Review of Peel Inlet — Harvey Estuary Management Strategy, Stage 2, Environmental Conditions

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Appendix

PART 2 - Peel-Harvey Management Program - Review of Peel-Harvey Environmental Conditions and Management Commitments

Prepared on behalf of the proponent Ministers by officers of the Department of Transport, Agriculture Department and Waterways Commission

Purposes of document

This document has the following purposes:

- to provide the public with background information about the status of the environmental conditions set for the management of the Peel-Harvey estuary;
- to present the Environmental Protection Authority's preliminary appraisal of the management of the Estuary; and
- to seek public comment on the request to modify some of these Conditions prior to the EPA considering that request in detail.

There are two parts to this document.

Part 1 has been prepared by the EPA and provides:

- a summary of Stages 1 and 2 of the "Environmental Review and Management Programme for Peel Inlet and Harvey Estuary Management Strategy",
- an overview of EPA involvement in assessing the proposed management strategy of the Peel — Harvey catchment;
- a summary of environmental Conditions imposed by the Minister for the Environment to manage the Peel — Harvey system;
- background to the request from the proponent to make changes to the environmental conditions; and
- the EPA's preliminary appraisal of the management of the estuary.

The proponents for this proposal were the Ministers for Transport, Agriculture and Waterways. Part 1 should be seen as a context paper.

Part 2 has been written by senior officers of the Waterways Commission, Department of Transport and Western Australian Department of Agriculture acting on behalf of the proponent Ministers. It is entitled "Peel-Harvey Management Program - Review of Peel-Harvey Environmental Conditions and Management Commitments", and describes the status of implementation of environmental conditions. This document will be referred to in Part 1 as "the review document".

The review document was presented as supporting information when, on 21 December 1993, the proponents formally requested the EPA to consider changes to certain conditions. It was considered necessary to review the conditions for two reasons. Firstly, it is felt that some conditions can now be cleared, and, secondly, several conditions are viewed as being either outdated or no longer appropriate (Part 2 of this bulletin, introduction).

It is normal practice for the EPA to audit conditions, and to clear conditions following compliance. Changes to conditions are dealt with under Section 46 of the Environmental Protection Act (1986), through a separate report to the Minister for the Environment.

The review document:

- describes work which has been undertaken to meet the intent of the conditions;
- suggests specific changes to the certain conditions; and
- describes suggested pathways for future progress in the implementation of specific Conditions.

In view of the public interest likely to be expressed over changes to these Conditions, the EPA believes interested members of the public should be invited to comment on the review prior to the EPA commencing its assessment.

A copy of the environmental conditions and the proponent's review document on the status of implementation of the environmental Conditions are included as appendices to this report.

Submissions should be forwarded to:
The Chairman
Environmental Protection Authority
Westralia Square
141 St Georges Terrace
Perth WA 6000
Attention : Eve Bunbury, Garry Middle

The closing date for submissions is 29 August 1994

PART 1 - Context paper

Environmental Review and Management Plan (ERMP) for Peel Inlet and Harvey Estuary Management Strategy Stages 1 & 2

Prepared by the Environmental Protection Authority

1. Overview

1.1 Limitations of the assessment of the Stages 1 and 2 ERMP for the management of the Peel — Harvey catchment.

1.1.1 Establishing measurable criteria for assessment

In assessing the Stage 1 ERMP in 1985, the EPA set the following management objective :

> *"to produce and maintain an estuary system that is visibly clean and healthy and is ecologically healthy and resilient'.* (Environmental Protection Authority, 1985, P 7)

The EPA now recognises that while this objective is still valid, it is necessary to give a more precise meaning to 'clean and healthy' and 'resilient' by establishing measurable criteria on which the performance of the estuary and the management strategies can be assessed. It is also recognised that at the time of the assessment of the two stages of the ERMP there was limited information available from which suitable criteria could be established.

The EPA acknowledges that the departments carrying out the management of the catchment have now collected considerable data across a wide range of ecological parameters. The suggestion to broaden the criteria used to measure the "biological health" of the estuary (Part 2 of this Bulletin, P3) is consistent with the EPA's desire to establish appropriate measurable criteria.

1.1.2 "Assimilative capacity"

In 1988, the EPA referred to the "assimilative capacity" of the estuary (Environmental Protection Authority, 1988: Part II, p. 7). The use of the term "assimilative capacity" is currently the subject of some controversy in the scientific community. At the time of the EPA's assessment of the two stages of the Peel-Harvey ERMP the term "assimilative capacity" was used to describe the situation where amounts of phosphorus entering into the estuarine waterways exceeded the ability of the estuary to absorb it, resulting in the growth of algal blooms at a frequency of occurrence and extent considered unacceptable.

In effect, the EPA at this time set an upper limit on the amount (mass) of phosphorus that should enter the estuary. If this "target" was exceeded it was thought that the growth of algal blooms would occur at a frequency of occurrence and extent considered unacceptable. The EPA is now of the view that this limit is better defined as target load of phosphorus. This report will use the term "target load" rather than "assimilative capacity".

Setting a target load is seen by catchment managers as a useful management tool as it provides a concrete goal for land owners and the managers themselves to aim at (George & Bradby, 1993. P191).

It should be noted that the target load is expressed as a statistical figure rather than a single number. Section 2.2 explains this concept in more detail.

1.2 The problem within the Peel — Harvey Catchment

Historical land use and land management practices, for example catchment clearing and fertiliser use, have contributed to water quality problems being experienced within the Peel — Harvey Estuary, particularly over the last 10 to 15 years. Excessive quantities of phosphorus and nitrogen have been washed into the estuary from the surrounding farmland via the Harvey, Serpentine and Murray Rivers. High quantities of nitrogen and phosphorus have accumulated in estuarine sediments, contributing to excessive algal growth and associated eutrophication problems.

Attempts have been made by governments to address this problem, and extensive research by various individuals and organisations has been undertaken to provide the necessary information to properly manage the problem (for example, refer to the Bibliography in Hodgkin et al, 1985)

1.3 Management strategies proposed by State Government for the Peel — Harvey Catchment — Peel Inlet and Harvey Estuary Management Strategies — Environmental Review and Management Programme's Stages 1 and 2

In 1985 the EPA assessed the Stage 1 ERMP for the proposed management of Peel Inlet and Harvey Estuary (Peel-Harvey Study Group, 1985). Stage 2 of the ERMP (Kinhill Engineers, 1988) was assessed by the EPA in 1988.

The Stage 1 ERMP was prepared in 1984 by the Harbours and Rivers Branch of the Public Works Department (subsequently the Department of Marine and Harbours, and now Department of Transport), and included detailed discussion of the nature and causes of the algal problems of the Peel Inlet and Harvey Estuary. The ERMP addressed various alternative management options and proposed a management strategy to effect a long term solution.

The Stage 2 ERMP was prepared by the Department of Marine and Harbours and the Department of Agriculture following recommendations made by the EPA in its Stage 1 assessment.

In summary, a management strategy was proposed with three principle elements:

- catchment management, to reduce the input of phosphorus into the estuary;
- construction of the Dawesville Channel, to increase the water exchange with the ocean thereby reducing the biologically available phosphorus in the estuary; and
- weed harvesting, to alleviate the effects of weed accumulations on residential areas adjacent to the waterway. (Peel-Harvey Study Group, 1985: p39).

1.4 Environmental Protection Authority assessment of the Peel Inlet and Harvey Estuary Management Strategies — Environmental Review and Management Programme's Stages 1 and 2

The objective of the Stage 1 assessment was to present the eutrophication problems and to assess the possible management strategies which would alleviate these problems (Peel-Harvey Study Group, 1985: p2). The Stage 2 assessment examined in detail the consequences of constructing the Dawesville Channel and the implementation of a land management strategy on the estuary. Also considered were the implications of changes in the estuary for land management and the management of new developments likely to impact on the estuary (Kinhill Engineers, 1988: p 1).

In summary, in 1985 the EPA concluded that the estuarine water quality was seriously degraded, and required significant improvement to make it environmentally acceptable (Environmental Protection Authority, 1985: p2). The estuary is important for a number of reasons, including as a wildlife habitat of international importance, for water based recreation, fishing, tourism and fishery protection.

The land surrounding the estuary is also subject to considerable development pressure, particularly urban development as the population of the City of Mandurah grows.

Part I of the EPA's assessment report of Stage 2 in 1988 (Environmental Protection Authority, 1988) was divided into five sections, which addressed:

- the scope of the ERMP;
- what problems are currently experienced in the area and why they occur;
- objectives for the management of these problems;
- proposals for the management strategy as suggested within the ERMP; and
- conclusions.

Part of the EPA's assessment report was a technical report (Part II) containing detailed scientific information and justification for the conclusions presented in Part I.

The EPA concluded that:

> *successful management of the estuary can only be achieved by both reducing phosphorus and other nutrient inputs to the system, increasing the rate at which phosphorus and other nutrients are lost from the estuarine system, and by making the estuarine system more marine and therefore unfavourable to blue-green algal (cyanobacterial), particularly Nodularia, growth.* (Environmental Protection Authority, 1988: Part I. p18)

A long term approach to the management of the estuary is required, and the construction of the Dawesville Channel and changes to catchment management were identified as two important elements of this long term strategy.

The EPA found that the proposed management strategies were environmentally acceptable, subject to minor modification as detailed in the assessment report, and recommended that these strategies proceed in accordance with the proponents commitments and EPA recommendations. A list of these commitments and the Environmental Conditions set by the Minister for the Environment in January 1989, and subsequent additions and changes, is included in Appendix 1.

2. Current status of the environmental conditions

2.1 Introduction

The environmental conditions were set to address the following key issues:

- assigning a target phosphorus load for the estuary system, to be reviewed in the light of the performance of the system (Condition 2);
- controlling phosphorus and nitrogen loadings into the Peel Inlet and Harvey Estuary (Condition 2);
- formulating an 'Integrated Catchment Management Plan' for the Peel — Harvey catchment (Condition 4);
- formulating an Environmental Protection Policy (EPP) and a Statement of Planning Policy (SPP) (Conditions 3 and 14);
- continuing the moratorium on clearing and drainage within the Swan Coastal Plain Peel — Harvey catchment (Condition 5);
- requiring the installation of nutrient attenuating waste disposal systems and management practices within 2km of the Peel — Harvey estuary (Condition 6);
- constructing the Dawesville Channel and monitoring its potential impacts (Conditions 7, 11, 12 and 13);
- continuing the weed harvesting within the Peel Inlet and Harvey Estuary (Condition 8);
- declaring that until the effects of the management strategy are known, developments that are likely to release phosphorus and nitrogen into the system should be referred to the EPA for assessment, with conditions set to be conservative in terms of nutrient export (Condition 9); and
- implementing the Peel — Harvey Region Park (Condition 10).

Each of these issues will be dealt with in detail in subsequent sections of Part 1 of this report.

2.2 Interim targets for phosphorus

Algal blooms usually result when levels of nutrients such as nitrogen and phosphorus in the waterbody exceed the ability of the waterbody to accommodate those nutrients. These nutrients are mostly carried by surface run-off (rivers and drains). In order to restore the estuary to

normal health it is important to establish appropriate nutrient levels above which the frequency of occurrence and extent of algal blooms is unacceptable.

Monitoring of the nutrients such as phosphorus and nitrogen in the water courses that flow into the estuary system, and the estuary itself, enables estimates to be made of the total mass of phosphorus and nitrogen flowing into the estuary each year, and the concentration of nutrients dissolved in the water. It was known in 1988 that nutrient levels in the estuary were too high: in other words, the mass of nutrients flowing into the estuary and in the estuary waters was sufficiently high to allow algal blooms to occur at a frequency of occurrence and extent considered unacceptable.

As discussed in Section 1.1, in assessing the Stage 2 ERMP in 1988, the Environmental Protection Authority decided to set an upper limit on the total mass of phosphorus that should enter the estuary, to be set at well below existing levels.

Upper levels were not set for nitrogen for the following reasons:

- phosphorus is usually the critical nutrient in estuary waters;
- nitrogen levels are difficult to control because nitrogen can enter the system from the air via opportunistic species, for example blue-green algae; and
- it is more difficult to control nitrogen export from certain land uses.

Phosphorus levels are best expressed in two ways:

- total mass of phosphorus entering the system (nutrient load); and
- actual phosphorus available measured as the concentration of dissolved phosphorus.

The amount of phosphorus entering the estuary will vary from year to year depending on a number of factors, most notably, amount of rainfall and subsequent run-off; the greater the run-off the greater the load. Concentrations of phosphorus both in the estuary and the watercourse flowing into the estuary will also vary depending on a number of factors, including rainfall, land uses adjacent to the watercourse and quantity of phosphorus released from the sediment.

Because loads will vary from year to year, it is not possible to set a simple target load, and a statistical approach is preferred. Based on monitoring carried out by the EPA prior to the preparation of the ERMP, it was possible to estimate the loads of phosphorus entering the estuary each year and compare that to the total volume of water flowing in the watercourses. As discussed above, phosphorus loads increase with increasing annual flow.

The quantity of annual flows are usually expressed statistically as percentiles. Percentiles are calculated by first ranking all the known annual flows for a particular watercourse. A specific percentile can then be determined based on the percentage of the ranked annual flows below that figure. For example, a 10 percentile flow year is the annual flow where only 10 per cent of the known annual flows are less than or equal to that figure. This occurs in a very dry year. The 90 percentile flow year is the annual flow where 90 per cent of known annual flows are less than or equal to that figure. This would be considered a very wet year.

Phosphorus loads can also be expressed as percentiles: for example, a 10 percentile load is the load carried in a year where only 10 per cent of the known annual loads are less than or equal to that figure.

As part of its assessment, the EPA estimated that the 50 percentile load entering the estuary was 143 tonnes (Kinhill Engineers, 1988:p 121). It was further estimated that about 60 tonnes of phosphorus left the estuary through the Mandurah channel (the mouth of the estuary). Following the construction of the Dawesville Channel, this export figure was estimated to double, reducing ultimately to 85 tonnes as the concentration of phosphorus in the estuarine waters fell with time due to increased flushing. The 85 tonnes was proposed in the Stage 2 ERMP as the maximum annual phosphorus load for the whole estuary , in other words, the 100 percentile figure (Kinhill Engineers, 1988:p 121).

However, it was also the EPA's view that, given the existing loads and land uses in the catchment, this was not achievable (Environmental Protection Authority, 1988: Part II, p32). Instead, the EPA determined that specified target phosphorus levels, which were set based on:

- how often the load would exceed specified criteria (percentile); and
- how often the concentration of phosphorus should exceed a specified figure.

Consequently, the EPA recommended the determination of two target levels for phosphorus:

- annual phosphorus input into the system should be 85 tonnes in a 60 percentile year and 165 tonnes in a 90 percentile year; and
- average phosphorus concentrations in estuary water should not exceed 0.2 milligrams per litre in a 90 percentile year.

The concentration level (0.2 mg per L) should have been 0.02 mg per L, but appeared as the higher figure through a typographical error. The 0.02 mg per L figure was subsequently used in the Environmental Protection Policy (refer to Section 2.5). The 0.02 mg per L of phosphorus was chosen as the target concentration as it is widely recognised (for example, Davis and Rolls, 1987. P 42) that this figure is within the meso-eutrophic range for phosphorus (phosphorus levels less than that required for the waterbody to be eutrophic or enriched).

Members of the public are invited to comment on the usefulness of setting target phosphorus levels.

2.3 Controlling nitrogen and phosphorus

Control of phosphorus export to the estuary has involved a number of measures which are covered by other conditions, most notably:

- developing a catchment management plan to manage existing land uses (condition 4); and
- for new developments, establishing management practices which use conservative estimates of phosphorus and nitrogen export (condition 9).

These are discussed in detail later.

2.4 Formulation of the Environmental Planning Policy and Statement of Planning Policy

Environmental Protection Policies (EPPs) are prepared under Part III of the Environmental Protection Act 1986, and, once proclaimed, have the force of law. EPPs are usually established to protect a portion of the environment under threat because of development pressures. In general, EPPs set broad management frameworks rather than provide specific management measures.

The EPA recommended that an EPP be prepared for the Peel-Harvey Swan Coastal Plain catchment to ensure that land uses within the catchment are properly controlled (Environmental Protection Authority, 1988: Part I, p19). The environmental conditions are binding on the proponents (in this case the three Ministers), but not on individual land owners, developers and decision making authorities. An EPP ensures that decision making authorities not bound by the conditions approve and manage developments and changes to land uses consistent with the broad principles set out in the policy.

The planning agencies - the Department of Planning and Urban Development and the various local authorities - have responsibility for controlling land use changes. There is provision within the Town Planning and Development Act to develop planning policies called Statement of Planning Policies (SPPs). Whilst a SPP is not a statutory document, it is still considered to be a powerful planning tool as it sets the policy framework under which planning decisions are made.

Where an EPP and SPP are developed to cover the same geographic area, the EPP can be used to set the broad environmental objectives and the SPP to provide details of specific management

measures to be applied through the planning process to meet those objectives. This complementary EPP/SPP approach has been adopted in the management of the Peel-Harvey catchment.

The 'Environmental Protection (Peel Inlet - Harvey Estuary) Policy' was proclaimed in December 1992. The 'Peel — Harvey Coastal Plain Catchment' SPP No. 2 was gazetted in February 1992.

The SPP has been used as the policy framework for local authorities to amend their statutory Town Planning Schemes and/or develop rural strategies.

2.5 Formulation of an 'Integrated Catchment Management Plan' for the Peel — Harvey catchment

The EPA recommended that the Integrated Catchment Management Plan consider the following issues:

- there should be constraints on land uses within the catchment to meet water quality objectives;
- changes to land uses should benefit the estuary;
- phosphorus export from properties should be reduced;
- nitrogen export should meet a specific target to be specified as part of catchment planning;
- appropriate fertilizers should be developed for use in the area;
- soil testing should be carried out to provide information on fertilizer requirements;
- alternative methods of fertilizer application should be considered;
- nutrient export from urban areas should be managed;
- point source pollution should be controlled;
- major tree planting programmes need to be managed for environmental gains;
- review of clearing practices; and
- review of drainage practices (Environmental Protection Authority, 1988: Part I, p19-20).

Clearly, some of these issues are covered by other conditions.

The EPA did not specify the form that plan should take, leaving the proponents with considerable discretion in deciding how the plan should be formulated. A draft plan has been prepared by the Department of Agriculture covering many of the issues discussed above. Some parts are already in operation. A final plan is proposed to be developed following consultation with a wide variety of community, industry and government groups (Part 2 of this Bulletin, p4)

2.6 Moratorium on clearing and drainage within the Peel — Harvey catchment

2.6.1 Introduction

A moratorium on clearing of vegetation and directing additional drainage into the Peel — Harvey waterways was considered to be one way of controlling nutrient export (Environmental Protection Authority, 1988: Part I, p14, 20-21). This view was based on information obtained from monitoring other catchments, both in Australia and overseas, which indicate that phosphorus concentrations in drainage waters rise with increased clearing. This is due to increased surface runoff where deep rooted vegetation is cleared and water tables rise, and through increased fertilizer application where land is used for agricultural or urban purposes.

The EPA believed that the moratorium should continue until the effects of the other management measures can be assessed and the Government can be satisfied that a lifting of the moratorium would not add to the estuary's problems.

2.6.2 Moratorium on clearing in the Peel — Harvey Catchment

The moratorium on clearing of vegetation has been in place since January 1989 and has been implemented by the Department of Agriculture using the clearing control regulations under the provisions of the Soil and Land Conservation Act. This Act requires a 'Notice of Intent' to clear areas greater than 1ha. The SPP provides guidelines for clearing control where a land use change is proposed. The moratorium has also been implemented by the EPA through the setting of environmental conditions associated with specific proposals.

Some concern has been raised regarding the implementation of the clearing moratorium. It has been argued that the moratorium has been applied strictly to agricultural land while, at the same time, other land has been allowed to be cleared for urban development (refer to Part 2 of this report, p5-6).

2.6.3 Moratorium on drainage

This moratorium has been applied at two levels.

The first level affects the Water Authority of Western Australia. The moratorium has prevented the construction of any new major public drains which discharge directly into the Peel — Harvey waterways. The Water Authority has had to confine its activities to drain maintenance activities only. This arrangement has been in place since 1985.

The EPA has recently, however, raised some concerns regarding possible unintended effects of the Water Authority's maintenance works. Maintenance within the drains could cause nutrients stored in the drain sediments to be released back into the waterways, which in turn could make its way into the estuary. The Water Authority has applied for research funds to investigate this problem further with the view of adopting a whole of catchment approach to drain management.

The second level involves drainage management where development is to take place. Specific controls on drainage has been applied firstly through EPA assessments (and the subsequent setting of conditions by the Minister for the Environment), and through the application of the SPP. Drainage control regulations under the Soil and Land Conservation Act have been drafted for rural land but are yet to be gazetted.

2.7 Installation of nutrient attenuating waste disposal systems and management practices within the Peel — Harvey catchment

These disposal systems use an amended soil to treat the effluent before release to the environment. The amended soil contains chemicals (usually iron compounds) which react with the phosphorus preventing its export.

There are two types of systems. The first are called aerobic treatment units (ATUs), which are really small waste water treatment plants suitable for use in homes. They have an above ground area of amended soil on which the effluent is reticulated.

The second type are modified leach drain systems, where the leach drain is enclosed in an amended soil area.

These systems are now used throughout the catchment for new subdivisions where lots sizes range between 2000 square metres up to 4 hectares, where reticulated sewerage is not available, and site conditions prohibit the use of conventional septic tanks.

2.8 Target load and a conservative approach to new developments

The Stage 2 ERMP predicted that there were likely to be changes to the estuary following the construction of the Dawesville Channel and the implementation of the catchment management

plan. It is expected that the phosphorus loads entering the estuary will decrease, and the amount of phosphorus leaving the estuary will also increase (Kinhill Engineers, 1988: p169). Other potential changes are discussed in Section 2.9.5 of Part 1 of this report.

It was the EPA's view that until the results of these changes are known existing land uses and changes to land uses should be managed in ways that are deliberately conservative with respect to expected phosphorus and nitrogen export rates (Environmental Protection Authority, 1988: Part I, p22).

As a way of ensuring that new developments within the coastal plain catchment do not adversely affect the estuary, the EPA adopted a policy of formally assessing these proposals. This policy created problems both for the EPA in terms of work loads, and for the development community within the catchment where it was perceived that delays were becoming unmanageable.

It became apparent that most of these developments could be managed through the planning system provided that suitable controls were put in place. It was decided that a Statement of Planning Policy should be developed for the catchment, with the principles established in the formal assessments used to guide the development of the SPP.

Following considerable consultation, the EPA considered that the SPP was in a form which, although not finalised, adequately addressed the key environmental issues. Consequently, it was decided that new developments need no longer be formally assessed provided that the planning agencies managed developments in accord with the draft SPP. This occurred on 2 October 1991 when Condition 14 was published by the Minister for the Environment where it stated that:

> *Proposals which may release nitrogen and phosphorus to the environment shall not be referred to the Environmental Protection Authority provided that they are consistent with the draft Statement of Planning Policy for the Peel-Harvey Coastal Catchment. Proposals not consistent with the draft Statement of Planning Policy for the Peel-Harvey Coastal Catchment shall be referred to the Environmental Protection Authority.*
>
> *This Conditions will apply to the final Statement of Planning Policy for the Peel-Harvey Coastal Catchment when it is gazetted.*

2.9 Construction of the Dawesville Channel

2.9.1 Introduction

In November 1991 the Minister for Transport announced that the Dawesville Channel would be constructed under a joint development between the State Government and a private developer. The Channel was completed and opened for water exchange between the ocean and estuary in April 1994.

Urban developments proposed adjacent to the Channel have been assessed separately by the EPA. The conditions set on these developments are not being reviewed here.

2.9.2 Dredging activities associated with construction

This condition required the proponent to prepare a 'Dredging and Spoil Disposal Management Plan'. It was agreed that this requirement could be met within a four stage plan.

Stage 1 - Clearing of the dunes along the Dawesville Channel alignment, prior to the construction of the ocean training walls. This was submitted to the EPA in January 1992 and found to be environmentally acceptable.

Stage 2 - Spoil disposal associated with the dryland excavation of the channel, using conventional land based earthmoving vehicles, and spoil generated through dewatering activities. This plan was submitted to the EPA in March 1992 and found to be environmentally acceptable.

Stage 3 - Dredge spoil disposal associated with reclamation of part of the Harvey Estuary. In 1988 following assessment of the Stage 2 ERMP, the EPA determined that a total area of 10 hectares was allowed to be reclaimed from the estuary. In January 1992 the Department of Marine and Harbours submitted a letter to the Environmental Protection Authority requesting permission for an additional 26 hectares of estuary reclamation, resulting in a total of 36 hectares of reclamation. This request was later amended to a total area 25 hectares.

This proposal was assessed under Section 46 of the Environmental Protection Act as a change to an existing environmental condition (Condition 7). Following completion of this assessment in August 1992, it was concluded that the additional area of 15 hectares was environmentally acceptable (EPA Bulletin 640).

In August 1993 the Department of Marine and Harbours submitted Stage 3 of the Dredging and Spoil Disposal Management Plan. This was considered to be environmentally acceptable, subject to the regular monitoring of adjacent estuary water quality during dewatering.

Stage 4 - This stage is proposed to address on-going maintenance dredging and spoil disposal associated with the sand by-pass system at the ocean (west) end of the channel, and maintenance dredging of the channel as required.

2.9.3 Mosquito management following construction

A regional strategy for mosquito management in the Peel — Harvey area has been prepared and a 'Contiguous Local Authority Group' known as CLAG has been formed. This includes representatives from the Shires of Waroona, Murray, Rockingham and City of Mandurah. The Group meets on as 'as needs' basis. Other CLAG groups have also been formed for the Leschenault area and the eastern metropolitan area. A 'Mosquito Control Advisory Committee' has also been formed, which is chaired by the Health Department. This Committee monitors the activities of the CLAG groups, and provides advice, support and funding when required.

It is anticipated that the CLAG for Mandurah will continue to meet following construction of the channel, and take action regarding mosquito management when and where appropriate.

2.9.4 Environmental monitoring and management

The environmental condition requires the preparation of an environmental monitoring and management programme to include essential baseline monitoring prior to construction commencing, construction stage impacts, and operational and long term monitoring in stages, prior to construction.

Responsibility for waterway monitoring rests with the Waterways Commission. Water quality monitoring continues to be undertaken by staff of the Waterways Commission.

The EPA is aware that the Department of Transport has initiated the following monitoring programmes :

- hydrographic monitoring at estuary entrance of the channel;
- tide regimes through the installation of gauges at ocean entrance of the channel in addition to those already in the estuary;
- current hydrodynamic regime modelling at two sites: at the Dawesville Channel, and Mandurah Inlet Channel (traffic bridge); and
- monitoring to verify impacts associated with more frequent inundation of low lying areas adjacent to the inlet and estuary, in association with the Water Authority of Western Australia specifically in relation to the monitoring of monitoring of drains, and the Department of Conservation and Land Management in relation to the potential impact on waterbird populations and their habitats.

These studies are on-going.

The EPA is also aware of the following studies also being undertaken :

- groundwater levels before, during and after construction of the channel;

- blast monitoring (during construction);
- dust control measures as a result of large areas of land being cleared of vegetation during construction;
- survey and monitoring of the nearshore marine environment, including monitoring of water quality, and habitat mapping on a seasonal basis from the present and continuing for two years post construction;
- monitoring of water quality within the estuary during reclamation associated with dredge spoil disposal at the eastern end of the channel, in consultation with officers of the Peel Inlet Management Authority; and
- physical changes to the ocean beaches north and south of the channel (summer and winter monitoring).

2.9.5 Likely post-construction impacts

Potential effects of the Dawesville Channel identified within the EPA's original assessment report in 1988 (Bulletin 363) include:

- the establishment of daily tidal exchange of water within the estuarine waterbody;
- a reduction in stratification (or layering) of fresh and saline water within the estuary and inlet;
- changed salinity regime in the estuary to more resemble the marine environment, which is likely to prevent the germination of Nodularia, but will increase the potential growth of macroalgae within the waterways;
- increased flooding of low lying land adjacent to the inlet and estuary; and
- increased mosquito numbers as a result of increased flooding of low lying areas adjacent to the inlet and estuary, creating inter-tidal pools.

Changes to macroalgal biomass following construction of the channel are difficult to quantify at present, however, on-going monitoring work undertaken by the Waterways Commission following construction of the Channel will help to determine the extent of impact on water quality within the inlet and estuary, particularly in relation to macroalgal weed growth and accumulation.

The Health Department is regularly monitoring numbers and types of mosquitos within the area, and is undertaking research to minimise potential impacts. As stated in Section 2.9.3, this work will continue following construction of the channel.

The Department of Transport, with assistance from the Water Authority of Western Australia, is also monitoring low lying land adjacent to the inlet and estuary to determine the extent of the increased tide. In order to inform members of the public of this potential impact, a pamphlet has prepared by the department on the potential impact of the Dawesville Channel on water levels in the Peel — Harvey estuarine system. The Waterways Commission has also prepared pamphlets on 'Managing the Impacts' of the Dawesville Channel.

Copies of pamphlets which identify potential impacts and their management are available at the Department of Environmental Protection, Department of Transport and Waterways Commission.

2.10 Weed harvesting within the Peel — Harvey waterways

Mechanical weed harvesting has been undertaken on a regular basis within the Peel Inlet by the Peel Inlet Management Authority since 1982. Efforts to control weed accumulation are concentrated on areas such as Novara and Coodanup where weed is washed ashore by prevailing winds and builds up to a degree which causes a nuisance to nearby residents, particularly during late summer months. Weed harvesting generally takes place on an 'as needs' basis.

Two types of harvesting take place. Front-end loaders are used to scrape off weed accumulated on the beach and to a depth of approximately five centimetres. Weed harvesters are used in water between 0.5 to one metre in depth. Weed accumulated by the harvesters is dumped on floating barges nearby, where it is transported to disposal sites within the City of Mandurah.

2.11 Peel — Harvey Region Park concept

The Department of Planning and Urban Development is currently co-ordinating a study to develop a plan for the establishment, management and use of a proposed Peel-Harvey Region Park. The study area includes the Peel-Harvey Estuary, and the lower portions of the Serpentine, Murray and Harvey Rivers and adjacent land.

Objectives of the plan include defining boundaries of the Park, establishing preferred land and water uses, establishing management arrangements to provide for the preferred uses and adequate protection, and establishment of guidelines for subsequent management. As part of this strategy, the plan has taken into consideration System 6 Recommendations (1983) located within the area and the Peel Inlet Management Authority's recommendations contained within the Peel Inlet Management Programme (1992).

The plan has had input from a steering committee including representatives of the Shires of Waroona, Boddington and Murray, the City of Mandurah, and key Government departments, a Community Consultative Committee and a Technical Committee. A draft Plan was completed in 1992, and open for a five-month public comment period, ending in June 1993. These comments are currently under review by the Department of Planning and Urban Development. One expected outcome of implementation of the final plan is likely to be a recommendation to establish a Peel Region Park.

3. Review of environmental conditions

Over recent years a need to review the Conditions has been considered necessary by officers of the Waterways Commission, Department of Marine and Harbours (now Department of Transport) and the WA Department of Agriculture, (on behalf of the proponent Ministers) as many of the Conditions are viewed as either outdated or no longer appropriate.

A formal request to undertake this review of the conditions was received by the Minister for the Environment in December 1993. In response to this request, the EPA initiated an investigation into the status of the environmental conditions under Section 46 of the Environmental Protection Act (1986).

The EPA also received a document prepared by senior officers of the Department of Transport and Agriculture and the Waterways on behalf of the proponent Ministers entitled 'Peel — Harvey Management Programme - Review of Peel — Harvey Environmental Conditions and Management Commitments'. A copy of this review document is included as Part 2 of this report. This document details work undertaken by the proponents towards implementation of the Conditions since they were originally imposed. It also includes suggestions for changes to the Conditions, and suggestions for future progress of the conditions.

4. Environmental Protection Authority assessment of the review of environmental conditions

As discussed in the front of this report, the EPA believes interested members of the public should be invited to comment on the review prior to the EPA commencing its assessment. A four week public comment period has been set.

Following consideration of issues raised in public submissions, the EPA will undertake an assessment of the conditions under Section 46 of the Environmental Protection Act (1986).

Following this assessment, the EPA will report and make recommendation to the Minister for the Environment in the form of an assessment report. A copy of this assessment report will be forwarded to all groups and individuals making a submission on this report.

5. Conclusion

It is anticipated that at the end of this assessment process the Environmental Conditions will be reviewed and changed where necessary to reflect the on-going and sustainable management requirements of the estuary.

The EPA acknowledges that considerable work has been undertaken by the proponents to meet the intent of the conditions. The EPA recognises that since the original assessment of the Stage 2 ERMP the nature of catchment management has evolved significantly, and that certain conditions may no longer be relevant. The proponent's request to have certain conditions deleted or changed will be given due consideration.

The EPA endorses the use of 'best management' practices as part of catchment management, including management of fertilizer application rates and control of point sources of pollution.

The EPA acknowledges that the departments carrying out the management of the catchment have now collected considerable data across a wide range of ecological parameters. The suggestion to broaden the criteria used to measure the "biological health" of the estuary (Part 2 of this Bulletin, p3) is consistent with the EPA's desire to establish appropriate measurable criteria.

6. References

Davis, J. A. & Rolls, S. W. *A baseline Biological Monitoring Programme for the Urban Wetlands of the Swan Coastal Plain, Western Australia.* Environmental Protection Authority Bulletin 265, April 1987. Perth, Western Australia.

Environmental Protection Authority, 1985. Peel Inlet and Harvey Estuary Management Strategy: Report and Recommendations by the Environmental Protection Authority, Assessment of Stage 1. Department of Conservation and Environment Bulletin No. 243, December 1985. Perth, Western Australia.

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George, P. R., and Bradby, Keith, 1993. The Peel-Harvey Catchment Management programme. *Fertilizer Research,* 36. P185-192.

Hodgkin, E. P., Black, R. E., Birch, P. B. and Hillman, Karen. 1985. The Peel-Harvey Estuarine System: Proposal for management. Department of Conservation and Environment, Report No. 14. Perth, Western Australia.

Kinhill Engineers, 1988. Peel Inlet and Harvey Estuary Management Strategy: Environmental Review and Management Programme - Stage 2. Department of Agriculture and Department of Marine and Harbours, Perth, Western Australia.

Peel-Harvey Study Group, 1985. Peel Inlet and Harvey Estuary Management Strategy: Environmental Review and Management Programme - Stage 1.

Appendix 1

Environmental conditions

MINISTER FOR ENVIRONMENT

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED (PURSUANT TO THE PROVISIONS OF THE ENVIRONMENTAL PROTECTION ACT 1986)

PEEL INLET-HARVEY ESTUARY MANAGEMENT STRATEGY - STAGE 2

MINISTER FOR TRANSPORT
MINISTER FOR AGRICULTURE
MINISTER FOR WATERWAYS

This proposal may be implemented subject to the following conditions:

1. The proponents shall adhere to the proposal as assessed by the Environmental Protection Authority and shall fulfil the commitments made and listed in Appendix 2 of Environmental Protection Authority Bulletin 363, as amended (copy of commitments attached).

2. The proponents shall develop proposals for control of phosphorus through catchment management, to the satisfaction of the Environmental Protection Authority, and shall implement them as rapidly as possible so that, in conjunction with the Dawesville Channel, the following objective is met:

   . the Peel-Harvey System becomes clean, healthy and resilient.

   To achieve this objective, the following interim targets should be used:

   (1) annual phosphorus input to the system shall not exceed 85 tonnes in more than four years out of ten (on average) and shall not exceed 165 tonnes in more than one year out of ten (on average). [These are based on 60 and 90 percentile loads]; and

   (2) average phosphorus concentration in estuary water shall not exceed 0.2 milligrams per litre in nine years out of ten (on average).

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-4 JAN 1988

7th Floor, May Holman Centre,
Phone (09) 325 4133

These target figures shall be reviewed by the Environmental Protection Authority after 3 years or sooner if environmental conditions dictate, in the light of measured performance of the System and may subsequently be varied by the Environmental Protection Authority.

3. The proponents shall jointly prepare an Environmental Protection Policy for the Peel-Harvey catchment in consultation with such persons and agencies as Government may specify, to the satisfaction of the Environmental Protection Authority, in accordance with the objective and targets specified in Condition 2 above. The target date for the Draft Policy (under Section 26 of the Environmental Protection Act 1986) is 31 December 1989.

4. The proponents shall develop in consultation with such persons and agencies as Government may specify, an integrated catchment management plan designed to meet the objective and targets specified in Condition 2 above, to the satisfaction of the Environmental Protection Authority, and which shall be in accordance with the principles to be developed in the Environmental Protection Policy for the area pursuant to Condition 3. The target date for the implementation of the integrated catchment management plan shall be 31 December 1990.

5. The proponents shall ensure that the moratorium on clearing and drainage in the Peel-Harvey coastal plain catchment proposed in the Stage 2 Environmental Review and Management Programme (Commitment 3.6) continues until the Minister for Environment is satisfied that these activities would be environmentally acceptable.

6. Relevant decision-making authorities shall ensure that all developments within 2 kilometres of the Peel-Harvey Estuary System (as defined in the Estuarine and Marine Advisory Committee Report to the Environmental Protection Authority, Department of Conservation and Environment Bulletin 88, March 1981.) include appropriate nutrient-attenuating waste disposal systems and management practices, to the satisfaction of the Environmental Protection Authority.

7. Prior to construction, a dredging and spoil disposal management plan for the Dawesville Channel shall be prepared by the proponents, to the satisfaction of the Environmental Protection Authority. Dredging not already forming part of the proposals in the Stage 2 Environmental Review and Management Programme shall be the subject of separate assessment by the Environmental Protection Authority.

8. The proponents shall ensure that weed harvesting and control is continued and increased as necessary to manage the expected initial increase in the occurrence of nuisance macroalgae.

9. Decisions on developments which may release phosphorus or nitrogen to the environment in the Peel-Harvey Estuary area and coastal plain catchment area should be conservative until the new assimilative capacity of the Peel-Harvey Estuary System is determined and the effects of the management elements have been measured or are being managed. To this end, such proposals for development in these areas shall be referred to the Environmental Protection Authority for assessment. These developments include new and expansion of existing intensive horticultural and intensive animal industries.

10. The Peel-Harvey regional park concept, as originally proposed in the System 6 Redbook report (Conservation Reserves for Western Australia: The Darling System - System 6, Department of Conservation and Environment Report 13, Parts I and II, October 1983.) shall be implemented within such time as to be determined by the Minister for Environment.

11. If the Dawesville Channel is constructed, the proponents shall be responsible for ensuring that mosquito management is effective and is carried out in an environmentally acceptable manner, to the satisfaction of the Minister for Environment and the Minister for Health.

12. The proponents shall be jointly responsible for the environmental aspects of:

    (1) the construction, operation, monitoring and maintenance of the Dawesville Channel and its impacts within the estuaries and within the immediate marine environment;

    (2) the management and required monitoring of the catchment, and collection of data necessary for the development of the integrated catchment management plan for the Peel-Harvey catchment; and

    (3) all in-estuary monitoring and management, including weed harvesting.

    All of the above shall be carried out to the satisfaction of the Environmental Protection Authority.

13. Prior to the construction of the Dawesville Channel, the proponents shall prepare in stages, a monitoring and management programme, to the satisfaction of the Environmental Protection Authority. This programme shall include:

    (1) essential additional baseline monitoring required to be in place as soon as possible and prior to construction commencing;

(2) construction stage impacts and monitoring, prior to construction; and

(3) operational and long-term monitoring, in stages, to be determined by the Environmental Protection Authority.

Barry Hodge, MLA
MINISTER FOR ENVIRONMENT

14. Proposals which may release nitrogen or phosphorus to the environment shall not be referred to the Environmental Protection Authority provided that they are consistent with the draft Statement of Planning Policy for the Peel-Harvey Coastal Catchment. Proposals not consistent with the draft Statement of Planning Policy for the Peel-Harvey Coastal Catchment shall be referred to the Environmental Protection Authority.

This Condition will apply to the final Statement of Planning Policy for the Peel-Harvey Coastal Catchment when it is gazetted.

Bob Pearce, MLA
MINISTER FOR THE ENVIRONMENT

2 OCT 1991

MANAGEMENT COMMITMENTS MADE BY THE PROPONENTS

The following list has been amended by the EPA and accepted by the proponents to reflect the 'whole of Government approach' which is essential for management of this proposal.

1. DAWESVILLE CHANNEL

1.1 The proponents will conduct a detailed survey to locate, assess and offer protection to Aboriginal sites and heritage.

1.2 During construction of the Dawesville Channel, the proponents will ensure the continuity of road access, power supply, communications, and water and sewerage services that require relocation, and will minimize dust and noise impacts upon nearby residential areas.

1.3 Spoil from the excavated channel will be used in redeveloping the fill areas as a stable and varied landscape, reflecting naturally occurring topography elsewhere on the coastal strip.

1.4 The proponents will manage spoil disposal to minimize disturbance to important land elements, including coastal dunes, tree belts along Old Coast Road and near the estuary foreshore. Spoil disposed of adjacent to the undisturbed coastal dunes will be contoured to co-ordinate with natural dune topography in order to minimize the potential for erosion.

1.5 The land area used to dispose of excavated material will be contoured to facilitate possible future development into a prime residential and holiday area. Views from existing residences near the estuary will be retained, taking into consideration that these views may have been ultimately reduced by foreshore development and landscaping, irrespective of the proposed channel development.

1.6 Littoral sand drift northwards along the ocean coast will be mechanically bypassed beyond the channel entrance, to minimize siltation within the channel and to avoid adverse effects on beaches to the north and south.

1.7 The Dawesville Channel will be maintained as a navigable waterway, although, as with the existing Mandurah Channel, sea conditions at the ocean entrance may frequently preclude its use by small boats.

1.8 The estuary will be closely monitored to evaluate the management strategy's success in reducing the algal nuisance and to enable the development of appropriate management strategies to mitigate any deleterious effects that may occur. Current and proposed future monitoring studies in the estuary are described in Section 13 of the ERMP and Section 11 of the EPA assessment report.

2. CONTROL OF WEED ACCUMULATIONS

2.1 Weed harvesting will be continued most likely at an increased rate, until the weed nuisance in the estuary is successfully reduced.

2.2 Possible methods of improving the efficiency of harvesting operations, and the possible use of algicides to control weed growth, will be evaluated by the proponents and implemented if shown to be practicable.

2.3 The Peel Inlet Management Authority will continue the existing programme of shoreline management and will rehabilitate areas where weed accumulations or harvesting operations cause excessive retreat of the shoreline.

3. CATCHMENT MANAGEMENT

3.1 The proponents will continue to provide advice to farmers on fertilizer requirements, based on accurate assessment by paddock-specific soil tests.

3.2 The proponents will encourage further development and use of individual-nutrient fertilizers, and will undertake detailed investigations of ways to overcome existing economic constraints to their production and use.

3.3 The proponents will ensure that large-scale field trials are carried out to ascertain the technical and economic feasibility of converting use of sandy soils from agriculture to forestry Private enterprise involvement in these studies will be encouraged.

3.4 The EPA and the Department of Agriculture will continue to provide advice to producers to define and implement practicable and cost-effective waste management strategies for control of point sources of phosphorus.

3.5 The Department of Agriculture will coordinate the preparation and implementation of a detailed catchment management plan aimed at reducing phosphorus losses to the estuary to less than 85 t/a in a 60 percentile year with minimal economic or social disruption to the catchment community

3.6 The proponents will implement a moratorium on further clearing and drainage in the catchment, pending determination of the success of the catchment management plan in reducing phosphorus losses from existing cleared land.

3.7 The success of catchment management measures in reducing phosphorus losses to the estuary will be monitored by the proponents and audited by the EPA. The social and economic effects of catchment management measures upon the catchment community will be closely monitored by the proponents. Current and proposed future monitoring studies are described in Section 13 of the ERMP and in Section 11 of the EPA assessment report. The catchment management plan will be regularly reviewed by the EPA.

WESTERN AUSTRALIA

MINISTER FOR THE ENVIRONMENT

STATEMENT TO AMEND CONDITIONS APPLYING TO A PROPOSAL (PURSUANT TO THE PROVISIONS OF SECTION 46 OF THE ENVIRONMENTAL PROTECTION ACT 1986)

PROPOSAL :	PEEL INLET - HARVEY ESTUARY MANAGEMENT STRATEGY, STAGE 2 (010/701)
CURRENT PROPONENT :	MINISTER FOR TRANSPORT MINISTER FOR AGRICULTURE MINISTER FOR WATERWAYS
CONDITIONS SET ON :	3 JANUARY 1989
CONDITIONS AMENDED ON :	2 OCTOBER 1991

Condition 1 is amended to read as follows:

1A Proponent Commitments

In implementing the proposal, including the amendments reported on in Environmental Protection Authority Bulletins 543 and 640, the proponent shall fulfil the commitments (which are not inconsistent with the conditions or procedures contained in this statement) made and listed in Appendix 2 of Environmental Protection Authority Bulletin 363, as amended, and subsequently, including the Department of Marine and Harbours letter of 24 February 1992 on reclamation associated with the Dawesville Channel. (A copy of the commitments is attached).

1B Implementation

Subject to the conditions in this amended statement, the manner of detailed implementation of the proposal shall conform in substance with that set out in any designs, specifications, plans or other technical material submitted by the proponent to the Environmental Protection Authority with the proposal. Where, in the course of that detailed implementation, the proponent seeks to change those designs, specifications, plans or other technical material in any way that the Minister for the Environment determines on the advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

The following conditions and procedure are inserted following condition 14 (which resulted from the amendment of 2 October 1991):

15 Estuary Reclamation (Dawesville Channel)

15-1 The proponent shall ensure that the total area of estuary reclaimed in association with the

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construction of the Dawesville Channel does not exceed 25 hectares (ha). Five hectares of this land may be granted to Wannunup Development Nominees Pty Ltd as part of an existing Land Exchange Agreement with the State Government. The remaining 20 hectares shall be available for public use. Five hectares of this land can include part of the canal waterway, to be available for public use.

15-2 The proponent shall endeavour to reduce the area of reclamation associated with the construction of the Dawesville Channel specified in condition 15-1 by increasing the height of the spoil, consistent with the recreational use of the reclaimed land, to the requirements of the Environmental Protection Authority on advice of the Peel Inlet Management Authority.

16 Foreshore Vegetation (Dawesville Channel)

Foreshore vegetation in and near the area of construction of the Dawesville Channel should be retained wherever possible.

16-1 The proponent shall ensure that the foreshore vegetation in and near the area of construction of the Dawesville Channel is retained wherever possible. Those stands of Casuarina, Paperbark and Tuart which are located on/along the existing foreshore and outside the proposed alignment of the channel should be retained, to the requirements of the Environmental Protection Authority on advice of the Peel Inlet Management Authority.

17 Compliance Auditing

In order to ensure that environmental conditions and commitments are met, an audit system is required.

17-1 The proponent shall prepare periodic "Progress and Compliance Reports", to help verify the environmental performance of the Peel Inlet - Harvey Estuary Management Strategy, Stage 2, in consultation with the Environmental Protection Authority.

Procedure

The Environmental Protection Authority is responsible for verifying compliance with the conditions contained in this statement, with the exception of conditions stating that the proponent shall meet the requirements of either the Minister for the Environment or any other government agency.

If the Environmental Protection Authority, other government agency or proponent is in dispute concerning compliance with the conditions contained in this statement, that dispute will be determined by the Minister for the Environment.

Note

Conditions 15 and 16 relate to the construction of the Dawesville Channel and should be audited in association with condition 7.

K. J. Minson

Kevin Minson MLA
MINISTER FOR THE ENVIRONMENT

16 APR 1993

PART 2 - Peel-Harvey Management Program - Review of Peel-Harvey Environmental Conditions and Management Commitments

Prepared on behalf of the proponent Ministers by officers of the Department of Transport, Agriculture Department and Waterways Commission

WATERWAYS COMMISSION

PROTECTING OUR WATERWA

Our Ref: RP.83.025
Your Ref:
Enquiries: Robert Atkins

Chairman
Environmental Protection Authority
141 St George's Tce. PERTH 6000

ATTENTION Ms E. Bunbury

PEEL HARVEY ENVIRONMENTAL CONDITIONS

On behalf of the proponent Ministers I wish to submit a review of the Peel Harvey Management Strategy Stage II Environmental Conditions.

The review was prepared by the project managers group and the senior officer group. Commensurate with the Authority's request following its assessment of an earlier draft, the review has been written to suit public circulation. An electronic copy is available should you require it.

If you have any enquires regarding this matter, please contact Mr Robert Atkins (Director, Environmental Investigations), Waterways Commission on 327 9738. In all correspondence on this matter, please quote the above Waterways Commission reference number.

Bruce Hamilton

BRUCE HAMILTON RJA
EXECUTIVE DIRECTOR

71908

21 December, 1993

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Peel-Harvey Management Program

Review of Peel-Harvey Environmental Conditions and Management Commitments

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The accompanying document summarises the status of the Environmental Conditions and Management Commitments set for the implementation of the Peel-Harvey Management Program. This document represents an assessment by the proponents of the progress made in meeting those conditions since January 1989, when they were set. It finds the intent of all conditions has either been met, or is in the process of being met.

SPECIFIC PROGRAMS

Dawesville Channel

The decision to proceed with the Dawesville Channel component of the management program was initially deferred but is now well underway with an anticipated opening in the autumn of 1994. Planning, environmental approval and implementation of associated monitoring and management strategies for conditions pre and post channel opening are largely complete and can be implemented following the provision of funding.

Predicted adverse environmental and social impacts can be minimised through additional base-line monitoring before the channel opens, strategic monitoring and management after the channel is opened, and a greater recognition of community concerns. Adverse impacts include increased mosquito nuisance and subsequent increase in health risks through Ross River virus. There may be increased macroalgal nuisance, particularly in the Harvey Estuary and lower riverine reaches of the Serpentine and Murray Rivers, and some localized flooding of low lying land.

There will be profound changes in the character of the estuary with changes in the type, occurrence and size of commercial and non-commercial animals.

Catchment

Implementation of the catchment component of the Management Plan is continuing. A range of planning initiatives investigations and management strategies are currently being undertaken by various State and Local Government agencies, tertiary institutions, LCDCs, landholder groups and individuals. These are all aimed at improving long term sustainable landuse.

The process of land use change is now largely managed by the Department of Planning and Urban Development who have developed a Statement of Planning Policy for the catchment. The EPA has participated in the Management Program through policy development, pollution control, environmental assessment of small and large development proposals, and through review of regional and local planning strategies.

Successful implementation of catchment initiatives required a shift in community attitude toward local ownership of the problem and acceptance of responsibility. Local landholders have now been recognised as an essential part of the management process and are beginning to provide leadership in the development and implementation of solutions.

Monitoring

Harvesting of macroalgae has proceeded to plan. Audit monitoring reports for 1990, 1991 and 1992 have been prepared.

GENERAL

The Peel - Harvey program was the first use in WA of formal Environmental Impact Assessment procedures on a wide ranging program affecting a complex range involving engineering, geographic, statutory and social situations. As such, it can be expected that any review will find areas capable of further refinement.

Where the conditions apply to well defined engineering situations (ie. construction of the Dawesville Channel) it is appropriate that they continue. Formal assessment has proved less appropriate for the catchment - wide components of the program. Considerable flexibility of approach has been needed to implement the program.

The wording of some of the original conditions is now causing difficulties and may put Ministers in technical breach of Ministerial Conditions. This is particularly the case for the six Ministerial Conditions over which the proponents have either little or no decision making authority. Performance of the proponents cannot be judged on matters over which they have no control. Where it has not been possible to meet the specific letter of conditions applicable to the proponents alternative mechanisms have been developed and adopted to ensure that the intent is met.

Additionally, there have been major concerns in the communities of the catchment at the implications of the statutory process itself. Perceived inconsistencies between the Ministerial Conditions and some recent land use changes, along with inappropriate landuses within the catchment which remain unmanaged, have fuelled this scepticism and reduced the credibility of the entire catchment management program. Examples include ongoing confusion over the perceived clearing and drainage "moratorium", the fact that some major point sources have continued unabated till very recently, and the difficulties in providing effective sewerage to urban development.

Many aspects of the current catchment program go beyond the intent of the conditions. While phosphate load reduction remains the core purpose of the program, its operations have broadened significantly and are now directed towards the attainment of sustainable land-use throughout the catchment.

Underpinning the entire Peel-Harvey program are the target phosphorus loadings set in the conditions. While considerable progress has been made in reducing the tonnage of phosphorus entering the system, this review raises a number of questions regarding the validity and relevance of the target loadings. Detailed assessments of the numbers currently used is required, as is the development of broader targets which the community can more readily identify with and act upon.

REVIEW OF ENVIRONMENTAL CONDITIONS

PEEL INLET-HARVEY ESTUARY MANAGEMENT STRATEGY - STAGE 2

MINISTER FOR TRANSPORT
MINISTER FOR AGRICULTURE
MINISTER FOR WATERWAYS

1. *The proponents shall adhere to the proposal as assessed by the Environmental Protection Authority and shall fulfil the commitments made and listed in Appendix 2 of Environmental Protection Authority Bulletin 363, as amended (see copy of commitments).*

STATUS

The proposal is being adhered to in the manner outlined in this document. A list of references which substantiate the statements made is included.

PATHWAYS FOR FURTHER PROGRESS

This document has been prepared to assist the EPA and the general public to assess the progress made, and decide on the future of the program.

2. *The proponents shall develop proposals for control of phosphorus through catchment management, to the satisfaction of the Environmental Protection Authority, and shall implement them as rapidly as possible so that, in conjunction with the Dawesville Channel, the following objective is met: the Peel-Harvey System is clean, healthy and resilient.*

   To achieve this objective, the following interim targets should be used:

   (1) annual phosphorus input to the system shall not exceed 85 tonnes in more than four years out of ten (on average) and shall not exceed 165 tonnes in more than one year out of ten (on average). [These are based on 60 and 90 percentile loads]; and

   (2) average phosphorus concentration in estuary water shall not exceed 0.2 milligrams per litre in nine years out of ten (on average).

   These target figures shall be reviewed by the Environmental Protection Authority after three years or sooner if environmental conditions dictate, in the light of measured performance of the system, and may subsequently be varied by the Environmental Protection Authority.

STATUS

The development and implementation of proposals for the control of phosphorus have been underway for some years. They are discussed under Condition 4, and are set out in detail in documents prepared by the Department of Agriculture.

Audit data for 1990, 1991 and 1992 are complete. The figure 0.02 mg/L has been used in the Environmental Protection Policy.

PROBLEMS

Catchment targets

The probabilistic nature of the catchment water quality targets mean that it is only possible to assess the success of catchment management initiatives by comparing current data with the historical record. However, total load data are only available in summary form in the Stage II ERMP (for the period 1977-1987) and in the subsequent EPA assessment report (for the period 1977-1988).

A recorded methodology and complete data set for the period 1980-89 is not presently available. Estimation of nutrient loads is a complex process involving the computation of data from both representative nutrient samples and water flow volume. The process often requires extensive modelling to replace data missing due to failure of the flow loggers, or inability to collect nutrient samples during the peak of major flow events, or to uses of different methodologies (Weaver 1993). It has been shown that failure to collect representative samples over peak flow periods may cause a major underestimation of nutrient loads (Richards and Holloway, 1988, Ellis, 1989).

For most sub-catchments the proponents have been unable to determine how these difficulties were overcome for data collected between 1980-1989. Annual audit of nutrient export to the estuary has been conducted by the Waterways Commission since mid 1990, and reporting of the 1990, 1991, and 1992 data is complete. This recent data is, for the reasons outlined above, not statistically comparable with the data upon which the EPA targets were based. Therefore it is not currently possible for the proponents to provide the EPA with an assessment of the success or otherwise of the catchment management strategy. Additionally, the validity of the current targets cannot be tested.

Notwithstanding these difficulties, catchment management since 1990 is known to have directly reduced the tonnage of phosphorus entering the waterways of the Peel-Harvey system by over 35 tonnes, and additional significant but unmeasureable reductions from diffuse sources are known to have also occurred. This corresponds with Waterways Commission catchment audit data which is showing a noticeable reduction in the flow weighted phosphorus concentrations of the three major rivers. This trend while not yet statistically verifiable, also corresponds with the data on raw phosphorus concentrations in the rivers.

Estuarine targets

It is the proponents understanding that the estuarine water quality target of 0.2 mg/L for phosphorus is in fact a typographical error, and was meant to be 0.02 mg/L. Not withstanding this, it has been difficult to determine exactly what is meant by this measure and how it is to be computed.

The use of water quality targets based on phosphorus chemistry (EPA Bulletin 363, 1988) follows work done on deep freshwater lakes in the northern hemisphere (Vollenweider, 1968, 1976). The proponents question the applicability of this approach to a shallow poorly-flushed estuary, where large macro-algal populations are also part of the phosphorus cycle. This approach will become even less applicable as the system becomes more marine following the construction of the Dawesville Channel, with the likelihood of increased macroalgal biomass down the length of Harvey Estuary.

While there are some references in the scientific literature on the practical implementation of Vollenweider theory for waterways in the northern hemisphere, this approach has not been widely used elsewhere in Australia.

Current estimates of estuarine water quality are based on monitoring programs conducted by the Waterways Commission over the last ten to twelve years. Both physical and chemical variables have been measured, and have shown that poor water quality events are highly seasonal and

generally relate to freshwater inputs during a winter. Trends in phosphorus concentrations in the estuary are not yet discernible.

PATHWAYS FOR FURTHER PROGRESS

The use of legal targets based on phosphorus alone, particularly when the basis for their calculation is not well documented or understood, has caused difficulties in the securing of widespread public support for the program.

The EPA may wish to assist in the documentation and interpretation of the historical catchment audit record (pre 1990), and with the establishment of practical targets for the program.

Amended targets may include criteria in addition to phosphorus levels such as estuarine oxygen status, plant productivity, presence of toxins (algal toxins), and other more visible measures of biological health readily understood by the general public, such as water clarity, silt loads, and water animals.

A broader approach was used by the EPA for Princess Royal Harbour where estuarine targets include measures of macroalgal biomass, levels of bacteria, and limits on toxic materials (in this case heavy metals).

CHANGES NEEDED

The current condition needs re-assessment. It may be appropriate for the proponents, or stakeholders, to prepare an amended management program, with readily measurable targets, providing regular feed back could be provided by the EPA during such a review.

3.	*The proponents shall jointly prepare an Environmental Protection Policy for the Peel-Harvey catchment in consultation with such persons and agencies as Government may specify, to the satisfaction of the Environmental Protection Authority, in accordance with the objective and targets specified in Condition 2 above. The target date for the Draft Policy (under Section 26 of the Environmental Protection Act 1986) is 31 December 1989.*

STATUS

A draft Environmental Protection Policy was prepared by the Department of Agriculture after consultation with local government authorities and landholder groups in the catchment. This draft was handed to the EPA in November 1990. The draft EPP was released for formal public comment by the Minister for the Environment in March 1992. After adjustments following the public comment period the EPP became law in December of 1992.

During development of the "first draft" Environmental Protection Policy for the Peel-Harvey coastal catchment in early 1990 it soon became apparent that planning controls would be better implemented through the existing statutory planning process.

A mechanism was then developed so that guidelines affecting the planning process would be "delivered" to local government through existing planning procedures (via a Statement of Planning Policy under Section 5AA of the Planning Act). This arrangement gives local government a greater level of flexibility to deal with local situations. The Statement of Planning Policy was gazetted on 15 February 1991 after considerable local government involvement.

PROBLEMS

There were problems encountered in preparing the document, but these have now been largely overcome. The current EPP is one of three umbrella documents (the Statement of Planning Policy, the Environmental Protection Policy, and the original Environmental Conditions) prepared to provide legal guidance on land management in the catchment. There is some confusion on the roles and future of these three legal guidelines.

PATHWAYS FOR FURTHER PROGRESS

Detailed supporting guidelines enabling the incorporation of the requirements of the Peel-Harvey SPP into Local Government Authority planning schemes would clarify some of the remaining legal confusion. These have now been prepared for two of the Shires in the catchment and, to date, formally adopted by one of those Shires.. A mechanism which regularly monitors adherence to the SPP by involved agencies would provide valued information on its effectiveness.

The boundary of the EPP requires re-assessment in the light of comment from local government and agencies as to how appropriate it is. For example some areas of foothills are subject to the conditions, while others are not, and this is seen by some shires as both inequitable and impractical. Additionally, as our knowledge of phosphorus sources has improved, the desirability of working to water catchment boundaries and not administrative boundaries has become more apparent.

CHANGES NEEDED

The current condition has been met, and could be cleared. The boundary of the EPP requires re-assessment.

4. *The proponents shall develop in consultation with such persons and agencies as Government may specify, an integrated catchment management plan designed to meet the objective and targets specified in Condition 2 above, to the satisfaction of the Environmental Protection Authority, and which shall be in accordance with the principles to be developed in the Environmental Protection Policy for the area pursuant to Condition 3. The target date for the implementation of the integrated catchment management plan shall be 31 December 1990.*

STATUS

A draft catchment management plan was prepared by the Department of Agriculture and sent by the Minister for Agriculture to the Minister for the Environment by the target date. A revised draft is now in preparation. This is a succinct document outlining an approach to catchment management in which changes to current land management practices are fostered by raised awareness with a collaborative approach being adopted by landholders and government agencies.

Changes in land use, through the statutory planning side of catchment management, is now guided by the Statement of Planning Policy and through the development by local government of environmentally acceptable Rural Strategies, and modification of Town Planning Schemes. The Department of Agriculture has given considerable assistance in this process in the past 3 years.

PROBLEMS

Initial concepts of an "integrated catchment management plan" seem to have been of a formal single document with statutory sections. In the opinion of those undertaking the catchment management program this would have been unacceptable to the people of the catchment, caused social

disruption, and damaged the adoption of catchment management measures. The reaction of landholders and relevant community groups to the ERMP Stage II is one firm indication of this.

Reliable monitoring data, which pinpoint actual sources of phosphorus, has been lacking. Development of a precise catchment management plan, in the absence of this information, would have been meaningless. Since 1990 by the Department of Agriculture, and in some areas members of the general community, have conducted an investigative monitoring program. Much of the information collected has already been used for management purposes, and all the data is now being collated onto a Geographic Information System.

An additional difficulty at the outset of the program was the lack of practical measures to reduce phosphorus loads from existing land uses. The main management tools being written into the current draft of the catchment management plan have largely been developed in the past three years. Some of these are still undergoing final assessment before being recommended for widespread use.

There has also been concern that production of a catchment plan guided by phosphorus alone would not adequately service the range of environmental repair and related issues underway in the catchment, and would further isolate the catchment program from the support it needs to achieve implementation.

It should be noted that the Ministerial Condition calls for the implementation of the catchment management plan to begin on 31 December 1990. A range of catchment management measures had been implemented well before that date, and new measures are continually being developed and implemented. Implementation of catchment management measures is a developing and ongoing process and cannot be prescribed to any set date.

CHANGES NEEDED

This condition could be cleared following EPA endorsement of the approach currently being followed, the progress made, and the documentation prepared. This endorsement needs to recognise that catchment management is an ongoing process which cannot be encapsulated into a single final plan

5. *The proponents shall ensure that the moratorium on clearing and drainage in the Peel-Harvey coastal plain catchment proposed in the Stage 2 Environmental Review and Management Program (Commitment 3.6) continues until the Minister for Environment is satisfied that these activities would be environmentally acceptable.*

STATUS

A range of controls now exist over any new clearing and drainage. These include:

- the provisions of the Statement of Planning Policy issued by the Department of Planning. Particularly relevant are Sections 5.4 and 5.5 which target clearing and drainage generally, Sections 6.1.2 and 6.2.4 which control clearing for other than building sites on residential and rural residential zones, and Section 6.6.3 which controls drainage from proposed new intensive agricultural enterprises.

- regulations adopted under the Soil and Land Conservation Act. Landholders have been required for some time to lodge a Notice of Intent to clear areas above 1ha. They are now also required to lodge a Notice of Intent to drain. These NOI's are assessed by Departmental Officers for potential to cause land degradation, and conditions placed on the proposal if

appropriate. Nutrient loss leading to eutrophication is accepted as land degradation under the Act.

PROBLEMS

No legal mechanisms exist through which it is possible to implement a total moratorium on clearing or drainage, and not all the regulatory mechanisms that do exist are within the legal jurisdiction of the proponents. Additionally, the Ministerial conditions relate to phosphorus loss, not to the broad range of environmental issues relevant to land clearing and drainage.

Management of this difficult issue has followed the lead set by the EPA in its assessment of clearing and drainage issues for urban or special rural developments which have been the subject of formal assessment. In these circumstances clearing and drainage has been allowed where the proponent could demonstrate that nutrient loads would not be increased by the development proposal. This approach has been formalised in the SPP, which received EPA approval.

Proposals for clearing or drainage for agricultural purposes, which are generally assessed under the Soil and Land Conservation Act are also allowed to proceed where the proponent can demonstrate that nutrient loads will not be increased, and that other land degradation issues have been satisfactorily addressed.

Some confusion still exists over the inconsistency between the approach adopted on the ground, with EPA involvement, and the precise wording of this Ministerial Condition. Additionally, clearing and drainage are integral parts of both urban and agricultural development, and inconsistencies also still exist between controls in these areas. Further refinement is required on where the geographic or procedural boundary exists between those assessments conducted under the guidance of the SPP and those conducted under the Soil and Land Conservation Act.

In 1985 an agreement was reached between the EPA and the WA Water Authority that no additional main drains would be installed in the catchment. The Environmental Protection Authority has received for comment some major drain maintenance measures proposed by the Water Authority, and has discussed with the Authority the preparation of a strategy on drain maintenance in the catchment. The level of assessment for these has not yet been set. The proponents will need to be involved in this process.

The same type of formal assessment may be necessary for drainage managed by local government authorities.

PATHWAYS FOR FURTHER PROGRESS

The EPA needs to formally comment on the environmental acceptability of the current control measures.

Drainage management and maintenance needs to be undertaken in the context of catchment water quality targets as set by the EPA.

CHANGES NEEDED

The current condition could be cleared.

6. *Relevant decision-making authorities shall ensure that all developments within 2 kilometres of the Peel-Harvey Estuary System (as defined in Estuarine and Marine Advisory Committee Report to the Environmental Protection Authority, Department of Conservation and Environment Bulletin 88, March 1981) include appropriate nutrient-attenuating waste disposal systems and management practices, to the satisfaction of the Environmental Protection Authority.*

STATUS

These matters are being dealt with by DPUD and EPA through the Statement of Planning Policy.

PROBLEMS

The proponents are not the relevant decision making authorities. This condition is therefore inappropriate.

CHANGES NEEDED

Notwithstanding the above, the SPP does meet this objective, and this condition could be cleared.

7. *Prior to construction, a dredging and spoil disposal management plan for the Dawesville Channel shall be prepared by the proponents, to the satisfaction of the Environmental Protection Authority. Dredging not already forming part of the proposals in the Stage 2 Environmental Review and Management Program shall be the subject of separate assessment by the Environmental Protection Authority.*

STATUS

The Department of Marine and Harbours (DMH) has received approval from the Environmental Protection Authority (EPA) to submit the Dredging and Spoil Disposal Management Plan in four parts as follows:

PART 1 Dealing with the cutting through the dunes to the ocean

PART 2 Spoil disposal and land management plan for the works relating to inshore excavation using conventional land based plant and dewatering for excavation below mean sea level.

PART 3 Dredging spoil disposal plan for the estuary dredging. This plan includes details of the proposed estuary reclamation.

PART 4 Ongoing maintenance dredging and spoil disposal plan relating to the sand bypass dredging and channel maintenance dredging if required.

Parts 1, 2 and 3 have already been submitted and approved by the EPA. Eighty percent (80%) of the land based excavation including all of the ocean entrance, is complete. Estuary dredging commenced in August 1993 and should be completed by December 1993. Approval was obtained from the EPA to increase the amount of estuary reclamation from the 10ha approved in 1988 to a maximum of 25ha. This increase was necessary to accommodate all spoil generated from the estuary dredging and to create additional public open space.

A. .tional dredging is required to construct the proposed public Marina. This proposal has been assessed by the EPA and the assessment report (EPA Bulletin 698) was released in August 1993.

Part 4 will be submitted after the design of the sand bypassing plant is complete in January 1994.

PROBLEMS

The landscape plan has been circulated for comment. It is the intention of DMH to vest the areas of public open space with the local authority for ongoing management and maintenance. DMH have encountered difficulties in pursuing these discussions, particularly in relation to the estuary reclamation, as these areas are subject to a boundary dispute between the City of Mandurah and the Shire of Murray.

The budget allocation for the construction of the Dawesville Channel does not include an amount for landscaping these areas of public open space. It is unlikely that the local authority will accept vesting until such time as the landscape plan has been implemented.

PATHWAYS FOR FURTHER PROGRESS

The landscape plan will be progressed to a detailed design stage and cost estimates prepared. Funding will be sourced to enable the first stage of landscaping to be implemented before the onset of winter 1994.

CHANGES NEEDED

None

8. *The proponents shall ensure that weed harvesting and control is continued and increased as necessary to manage the expected initial increase in the occurrence of nuisance macroalgae.*

STATUS

Three additional macroalgal harvesters and three transport barges have been purchased to add to the existing harvesting fleet in anticipation of increased harvesting requirements. Macroalgal biomass and distribution will be closely monitored by WWC to optimise strategic harvesting effort.

PROBLEMS

Expected changes in macroalgal biomass are extremely difficult to quantify. There may be only modest increases in macroalgal nuisance easily managed under the existing arrangements. There could also be a rapid establishment of macroalgae along the length of Harvey Estuary. This may reduce the effectiveness of flushing improvements gained from the Dawesville Channel, particularly in terms of the availability of nutrients currently held in estuary sediments.

PATHWAYS FOR FURTHER PROGRESS

There will need to be a greater reliance on strategic monitoring of macroalgal biomass so that weed harvesting effort can be optimised. This will minimise the establishment of unmanageable macroalgal biomass within the estuary.

Additional funds will be needed to complete strategic estuarine monitoring and a submission is currently with Government.

Existing operational funds are insufficient for full deployment of new harvesting fleet should this be necessary and additional funds will be requested as necessary.

CHANGES NEEDED

None.

9.	*Decisions on developments which may release phosphorus or nitrogen to the environment in the Peel-Harvey Estuary area and coastal plain catchment area should be conservative until the new assimilative capacity of the Peel-Harvey Estuary System is determined and the effects of the management elements have been measured or are being managed. To this end, such proposals for development in these areas shall be referred to the Environmental Protection Authority for assessment. These developments include new and expansion of existing intensive horticultural and intensive animal industries.*

STATUS

With the later addition of Condition 14 it is no longer mandatory for all decisions on development to be referred to the EPA.

Planning issues are now being dealt with by DPUD and Local Government Authorities through the Statement of Planning Policy, which has largely resolved the mechanisms for control of land use change. Responsibility for environmental planning now largely lies with DPUD and the Local Government Authorities.

A draft Horticultural Strategy has been finalised by the Water Authority, in consultation with the proponents, EPA and DPUD. This document identifies environmentally safe sites for the location of new horticultural enterprises, and identifies areas where formal assessment under the Environmental Protection Act needs to be undertaken.

Furthermore, proposals for intensive animal industries are routinely referred to the EPA.

PROBLEMS

The proponents are not the relevant decision making authorities. This condition is therefore inappropriate.

There has been ongoing community discussion and dissension over the application of the word "conservative". Large-scale urban, special rural, and canal developments have occurred in the catchment since the Ministerial Conditions were set and these developments are often interpreted by the local community as exceeding the definition of "conservative". However each development is subject to scrutiny under the Environmental Protection and Town Planning Acts, and are meant to be "conservative" in their impact on nutrient loads.

Intensive horticulture has come under greater scrutiny through the EPA assessment of new well license applications. However, this process was time consuming and has caused some individual hardship. A draft joint agency policy aimed at resolving and confirming an interim mechanism for controlling the location of horticulture in the catchment has been dropped because of unresolved differences between agencies. The current system remains relatively ad hoc, with the Water Authority referring well license applications to agencies as and when this is deemed necessary.

PATHWAYS FOR FURTHER PROGRESS

EPA support is required in order for the Horticultural Strategy to be finalised and adopted.

As discussed under Condition 2, it may be appropriate for the proponents, or stakeholders, to prepare an amended management program, with readily measurable targets, providing regular feed back could be provided by the EPA during such a review.

Th. is particularly relevant to the assessment and estimation of ecosystem health for the estuary as the system stabilises after the Dawesville Channel is completed.

CHANGES NEEDED

Notwithstanding the above, this condition could be cleared.

10. The Peel-Harvey regional park concept, as originally proposed in the System 6 Redbook report (Conservation Reserves for Western Australia: the Darling System -- System 6, Department of Conservation and Environment Report 13, Parts I and II, October 1983) shall be implemented within such time as to be determined by the Minister for the Environment.

STATUS

The Department of Planning and Urban Development has established a committee process for the development of the Peel Regional Park and a draft strategy document was released in January 1993. The park will provide a framework to enable the long term conservation of the wetland environment around the waterway. It will involve the rationalisation of all reserves and vacant crown land to provide appropriate vesting and management as recommended in the Peel Inlet Management Program 1992. It will also assist in the application of conditions to development to provide for the protection of the estuary.

Two proponents, the Department of Agriculture and the WWC, are represented in the committee structure. Assistance has been given through the Community Catchment Centre in the operation of the community consultative committee for the Regional Park.

PROBLEMS

The proponents are not the relevant decision making authorities. This condition is therefore inappropriate.

It is inappropriate that the development of a Regional Park be linked to the Peel-Harvey management strategy, unless the broader landscape protection and nature conservation goals of a Peel Regional Park were to become operationally linked to both the estuarine and the catchment programs.

PATHWAYS FOR FURTHER PROGRESS

The Regional Park concept is progressing.

CHANGES NEEDED

Notwithstanding the above this condition could be cleared.

11. If the Dawesville Channel is constructed, the proponents shall be responsible for ensuring that mosquito management is effective and is carried out in an environmentally acceptable manner, to the satisfaction of the Minister for Environment and the Minister for Health.

STATUS

A regional strategy for mosquito management has been prepared and a consultative local area group (CLAG) has been formed. The Health Dept is working with the CLAG to manage ongoing issues. This structure can respond to any increased mosquito breeding caused by the Dawesville Channel.

The Health Department and Local Government Authorities have decision making responsibility. WWC is represented within the committee structure.

DMH has completed a more detailed assessment of the expected change to the tidal regime within the Peel Inlet and Harvey Estuary, and the associated changes in inundation patterns on low lying land.

The full report will be made available to the Health Department and other interested agencies. A brochure has also been published for circulation to the general public.

PROBLEMS

There is a degree of uncertainty in the prediction of future mosquito nuisance requiring effective strategic monitoring and management. Additional funding for strategic monitoring and management will be required.

The proponents cannot carry full responsibility for mosquito control in the region, as implied in the wording of this condition.

PATHWAYS FOR FURTHER PROGRESS

The proponent Ministers need to clarify with the Minister for Health the tasks involved and resources required to meet this condition, and the specific targets of the mosquito control program.

CHANGES NEEDED

This condition requires re-wording to reflect the relative role of the various goverment agencies involved in mosquito management in the region. These changes depend on the agreement reached with the Minister for Health.

12. The proponents shall be jointly responsible for the environmental aspects of:
(1) the construction, operation, monitoring and maintenance of the Dawesville Channel and its impacts within the estuaries and within the immediate marine environment.

STATUS

Construction

DMH has instituted a construction impact monitoring program in conjunction with the contractor. This program includes:

- Groundwater levels and quality within a 3km radius of the channel.

- The Water Authority of Western Australia has been engaged to monitor the groundwater within a 1km radius of the channel. Monitoring commenced in early 1992 and will continue for at least 6 months after completion of construction. Where owners of private bores have been inconvenienced the contractor has made alternative arrangements for those owners. This has generally resulted in the contractor paying the excess water account for those affected.

- Blast monitoring - ground water vibration and air blast pressures have been recorded during blasting operations.

- Dust control - several dust control measures have been implemented in order to minimise dust nuisance. This activity is being undertaken in close liaison with officers from the EPA.

- A limited survey of the nearshore marine areas was undertaken to assess the impact of the turbidity plume associated with the dewatering operation.

- Monitoring of the dredging operations within the estuary is being undertaken in accordance with the conditions set by the Waterways Commission.

All activities are being periodically recorded on video with a view to producing a documentary.

Post Construction

Tidal monitoring within the estuary has been underway for the past 15 years and will continue indefinitely after construction of the channel is complete. Construction of an additional tide gauge situated within the channel is complete. In addition 4 tide gauges have been installed within the main drains leading into the Harvey Estuary in order to assess the risk of salt water intrusion.

An information brochure outlining predicted changes to the tidal regime within the Peel Inlet and Harvey Estuary has been circulated. This brochure was prepared by DMH following further numerical modelling studies.

Discussions have been held with the EPA with a view to determining the extent of nearshore water quality monitoring studies required. Monitoring will commence prior to the opening of the channel.

DMH is currently finalising the sand bypassing methodology to be employed at the ocean entrance. Responsibility for sand bypassing will rest with DMH.

Discussions have been held with DOLA and the Centre for Water Research (UWA) to repeat the study of the Estuary using satellite imagery after the channel is completed.

PROBLEMS

A submission is currently being considered by Government for funding to assess or monitor changes in estuarine habitat which may affect birds (many of which are covered by international treaties), peripheral vegetation or animal populations which are important to commercial and recreational groups.

PATHWAYS FOR FURTHER PROGRESS

Additional funding for monitoring is the subject of a submission currently before Government.

CHANGES NEEDED

None

12. The proponents shall be jointly responsible for the environmental aspects of:

(2) the management and required monitoring of the catchment, and collection of data necessary for the development of the integrated catchment management plan for the Peel-Harvey catchment.

STATUS

Catchment bottom-end auditing has been the responsibility of WWC, with co-operation from the Water Authority and the Chemistry Centre of WA. Reporting for 1990, 1991 and 1992 audits are complete and will be published before the end of 1993.

Investigative water quality monitoring has been coordinated through the Community Catchment Centre. The CCC has been conducting intensive investigative monitoring to identify sources of phosphorus, and assist in the development of localised management strategies by landholder groups and local government authorities. Community monitoring initiatives have been supported.

Audit monitoring is an ongoing process, with the investigative monitoring being scaled down as management priorities are established and implemented.

Collection of a data to support catchment management is an ongoing process. The Department of Agriculture is continuing to research and develop techniques for drain modernization, general treeplanting and agroforestry systems, fertilizer and pasture management, effluent management, soil amendment, nutrient filters and other related aspects of improved land management.

PROBLEMS

Historical catchment monitoring data has been difficult to access, and so far has not provided reliable insights into the dynamics of phosphorus movement through the catchment. In the past two years considerable resources have been devoted to providing the essential raw data. Difficulties have been encountered in collating the monitoring information due to the differing work schedules of the various agencies involved in water monitoring in the Catchment (WWC, EPA, WAWA). The WWC program is currently being scaled down because of economic constraints.

Since 1990 the Department of Agriculture, and in some areas members of the general community, have conducted an investigative monitoring program. Results from this have opened numerous opportunities for reduction in phosphorus loads from specific areas, and a number of measures have already been implemented. Data is being collated onto a Geographic Information System, and is being used for ongoing development of the draft Catchment Management Plan (the "Guidebook"). The WADA program has been scaled down, as it had met most of its objectives by the third year of operation.

PATHWAYS FOR FURTHER PROGRESS

Notwithstanding current good inter-agency co-operation, the potential exists for improved co-ordination, collection, storage and documentation of water monitoring data.

Scope also exists for broadening the monitoring program beyond mere assessment of water chemistry. Other indicators of waterway health and biological worth, such as silt loadings, vegetation density, invertebrate life and waterbird usage are worthy of inclusion in future monitoring programs. They may even provide a simplified means of measuring improvements in water system health following implementation of catchment management measures. Their inclusion in a monitoring program would certainly provide relevant feedback to landholders and local government authorities currently engaged in stream rehabilitation for a broader range of objectives than mere improvement in water chemistry.

Collection of other data relevant to the catchment program will continue, but on a reduced scale as many of the techniques developed in recent years are at the implementation stage. Particular emphasis will continue to be given to data on the performance of bauxite residue a a soil amendment, as this techniques has also been subject to EPA assessment.

CHANGES NEEDED

None

12. The proponents shall be jointly responsible for the environmental aspects of:

(3)all in-estuary monitoring and management, including weed harvesting.

All of the above shall be carried out to the satisfaction of the Environmental Protection Authority.

STATUS

Waterways Commission has been responsible for ongoing base-line monitoring of estuarine water quality, macroalgal biomass and distribution and phytoplankton occurrence in consultation with the Centre for Water Research at Murdoch University. Reports are produced on an ongoing basis. WWC produces annual 'State of the Waterways' reports.

PROBLEMS

The estuary is currently being under monitored with water quality, phytoplankton and macroalgal biomass and distribution being covered at minimal base-line levels only. The EPA recommended that a higher level of monitoring be undertaken prior to and following the opening of the Dawesville Channel, so that potential adverse impacts could be minimised. Potential adverse impacts include increased mosquito, macroalgal nuisance, and loss of internationally protected bird habitat.

Additional funds for increased monitoring were previously approved by Cabinet, but this approval lapsed when the decision to proceed with the construction of the channel was deferred. A second submission is currently with Government.

CHANGES NEEDED

None.

13. Prior to the construction of the Dawesville Channel, the proponents shall prepare in stages a monitoring and management program to the satisfaction of the Environmental Protection Authority. This program shall include:

(1) essential additional baseline monitoring required to be in place as soon as possible and prior to construction commencing;

(2) construction stage impacts and monitoring, prior to construction; and

(3) operational and long-term monitoring, in stages, to be determined by the Environmental Protection Authority.

STATUS

(i) Baseline data has been collected for the following:

- Nearshore bathometry and beach profiles extending 1 km north and south of the channel.
- Bathymetry of the Harvey Estuary in the vicinity of the channel.
- Shoreline movements using aerial photography either side of the channel.

- Water exchange between the Harvey Estuary and the Peel inlet and between the Peel Inlet and the ocean.
- Tidal regime within the Peel Inlet and Harvey Estuary.
- Groundwater levels and quality within a 3km radius of the channel.

Water quality in the estuarine system has been monitored by WWC with co-operation from the Centre for Water Research at Murdoch University. This monitoring provides a good indication of the ongoing nature of water quality problems, nodularia occurrence and macroalgal biomass and distribution (refer to condition 12 comments).

A long term management program will be prepared in conjunction with the Waterways Commission and the EPA. This program will require funding commitments into the future.

A submission for the re-approval of these funds has been prepared and submitted as previous approval had lapsed. A higher level of monitoring is required to optimise strategic management initiatives.

Liaison with EPA to decide on an acceptable level of operational and long term monitoring requirements is in progress.

PROBLEMS

Funding for more detailed base-line monitoring and strategic monitoring pre and post channel opening was originally approved as part of the initial Dawesville Channel approval. Deferral of the Dawesville Channel construction means that the original approval of funds for this purpose has now lapsed.

PATHWAYS FOR FURTHER PROGRESS

Additional funding for focussed strategic monitoring is essential in order to measure changes that will occur after the Dawesville Channel is opened. This will enable any adverse impacts to be identified should they occur.

CHANGES NEEDED

None

14. Proposals which may release nitrogen or phosphorus to the environment shall not be referred to the Environmental Protection Authority provided that they are consistent with the draft Statement of Planning Policy for the Peel-Harvey coastal catchment. Proposals not consistent with the draft Statement of Planning Policy for the Peel-Harvey coastal catchment shall be referred to the Environmental Protection Authority.

STATUS

This condition was added following prolonged negotiations between DPUD and EPA on assessing new developments and planning proposals. The Statement of Planning Policy (SPP) was gazetted 25 February 1992. It is the only reference to nitrogen in the Ministerial Conditions, and nitrogen loads were not considered to any degree in the ERMP Stage 2. Nitrogen data for the period prior to 1990 is not presently available.

The proponents understand that most sub-division assessments are now managed under the above arrangement, with DPUD staff assessing nutrient management as an integral part of the proposal, and EPA staff no longer involved in the assessments.

PROBLEMS

The proponents are not the relevant decision making authorities. This condition is therefore inappropriate. Notwithstanding this, the proponents have helped facilitate the process of SPP development, review, and adoption by local government authorities. This included arranging a series of forums with local government at which revisions were made to the draft SPP, and at which the need for ongoing revision and adjustment of the document was recognised.

Some difficulties have been experienced by DPUD assessment officers and local government authorities in applying the conditions, as set out in the SPP, to specific sub-divisions. There are also some concerns that the SPP is not being applied consistently across the catchment, as the area is managed by DPUD through three separate regional offices. The issue of the SPP's boundary also requires some re-examination, as it is currently being informally applied outside the Peel-Harvey coastal catchment administrative boundary.

There is no documentation available which details the effectiveness of the SPP in ensuring that developments in the catchment are compatible with sound nutrient management, and this is of concern to the proponents who currently have a legal responsibility for nutrient management. Furthermore, there is concern that the planning appeals system enables decisions which are potentially in conflict with the detail and content of the current SPP.

PATHWAYS FOR FURTHER PROGRESS

The SPP was first included in the Ministerial Conditions in October 1991, and the current version has now been in operation formally since February 1992. A revision of its wording and operation would assist those involved in implementing of the intent of the document. This revision needs to include:

- ensuring that DPUD officers and local government authorities are able to adequately assess the catchment management requirements related to planning approval under the SPP.
- developing clear guidelines which assist and enable local government to interpret the requirements of the SPP into the policies of their Town Planning Schemes.
- ensuring that state and local government planning policies (Structure Plans, Local Rural Strategies, Town Planning Schemes etc.) are developed and implemented in manner consistent with the SPP.

While not involved as decision making authorities in the planning process, the proponents are prepared to assist in this revision process if necessary. However, it is felt that undertaking a performance audit of the SPP is now required, and that this is a joint responsibility of the EPA and DPUD.

CHANGES NEEDED

Notwithstanding the above, this condition can continue providing a mechanism which makes it binding on the relevent Minister can be found. The inclusion of nitrogen is inappropriate, as this was not part of the original ERMP Stage 2, and hence is not part of the proposal to which these conditions apply. A joint DPUD/EPA compliance audit of the SPP is required.

MANAGEMENT COMMITMENTS MADE BY THE PROPONENTS

The following list has been amended by the EPA and accepted by the proponents to reflect the 'whole of Government approach' which is essential for management of this proposal.

1. DAWESVILLE CHANNEL

1.1 The proponents will conduct a detailed survey to locate, assess and offer protection to Aboriginal sites and heritage.

STATUS

Completed by Department of Marine and Harbours to the satisfaction of the Department of Aboriginal Sites of the Western Australian Museum .

1.2 During construction of the Dawesville Channel, the proponents will ensure the continuity of road access, power supply, communications, and water and sewerage services that require relocation, and will minimise dust and noise impacts upon nearby residential areas.

STATUS

Continuity of services and access is ensured and noise and dust impact has been controlled.

1.3 Spoil from the excavated channel will be used in redeveloping the fill areas as a stable and varied landscape, reflecting naturally occurring topography elsewhere on the coastal strip.

1.4 The proponents will manage spoil disposal to minimise disturbance to important land elements, including coastal dunes, tree belts along Old Coast Road and near the estuary foreshore, Spoil disposed of adjacent to the undisturbed coastal dunes will be contoured to co-ordinate with natural dune topography in order to minimise the potential for erosion.

STATUS

A Spoil Disposal and Land Management Plan (SDLMP) has been completed and approved by the Environmental Protection Authority. Spoil has been and continues to be placed in accordance with Parts 2 and 3 of the SDLMP. Approximately 80% of spoil disposal is complete and it is anticipated that all spoil disposal will be finalised by April 1994.

Disposal areas which are at final design contour will be resurfaced with topsoil and stabilised by hydromulch or similar. Exposed dune batters have been brushed.

Areas of tree belts, heritage foreshore vegetation and dunal vegetation have been preserved where possible in accordance with the SDLMP.

1.5 The land area used to dispose of excavated material will be contoured to facilitate possible future development into a prime residential and holiday area. Views from existing residences near the estuary will be retained, taking into consideration that these views may have been ultimately reduced by foreshore development and landscaping, irrespective of the proposed channel development.

STATUS

The surrounding land was the subject of the Port Bouvard Outline Development Plan (ODP) and the Port Bouvard Public Environment Review.

The developer has now obtained all requisite environmental and planning approvals to allow for the development to proceed as depicted in Port Bouvard ODP.

The contouring of the areas of public open space, including estuary reclamation, is being undertaken in accordance with plans recently approved by the Minister for the Environment under a Section 46 amendment to the ERMP Stage 2. This amendment allowed for the increase of estuary reclamation from 10 Ha to a maximum of 25 Ha.

DMH is currently arranging the detailed design of the landscape plan for these public areas.

1.6 Littoral sand drift northwards along the ocean coast will be mechanically bypassed beyond the channel entrance, to minimise siltation within the channel and to avoid adverse effects on beaches to the north and south.

STATUS

Beach monitoring by the Department of Marine and Harbours since the commencement of construction has confirmed the need for mechanical sand bypassing. Two bypass pipes have already been installed below channel invert at the ocean entrance. DMH will now enter into a design and construction contract with Thiess for the installation of the necessary sand bypass infrastructure.

Following advice from Professor Per Brunn it has been decided to improve the trapping efficiency of the southern training wall by the addition of a short spur groyne to the Southern Training wall. Professor Brunn was commissioned by the Government to review all sand bypassing operations undertaken by DMH throughout the State.

1.7 The Dawesville Channel will be maintained as a navigable waterway, although, as with the existing Mandurah Channel, sea conditions at the ocean entrance may frequently preclude its use by small boats.

STATUS

A management plan for ongoing maintenance dredging and soil disposal relating to sand bypass dredging and channel maintenance dredging will be submitted after details of the sand bypassing plant are known. These should be available in December 1993.

1.8 The estuary will be closely monitored to evaluate the management strategy's success in reducing the algal nuisance and to enable the development of appropriate management strategies to mitigate any deleterious effects that may occur. Current and proposed future monitoring studies in the estuary are described in Section 13 of the ERMP and Section 11 of the EPA assessment report.

STATUS

A Research Advisory Working Group (RAWG) has been established by WWC to identify the appropriate mix of monitoring and investigations needed to evaluate the success of the management strategy particularly the effects of the Dawesville Channel. RAWG will report regularly to the

Peel-Harvey Project Managers Group. Funds are not currently available to undertake the work required to fulfil this committment.

2. CONTROL OF WEED ACCUMULATIONS

2.1 Weed harvesting will be continued most likely at an increased rate, until the weed nuisance in the estuary is successfully reduced.

STATUS

Harvesting equipment has been upgraded in anticipation of increase in harvesting requirements post channel opening. Macroalgal biomass and distribution will be closely monitored to optimise strategic harvesting effort. Current levels of weed harvesting are successfully controlling weed nuisance although some problems have occurred with beach erosion caused by shore removal.

2.2 Possible methods of improving the efficiency of harvesting operations, and the possible use of algicides to control weed growth, will be evaluated by the proponents and implemented if shown to be practicable.

STATUS

The potential use of algicides for weed control has been investigated and reported by Richard Gorham. WWC will not proceed with this initiative because of ecological concerns raised by this method of control.

2.3 The Peel Inlet Management Authority will continue the existing program of shoreline management and will rehabilitate areas where weed accumulations or harvesting operations cause excessive retreat of the shoreline.

STATUS

Shoreline management and rehabilitation is ongoing by PIMA.

3. CATCHMENT MANAGEMENT

3.1 The proponents will continue to provide advice to farmers on fertilizer requirements, based on accurate assessment by paddock-specific soil tests.

STATUS

The Department of Agriculture continues to provide advice. Soil and tissue testing technology is also being developed and refined for a growing range of agricultural enterprises, including horticulture.

The provision of free soil tests was found to reduce the credibility of the advice given. Free soil testing has now been discontinued, except to introduce the technique to a few target areas not included in earlier programs. The phosul-K programme has been changed to become more flexible and user-friendly.

PATHWAYS FOR FURTHER PROGRESS

The main focus of Departmental advice on fertiliser regimes is the economic value to landholders of more efficient use. Investigative run-off monitoring is also being developed as a guide to efficient fertiliser use, particularly in irrigation areas.

CHANGES NEEDED

This commitment can be continued, but only as part of the overall package developed in co-operation with landholders in order to achieve sustainable land-use and associated phosphorus load reductions.

3.2 The proponents will encourage further development and use of individual-nutrient fertilizers, and will undertake detailed investigations of ways to overcome existing economic constraints to their production and use.

STATUS

Detailed investigations are continuing, and on-farm demonstrations are installed each year. The role of various nutrients for improving agricultural efficiency is being evaluated on an on-going basis.

PROBLEMS

Production of individual nutrient fertilizers is reliant on the commercial attitude of fertilizer companies. There is limited opportunity to pursue this option.

There have been difficulties in achieving economic sources of sulphur. These have now been largely overcome, and are being demonstrated.

PATHWAYS FOR FURTHER PROGRESS

Considerable work is also underway on the development of soil amendment utilising bauxite residue.

CHANGES NEEDED

This commitment can be continued, but only as a part of the overall package developed in co-operation with landholders in order to achieve sustainable land-use and associated phosphate load reductions.

3.3 The proponents will ensure that large-scale field trails are carried out to ascertain the technical and economic feasibility of converting use of sandy soils from agriculture to forestry. Private enterprise involvement in these studies will be encouraged.

STATUS

Large-scale field trials were established by CALM under the Tree Trust program. The possibility of large-scale conversion of areas of sandy soils to plantations is no longer being actively considered.

PROBLEMS

The forestry uses outlined in the Stage 2 ERMP were found to be sub-economic on the sandy soils targeted in the ERMP, and are not supported by landholders.

PATHWAYS FOR FURTHER PROGRESS

There is significant landholder support for more general re-vegetation programs, particularly for shelterbelts and strategic plantings along watercourses and around wetlands. There is also strong landholder concern at the ongoing rapid loss of remnant vegetation in the catchment. This is now recognised as an extremely serious problem.

There are has been only minor involvement in these issues by the Department of Conservation and Land Management.

CHANGES NEEDED

This commitment has been met, and needs to be cleared.

3.4 The EPA and the Department of Agriculture will continue to provide advice to producers to define and implement practicable and cost-effective waste management strategies for control of point sources of phosphorus.

STATUS

Point source management continues. It is believed that all major point sources have been identified and all now have EPA approved effluent management programs underway.

The major point source, Wandalup Piggery, has now agreed to follow a set of licence conditions which, over a three year period, will considerably reduce the phosphorus load leaving the property. A nutrient filtration system has been installed at the Pinjarra Wastewater Treatment Plant. WAWA have prepared an Effluent Management Plan for the Yunderup plant, and once this plan is approved and implemented it will be the last major known point source in the catchment dealt with.

PROBLEMS

Investigative monitoring data collected in recent years shows that point sources contributed a much greater proportion of the total phosphate load than was identified in the ERMP. This data is currently being collated and will be incorporated into the Catchment Management Plan.

There have been considerable difficulties in recent years in resolving major point source pollution issues. Although these issues were tackled somewhat late in the program, they are now largely satisfactorily resolved.

CHANGES NEEDED

None. Ongoing.

3.5 The Department of Agriculture will co-ordinate the preparation and implementation of a detailed catchment management plan aimed at reducing phosphorus losses to the estuary to less than 85 t/a in a 60 percentile year with minimal economic or social disruption to the catchment community.

STATUS

A draft document has been prepared. Re-draft of this will be finalised after formal EPA comment is received on progress to date. Implementation of catchment management measures has been underway for some years.

PROBLEMS

Production of a definitive detailed catchment management plan has not been possible given the paucity of feasible and acceptable phosphate reduction techniques, and an absence of community ownership of the phosphate problem and its solutions. Production of such a plan, as envisaged in the commitment, is no longer considered the most practical method.

PATHWAYS FOR FURTHER PROGRESS

The original draft is being further developed in conjunction with the network of landholder groups established in the catchment since 1989. Acceptance is required that a Catchment Management Plan is best recognised as consisting of a range of documents produced by the range of groups and agencies involved in the program. A unified landholder group has formed to oversee finalisation of the ongoing program, as it is currently envisaged.

CHANGES NEEDED

Endorsement of the current co-operative approach is required.

The Department of Agriculture, in close consultation with landholders, is prepared to produce a detailed annual program each March. This would require the EPA to provide ongoing formal feedback. This, in conjunction with practical techniques to be included in the next edition of "The Guidebook", will constitute what was originally referred to as a catchment management plan.

3.6 The proponents will implement a moratorium on further clearing and drainage in the catchment, pending determination of the success of the catchment management plan in reducing phosphorus losses from existing cleared land.

STATUS

A range of controls exist over any new clearing and drainage (as listed under Condition 5) to ensure that they are environmentally acceptable. These are the SPP and regulations under the Soil and Land Conservation Act.

CHANGES NEEDED

This commitment could be cleared.

3.7 The success of catchment management measures in reducing phosphorus losses to the estuary will be monitored by the proponents and audited by the EPA. The social and economic effects of catchment management measures upon the catchment community will be closely monitored by the proponents. Current and proposed future monitoring studies are described in Section 13 of the ERMP and in Section 11 of the EPA assessment report. The catchment management plan will be regularly reviewed by the EPA.

STATUS

Annual audit of nutrient export to the estuary has been conducted by WWC since mid 1990. Reporting of 1990,1991 audit is complete. EPA data for the period 1983 to 1990 has not yet been collated.

Review of statistical basis for performance appraisal has been undertaken, and are documented in the 90-92 audit report. Further investigations are ongoing. It is difficult to fully assess the performance of catchment management measures given the lack of reliable historical data.

Load reductions achieved from specific point sources has been documented.

The social and economic impacts of catchment management have been significantly reduced by the program working in close consultation with landholders.

PROBLEMS

Difficulties with the monitoring and audit program are discussed under Condition 1.

Following release of the ERMP (Stage 2) considerable concerns were raised in the local community at the social and economic impacts of proposed catchment management measures. WADA has tackled these by re-focusing the catchment management program to ensure that any measures implemented have the support of the communities and landholders involved, (ie a positive social impact) and are economically attractive.

PATHWAYS FOR FURTHER PROGRESS

The proponents are awaiting input from the EPA on progress with the strategy, following review of this document.

CHANGES NEEDED

Approaches can be developed further after following EPA audit of these environmental conditions.

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