East Perth project, Claisebrook Inlet

East Perth Redevelopment Authority

Report and recommendations
of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
Bulletin 653
October, 1992

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THE PURPOSE OF THIS REPORT

This report contains the Environmental Protection Authority's environmental assessment and recommendations to the Minister for the Environment on the environmental acceptability of the proposal.

Immediately following the release of the report there is a 14-day period when anyone may appeal to the Minister against the Environmental Protection Authority's recommendations.

After the appeal period, and determination of any appeals, the Minister consults with the other relevant ministers and agencies and then issues his decision about whether the proposal may or may not proceed. The Minister also announces the legally binding environmental conditions which might apply to any approval.

APPEALS

If you disagree with any of the assessment report or recommendations you may appeal in writing to the Minister for the Environment detailing the environmental reasons for your concern and enclosing the appeal fee of $10.

It is important that you clearly indicate the part of the report you disagree with and the reasons for your concern so that the grounds of your appeal can be properly considered by the Minister for the Environment.

ADDRESS

Hon Minister for the Environment
18th Floor, Allendale Square
77 St George's Terrace
PERTH WA 6000

CLOSING DATE

Your appeal (with the $10 fee) must reach the Minister's office no later than 5.00 pm on 23 October, 1992.

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Summary and recommendations

The East Perth Redevelopment Authority, as part of a major redevelopment of much of East Perth, proposes to construct an artificial waterway called Claisebrook Inlet at the outlet of the existing Claisebrook Drain, (see Figure 1). The waterway is to be a focal point for the redevelopment of the East Perth area. Claisebrook Inlet basically will be a canal waterway that provides an aesthetic and direct connection with the Swan River and will have publicly owned facilities along its edge. The construction of the waterway and edge facilities has the following components: an entrance channel, main basin, perched water feature, habitat island and surrounding hard and soft edge treatments and facilities.

The construction of the Inlet is partly in an area which has been contaminated by coal tars from the State Energy Commission of WA's East Perth gas works site. The Environmental Protection Authority has assessed a proposal for addressing contamination of the gas works site which it requested the State Energy Commission to prepare, at the same time as the Claisebrook Inlet proposal because the contamination is of environmental concern.

A Public Environmental Review document was prepared and released for a period of public comment which concluded on 1 May 1992. Eleven submissions were received from State and Local Government Authorities, industry groups, conservation groups and members of the public.

The key environmental issues identified during the assessment process were:

- protection of the values of the Swan River;
- management of contamination from the gas works site;
- flushing of the Inlet;
- management of existing contamination from the Claisebrook Drain; and
- long term management of the Inlet.

The protection of the values of the Swan River

The Authority believes that its prime objective in its guardianship of the environment of the Swan River is to ensure that it remains "alive and healthy" and that, to the greatest extent possible, its integrity is maintained. This means that a full complement of ecological functions must be sustained.

The proposed Inlet is associated with a number of impacts which may affect the values of the Swan River, including impacts from contamination from the gas works site and the Claisebrook drain and impacts from dredging in the river.

Because the dredging required for this proposal is linked to the removal of contaminated sediments in the river by the State Energy Commission of WA, the dredging is considered to be beneficial to the river's ecology.

The Swan River system is receiving a number of contaminants including, nutrients, faecal coliforms, hydrocarbon wastes, heavy metals and other contaminants from numerous sources in its catchment and the ecology of the river has changed and is still changing because of the impact of this contamination. Nutrients are of most concern to the Authority because it is these which could significantly affect the ecology and health of the whole river system by promoting excessive algal growth. Major sources of nutrients are the fertilisers from farms and gardens in the rural and urban areas of the catchment and the Swan River Trust is developing programmes to improve management of these major sources.

Stormwater from the urban drainage system is a significant local source of all the contaminants mentioned above and the Claisebrook drain has been identified as one of the most polluted urban main drains entering the river. Contaminants from the Claisebrook drain, if unmanaged, could have an adverse impact on the proposed Inlet and the local river environs.

Management of contamination and other impacts during construction

The East Perth Redevelopment Authority proposes to construct the Claisebrook Inlet in an area affected by contamination from the adjacent gas works site. The Environmental Protection Authority considers that the management of the contamination arising from the former East Perth gas works site is the responsibility of the State Energy Commission of WA. **The Environmental Protection Authority agrees with the strategy put forward by the State Energy Commission that the contaminated material needs to be removed because its removal will be beneficial to the Swan River.** The Authority is recommending in its assessment report on the Public Environmental Review produced by the State Energy Commission that the Commission immediately commence to remove the contamination.

To ensure the removal of the contamination in the sediments is included as part of the Commission's strategy for the clean-up of the gas works site, the Environmental Protection Authority has recommended that the East Perth Redevelopment Authority's construction programme and the State Energy Commission's Contamination Management Strategy for the area be co-ordinated.

The excavation of the Claisebrook Inlet will involve de-watering which has the potential to draw contaminated groundwater or coal tars from the gas works site. To overcome this problem, the State Energy Commission will construct a barrier wall along the southern boundary of the gas works site prior to the commencement of the de-watering for Inlet construction.

The management of other construction impacts such as dust, noise, drainage, traffic, etc, has not been fully defined by the proponent at this stage but commitments have been made to prepare environmental management programmes addressing these issues before the start of construction. Such construction impacts can be adequately managed through the later design and construction phases. Maintenance, management and monitoring programmes also require finalisation.

Flushing the Inlet

In examining the flushing characteristics of the Inlet, the Environmental Protection Authority separately considered the water quality parameters affected by the flushing characteristics and the quality of the receiving water from the Swan River and the impact of the Claisebrook drain on water quality.

The Environmental Protection Authority considers that the proponent's estimates of the flushing and frequency of maintenance dredging are reasonable and the Inlet should maintain a water quality suitable for the proposed use of the Inlet which is secondary contact recreation, including boating.

Management of Claisebrook Drain

The Claisebrook Inlet proposal is to construct a low flow diversion drain for most of the more contaminated drain water to discharge directly into the river to the south of the current outlet and an overflow drain which will enter the Inlet directly. The drainage water is contaminated, mainly by faecal coliforms, nutrients, oils, heavy metals and illegal dumping of wastes into the drain and suspended solids.

While it is acknowledged that the contamination in Claisebrook Drain will not have a significant impact on the of the Swan River, as a whole system, the Environmental Protection Authority considers that every opportunity to decrease contamination should be taken for the benefit of the river and its users. There is also a concern that this local source of pollution would adversely affect the Inlet and the waters around the drain to prevent the use of the water for recreation .

Accordingly, the Authority considers that the contamination from the Claisebrook Drain is not acceptable and in the long term, should be improved.

The Authority considers that a catchment management plan should be dawn up for the management of the Claisebrook Main Drain catchment to reduce the levels of contamination entering the Inlet and the river from the drain.

However, the East Perth Redevelopment Authority is only one agency which would be responsible for the management of inputs to the drain because its jurisdiction is confined to the East Perth area. Accordingly, the preparation of a catchment management plan would require the participation of other government agencies.

Until the successful implementation of the catchment management strategies, the Environmental Protection Authority considers that the proponent needs to manage the diversion drain such that there is a very low potential for the contamination to enter the Inlet . There is also a need for a management strategy for gross pollutants such as oils and litter.

The Environmental Protection Authority considers that the management of the flows in the main drain extension and low flow diversion drain should be such that the contamination entering the Inlet should not adversely affect the water quality of the Inlet.such that it would not be suitable for secondary recreation use, including boating.

Long term management

The East Perth Redevelopment Authority has indicated that it would have the responsibility for maintenance and management of the waterway for as long as the Government determines that the Redevelopment Authority should exist. A waterways manager is necessary for the life of the Inlet, however, and a mechanism should be put in place to ensure that a replacement agency is made responsible for management should the Redevelopment Authority cease to exist.

Conclusion

The Environmental Protection Authority's main conclusion is that the proposal is environmentally acceptable subject to the following recommendations:

Recommendation 1

The Environmental Protection Authority has concluded that the proposal to construct an artificial waterway (Claisebrook Inlet) and associated development at East Perth is environmentally acceptable, subject to the recommendations in this report and the proponent's commitments. In reaching this conclusion, the Environmental Protection Authority identified the main environmental issues requiring detailed consideration as:

- **protection of the values of the Swan River;**
- **management of contamination from the gas works site;**
- **flushing of the Inlet;**
- **management of Claisebrook Drain; and**
- **long term management of the Inlet.**

The Environmental Protection Authority considers that these environmental issues have been adequately addressed. Accordingly, the Environmental Protection Authority recommends that the proposal could proceed subject to the recommendations in this report and the proponent's commitments listed in Appendix 4.

Recommendation 2

The Environmental Protection Authority recommends that the parts of the East Perth Redevelopment Authority's construction programme which are related to the contamination from the gas works site, involving the dredging of the entrance channel, the excavation of the lower parts of Claisebrook Drain, the connection of the Inlet with the Swan River and the commissioning of the entrance channel for public use, should be co-ordinated with the State Energy Commission's Contamination Management Strategy so that the Inlet construction programme will be completed at the same time or before the clean-up of off-site contamination by the State Energy Commission, to the requirements of the Minister for the Environment, on advice of the Environmental Protection Authority and the Swan River Trust.

Recommendation 3

The Environmental Protection Authority recommends that the East Perth Redevelopment Authority should not commence the de-watering for the construction of the Inlet until the barrier wall between the gas works site and the Inlet has been constructed to prevent the movement of any further contaminants from the gasworks site to meet the requirements of the Minister for the Environment on the advice of the Environment Protection Authority.

Recommendation 4

The Environmental Protection Authority recommends that the State Government have prepared and implemented a catchment management programme for the Claisebrook Main Drain catchment, to the requirements of the Ministers for the Environment, Water Resources and Local Government.

Recommendation 5

The Environmental Protection Authority recommends that prior to any modifications to the Claisebrook Main Drain commencing, the East Perth Redevelopment Authority should prepare a design and management report for the section of drain being modified which provides details on:

- the location of the low flow diversion drain entry to the river;
- measures to minimise any contamination entering the Inlet from either the low flow diversion drain or the high flow drain;
- the measures which prevent gross pollutants from entering the river; and
- a management strategy for use of the Inlet.

to the requirements of the Environmental Protection Authority on advice from the Swan River Trust and the Water Authority of Western Australia.

Recommendation 6

The Environmental Protection Authority recommends that the proponent should manage the water of the Claisebrook Inlet so that the Inlet's water quality meets standards for secondary contact recreation to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority and the Swan River Trust. Any changes to the proposed use of the Inlet which involve different water quality standards should be made in consultation with the Environmental Protection Authority.

Recommendation 7

The Environmental Protection Authority recommends that, prior to the connection of the Inlet to the Swan River, the proponent put in place a mechanism to designate a replacement manager of the waterway to be responsible for the on-going management of the Inlet should the East Perth Redevelopment Authority no longer be available to undertake this role, to the requirements of the Minister for the Environment.

Recommendation 8

The Environmental Protection Authority recommends that, prior to the start of the construction programme, the proponent prepare and subsequently implement an Environmental Management and Monitoring Programme which addresses how the potential environmental impacts or issues will be managed, to the requirements of the Environmental Protection Authority, on advice of the Swan River Trust. The programme should address the management, monitoring, auditing and reporting of the following activities or issues, at the appropriate stage as committed to by the proponent:

- **management of construction impacts, including dust, noise, traffic, drainage and removal of any contaminated material encountered during excavation;**
- **design and management of a maintenance dredging programme;**
- **monitoring of water quality in the Inlet and perched water feature; and**
- **management of water based recreation activities.**

The Environmental Management and Monitoring Programme should be updated every second year for five years to the requirements of the Environmental Protection Authority on the advice of the Swan River Trust. After five years, the need for the Environmental Management and Monitoring Programme should be reviewed.

1. Introduction

The East Perth Redevelopment Authority (the proponent), as part of a major redevelopment of much of East Perth, proposes to construct an artificial waterway called Claisebrook Inlet as a focal point for the redevelopment of the East Perth area. The waterway is proposed to be constructed at the existing outlet of the Claisebrook Drain which enters the Swan River adjacent to the southern boundary of the State Energy Commission of WA's former gas works site.

The former gas works site is a major contaminated industrial site. The contamination has spread into the Claisebrook Drain and the Swan River and is a major constraint to the way in which the affected section of the redevelopment project may proceed.

The affected section of the East Perth redevelopment proposal is constrained by the necessity for the contamination to be properly managed by the appropriate agency, in this instance, the State Energy Commission of Western Australia. Accordingly, the State Energy Commission's proposal for addressing contamination of the gas works site has been assessed at the same time as the redevelopment proposal and the Environmental Protection Authority has made its recommendations on both proposals at the same time to the Minister for the Environment.

The Environmental Protection Authority considered that the environmental issues involved with this Claisebrook Inlet proposal warranted a formal review at an assessment level of Public Environmental Review. The proponent prepared the document which was released for public comments for eight weeks from 7 March to 1 May, 1992. Subsequently, the proponent responded to the issues raised in the eleven submissions on the proposal.

2. The proposal

The East Perth Redevelopment Authority's proposal includes an artificial waterway, to be called Claisebrook Inlet and is described in the Public Environmental Review. The Inlet basically will be a canal waterway that provides an aesthetic and direct connection with the Swan River and will have publicly owned facilities along its edge. The construction of the waterway and adjacent edge facilities has the following components: an entrance channel, main basin, perched water feature, habitat island and surrounding hard and soft edge treatments and facilities (Figure 1).

The Claisebrook Inlet will be constructed at the outlet of the existing Claisebrook Drain stormwater system. The proponent proposes to construct an extension of the main drain to enter the Inlet and to construct a low flow diversion drain to divert some of the more contaminated drain water from the Inlet to discharge directly into the river downstream of the existing outlet. In response to concerns about contamination in the drain, the proponent considered two options of discharging the diversion drain either into a channel which would separate the proposed habitat island from the new river bank or further to the south as shown in the Public Environmental Review.

To stop the contamination from spreading into the Inlet from the gas works site, the proponent endorsed the State Energy Commission's strategy of constructing an impermeable, subterranean barrier wall along the southern edge of the gas works site (northern edge of the waterway). Other measures to contain and treat the contamination will also be implemented by the State Energy Commission with an objective that the rest of the East Perth Redevelopment Project will be unaffected by the clean-up of the gas works site.

3. The Swan River

The Authority believes that its prime objective in its guardianship of the environment of the Swan River is to ensure that it remains "alive and healthy" and that, to the greatest extent possible, its integrity is maintained. This means that a full complement of ecological functions must be sustained.

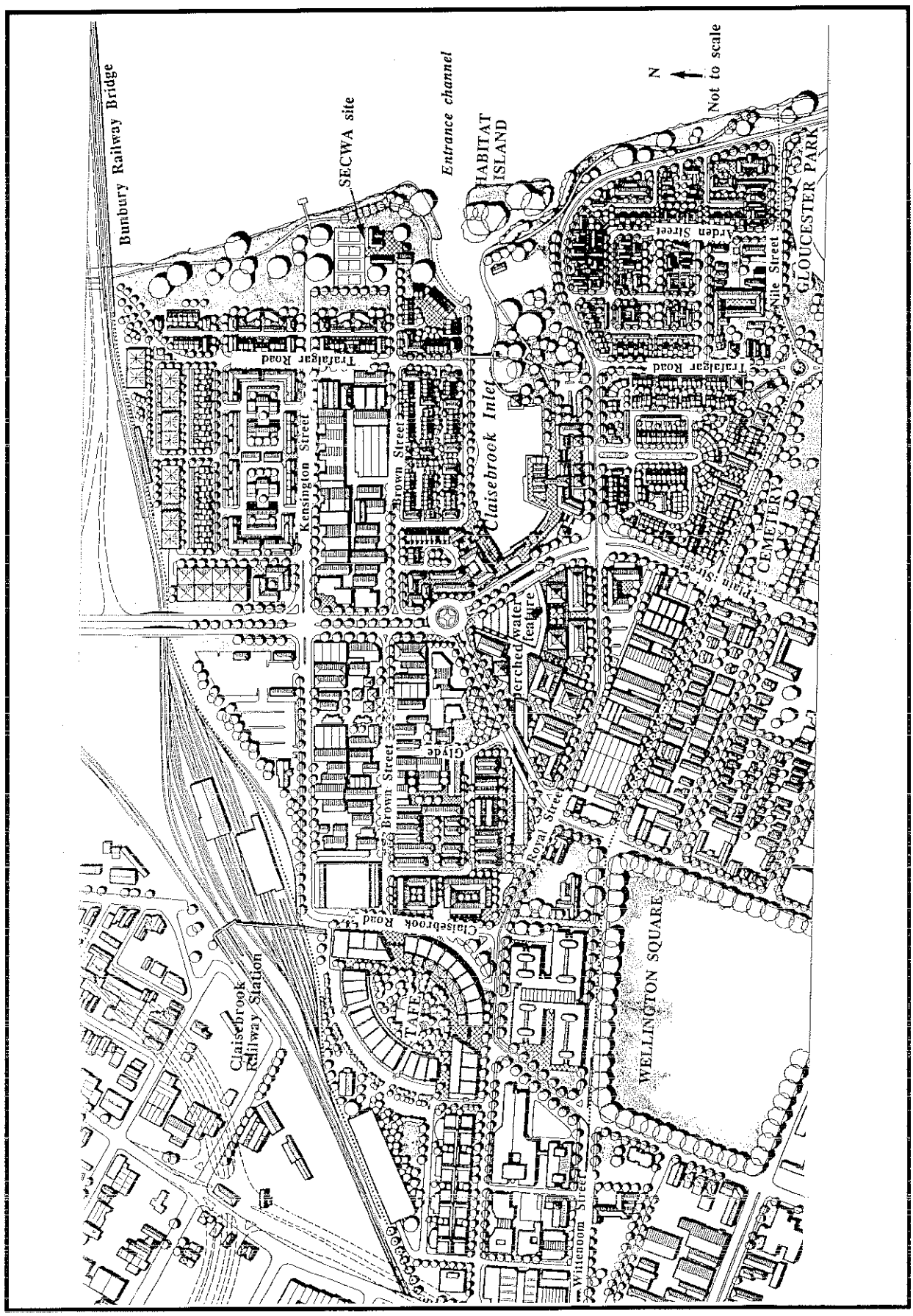

Figure 1: Claisebrook Inlet, East Perth

The construction of an artificial canal waterway from the river into the river bank where the Claisebrook main drain currently enters the river and the dredging of the Swan River to deepen an entrance channel to the canal are associated with a number of impacts which may affect the values of the Swan River. The main issues of concern to the Environmental Protection Authority with regard to the Swan River include impacts from contamination from the gas works site and the Claisebrook drain and impacts from dredging in the river.

The Swan River system is receiving nutrients, faecal coliforms, hydrocarbon wastes, heavy metals and other contaminants from numerous sources in its catchment and the ecology of the river has changed and is still changing because of the impact of this contamination. Nutrients are of most concern to the Authority because it is these which could significantly affect the ecology and health of the whole river system by promoting excessive algal growth. Major sources of nutrients are the fertilisers from farms and gardens in the rural and urban areas of the catchment and the Swan River Trust is developing programmes in place to improve management of these major sources.

The other contaminants could affect local areas of the river. These come from septic tanks in use in the urban catchment of the river and illegal dumping of industrial wastes in urban drains.

Stormwater from the urban drainage system is a significant local source of all the contaminants mentioned above and the Claisebrook drain has been identified as one of the most polluted urban main drains entering the river. While it is acknowledged that contaminants from one drainage catchment will not impact on the health of the river system as a whole, the cumulative impacts from all these drains is of concern. Concern also exists over the specific impacts from concentrations of contaminated water on local areas of the river where the drains discharge. Pollutants from the Claisebrook drain, if unmanaged, could have an adverse impact on the proposed Inlet and the local river environs.

The Environmental Protection Authority has a position on dredging in the Swan River.

In justifying changes to the river's waterways, proponents of dredging proposals must not only satisfy the Authority that they will not cause adverse impacts to the river system, but must go further and show that the dredging will be either environmentally beneficial to the river, or necessary for the maintenance of existing river activities.

4. Review of public submissions

The Public Environmental Review document prepared for the proposal was available for an eight week public submission period which closed on 4 May 1992. Comments were sought on the proposal from the public, community groups and local and State Government agencies.

A total of eleven submissions were made on the proposal during the assessment process (Appendix 3). The key issues raised (listed in Appendix 1) are discussed below and these and the other issues raised during the assessment of the proposal were submitted to the proponent and a satisfactory response was provided to the Environmental Protection Authority (Appendix 2).

The key issues listed in Appendix 1 involved the impact of the dredging on the ecology of the river, the flushing of the waterway, the navigability of the entrance channel, the long-term water quality of the waterway, the management of the perched water feature, general contamination management concerns and Aboriginal concerns. With regard to Aboriginal concerns, the East Perth Redevelopment Authority consulted widely and has indicated that there are no outstanding issues to be resolved.

5. Environmental impacts and management

The key environmental issues which were identified during the assessment process are:

- protection of the values of the Swan River;
- management of contamination from the gasworks site and other impacts during construction;
- flushing of the inlet;
- management of Claisebrook Drain; and
- long term management of the Inlet.

The proponent has made a number of environmental management commitments in its Public Environmental Review and its response to issues. These commitments are attached in Appendix 4.

The Environmental Protection Authority's main conclusion is that the Claisebrook Inlet proposal is associated with aspects which will be of benefit to the Swan River and that it is environmentally acceptable subject to the following recommendations and the proponent's commitments:

Recommendation 1

The Environmental Protection Authority has concluded that the proposal to construct an artificial waterway (Claisebrook Inlet) and associated development at East Perth is environmentally acceptable, subject to the recommendations in this report and the proponent's commitments. In reaching this conclusion, the Environmental Protection Authority identified the main environmental issues requiring detailed consideration as:

- **protection of the values of the Swan River;**
- **management of contamination from the gas works site;**
- **flushing of the Inlet;**
- **management of Claisebrook Drain; and**
- **long term management of the Inlet.**

The Environmental Protection Authority considers that these environmental issues have been adequately addressed. Accordingly, the Environmental Protection Authority recommends that the proposal could proceed subject to the recommendations in this report and the proponent's commitments listed in Appendix 4.

5.1 Management of contamination from the gasworks site

The East Perth Redevelopment Authority proposes to construct the Claisebrook Inlet partly in the Swan River and parts of the Claisebrook Drain adjacent to the East Perth gas works site. As mentioned previously, the river and drain adjacent to the gas works site are contaminated, mainly by coal tars from the gas works site. The Environmental Protection Authority considers that the management of the contamination arising from the former gas works site is the responsibility of the State Energy Commission of WA. **The Environmental Protection Authority agrees with the strategy put forward by the State Energy Commission that the contaminated material needs to be removed because this removal will be beneficial to the Swan River.** The Authority is recommending in its assessment report on the Public Environmental Review produced by the State Energy Commission that the Commission immediately start to remove this off-site contamination as part of the clean-up strategy (Bulletin 651).

The State Energy Commission proposes a dredging programme to remove the contaminated sediments from the river and the drain but this has not been fully determined because the full

extent of the contamination at depth has not yet been evaluated. The Commission has evaluated the contamination in the river to a depth of 0.5 metres and proposes to remove the sediment to this depth at least. Further monitoring will need to be done to ascertain whether sediments below this depth are contaminated to an unacceptable level and require removal.

The East Perth Redevelopment Authority proposes to dredge an entrance channel to a depth of two metres over a width of about fifty metres through the middle of the contaminated sediments in the Swan River. It has determined that contamination of the river sediments extends to at least 2.5 metres in that area and, hence, the removal of these sediments is linked to the clean-up strategy for the gas works site.

The Environmental Protection Authority considers that because this dredging is linked to the need to remove the contaminated material from the River bed, the dredging of the entrance channel is environmentally acceptable and would be beneficial to the River. However, the need to handle the contamination in the sediments as part of the Commission's strategy for the clean-up of the gas works site, the Environmental Protection Authority recommends that the East Perth Redevelopment Authority's construction programme and the State Energy Commission's Contamination Management Strategy should be co-ordinated so that the clean-up of off-site contamination would be completed at the same time or before the completion of the Inlet construction programme. The Environmental Protection Authority has recommended that the State Energy Commission immediately start its clean-up of the off-site contamination in its report on the Contamination Management Strategy.

Recommendation 2

The Environmental Protection Authority recommends that the parts of the East Perth Redevelopment Authority's construction programme which are related to the contamination from the gas works site, involving the dredging of the entrance channel, the excavation of the lower parts of Claisebrook Drain, the connection of the Inlet with the Swan River and the commissioning of the entrance channel for public use, should be co-ordinated with the State Energy Commission's Contamination Management Strategy so that the Inlet construction programme will be completed at the same time or before the clean-up of off-site contamination by the State Energy Commission, to the requirements of the Minister for the Environment, on advice of the Environmental Protection Authority and the Swan River Trust.

The Environmental Protection Authority considers that any contaminated materials encountered during the excavation of the Inlet are the responsibility of the State Energy Commission to manage. The East Perth Redevelopment Authority reports that the site investigations carried out so far indicate that there is little chance of encountering such material, but is committed to preparing an environmental management programme to handle the contingency should it arise.

The excavation of the Claisebrook Inlet will involve de-watering which has the potential to draw contaminated groundwater or coal tars from the gas works site. To overcome this problem, the State Energy Commission will construct a barrier wall along the southern boundary of the gas works site.

The East Perth Redevelopment Authority should not commence the de-watering for the construction of the Inlet until the barrier wall between the gas works site and the Inlet to prevent the movement of further contaminants from the gasworks site has been constructed.

Recommendation 3

The Environmental Protection Authority recommends that the East Perth Redevelopment Authority should not commence the de-watering for the construction of the Inlet until the barrier wall between the gas works site and the Inlet has been constructed to prevent the movement of any further

contaminants from the gasworks site to meet the requirements of the Minister for the Environment on the advice of the Environment Protection Authority.

5.2 Flushing the Inlet

The Environmental Protection Authority considers that the quality of the water in the Inlet should be maintained to a standard for secondary contact recreation. The Inlet could be affected by three factors which will influence water quality, the Inlet's flushing characteristics, the quality of the water in the Swan River and the quality of the water in the Claisebrook drain.

The impact of the Claisebrook drain on water quality is examined in the section below and is not included at this stage of the discussion.

The proponent's calculations show that the Inlet will flush adequately (less than 3 days) via the entrance channel such that the Inlet will reflect the water quality of the Swan River. The proponent's estimates of the siltation rate indicate that the entrance channel will require maintenance dredging every 10 - 15 years.

The Environmental Protection Authority considers that these estimates are reasonable and that the Inlet should maintain a water quality which is suitable for the proposed use of the Inlet. Requirements for on-going management and monitoring and maintenance dredging are addressed in Section 5.6.

5.3 Management of Claisebrook Drain

The Claisebrook Main Drain stormwater system is a significant source of contamination which will affect the local environs of the Swan River. The Environmental Protection Authority considers that every opportunity to decrease that contamination should be taken for the benefit of the river and, hence, the Perth community and to ensure that there is no adverse impact on the Inlet and the increased numbers of people attracted to use this section of the river by the redevelopment of East Perth. In addition, the East Perth Redevelopment Authority's Claisebrook Inlet proposal will directly affect the lower parts of the existing drain and the capacity for management of contaminants that currently exists. Therefore, that Authority should be responsible for ensuring that there are no environmentally significant changes to the current management capacity for the drain and that there are no adverse effects on its proposal from the contamination in the drain.

The main contaminants in the drain are faecal coliforms, nutrients (phosphorus and nitrogen), hydrocarbons waste, floating litter and suspended sediments containing heavy metals from industrial wastes. The sources of the contamination appear to be leaking septic systems, illegal sewage connections, illegal industrial discharges and domestic, animal and litter wastes from restaurants, parks and streets.

These contaminants can be divided into two types for management purposes - gross pollution which includes oils and litter, and other contamination. The gross pollution can be trapped by physical means and removed from the drain prior to it entering the river or the Inlet. The other contaminants need to be stopped at source from entering the drain as much as possible. The proponent has committed to the installation of gross pollution traps and to being involved in an integrated catchment management approach to decreasing the contamination in the drain.

The proposal is to construct a low flow drain to divert as much of the drainage water from the Inlet as possible to discharge directly into the river downstream of the existing outlet. An extension, to accommodate overflow drainage water will enter the Inlet.

Concerns were raised regarding contamination of the Inlet water and the local river environs from the drainage waters from both the low flow diversion drain and the overflow drain.

It is recognised that the contamination of the drainage water arises mainly from the catchment outside the East Perth Project area (Figure 2). The East Perth Redevelopment Authority is thus only one agency responsible for management of part of Claisebrook Drain in the long term. The Water Authority of WA, the Swan River Trust, the Local Government Authorities, the industrial developments within the catchment and the wider community should all be involved if a clean-up and management programme is to be successful.

The Environmental Protection Authority considers that a catchment management plan should be drawn up for the management of the Claisebrook Main Drain catchment to reduce the levels of contamination entering the Inlet and the river from the drain.

As the East Perth Redevelopment Authority is only one agency which would be responsible for the management of the drain because its jurisdiction is confined to the East Perth area, catchment management would require a whole of government approach.

Recommendation 4

The Environmental Protection Authority recommends that the State Government have prepared and implemented a catchment management programme for the Claisebrook Main Drain catchment, to the requirements of the Ministers for the Environment, Water Resources and Local Government.

As it will take some time before the successful implementation of the catchment management strategies, the Environmental Protection Authority considers that the proponent needs to manage the diversion drain so that there is a very low potential of any contamination entering the Inlet and so that the management capacity that currently exists on the open section of the Claisebrook Drain to prevent gross pollutants entering the river is retained.

Concerns were raised about the contamination from both drains affecting the quality of water in the Inlet.

With regard to the low flow diversion drain, the proponent considered two options of discharging the drain either to exit into a channel which would separate the proposed island from the new river bank or further to the south as shown in the Public Environmental Review.

The Environmental Protection Authority considers the option shown in the Public Environmental Review to be the better solution because of the lower potential impact on the Inlet from the contaminated drainage water and because the contamination in the drain could be more effectively managed at this location. The final location needs to be ratified during the detailed design stages in consultation with the Swan River Trust.

It is acknowledged that there will be contaminants entering the Inlet from time to time when the overflow drain is operative. Should the water quality in the Inlet be reduced, the use of the Inlet during these times needs to be carefully managed to ensure that recreational contact does not occur. This situation should not occur once the catchment management plan becomes effective.

With regard to gross pollution management, measures such as a current diversion bank north of the outlet, a gate to block the diversion drain and the placement of structures to support a containment boom around the outlets of the main drain extension and the low flow diversion drain need to be provided. Accordingly, before the modifications to the drain commence, the proponent should prepare a design and management report for the section of drain being modified which provides details on the location of the low flow diversion drain entry to the river, the measures to minimise any contamination entering the Inlet from either the low flow diversion drain or the high flow drain and the measures which prevent gross pollutants from entering the river.

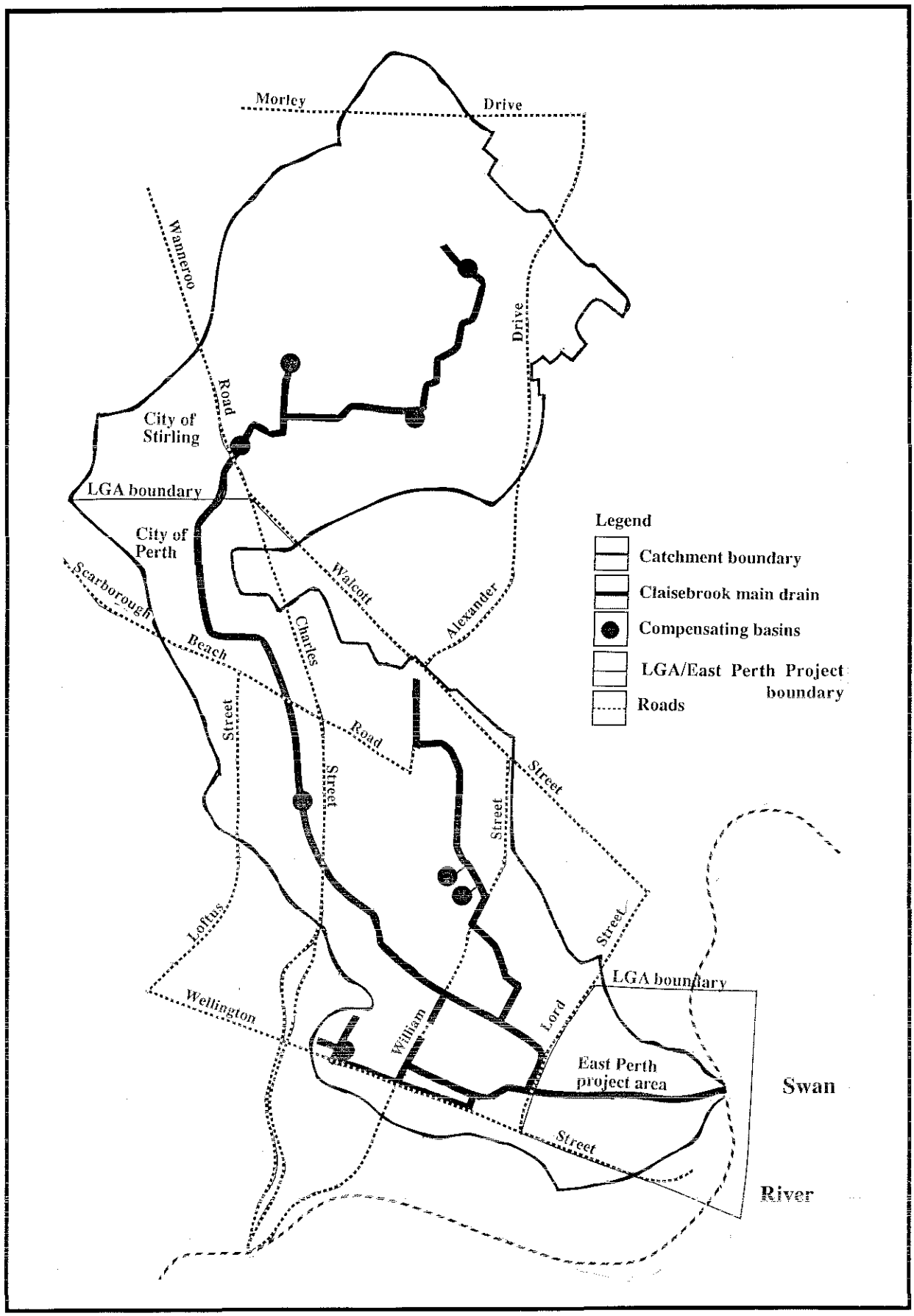

Figure 2: Claisebrook main drain catchment

Recommendation 5

The Environmental Protection Authority recommends that prior to any modifications to the Claisebrook Main Drain commencing, the East Perth Redevelopment Authority should prepare a design and management report for the section of drain being modified which provides details on:

- **the location of the low flow diversion drain entry to the river;**
- **measures to minimise any contamination entering the Inlet from either the low flow diversion drain or the high flow drain;**
- **the measures which prevent gross pollutants from entering the river; and**
- **a management strategy for use of the Inlet**

to the requirements of the Environmental Protection Authority on advice from the Swan River Trust and the Water Authority of Western Australia.

5.4 Water quality in the Inlet

The Environmental Protection Authority considers that the water quality in the Inlet should be maintained so that the water quality is suitable for secondary contact recreation. The management of the flushing regime and the flows in the main drain extension and low flow diversion drain should be such that the contamination entering the Inlet should not affect the water quality of the Inlet.

As mentioned above, until the catchment management plan becomes effective, it is acknowledged that there will be contaminants entering the Inlet from time to time when the overflow drain is operative. Should the water quality in the Inlet be reduced, the use of the Inlet during these times needs to be carefully managed to ensure that recreational contact does not occur.

Recommendation 6

The Environmental Protection Authority recommends that the proponent should manage the water of the Claisebrook Inlet so that the Inlet's water quality meets standards for secondary contact recreation to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority and the Swan River Trust. Any changes to the proposed use of the Inlet which involve different water quality standards should be made in consultation with the Environmental Protection Authority.

5.5 Long term management

The current policy on the management of artificial waterways and canal estates (State Planning Commission Policy No. DC 1.8) involves the proponent normally being responsible for a period of five years before handing over the management to a Waterways Manager, normally the Local Government Authority. The East Perth Redevelopment Authority, the proponent, has indicated that it would have the responsibility for managing the Claisebrook Inlet for as long as the government determines that it should exist. Another manager for the waterway will need to assume the responsibility for the on-going management of the waterway should the East Perth Redevelopment Authority cease to exist and and a mechanism needs to be put in place to ensure that such a responsible body is nominated if required.

Recommendation 7

The Environmental Protection Authority recommends that, prior to the connection of the Inlet to the Swan River, the proponent put in place a mechanism to designate a replacement manager of the waterway to be responsible for the on-going management of the Inlet should the East Perth

Redevelopment Authority no longer be available to undertake this role, to the requirements of the Minister for the Environment.

5.6 Other issues

The management of construction impacts such as dust, noise, drainage, traffic, etc, has not been fully defined by the proponent at this stage, though commitments have been made to prepare environmental management programmes before the start of construction. It is agreed that such construction impacts can be adequately managed through the later design and construction phases.

Artificial waterways such as this also need regular monitoring, maintenance and dredging to ensure that the water quality and flushing characteristics are maintained.

The Environmental Protection Authority has recommended, and the proponent has committed to the preparation of an Environmental Management Programme to address the issues in further detail at the appropriate stages of the proposal.

Recommendation 8

The Environmental Protection Authority recommends that, prior to the start of the construction programme, the proponent prepare and subsequently implement an Environmental Management and Monitoring Programme which addresses how the potential environmental impacts or issues will be managed, to the requirements of the Environmental Protection Authority, on advice of the Swan River Trust. The programme should address the management, monitoring, auditing and reporting of the following activities or issues, at the appropriate stage as committed to by the proponent:

- **management of construction impacts, including dust, noise, traffic, drainage and removal of any contaminated material encountered during excavation;**
- **design and management of a maintenance dredging programme;**
- **monitoring of water quality in the Inlet and perched water feature; and**
- **management of water based recreation activities.**

The Environmental Management and Monitoring Programme should be updated every second year for five years to the requirements of the Environmental Protection Authority on the advice of the Swan River Trust. After five years, the need for the Environmental Management and Monitoring Programme should be reviewed.

Appendix 1

List of issues raised in submissions

1. Ecology

1.1 the establishment of a wetlands ecology should be part of the rehabilitation plan, eg, islands left, reeds planted.

1.2 how would the proponent stop the on-going dredging from creating a biological desert opposite the Inlet?

1.3 what evidence has the proponent got that aquatic biota would re-colonise the Inlet areas?

2. Facilities

What would be the long term navigability of the jetty and Inlet areas for the proposed water sports activities?

3. Hydrology

3.1 what is the rate of siltation in the river opposite the Inlet?

3.2 what is the significance of the effect of dredging on the adjacent Swan River?

3.3 what is the significance of the observation that the groundwater entering the Swan River is good quality when the groundwater beneath the gas site is polluted?

3.4 what management strategies are needed for the increase in runoff from the new urban areas which will be created?

3.5 why should the river water quality be compromised to clean up the Inlet?

4. Heritage

What recognition of the heritage sites of the historical development of the drainage system in the area has been done?

5. Management

What would the Swan River Trusts' role be in the management of the Inlet?

6. Soil/sediment contamination

6.1 are any strategies available for the removal of nutrient rich sediment from the perched section of the Inlet?

6.2 how would the contamination be stopped from spreading during the earthworks operation?

6.3 table 4.1 has two errors in it which should be corrected.

6.4 what co-ordination is possible between SECWA and EPRA about the dredging of the river?

6.5 what disposal sites for contaminated fill are available in Western Australia?

6.6 what implications do the higher levels at depth for arsenic and chromium at sampling sites 4,5 and 6 have?

6.7 what is the chance that the coal tars may seep into the Inlet?

6.8 what is the existing need to remove the contaminated sediments at the mouth of the Inlet?

6.9 what justification is there for the conclusions about mixing the soil/sediment and lowering the heavy metal levels, considering the mercury levels are above normal soil levels throughout the profile along the length of the drain?

6.10 would dredging the mouth of the Inlet to remove the contaminated soil spread more contamination when it appears to be currently stable?

7. Water contamination

7.1 considering the water quality of the Swan River is predicted to deteriorate, what would this do to the quality of the Inlet water?

7.2 should further sampling be conducted to verify the elevated levels of zinc and phenol detected in the groundwater?

7.3 the dewatering water should be settled before being discharged into the river.

7.4 what action could be taken during the de-watering programme if the contaminants commence to move?

7.5 what can be done to clean up the water contamination in Claisebrook drain so that it does not add to the loading in the Swan River?

7.6 what criteria would be used for the initial connection of the Inlet to the river ?
7.7 what evidence is there that faecal coliform levels could be brought within acceptable limits in the Inlet?
7.8 what is the validity of the water quality criteria used?
7.9 what management might be necessary for the incidents of "first flush" contamination in the Inlet?
7.10 what management plans are needed for the control of nutrients from the fertilising of the open grassed areas surrounding the Inlet?
7.11 what options are there to dispose of any contaminated groundwaters?
7.12 what techniques are feasible to minimise coliform levels in the drain?
7.13 why is water to be pumped from the tidal Inlet into the perched freshwater system?
7.14 will the pumping system for returning water into the perched section of the Inlet be able to maintain a suitable water quality, and who would maintain the pumps?
7.15 what is the impact of the increase in concentration of contaminants at the SECWA gas site under scenario 2?

8. Late Submissions

8.1 Considering the design of the Inlet is not yet finalised, how accurate are the conclusions about the flushing of the Inlet and stormwater removal?

8.2 What are the management measures that could ameliorate the impact of the closure to traffic during construction of Plain and Bennett Streets?

8.3 The extent of consultation with the correct Aboriginal groups should be evaluated to ensure that it is comprehensive enough.

Appendix 2

East Perth Redevelopment Authority's response to issues

CLAISEBROOK PER

RESPONSES

1.1 The establishment of wetlands ecology should be part of the rehabilitation plan, eg islands left, reeds planted.

1.1a. A wetland area within the Inlet is being considered within the southernmost channel connecting the Swan River to the Inlet. Previously it was intended that this be a navigatable channel, however, geotechnical constraints have resulted in its conversion to a wetland area approximating a backwater of the Swan River. This backwater and its surrounds will be planted with species that would have occurred naturally in the past and will be reminiscent of the vegetation that existed around Tea Tree Lagon before its filling.

It is proposed that the island which would result from the construction of the Inlet will be planted heavily with reverine vegetation to provide a break between more developed areas and the Swan River.

1.2 How would the proponent stop the ongoing dredging from creating a biological desert opposite the Inlet?

1.2a Ongoing dredging would be required for the maintenance of the connecting channel between the Inlet and the Swan River. The previously proposed jetty and downstream channel have been dropped from the proposal and thus ongoing dredging will not be required at these locations. It is envisaged that maintenance dredging will occur every 10 years.

Dredging will result in the periodic destruction of the benthic biota, such as annelid worms and molluscs, which inhabit the area. It is considered that this is an unavoidable consequence of the proposal. However, the environmental impact of this dredging is not considered to be significant given the limited extent of the dredging, the depauparate fauna of the area (SECWA, 1991) and the recolonisation of the area by at least some species of benthic fauna in intervening periods.

1.3 What evidence has the proponent got that the aquatic biota would recolonise the Inlet areas?

1.3a The proponent has made no claims regarding colonisation of the Inlet by biota. However, it is expected that biota will colonise the Inlet after its construction. It should be noted that the construction of the Inlet will increase the area available to river biota including fringing shallow water areas associated with the proposed backwater as described in the answer to question 1.1.

2. What would be the long term navigability of the jetty and Inlet areas for the proposed water sports activity.

2.a Since preparing the PER the proponent has decided that the provision of an additional jetty at the southernmost channel is no longer appropriate. Water sport activity will be limited to boating and it is expected that an Inlet depth of 2-2.5m would be sufficient for such activities.

3.1 What is the rate of siltation in the river opposite the Inlet?

3.1a Currently the rate of siltation adjacent to the proposed Inlet is relatively high. This principally is related to the sediments carried down the Claisebrook Drain and their deposition at its mouth. The proposal to construct the Inlet includes the diversion of the Drain to a low flow pipe which will discharge to the river further downstream. Correspondingly rates of siltation are expected to decrease to rates typical of the deeper portions of the river. The rate of siltation in the river is minor and will result in the need for maintenance dredging adjacent to the Inlet every 10 years.

The proponent is prepared to commit to not disposing of spoil from maintenance dredging in the Swan River. Suitable alternatives will be investigated at the time of maintenance dredging.

3.2 What is the significance of the effect of dredging on the adjacent Swan River?

3.2a The predicted impact of dredging parts of the adjacent Swan River are described in Section 6.2 of the PER. Since writing the PER the second and southernmost channel has been dropped as a navigatible channel. As a consequence the area to be dredged is small and corresponds to the area most likely to be dredged by SECWA to remove hydrocarbon contamination. It is therefore concluded that the dredging of the Swan River for the Inlet will be of little incremental significance.

A study has been commissioned to examine the impact of dredging on the hydrology of the river. Dredging of the river during project construction or during the future maintenance should have no detrimental impact in terms of siltation or river dynamics.

3.3 What is the significance of the fact that groundwater entering the Swan River is good quality when the groundwater beneath the gasworks site is polluted?

3.3a References to groundwater in the PER relates primarily to that which currently enters the Claisebrook Drain along its length within the vicinity of the proposed Claisebrook Inlet. Groundwater investigations have shown that this water is generally of good quality, however, other studies have established the presence

of contaminated groundwaters on the gasworks site which discharges into a small portion of the length of the drain. Correspondingly the significance of this discharge is relatively small given the relatively small volumes involved ($22m^3$/day) as compared to a total groundwater influx in the area of $291m^3$/day. However, despite this the gasworks site can be seen as contributing to the load of pollutants entering the Swan River.

3.4 What management strategies are needed for the increase in runoff from the new urban areas which will be created?

3.4a Stormwater drainage has been one of the factors considered by EPRA engineers in the design of the Claisebrook Inlet and its urban environs. Stormwater drainage within the immediate vicinity of the Inlet will be designed to cope with runoff from the newly developed areas. Most of this runoff will discharge either into the ground, into the Inlet or into the proposed low flow drain which will have the capacity to cater for such drainage.

3.5 Why should the river water quality be comprised to clean up the Inlet?

3.5a It is the opinion of the proponent that the quality of water within the Swan River will not be compromised by the proposal to construct the Inlet. Work will be managed in such a way as to ensure that chemical pollution of the River does not occur. It is proposed that there will be no direct discharges to the Swan River of water or sediment without appropriate monitoring when chemical contamination is suspected. Connection of the Inlet to the River will occur during late winter months when the flow of water through the Swan is high and when suspended sediments are naturally abundant.

4. What recognition of the heritage sites of the historical development of the drainage system in the area has been done?

4a. A detailed examination of the cultural heritage values of the area within the EPRA's influence has been conducted. The proponent commits to liaising with the Water Authority of Western Australia (WAWA) and conducting research where appropriate to determine the potential of the Inlet construction to impact on archaeological sites relating to drainage. Every practical effort will be made to ensure that any impact will be minimised.

5. What would the Swan River Trust's role be in the management of the Inlet?

5a. The proponent is liaising with the Swan River Trust during the planning of the Inlet to ensure its concerns regarding management of the Inlet are considered as it has done in the past. EPRA will continue to liaise with the SRT throughout the development of the Environmental Management Plan (EMP) and the

physical construction of the Inlet. The role of the Swan River Trust in management of the Inlet is still a matter under negotiation.

6.1 Are any strategies available for the removal of nutrient rich sediment from the perched section of the Inlet?

6.1a. EPRA recognises that the Inlet and its perched section will need to be actively managed to ensure that its aesthetic value as an ornamental feature is maintained. One such management task will be the removal of sediment rich sediments to prevent the build up of nutrients within the system which may result in algal blooms in the medium to long term. This will be an easy matter as the perched area will be easily drained. It is proposed that water will be continuously pumped from the Inlet or from a bore which contains water with relatively low levels of nutrients. Both these alternatives will result in the perched section being continuously and thoroughly flushed.

6.2 How would the contamination be stopped from spreading during the earthworks operation?

6.2a There is the potential for contaminants to be spread during the excavation and transport of any material unless these activities are carried out in a responsible manner. Detailed plans regarding the methodologies for excavating and handling contaminated material will be presented in the EMP. At this stage of design of earthworks it is expected that any spread would be controlled by excavation in the dry, the use of covered trucks which would be less than fully loaded, the provision of washdown facilities for trucks leaving the site, and the sweeping of haul roads upon completion of the task.

6.3 Table 4.1 has two errors in it which should be corrected.

6.3a. The Draft Australian Guidelines for the Assessment and Management of Contaminated Sites were used to indicate the potential range of background concentrations for heavy metals. There have been a number of drafts which quote slightly different ranges of background criteria. Comparison indicated that levels of heavy metals in the drain sediments were generally below or close to background levels. Since publication of the PER finalised Guidelines for the Assessment and Management of Contaminated Sites have become available and the above comparison holds for the range of background levels presented in this document.

6.4 What co-ordination is possible between SECWA and EPRA about the dredging of the river?

6.4a. EPRA has and proposes to continue working closely with SECWA on the dredging of the Claisebrook Drain and Swan River, however, it is opposed to any formal linkage between the projects with regard to obtaining environmental approvals. EPRA is confident that a constructive working arrangement between EPRA and SECWA will ensure that the dredging is carried out in a cost effective and environmentally correct manner. This will most likely involve using the same dredging equipment to achieve the objectives of SECWA and EPRA.

6.5 What disposal sites for contaminated fill are available in Western Australia?

6.5a. The proponent is aware that currently a landfill approved to receive hazardous waste materials does not exist in WA. It is proposed that any material contaminated with PAHs would be relocated onto the adjacent East Perth Gasworks as this site is significantly contaminated with these chemical compounds. Remediation of the Gasworks site would then include the excavated material and this is addressed in the SECWA PER on the East Perth Gasworks site.

Investigations have not determined any significant quantities of contaminated waste within the main body of the Inlet construction area and it is considered that the probability of finding such material is remote. If material were to be uncovered there may be a need for interim storage at some as yet undertermined location until a suitable landfill is established. This storage would be in a manner which posed the minimum potential threat to the environment and is consistent with the actions taken at other sites in the metropolitan area.

It is proposed that inert material such as cement manufacturing waste will be placed in a landfill.

6.6 What implications do the high levels at depth for arsenic and chromium at sampling site 4, 5 and 6.

6.6a In all samples analysed chromium levels in Claisebrook Drain sediments were well within background levels. The chromium concentrations are a function of the presence of residual mineral sands which naturally occur in the sediments of the Swan Coastal Plain at low concentrations. In the Claisebrook Drain sediments may also have been contaminated as a result of airconditioner waste but the level of chromium is not sufficient to warrant special consideration.

The arsenic levels are higher than would normally occur in Perth sands, however, they are within or close to the range of levels found in Australian soils. No doubt sediments in the drain have been contaminated to some extent

by activities within the Drains catchment, however, the concentrations of these contaminants are low and the volumes of sediments small given the size of the drain. Consequently there is little significance with regards to these levels.

6.7 What is the chance that coal tars may seep into the Inlet?

6.7a The proposed installation of an impermeable cutoff wall along the length of the Claisebrook Drain will ensure that coal tars do not seep into the Inlet. This cutoff wall will be specifically designed to prevent the migration of coal tar and contaminated groundwaters into the Inlet. It will be incorporated into the Inlet as an edge treatment.

6.8 What is the existing need to remove the contaminated sediments at the mouth of the Inlet?

6.8a The SECWA PER and its associated documentation describes the need to remove the contaminated sediments within the Claisebrook Drain and Swan River with regards to their impact on the rivers biota. EPRA proposes to remove sediments to a depth of 2m within parts of the Swan River adjacent to the Inlet to allow the flushing of the Inlet to occur.

6.9 What justification is there for the conclusions about mixing the soil/sediment and lowering the heavy metal levels considering the mercury levels are above normal soil levels throughout the profile along the length of the drain?

6.9a Due to a typographical error the range for mercury levels in Australian soils were presented as 0.001-0.01mg/kg when in fact 0.1-0.01mg/kg is the correct range. As a result it can be seen that only some surface samples are the above this range. As such the justification presented in the PER for mixing of sediment during excavation remains valid. It is considered that when the sediments are excavated they will unavoidably mix with cleaner sediments at depth (>0.5m) resulting in their dilution to within the range for normal Australian soils.

6.10 Would dredging of the mouth of the Inlet to remove the contaminated soil spread more contamination when it appears to be currently stable?

6.10a The proponent does not propose dredging for the purpose of removing contamination rather it proposes it to provide a channel to the Claisebrook Inlet. SECWA propose dredging of the Swan River and Claisebrook Drain to remove contamination. EPRA will work in conjunction with SECWA regarding the dredging of contaminated sediments to ensure that no unacceptable impacts will occur. Specific methodologies will be described in the Environmental Management Plan which the proponent has committed to preparing. These will

require the approval of the EPA prior to construction commencing. At this stage the use of a cutter section dredge and the use of a silt curtain is proposed. This will prevent the spread of contamination bound to fine sediments.

7.1 Considering the water quality of the Swan River is predicted to deteriorate what would this do to the quality of the Inlet water?

7.1a Due to the exchange of water between the Inlet and the Swan River it is expected that the quality of water in the Inlet will reflect the quality of water within the Swan River. If the Swan River's water quality deteriorates so to will that of the Inlet.

7.2 Should further sampling be conducted to verify the elevated levels of zinc and phenol detected in the groundwater?

7.2a. The proponent is of the opinion that minor quantities of fill or possibly discharges of contaminated water may be responsible for the elevated levels of contaminants at two locations. These locations are outside the proposed site of the Inlet. Given that the concentrations of the contaminants are relatively low and that sampling and analysis of waters from monitoring bores nearby did not detect these contaminants suggesting that the contamination is not widespread it is concluded that verification and possible identification of the source of contamination is not warranted.

7.3 The dewatering water should be settled before being discharged into the river.

7.3a. It is proposed that any release of water from dewatering will be allowed to settle prior to discharge into the Swan River to prevent excessive suspended sediments being released.

7.4 What action could be taken during the dewatering programme if the contaminants commence to move?

7.4a Contaminants in groundwaters are known to occur beneath the gasworks site and not to any significant degree elsewhere near the proposed Inlet. It is proposed that the groundwater cutoff wall around the gasworks will be installed prior to dewatering for construction of the Inlet in that area. This will prevent contaminated groundwaters from discharging into the Inlet. Groundwater modelling based on bore hole information gained from the region indicates that groundwaters will not discharge into the Inlet from the gasworks site during dewatering. This modelling is presented in Appendix 2 of the PER.

7.5 What can be done to cleanup the water contamination in Claisebrook Drain so that it does not add to the loading in the Swan River?

7.5a The Claisebrook Drain has a large urban catchment and contains many sources of contamination which impact on the Drains water quality. The proponent has little or no direct influence throughout the catchment and correspondingly can do little to directly influence the quality of water within the Drain. The EPRA will however co-ordinate with the WAWA and SRT should these authorities examine methods by which the water quality of the drain can be improved. This may include pollution trapping devices, catchment management and policing measures amongst other measures.

The proponent is prepared to commit to liaising with the SRT and WAWA regarding the final design of the discharge point of the low flow drain. This will include an examination of the impact of the drain discharge to the Swan River with regard to recreational use of the river.

7.6 What criteria would be used for the initial connection of the Inlet to the River.

7.6.a The Proponent accepts that there will be a discharge of suspended sediments to the Swan River however, management techniques will ensure that the impacts of this will be minimised. Connection of the Inlet will be made at the best practical time after completion of the Inlet construction with the level of suspended sediments in mind. Time will be allowed for the settlement of sediments prior to connection and connection will be done at a time when suspended sediments are high naturally within the Swan River. The timing for the connecting of the Inlet with the Swan River will be addressed in full in the EMP.

7.7 What evidence is there that faecal coliform levels could be brought within acceptable limits in the Inlet?

7.7a. While it may be true that the achievement of faecal coliform levels within the Inlet equivalent to the draft EPA criteria may be difficult, the proponent is committed to reducing these levels. This is primarily because the proponent is endeavouring to create a healthy and clean living environment within East Perth as part of the redevelopment programme.

The proponent now proposes to divert the flow of the Claisebrook Drain around the Inlet for all but extreme storm events. These would occur with a frequency of up to 12 times per year. Modelling in association with monitoring has shown that the diversion of flows via the low flow drain will result in the concentrations of faecal coliforms within the Inlet being below the EPA Draft Criteria most of the year. It can be expected that during storm flows coliforms will be high, however, this will coincide with high silt levels in the Inlet thus it would be unlikely to be used for recreational purposes at this time.

7.8. What is the validity of the water quality criteria used?

7.8a. The proponent recognises that the draft EPA criteria have not been published and are thus not authoritive. These draft guidelines were used by the proponent's consultants to obtain relatively acceptable levels of contaminants that took into consideration the use which the Inlet would be put to. Their use was intended to provide a useful management guide only in the absence of suitable published criteria.

7.9 What management might be necessary for the incidents of "first flush" contamination in the Inlet?

7.9a The "first flush" of water coming down the Claisebrook Drain will be almost impossible to control. As is currently the case this will enter the Swan River from the drains catchment. The flush has a potential to create aesthetic problems because of suspended silts but this will be temporary due to the good water exchange times between the Inlet and the River. This will only be a problem if the first flush flows exceed the capacity of the low flow drain.

7.10 What management plans are needed for the control of nutrients from the fertilising of the open grassed areas surrounding the Inlet?

7.10a. The proponent has committed to minimising the quantities of fertilisers applied to the Open Space around the Swan River and Claisebrook Drain. It is probable that the authority will be responsible for the physical management of the Open Space and will also be responsible for providing details regarding irrigation and fertiliser application. This can be in the form of a Management Plan if required by the Swan River Trust.

7.11 What options are there to dispose of any contaminated groundwaters?

7.11a If contaminated groundwaters are detected they can be disposed of by:

(i) recharge to the ground, i.e. returned to the groundwater at another location where contamination already exists.

(ii) treated by the SECWA groundwater treatment plant if it is in operation.

(iii) evaporation of the water in a lined pond and then the trucking of the concentrated residual to a liquid treatment plant.

(iv) dilute the groundwater to acceptable concentrations of pollutants and then discharge indirectly to stormwater drainage.

However, groundwater investigations indicate that this should not be a problem. The above options and others will be considered in the projects environmental

management programme. The selection of an alternative will be dependant on the volumes involved and discussions with government authorities.

7.12 What techniques are possible to minimise colliform levels in the drain.

7.12a Faecal colliform levels are an indication of the degree of faecal pollution of a water body. Monitoring has shown that faecal colliform levels in the Claisebrook Drain are relatively high compared to other drains entering the Swan River. The most obvious method of reducing these levels would be to reduce the levels of faecal pollution entering the drain. Probable sources of pollution include illegal sewage connections, leaking sewage systems, illegal dumping of sewage together with pollution from urban runoff. Such sources will be numerous but small and given the extent of the catchment, difficult to control.

Co-ordinated management including additional policing of connections and the conversion of areas still on septic tanks to reticulated sewerage may decrease the level of pollution. There is no doubt that the urban renewal program in East Perth which will include the renovation of the stormwater drainage system will improve the situation.

7.13/7.14

Why is water to be pumped from the tidal Inlet into the perched freshwater system? Will the pumping system for returning water into the perched section of the Inlet be able to maintain a suitable water quality, and who would maintain the pumps?

7.13/7.14a

There are two options for water supply within the perched channel, i.e. water from the Inlet or water from groundwater sources. It has been assumed that the regulatory authorities would prefer water to be supplied from the Inlet, however, investigations of the suitability of using groundwater will be pursued. The water within the perched channel will be continually exchanged and therefore can expect to be of similar quality to the source water. There is always the option to drain the upper channel should the water quality need to be improved.

7.15 What is the impact of the increase in the concentration of contaminants at the SECWA gas site under Scenario 2?

7.15a Scenario 2 involves the construction of the groundwater cut off wall between the gasworks and the Inlet only. The construction of the wall will prevent the discharge of contaminated groundwater into the Inlet which was calculated to be approximately $7m^3$/day. Correspondingly this discharge would be diverted to the Swan River via the frontage of the gasworks site adjacent to the river. A

reduction in discharge to the Swan will result in increase in contaminants in groundwaters beneath the site. The impact of this increase when groundwaters reach the Swan will be offset by the reduced volume of water discharging, that is the total pollutant load entering the Swan River will remain the same and there should be no nett impact.

Appendix 3

List of submittors

1. Mrs Bernice Pexers
2. Conservation Council of WA Inc.
3. Dept. of Marine and Harbours
4. Swan River Trust
5. Australian Anglers Association Inc.
6. State Energy Commission of WA
7. Mr Max Hipkins
8. Swan Waste Action Group
9. Water Authority of WA
10. City of Perth
11. Aboriginal Affairs Planning Authority

Appendix 4

Proponent's commitments

CONSOLIDATED LIST OF COMMITMENTS FOR CLAISEBROOK

Commitments represent the Proponents solutions to potential environmental problems posed by the proposal. Essentially they are promises by the Proponent regarding the methods by which certain aspects of the proposal will be carried out.

The EPRA commits to carrying out the following commitment with respect to the Claisebrook Inlet:

1. With regard to connecting the Inlet to the Swan River the EPRA will ensure that, if required:

   - the connection will be made after most suspended sediment in the Inlet has had an opportunity to settle,
   - the connection will be timed if at all possible to correspond with high tide and a period during which suspended sediments are naturally high in the Swan River.

   The above will be implemented in consultation with the EPA and the SRT.

2. With regard to managing the quality of water in the Claisebrook Inlet the EPRA will:

   - monitor the level of faecal coliforms in the Claisebrook Inlet and the Claisebrook Drain on a monthly basis until such time as it is considered to be no longer necessary.

   The above will be performed to the satisfaction of the EPA and the SRT.

   - Jointly, with other responsible government authorities, contribute to a program designed to identify and prevent pollution currently entering the Claisebrook Drain. The Authority's financial contribution will be limited to $10,000.

   The above will be performed upon agreement with other authorities to undertake the study.

3. To prepare an Environmental Management Program (EMP) which will provide full details of the excavation, handling and disposal of hazardous wastes should

they be uncovered during excavation, and of contaminated sediments, clean fill, and groundwaters extracted during dewatering exercises. This EMP will be supplied to the EPA as soon as design details become available and prior to construction commencing. This will be done to the satisfaction of the EPA.

4. Provide the following in order to minimise the potential generation of nuisance dust during and after construction of the Inlet:

- adequate wind fencing will be stored on site during excavation,
- water carts will be available for use during excavation,
- stabilisation of areas if required.

The above will be carried out to the satisfaction of the EPA.

5. Perform the following with regard to minimising noise generation during Inlet excavation;

ensure trucks and excavators are in good operating order with standard noise mufflers,

ensure that dewatering pumps that are operating are within earth bunds,

only operate machinery with the exception of dewatering pumps and dredging and associated equipment during 0700 hours and 1800 hours Monday through Saturday.

The above will be done to the satisfaction of the EPA.

6. Minimise the fertilisers applied to landscaped areas adjacent to the Swan River and the Claisebrook Inlet to levels that maintain the grass in good health. The proponent will seek the advice of the City of Perth to achieve this objective.

This will be done to the satisfaction of the EPA.

7. If required construct a gross pollutant trap and facilities to accommodate a boom system to trap pollutants at the outfall of Claisebrook Drain.

This will be done in consultation with the Swan River Trust and WAWA.

8. Development of a foreshore landscaping program which will protect the banks of the Swan River and discourage primary contact recreation within 50 m of the outlet of Claisebrook Drain.

   This will be done in consultation with the Swan River Trust and WAWA.

9. Continue to liaise with the Swan River Trust, the Perth City Council and WAWA on the management of the Claisebrook Inlet and Main Drain.

D:CJ:0930LET