

# **Dampier solar salt field enhancement**

**Dampier Salt (Operations) Pty Ltd**

**Report and recommendations  
of the  
Environmental Protection Authority**

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# Summary and recommendations

Dampier Salt (Operations) Pty Ltd propose to enhance the production capacity of the existing Dampier salt field from the current level of 2.5 million tonnes per annum to 4 million tonnes per annum of salt. The existing salt field is six kilometres west of Karratha and four kilometres southeast of Dampier, adjacent to Karratha airport and the Hamersley Iron railway workshops.

Enhancement would be by re-dissolving and using existing waste salt (Stage 1) then installing three new 0.5 million tonne per annum stages to more productively utilise the existing area. The first stage would be completed early in 1991.

Production enhancement would be achieved by recovering residual salt previously deposited in the existing disused bitterns holding pond and then converting this area into additional productive brine concentration ponds and bitterns crystallisers to recover additional salt from the bitterns presently being discharged to Nickol Bay. An additional seawater supply from Nickol Creek (Figure 1), stormwater diversion structures and ancillary works complete the proposal. Additional supplies of earthen fill would be obtained from existing pits and a new lease south east of Karratha airport.

Due to continuing productivity efficiencies, the proposed increases in production would be achieved without increases in workforce levels.

The proposal lies largely on low lying former mudflats which have been previously disturbed by saltfield operations.

The proposal would lead to short term disturbance of earthfill borrow areas and some short term noise and dust generation during the construction phase. No significant environmental impacts have been identified during the operating phase.

The proposal is essentially a sustainable industrial development with an indefinite life. Accordingly, there are no proposals for decommissioning.

Commitments have been made by the proponent to rehabilitate borrow areas and to manage dust and the other minor environmental impacts. Continuance of existing monitoring programmes would facilitate sound environmental management of the proposal.

Surrounding land users, the responsible authorities and other involved agencies have received copies of the Consultative Environmental Review setting out the proposals and made comments where they have seen fit to do so. The proponent has responded to the issues raised in these comments as well as those of the Environmental Protection Authority and has modified the proposal and commitments as appropriate.

The Environmental Protection Authority notes that this proposal makes more efficient use of land which is already disturbed and encourages this approach. Accordingly, the Authority has concluded that this proposal could be implemented in an environmentally acceptable manner subject to the following recommendations:

## Recommendation 1

**The Environmental Protection Authority has concluded that the proposal to enhance the production capacity of the Dampier solar salt field, as described in the proponent's Consultative Environmental Review (CER) and modified during interaction between the proponent, the Environmental Protection Authority, public agencies and the government authorities that were consulted, is environmentally acceptable.**

**In reaching this conclusion the Environmental Protection Authority identified the main environmental factors requiring consideration as:**

- borrow pit management and rehabilitation.
- construction and monitoring of the seawater intake and pond over tidal mudflats.
- construction and monitoring of the stormwater diversion and discharge structures.

The Environmental Protection Authority notes that these and other issues have been addressed by environmental management commitments given by the proponent, the lease conditions proposed by the Department of Mines or by the recommendations of the Environmental Protection Authority in this report. Accordingly, the Environmental Protection Authority recommends that the proposed salt field enhancement could be approved subject to:

- the proponent's commitments (Appendix 1).
- the borrow pit lease conditions proposed by the Department of Mines (Appendix 2).
- the Environmental Protection Authority's recommendations in this report.

The Authority notes that during the detailed implementation of proposals, it is often necessary or desirable to make minor and non-substantial changes to the designs and specifications which have been examined as part of the Authority's assessment. The Authority believes that subsequent statutory approvals for this proposal could make provision for such changes, where it can be shown that the changes are not likely to have a significant effect on the environment.

The Environmental Protection Authority notes that the proponent has made a commitment to continue a programme of monitoring the effects of bitterns discharge to Nickol Bay on prawns and other marine life. Results of this monitoring should continue to be forwarded to the Department of Fisheries as required.

## **Recommendation 2**

The Environmental Protection Authority recommends that, upon decommissioning of this proposal, all facilities not required to be retained by the State Government should be removed and appropriate ground rehabilitation carried out to the satisfaction of the Minister for the Environment following the advice of the Environmental Protection Authority.

# 1. Introduction

Dampier Salt (Operations) Pty Ltd propose to expand the capacity of the existing Dampier salt field from 2.5 million tonnes per annum to 4 million tonnes per annum. Expansion is planned in four stages, depending on market demand, commencing in 1990 through to about 1997.

Expansion would occur within the existing salt field lease boundary which has been operating at Dampier since the late 1960s.

The proposed expansion is based on recovering waste salt from the disused bitterns holding pond then utilising this previously disturbed area for future production.

The expansion would allow the introduction of new technology to extract additional sodium chloride normally lost as waste, thereby increasing the productivity of both the land area presently used and the disused bitterns holding pond.

The proponent plans to begin construction of Stage 1 in the third quarter of 1990 to achieve production from the following summer onwards.

## 2. Evaluation of alternatives

The proponent has examined options for expanding capacity at both existing operations at Lake MacLeod (north of Carnarvon) and Dampier.

While Dampier offers the opportunity to obtain further production from an unused, already disturbed area the proponents do not believe that there are significant environmental benefits in choosing one site over the other. Dampier was chosen because it offers substantial capital and operating cost savings.

## 3. Project description

Salt production basically involves the progressive concentration of seawater by solar evaporation to produce concentrated brine and finally crystallised salt. Other residual ions are discharged as bitterns. Stage 1 of the proposal involves producing an extra 0.5 million tonnes per annum of salt for four years by re-dissolving previously deposited waste salt from the disused bitterns holding pond. Seawater would be pumped in from a small storage pond (Figure 1) and the re-dissolved brine introduced into the existing system. Six additional crystallisation ponds would also be added, inside the existing salt production field. A stormwater channel would be constructed to divert natural runoff around the southern shoreline of the bitterns pond and into Nickol Bay.

Stage 2 would involve increasing the effective evaporative area by converting the existing bitterns pond into additional brine concentration ponds and using the existing Pond Zero at full capacity to achieve a sustained 3 million tonnes per annum production rate. A further stormwater channel would be constructed to divert runoff around the northern shoreline of the bitterns pond and into Nickol Bay.

Stage 3 would involve additional bunds in the bitterns pond area to allow the recovery and re-use of currently non-marketable grade salt from the bitterns and the re-routing of brine flows to achieve 3.5 million tonnes per annum.

Stage 4 requires the construction of three more crystallisers in the existing salt production field and utilisation of the balance of the bitterns pond area by the construction of further bunds to achieve 4.0 million tonnes of salt production per annum.

Each stage involves the addition of earthen bunds or levees. The bunds would be made of earth fill and clay from existing borrow pits and a new shallow 200ha pit south east of Karratha airport. Rock armour to protect some exposed bunds from cyclonic wave action would be obtained from current stockpiles and an existing quarry.

The seawater storage pond would be excavated into bare mudflat parallel to the existing bitterns pond levee. The intake channel to this pond would involve the excavation of about 300m x 12m of mudflat, requiring the disturbance of samphire and a limited amount of mangroves. The route has been chosen to avoid as many mangroves as possible.



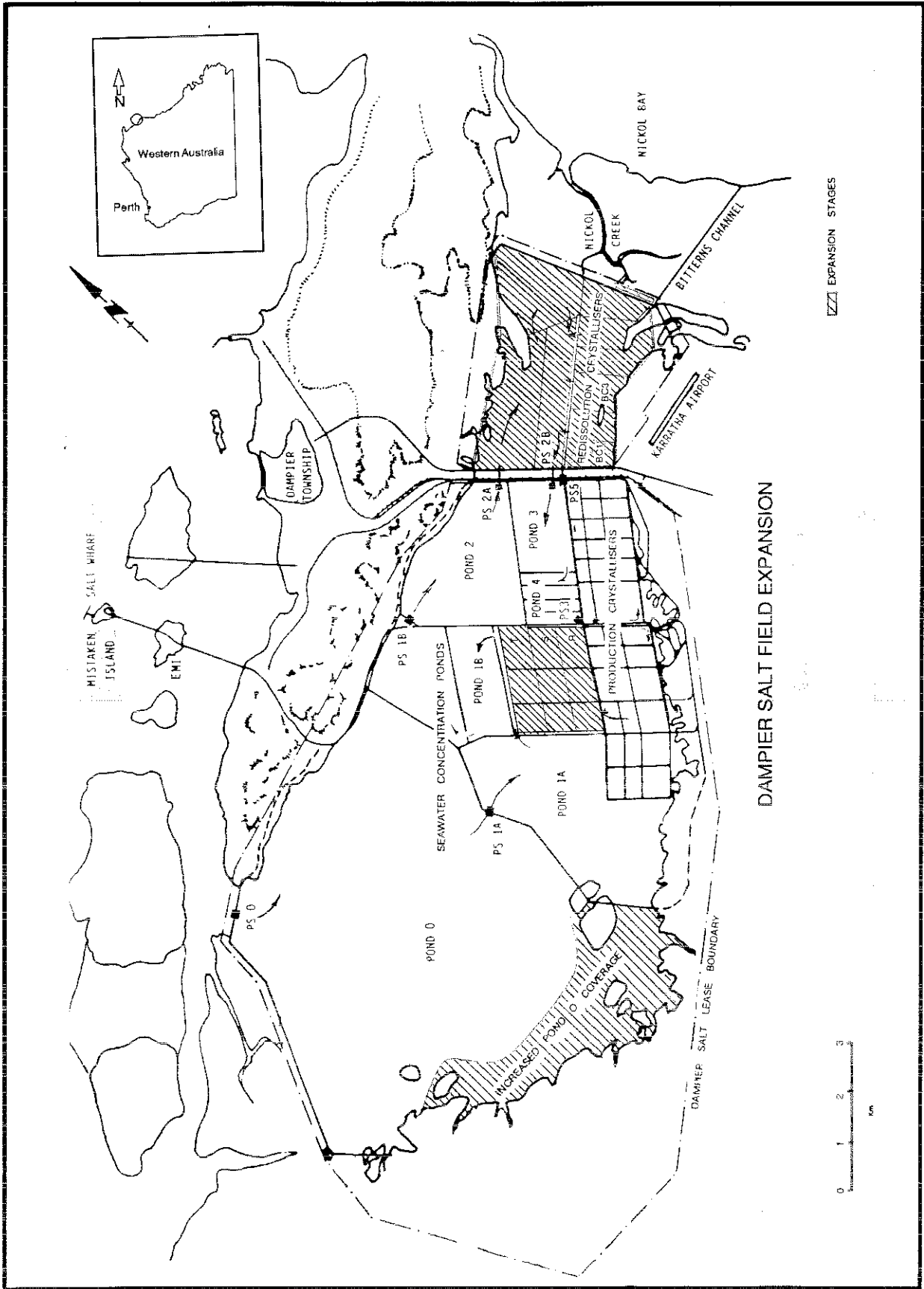


Figure 1: Dampier salt field expansion

## 4. Rehabilitation

Both existing borrow pits and the proposed new pit would be rehabilitated following excavation. In general, rehabilitated pits will be about one metre below natural surface level. Following reshaping, ripping and topsoil return, the pits will be re-seeded with native species of grasses and shrubs. Monitoring for revegetation success will be carried out monthly for the first year, then annually. Mangroves and samphire are expected to naturally recolonise the newly exposed banks of the seawater channel. Such regrowth to stabilise the banks will be actively promoted. Stormwater division channels will be rock armoured or seeded to stabilise them at points subject to erosive flow velocities.

## 5. Existing environment

The site, between Dampier Island (Burrup Peninsula) and the mainland, was formerly tidal mudflat. The proposed development is contained within areas previously disturbed by salt field operations.

Vegetation on the borrow pit area comprises native grasses and sparse shrubs.

The existing brine concentration ponds are highly productive. Seagrasses, seaweeds and micro algae support fish, crustaceans and benthic organisms on which many birds and larger fish feed. The area is an important habitat for migratory wading birds.

Rainfall is low (241mm/annum) and evaporation is high (3,530mm/annum) with warm dry winters and very hot summers during which irregular cyclones may occur.

## 6. Environmental impacts

Given the proposed mitigation, management and rehabilitation measures proposed, the residual impacts are not considered to be environmentally significant.

None of the existing brine concentration ponds will have their purpose, and hence salinity, changed. No impacts on these productive ecosystems are therefore predicted, with no consequent impact on the dependent bird species.

No additional ponds will be operated in the salinity range conducive to the breeding of the brine fly; thus, no increase in this nuisance species is predicted to result. None of the new ponds adjacent to Karratha airport will support marine life, due to their high salinities, and hence, no increases in hazards to birds or aircraft are predicted.

No significant terrestrial habitats or Aboriginal sites are planned to be disturbed.

Dust generated during borrow bit operations will be suppressed by watering on an 'as required' basis.

The proposal will lead to enhanced recoveries of sodium chloride from the incoming seawater. At the completion of Stage 4, sodium ion discharge in bitterns will be 70% below the current level and other major ions will increase by 28%. Bitterns discharge flow is expected to fall by 35%. The proponent does not expect these changes to significantly affect marine life in Nickol Creek or Nickol Bay but undertakes to continue current monitoring programmes of fish and prawns to verify this prediction.

While increased total salt production will help retain employees at Dampier Salt, increased productivity will result in the existing decline in employee numbers continuing to a final level about 9% below the current number. No significant social impacts on the surrounding community are anticipated as a result of this change.

## 7. Conclusions and recommendations

The Environmental Protection Authority notes that this proposal makes more efficient use of land which is already disturbed and encourages this approach. Accordingly, the Authority has concluded that this proposal could be implemented in an environmentally acceptable manner subject to the following recommendations:

### Recommendation 1

**The Environmental Protection Authority has concluded that the proposal to enhance the production capacity of the Dampier solar salt field, as described in the**

proponent's Consultative Environmental Review (CER) and modified during interaction between the proponent, the Environmental Protection Authority, public agencies and the government authorities that were consulted, is environmentally acceptable.

In reaching this conclusion the Environmental Protection Authority identified the main environmental factors requiring consideration as:

- borrow pit management and rehabilitation.
- construction and monitoring of the seawater intake and pond over tidal mudflats.
- construction and monitoring of the stormwater diversion and discharge structures.

The Environmental Protection Authority notes that these and other issues have been addressed by environmental management commitments given by the proponent, the lease conditions proposed by the Department of Mines or by the recommendations of the Environmental Protection Authority in this report. Accordingly, the Environmental Protection Authority recommends that the proposed salt field enhancement could be approved subject to:

- the proponent's commitments (Appendix 1).
- the borrow pit lease conditions proposed by the Department of Mines (Appendix 2).
- the Environmental Protection Authority's recommendations in this report.

The Authority notes that during the detailed implementation of proposals, it is often necessary or desirable to make minor and non-substantial changes to the designs and specifications which have been examined as part of the Authority's assessment. The Authority believes that subsequent statutory approvals for this proposal could make provision for such changes, where it can be shown that the changes are not likely to have a significant effect on the environment.

The Environmental Protection Authority notes that the proponent has made a commitment to continue a programme of monitoring the effects of bitterns discharge to Nickol Bay on prawns and other marine life. Results of this monitoring should continue to be forwarded to the Department of Fisheries as required.

## **Recommendation 2**

**The Environmental Protection Authority recommends that, upon decommissioning of this proposal, all facilities not required to be retained by the State Government should be removed and appropriate ground rehabilitation carried out to the satisfaction of the Minister for the Environment following the advice of the Environmental Protection Authority.**

The Environmental Protection Authority believes that any approval for the proposal based on this assessment should be limited to five years. Accordingly, if the proposal has not been substantially commenced within five years of the date of this report, then such approval should lapse. After that time, further consideration of the proposal should only occur following a new referral to the Environmental Protection Authority.

# **Appendix 1**

**Commitments by the proponent**



## Summary of commitments

The following commitments are made by Dampier Salt (Operations) Pty Ltd. As a result of the proposed salt field expansion, the company will:

1. Monitor the effects of discharge flow from stormwater channel outlets to identify scouring or sedimentation of adjacent mudflats, and report as required. Redesign discharge to better manage outflow effects to the satisfaction of the Environmental Protection Authority, if deemed necessary.
2. Remove excavated material from the seawater storage pond and seawater channel and use it to either build up mudflat areas contained by levees and road causeways, between Banana Island and the mainland or as backfill base in appropriate eastern lease area borrow pits, before replacing topsoil (See Appendix 2 of the CER).
3. Promote vegetation of seawater storage pond and seawater channel embankments through seeding with mangroves, samphire and sueda as described in Appendix 14 of the CER. Monitor long term stabilisation of embankments, and report as required. Embankment stabilisation to be to the satisfaction of the Environmental Protection Authority.
4. Stabilise and vegetate stormwater containment levees on north and south shorelines of bitterns pond area, to the satisfaction of the Environmental Protection Authority, using seed mix and methods as described in Appendix 14. Monitor long term stabilisation of stormwater levees, and report as required.
5. Restore new borrow pit areas after removal of materials. This will include:
  - contouring and floor preparation as described in Sections 7.5 and 8.4 of the CER.
  - seeding of prepared ground using method and seed mix as described in Appendix 14.
  - seed using minimum mix quantity of 5kg/ha.

The completed revegetation operation will be to the satisfaction of the Environmental Protection Authority.

6. Restore old disused borrow pits identified in Section 8.4 of the CER. These areas will be:
  - contoured.
  - surfaced with previously retained topsoil or adjacent materials obtained as part of the area contouring.
  - surface ripped where necessary.
  - seeded as for 5 above.
7. Monitor growth of vegetation on seawater pond and channel embankments, stormwater levees and regrowth of vegetation in prepared borrow pits. Results will be made available to the Environmental Protection Authority as required.
8. Continue monitoring bitterns discharge, and make data available to the Environmental Protection Authority, on request. This will include:
  - a) from the operating field -
    - densities on a daily basis.
    - volumes as monthly totals.
    - compositions, following changes in regime, to establish relationship to density.
  - b) in the bitterns channel and outflow area -
    - two yearly aerial photographs, including infra red exposures of the bitterns channel and adjacent mangrove areas.
    - continue yearly prawn surveys comparing prawn numbers in Nickol Creek with a control; Nickol River, for three years after each expansion stage.
    - bitterns mixing studies in the bitterns channel, following changes in discharge regime.
    - reporting any significant effects on marine life and vegetation.

9. Fence off single Aboriginal occupancy site in expansion area. Comply with Department of Aboriginal Sites' requirements as in Appendix 7 of the CER.
10. Assist Karratha Speedway in preparing new access road to their facility. Allow access to operators of sand mining leases.
11. Monitor seabird activity relating to the Seawater Pond, in conjunction with Roebourne Shire Council and CAA officers.  
Install CAA recommended bird deterrent methods, if deemed necessary by these authorities.
12. Monitor dust generation from haulage truck movement on earth roads adjacent to Karratha Airport, during field construction stages. Improve dust suppression if deemed necessary by Karratha Airport officers.

## **Appendix 2**

**Further conditions proposed by Department of Mines for mining lease  
application 47/243**





## **Draft recommended further conditions - mining lease application 47/243**

1. The construction and operation of the project and measures to protect the environment being carried out generally in accordance with the document titled 'Salt Field Expansion Consultative Environmental Review' dated July 1990 and retained on Mines Department File Number 677/90.

Where a difference exists between the above document(s) and the following conditions, then the following conditions shall prevail.

2. The development and operation of the project being carried out in such a manner so as to create the minimum practicable disturbance to the existing vegetation and natural landform.
3. All topsoil being removed ahead of all mining operations from sites such as pit areas, haul roads and new access roads and being stockpiled for later respreading or immediately respread as rehabilitation progresses.
4. At the completion of operations, all buildings and structures being removed from site or demolished and buried to the satisfaction of the State Mining Engineer.
5. All rubbish and scrap being progressively disposed of in a suitable manner.
6. At the completion of operations, or progressively where possible, all access roads and other disturbed areas being covered with topsoil, deep ripped and revegetated with local native grasses, shrubs and trees to the satisfaction of the State Mining Engineer.
7. Any expansion of operations within the lease boundaries beyond that outlined in the above document(s) is not to commence until a plan of operations and a programme to safeguard the environment are submitted to the State Mining Engineer for his assessment and until his written approval to proceed has been obtained.
8. The lessee providing a Bank Guaranteed Unconditional Performance Bond in favour of the Minister for Mines in the sum of \$10,000 for due compliance with the environmental conditions on the lease.
9. The lessee submitting to the State Mining Engineer in May of each year, a *brief* annual report outlining the operations and rehabilitation work undertaken in the previous 12 months and the proposed operations and rehabilitation programmes for the next 12 months.
10. Prior to commencement of Borrow Pit operation, the lessee providing to the State Mining Engineer for his assessment and for advice from the Environmental Protection Authority, a programme for topsoil management, a conceptual rehabilitation plan and a programme for dust control at the pits during periods of non-operation.



## **Appendix 3**

**Summary of queries raised in submissions and proponent's responses**



## **A. Bitterns discharge**

- Q) Will the flow rate and quality of bitterns discharge be maintained?
- A) Bitterns discharge into the Bitterns Discharge Channel at Levee 24 will be maintained during all the expansion stages. The predicted bitterns flow volumes and ionic concentrations for each stage are given in Table 1 of Dampier Salt's CER.
- It is not expected that interruptions to bitterns flow will occur during bitterns pond levee construction.
- Q) Will bitterns discharge and any effects on fish or prawns continue to be monitored and the results supplied to the Department of Fisheries?
- A) The monitoring of bitterns discharge parameters, two yearly aerial photography and general occurrence recording will continue indefinitely.
- Prawn population surveys, as described in Section 7.6 of the CER, will be continued for a period of three years following each expansion stage. Procedurally, results of surveys will be available through the EPA on request.

## **B. Stormwater diversion monitoring**

- Q) Will monitoring be undertaken of any scouring of the mudflats or siltation of mangroves below the stormwater drain outlets?
- A) All locations affected by stormwater discharge from the bitterns pond area will be monitored. A low level containment area at the stormwater channel discharge location at the northern end of the bitterns pond levee 24, is expected to retain sediments and disperse the stormwater discharge over a large area to reduce scouring velocity.

## **C. Construction site management**

- Q) Will temporary flagging or barrier fencing be used to limit disturbance of existing vegetation during construction?
- A) To allow construction of the planned seawater pond and channels, it will be necessary to operate all equipment from specially placed earth pads or strips. No excavating or other earthmoving equipment can move off these pads without sinking into the area's soft mud. It is planned to position the pads, etc, along the centre of the areas to be excavated and then progressively remove them along with the excavated material.
- It will be unnecessary to place any fencing, etc, because of the inability of equipment to operate off prepared areas.
- Q) Will employees and contractors be educated in the need to limit disturbance?
- A) In conjunction with the question above, the intention is to minimise the disturbance to the mudflat vegetation. This will be impressed on all contractors and operators involved with construction in the mudflat area outside levee 24.

## **D. Control of saline flooding**

- Q) Will monitoring be undertaken of possible expansion of saline water flooding of sandplain communities on the northern flank of the bitterns pond?
- A) The bitterns pond northern shoreline stormwater containment levees and discharge channel will prevent saline brine encroachment into creek beds previously opening into the bitterns pond. This will also allow rainwater flushing of salts already present in the creek beds.
- The brine level in the planned concentration pond 2A and 2B, will not be higher than the previous bitterns pond operating level and remnant shoreline, which in turn was not significantly higher than the current deposited salt level. There will be no encroachment of brine onto existing vegetated areas.
- Pond 2A, 2B brine levels will be monitored and controlled.

- Q) What will be the maximum extent and frequency of additional flooding in Pond Zero?
- A) Pond Zero area was increased to its maximum operating area of 5,200ha in 1981 and 1982. This area was subsequently reduced for operating reasons and is currently operating at 4,500ha.
- The planned area increase to 5,200ha is in conjunction with the expanded field requirements and is intended to be the future maintained area. There is no intention of lowering Pond Zero again.
- Q) What environmental impacts, if any, will this cause?
- A) The Pond Zero area to be covered is mudflat, devoid of any vegetation. Consequently, there will be no impact on vegetation. Because of the added pondage area downstream (Ponds 2A, 2B and 2C), in the brine concentration circuit, there will be no increase in Pond Zero brine density with the increased area. Consequently, there will be no added density stress on existing organisms and no expected changes in dominance.
- A beneficial effect will be that a greater area of covered peripheral mudflats will be available for wading birds to feed.
- Q) Are inflows to the new seawater holding pond likely to significantly scour the unprotected perimeter of the pond during filling?
- A) The rate of seawater inflow through the feed channel, into the seawater storage pond, will be sufficient to have the pond in a filled condition, as the tidal height commences to produce seawater flow across the mudflat areas surrounding the storage pond.
- The feed channel cross section area, in the completely filled condition (at tidal level 4.75 metres DCD) is sufficient to minimise the flow velocity through the channel to less than 10 metres/minute during the final stage of filling, for the rate of tide level increases approaching peak tide.