7 to 5-9), but concludes in effect that all of the flexibility supposedly available under schemes which have no emissions limits is equally available under the provisions of the EPP. The report also recognises that a reactive shutdown scheme is unworkable at Kwinana. The report does not examine the option's shortcomings from the EPA's viewpoint, notably the loss of ability to ensure that the EPP objectives are met (as explained above)

The Environmental Protection Authority has advised Kwinana Industries on a number of occasions, as far back as July 1990, that they are welcome to develop emissions limits which vary so as to take advantage of meteorological conditions, etc. Efficient treatment of intermittent emissions has also been agreed and demonstrated. The EPP explicitly allows for emissions limits to be expressed in variable or statistical forms. The computer model can be readily

adapted to handle these features. The current form of emissions limits, many of which are specified as fixed values, was the choice of Kwinana industries.
No valid reasons for removal of emissions limits have been advanced, nor advantages demonstrated.

Other Options Raised in the Towards Optimising Kwinana Report

Tradeable emissions rights

If tradeable emissions rights or other commercial arrangements were to be seriously considered at some future date, such arrangements could be accommodated by the EPP procedures.

Nevertheless the Environmental Protection Authority sees no incentive to pursue tradeable emissions rights. The Environmental Protection Authority considers that the air both within and beyond the boundaries of industrial premises is a State resource and should be used in a manner which most benefits the State and its people. Given the importance of industry in the Kwinana area, it is of benefit to the State to provide these industries with a secure emissions allowance to use in maintaining profitable operations whilst maintaining acceptable environmental standards.

The allocation may reduce if technological advances make cleaner operations possible at reasonable cost. There may be the opportunity for commercial arrangements which allow one industry to reduce emissions, making room for another. However, the allocation remains the property of the State; it does not become a commodity owned by industries which, for example, might be sold by an industry which is closing down.

Air dispersion model review

Review of the computer model, using collected data for emissions, meteorology and ground level concentrations, and consequent review of emissions limits, is part of the procedure established under the EPP (EPA Bulletin 644, section 4.5). It is not a separate option.

Review of actual industry emissions requirements

This point is treated under the discussion of "Removal of emissions limits" above. The Environmental Protection Authority will proceed with the reformulation of some of the emissions allocations (ie changing fixed allocations to statistical formulae without affecting the approved operations of existing industries) in order to provide room for additional emissions .

Time period on maximum permissible quantity allocation

This point relates to a crucial issue, namely the prospect of unreasonable gas price increases for industries which, by virtue of emissions limits, might be unable to use alternative sulphur-containing fuels. Concern over this issue has led some Kwinana industries to reserve large sulphur dioxide emissions limits as insurance against gas price increases, thereby limiting the introduction of new sources of sulphur dioxide. **The Environmental Protection Authority considers that this issue, and the underlying causes, warrant the careful attention of Government.** The report's discussion of increasing the use of gas (Section 8.1.2) is directly related.

Use of best practice technology

Section 51(b) of the Environmental Protection Act (1986) states that the occupier of a premises who does not take all reasonable and practicable measures to prevent or minimise the discharge of waste and the emissions of noise, odour or electromagnetic radiation from those premises commits an offence. **This obligation on industries is mandatory, not optional.** Practicable, as defined in the Act, means reasonably practicable having regard to, among other things, local conditions and circumstances (including costs) and the current state of technical knowledge.

This section of the Act and the associated definition provides the guiding principle for the Environmental Protection Authority's expectation that Kwinana industries will minimise their discharges of sulphur dioxide where possible, bearing the reasonable cost of so doing. It likewise provides guidance as to the level of emissions below which existing industries should not be forced to reduce, giving industries the security they need for continued investment and operation. Reduction in emissions below this level might nevertheless occur as a result of commercial arrangements between new and existing industries (as mentioned above).

As a final comment, it is the view of EPA that the spirit of this part of the Act encompasses the concept of 'pollution prevention' as discussed in Section 4 of this paper, and that industry should therefore approach their future commercial planning with this uppermost in mind.

6.2 System 6 areas

Chapter 8.2 of 'Towards Optimising Kwinana' provides options for a long-term industrial development strategy which it could be argued goes beyond the brief and objectives set up for the study. Option 4 suggests consolidating and joining the Cockburn, Henderson and Kwinana industrial sites into one main industrial region. While it is recognised that there are a number of environmental constraints, of which one is the location of two System 6 areas separating these industrial sites, the report implies that they may be expendable in the interests of further industrial development in the area.

The Environmental Protection Authority will only recommend in favour of options for Kwinana that are proven to ensure that these System 6 areas remain viable, and suggests that any further investigations into a long-term strategy for industrial development should consider other alternatives.

6.3 Risk

The report uses a 'risk footprint' approach to suggest the location(s) of future hazardous industry in the Kwinana industrial area. The EPA has no objections to this approach, so long as it is used carefully, with an appreciation of the limitations of risk assessment techniques. This approach offers some glimpse into the future - a cloudy crystal ball is far better than no crystal ball at all.

The significant impact region for risk in the Kwinana region does not extend beyond the buffer zone designated in the Environmental Protection Policy for atmospheric wastes (sulphur dioxide and particulate matter) in the Kwinana area. Consequently, risk is not (at least as yet) the principal controlling factor in land use development in the Kwinana region.

The Report puts forward a proposition, with no specific reasoning, that the risk criterion for housing in the air quality buffer zone should be relaxed. Irrespective of any justification that may be presented, putting future residents unacceptably close to industry according to existing risk criteria is, in effect, to knowingly expose people to serious risk in the event of a major catastrophe. Such a relaxation would be inconsistent with world-wide 'best' practice and is not acceptable to the EPA.

7. Conclusion

The Environmental Protection Authority has maintained a clear and consistent approach as to the required environmental performance of Kwinana Industrial Area and individual industry. The environmental issues of particular concern to the EPA, and referred to in this position paper, include:

- the quality of the Cockburn Sound marine environment;
- the nominated System 6 areas;
- issues associated with risk;

- sulphur dioxide and other emissions; and
- integrity of the existing land use buffers.

These issues are relevant to any discussion concerning efforts to increase the industrial capacity of the Kwinana Industrial Area, and all could be adversely impacted by suggestions contained in the Towards Optimising Kwinana report.

The matter of sulphur dioxide emission control and the necessity for consistent standards and fixed buffer areas, in order to provide certainty to both industry and the general community, is particularly critical.

Expansion of Kwinana's industrial capacity, either internally or by external expansion of Kwinana Industrial Area, through attempting to change the established groundrules and standards for allowable emissions and environmental impact, is unacceptable.

Expansion of Kwinana's industrial capacity by re-working the internal efficiencies of the Kwinana Industrial Area and the various industrial processes operating, without further impacts on Cockburn Sound, the System 6 areas, risk levels to the community, or relaxing the air quality standards of the EPP buffer zones, is a very feasible approach that should be pursued. Such an approach is considered essential by the Environmental Protection Authority. This is consistent with the principles of ecologically sustainable development which incorporate essential strategies for industry, such as pollution prevention.

If, in the face of a pressing need for industrial expansion, it is not possible for industry to comply with these environmental groundrules for KIA, the government should look to the rapid development of additional locations in the State suitable for heavy industry.

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