Dampier Port Authority – Port Expansion And Dredging Program

Dampier Port Authority

Report and recommendations
of the Environmental Protection Authority

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1. Introduction and background

This report provides the advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for the Environment on the environmental factors relevant to the proposal by Dampier Port Authority (DPA) to expand port facilities near the existing Dampier Cargo Wharf in Mermaid Sound (Figure 1). The proposal includes the improvement and extension of the current Dampier Cargo Wharf, the construction of a new jetty and associated shipping infrastructure and the dredging and disposal of up to 4.5 million cubic metres of sediments.

Initial discussions regarding this proposal in September 2001 resulted in the proponent being advised to develop a comprehensive scoping document to identify environmental issues associated with the proposal. At that time the proponent was advised that a level of assessment of Assessment on Referral Information (ARI) may be appropriate for the proposal, dependent on appropriate investigation and documentation, commitments to manage environmental impacts and consultation with stakeholders prior to referral.

Following ongoing discussion of the required information for EPA assessment of this proposal between the EPA Service Unit and the proponent, a final referral document for the proposal was received on 4 September 2003 (*Dampier Port Authority: Proposed Port Expansion and Dredging Program*, ENV Australia).

Based on the size and scope of the project and the information provided in the proponent's referral document, and subsequent discussions with the EPA Service Unit, the EPA considered that, while the proposal has the potential to affect the environment, it could be readily managed through implementation of legally binding environmental conditions imposed by the Minister for the Environment, in order to meet the EPA's environmental objectives.

The EPA considers that the proposal can be managed in an acceptable manner, subject to the EPA's recommended conditions being made legally binding.

The EPA has therefore determined under Section 40(1) of the Environmental Protection Act that the level of assessment for the proposal is ARI, and this report provides the EPA advice and recommendations in accordance with Section 44(1).

The proposal is subject to a permit application for the disposal of dredge material at sea from the Federal Department of the Environment and Heritage under the *Environmental Protection (Sea Dumping) Act 1981 (Cth),* which is currently under consideration.

The issue of dredging and disposal of contaminated sediment is expected to be adequately addressed by the Department of the Environment and Heritage through conditions on the Sea Dumping Permit and is not addressed in this report.

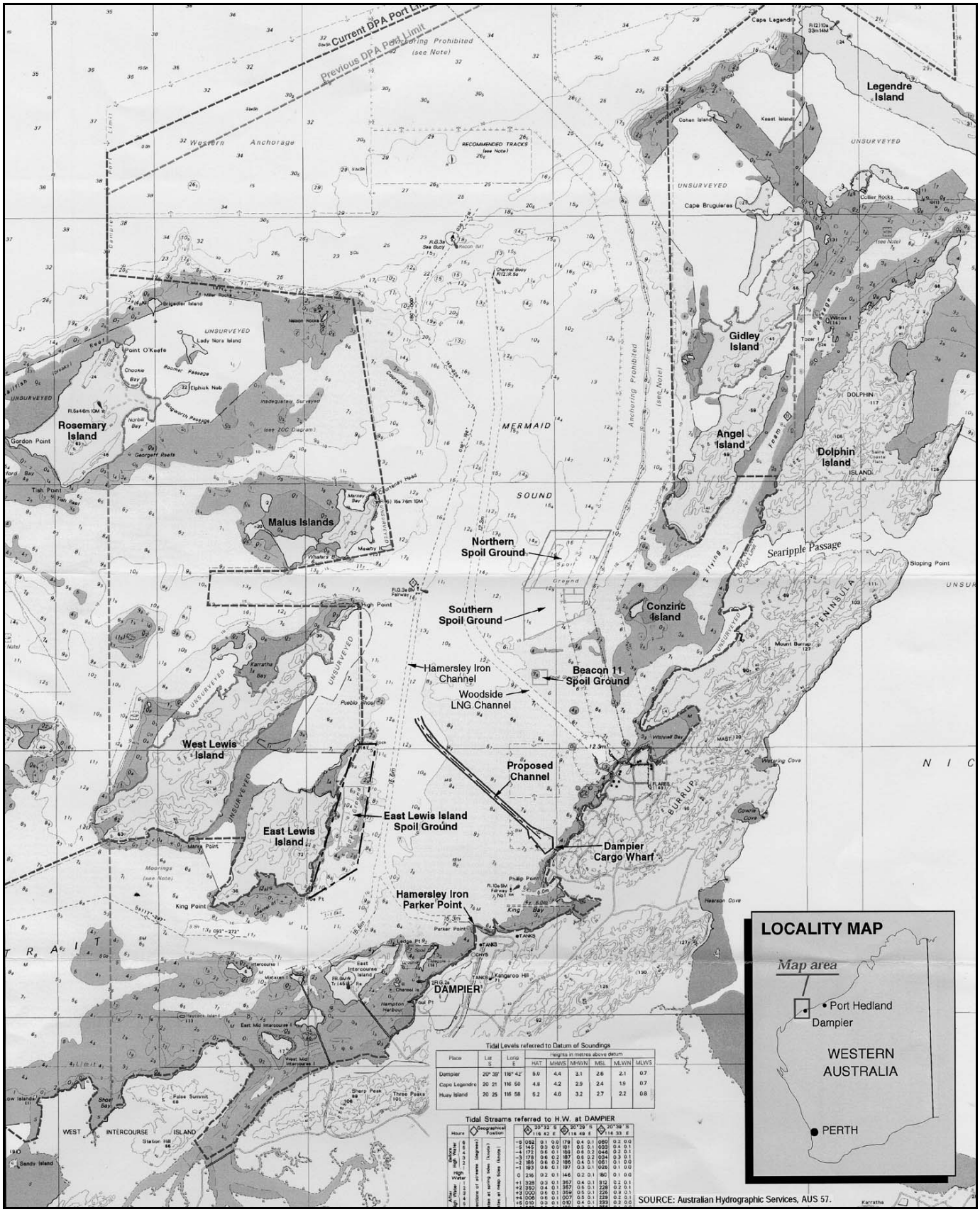

Figure 1: Location of proposal

It should also be noted that Hamersley Iron are proposing a concurrent operation of dredging and disposal to accommodate an increase in the company's export capacity through the Port of Dampier. The Hamersley Iron proposal involves dredging of approximately 3.1 million cubic metres of material and disposal of the dredged material on land near Parker Point and to disposal grounds at East Lewis Island and the Northern Spoil Ground. It is proposed that dredging and disposal activities would commence in December 2003 and be completed by July 2004. Hamersley Iron's proposal is also being assessed at the level of ARI (EPA, 2003a).

2. The proposal

The proposal by DPA to expand its port facilities includes the following (Figure 2):

- the improvement and extension of the current Dampier Cargo Wharf;
- the construction of a new jetty and associated shipping infrastructure; and
- the dredging, loading and disposal of up to 4.5 million cubic metres (m^3) of sediments to the Northern Spoil Ground and East Lewis Island Spoil Ground from the deepening of the harbour area and the associated approach channel.

The proposal is described in detail in Section 3 of the proponent's referral document (ENV Australia, 2003).

The main characteristics of the proposal are summarised in the table below.

Table 1: Summary of key proposal characteristics

Element	Description
Dampier Cargo Wharf	Extension of the wharf and deepening the Dampier Cargo Wharf berthing pocket and turning basin. • 85,000 cubic metres to be dredged for confined disposal at the East Lewis Island disposal ground due to contamination with tributyltin (TBT); and • the balance of the inner harbour requires 1,542,000 cubic metres to be dredged and disposed at the Northern Spoil Ground.
Jetty	Construction of a jetty with additional berthing areas and turning basin west of the Dampier Cargo Wharf which would attach to a load-out and lay-down facility. • 212,000 cubic metres to be dredged and disposed at the Northern Spoil Ground.
Channel	Creating a channel (160 metres wide and 6 kilometres long) that would link the Dampier Port to deeper water. • 2,145,000 cubic metres to be dredged and disposed at the Northern Spoil Ground.
Timing	Dredging for four to six months from approvals (nominally November 2003), followed by construction of the jetty to be completed by June 2005.
Dredging and Disposal	TOTAL 4,512,000 cubic metres: • 3,899,000 cubic metres as described above suitable for unconfined disposal to the Northern Spoil Ground; • 85,000 cubic metres of TBT contaminated material for confined disposal at the East Lewis Island disposal ground; and • 528,000 cubic metres allowance for over-dredge.

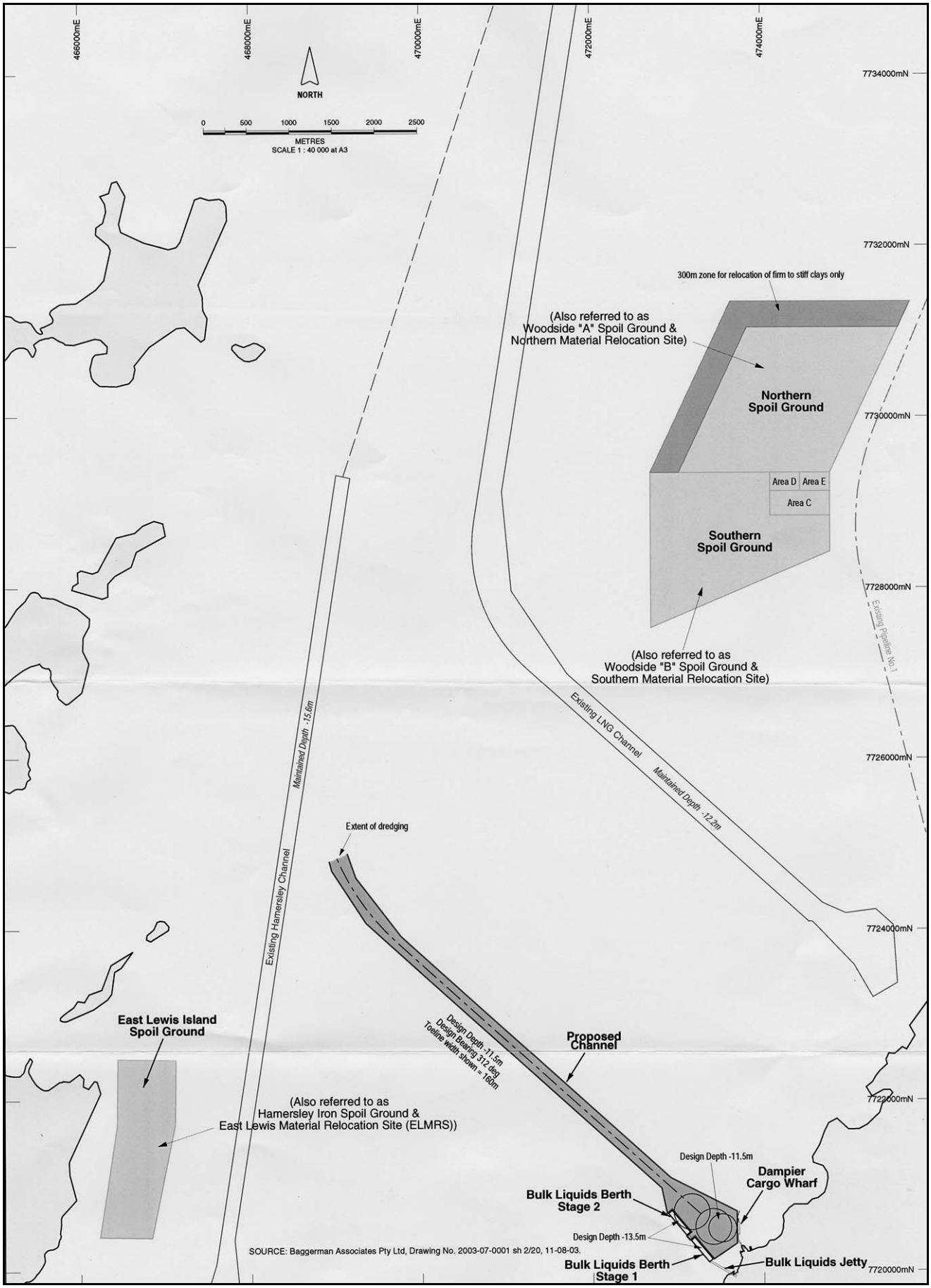

Figure 2: Proposal dredging and disposal locations

3. Consultation

The proponent undertook some preliminary consultation with Government agencies and other key stakeholders in February 2003, which is detailed in Appendix B of the referral document (ENV Australia, 2003). It should be noted that the consultation was done in relation to an initial Sea Dumping Permit seeking approval to dump approximately 320,000 m^3 of which approximately 12,000 m^3 was contaminated with tributyltin (TBT). The current referral document detailing a significantly increased scope of work (4.5 Mm^3 of which 85,000 m^3 is contaminated) has not been distributed for review.

As noted earlier, the proponent is also seeking a Sea Dumping Permit from the Federal Department of the Environment and Heritage for this proposal. The EPA has consulted with the Department of the Environment and Heritage regarding this proposal particularly in relation to the dredging and disposal of TBT contaminated material.

Extensive consultation has occurred between the EPA, the Dampier Port Authority and Hamersley Iron who are proposing dredging and disposal of approximately 3.1 Mm^3 of material. The proposed work by Hamersley Iron would occur at the same time as this proposal by DPA and also involves dumping at the East Lewis Island disposal ground and Northern Spoil Ground. The assessment of these two proposals by the EPA at the level of ARI is occurring concurrently and the EPA have reported to the Minister for the Environment in Bulletin 1117 regarding Hamersley Iron's proposal (EPA, 2003a).

4. Relevant environmental factor

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and the conditions and procedures, if any, to which the proposal should be subject. In addition, the EPA may make recommendations as it sees fit.

It is the EPA's opinion that 'Marine benthic habitats and biodiversity (coral communities)' is the environmental factor relevant to the proposal requiring evaluation in this report.

Details on the relevant environmental factor and its assessment are contained in Sections 4.1 - 4.3. The description of the factor shows why it is relevant to the proposal and how it will be affected by the proposal. The assessment of the factor is where the EPA decides whether or not a proposal meets the environmental objective set for that factor. Section 4.1 details the recommended management framework for management of dredging and disposal operations while Sections 4.2 and 4.3 deal with the requirement for a port-wide marine biological survey and ongoing port management.

4.1 Marine benthic habitats and biodiversity (coral communities)

Description

The Environment of Mermaid Sound

There is limited knowledge of the location, extent and significance of benthic communities, including corals that occur within Mermaid Sound. However, it is known that coral reef communities occur fringing the islands and coastline of Mermaid Sound. The proponent has identified areas of coral adjacent to its proposed dredging and disposal operations (Figure 15 of the proponent's referral documentation, ENV Australia, 2003).

Previous coral surveys that have been undertaken in the Dampier Port area in the recent past have been limited in terms of scope and spatial extent but appear to indicate that the community structure of coral reefs in the inner areas of Mermaid Sound may vary significantly from reefs in other parts of the Dampier Archipelago and the presence and distribution of communities is poorly understood.

There is also information available (eg. Forde, 1985) indicating that some species of corals in the Dampier area are located at the limits of their spatial and or ecological range and that cumulative loss of coral communities and habitat has occurred in the past as a result of previous industrial development and expansion in the Dampier/Burrup area.

The EPA considers that the surrounding waters of the Dampier Archipelago are of high environmental value, with areas designated as nature reserves and consideration being given to the establishment of a marine conservation reserve. The proposed Dampier Archipelago/Cape Preston Marine Conservation Reserve includes East Lewis Island and Conzinc Island (east of the Northern Spoil Ground).

The nature, magnitude and timing of this proposal (and the similar proposal by Hamersley Iron) are such that there appears to be significant risk of the dredging and/or disposal operations impacting on coral communities as a result of possible increased light attenuation caused by increased turbidity, and/or sedimentation possibly over large areas for an extended period.

Therefore, this proposal should be viewed in the context of the wider impacts of two potentially concurrent dredging programs proposed over the period November 2003 to July 2004 totalling approximately 7 million m^3 of material for dredging and disposal. Neither of the two proponents for these proposals have demonstrated a predictive capacity in relation to the extent and severity of sedimentation and/or water quality change likely to occur as a result of the individual proposals, or in combination, and it is considered that there is a significant level of uncertainty about the seriousness of potential impacts and their ecological consequences.

While acknowledging the risks posed to benthic communities inherent in dredging and disposal in sensitive locations, the EPA is aware that the Port of Dampier

(particularly the areas in proximity to Parker Point and the Dampier Public Wharf) has been subject to large scale shipping and dredging activities since the 1960s and therefore cannot be regarded as a pristine environment.

The Impacts

The main indirect risks to corals and other marine life from the proposed dredging and disposal activities are likely to arise from:

- the liberation of sediment into the water column in sufficient quantities to be transported to, and settle on, corals and other benthic organisms;
- the liberation of fine sediment into the water column in sufficient quantities to increase turbidity above natural levels and cause resultant deterioration in the quantity and quality of light reaching benthic photosynthetic organisms (eg. coral);
- the introduction of contaminated material into the water column at sufficient concentration to cause adverse impacts on marine organisms; and
- other forms of pollution (eg. hydrocarbon spills, introduced marine organisms).

There will also be direct damage to 700 m^2 of coral habitat associated with construction of the jetty and possibly more from piling out to the approximately 75 metre limit of coral.

A previous study (Forde, 1985) has shown that there is the possibility for dredging to cause increased turbidity over areas at least 10 kilometres from the site of operation. Coral communities occur adjacent to the proposed dredging within the wharf area; within 100 metres of the proposed disposal site at East Lewis Island; and within 2-4 kilometres from the Northern Disposal Ground at Conzinc Island.

The dredging is proposed to occur over ecologically important periods over summer and coral spawning. Summer is a naturally stressful time for corals due to high water temperatures, and pressures associated with dredging impose additional stress related to possible decreased photosynthetic production of energy (due to turbidity) and increased requirement to produce mucus (to remove sediment). Corals mass spawn and reproductive success depends on the ability of coral colonies to release eggs and sperm, the success of fertilisation in the water column and the ability of coral larvae to settle onto suitable substrate on the reef – each of these stages in the reproductive sequence of corals is potentially very sensitive to stressors such as sediment deposition and turbidity. In Western Australia, predicting potential impacts of dredging and disposal on the basis of information collected on the east coast of Australia may be complicated by the fact that in Western Australia the annual coral mass spawning period occurs shortly after the high temperature summer period. On the east coast of Australia the coral spawning occurs in spring.

The proponent has not predicted any such impacts in the referral document, citing the oceanographic characteristics of Mermaid Sound, the composition of the materials to be dredged and the results of previous monitoring studies, and has advised that it has not undertaken modelling of dredging or disposal plume dispersal because it is not considered likely that there will be significant impacts on coral communities.

Assessment

The area considered for assessment of this factor is the area of Mermaid Sound encompassing the Dampier Cargo Wharf, the East Lewis Island spoil ground and the Northern Spoil Ground and any adjacent areas that may be affected by the proposal.

The EPA's environmental objective for this factor is to maintain marine ecological integrity and biodiversity and ensure that impacts on adjacent marine communities are avoided.

Taking into account:

- the limited knowledge about the current spatial extent and biodiversity significance of coral communities in Mermaid Sound;
- that there is limited understanding of cumulative losses that have occurred as a result of industrial expansion in the Dampier/Burrup area;
- the degree of risk posed to environmental values from dredging and disposal and the ecological consequences of those risks are poorly understood due to a lack of knowledge about the cause-effect pathways associated with development in tropical marine ecosystems; and
- the lack of adequate prediction by the proponent (using appropriate modelling) of the behaviour of turbid plumes, the zone of influence from increased sedimentation or the stability of spoil, making it very difficult to assess potential impacts on key values/attributes,

the EPA has taken a precautionary approach for this assessment, whilst recognising that episodic large scale dredging has taken place in the Port of Dampier over a considerable period and cannot be regarded as a pristine environment.

The proponent has proposed some turbidity and coral monitoring. Turbidity is proposed to be measured at the nearest coral communities and at a background location, and should levels recorded at the nearest coral community exceed twice background level for a period of two weeks, then the spoil disposal location would be repositioned to prevent turbidity plumes from reaching the coral communities (as detailed in Section 6.4.3, p.39, ENV Australia, 2003).

The monitoring and management framework proposed by the proponent in the referral documentation is not considered adequate and therefore the EPA has recommended environmental conditions to address the potential environmental impacts identified above.

Management Recommended by the EPA

The EPA has prepared Recommended Environmental Conditions that include both a water quality monitoring framework that is consistent with the approach to water quality management set out in the National Water Quality Management Strategy (ANZECC, 2000) and coral health monitoring.

The Recommended Environmental Conditions are included as Appendix 2 and include the water quality management framework and coral health monitoring that reflects a precautionary approach to management. The EPA has recommended similar conditions for Hamersley Iron's dredging proposal (EPA, 2003a).

In summary, the EPA's management framework recommends that water quality criteria be used as the initial trigger for intensive coral health monitoring. In the event that monitoring detects that the water quality criteria are not being achieved, coral health criteria are then used to initiate control and management of dredging and disposal operations within defined management areas. If coral health criteria are not met following implementation of management options, the proponent is required to stop dredging and disposal operations within the relevant management area.

A short description of the key Recommended Environmental Conditions follows.

Water Quality Criteria, Monitoring and Evaluation

Recommended Environmental Condition 6 requires that water quality parameters be collected twice daily at the nearest coral communities to each of the major areas of dredging and disposal (impact site) and at similar reference or background locations and evaluated using the following approach.

The water quality parameters required to be collected are for turbidity, dissolved oxygen and pH. For the water quality measurement of turbidity (the key monitoring parameter used to measure the potential risk of light attenuation) in the Outer Management Areas, the conditions require that the five-day running median (n=10) of water quality parameters be calculated for each impact site and that a five-day running 80^{th} percentile be calculated for the reference site data.

The 80^{th} percentile calculated over a five-day period represents a level of difference from natural background variation within which it is reasonable to expect that turbidity would not have a significant detrimental effect on coral health.

The five-day running median for each impact site is then compared to the five-day running 80^{th} percentile of the reference site data (for each parameter) and the five-day running median of data from the impact site would be either less than the five-day running 80^{th} percentile from the reference site (dredging operating within acceptable limits for turbidity) or measurements from the impact site would be greater than those from the reference site (indicating that dredging is causing an impact on turbidity).

An Inner Management Area adjacent to the operational port areas has been identified, given that some areas of coral habitat within the Dampier Port located in close proximity to previous shipping and dredging are potentially more disturbed (Figure 3). The water quality parameter measurements within this area are different to those described above. In this area, "twice reference water turbidity" criteria is suggested as the main basis for triggering more intensive management and monitoring.

During the expected coral spawning periods of 14-26 March 2004 and 12-24 April 2004, the proponent should cease dredging during the four days of spawning (detailed

in Recommended Condition 7-1) and more stringent water quality criteria are suggested for the following nine-day settlement period.

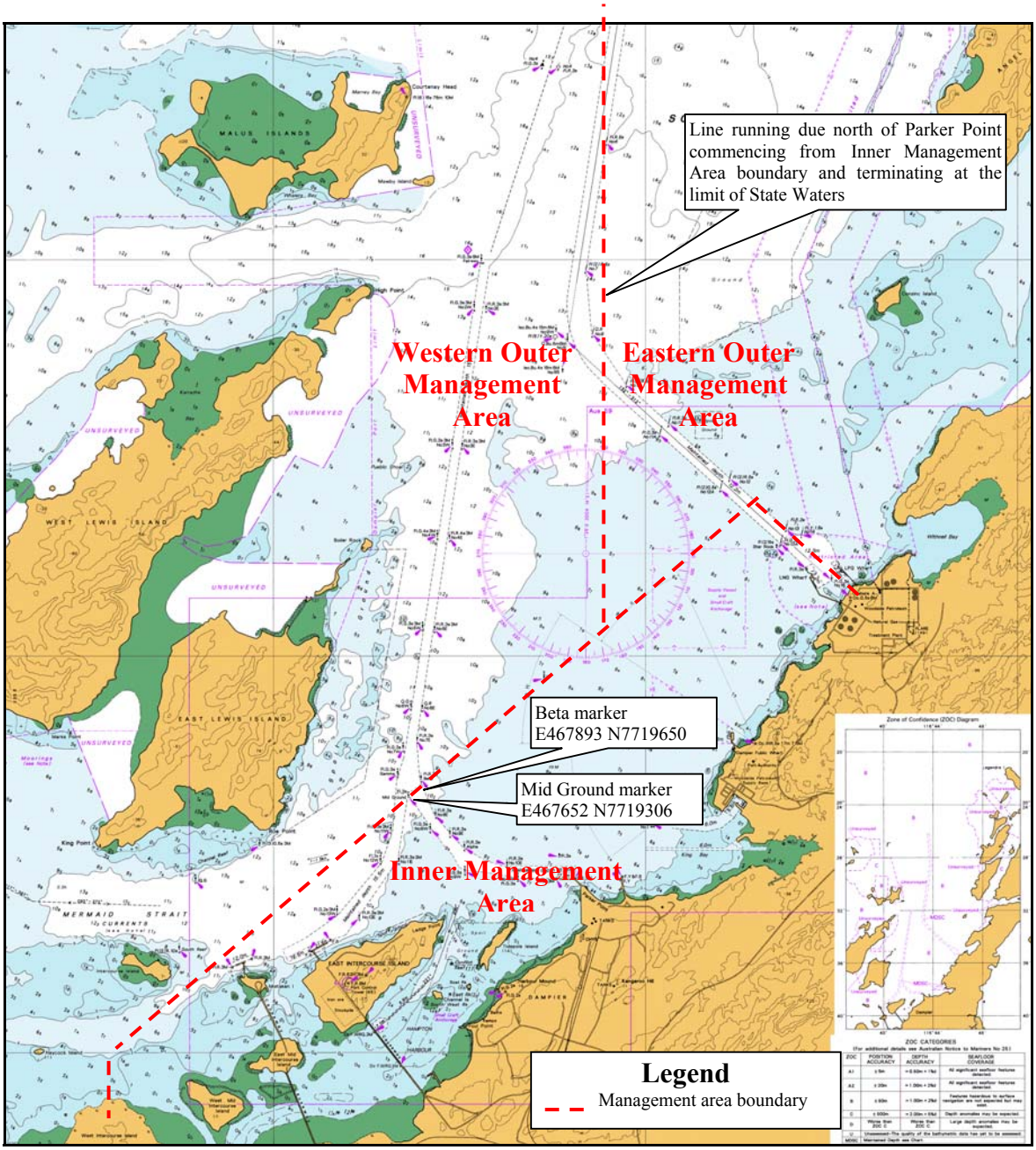

Figure 3: Management areas for the purposes of Environmental Conditions 6 and 7.

During the coral spawning periods, in the Outer Management Areas, the five-day running median for turbidity at each water quality potential impact site is required to be less than the five-day running 60th percentile of background turbidity measured at the appropriate reference site(s). Within the Inner Management Area, the mean of two measurements of turbidity at each water quality potential impact site is required to be less than 1.5 times the background turbidity measured at the appropriate reference site(s) on the day of sampling.

The requirement to cease dredging during the four-day spawning period may be varied at the discretion of the EPA in consultation with the proponent on the basis of results of investigations relating to the timing and extent of coral mass spawning and the results of monitoring of water quality and coral health (detailed in Recommended Condition 7-1). It is expected that the proponent would provide results as early as feasible to allow enough time for the EPA to make a preliminary determination regarding the requirement to cease dredging by at least one month prior to the first coral spawning event in mid-March. Final approval to a variation would not be granted until immediately prior to coral spawning, and only if results up until that time in mid-March were still to the satisfaction of the EPA. A similar procedure would apply to the second coral spawning event in mid-April.

Control and Management of Dredging and Spoil Disposal Operations

In order to protect the environmental values of marine ecosystems, particularly coral communities within Mermaid Sound, Recommended Environmental Condition 7 requires the proponent to manage and control dredging and spoil disposal activities within each of the management areas identified in Figure 3 based on the results of water quality and/or coral health monitoring within the respective management area.

Should monitoring show that water quality at coral communities (potential impact sites) have changed to the extent that predefined criteria have not been met for a period of two days, a series of management measures (options) would be progressively implemented by the proponent aimed at improving water quality. The proponent would also commence intensive coral health monitoring (estimated using levels of apparent coral whitening, detailed in Recommended Condition 10) fortnightly at reference and potentially impacted coral sites.

The management has two initial stages (before stopping of dredging and disposal operations) relating to specific criteria based on the extent and severity of sub-lethal impacts on coral health (ie. extent of coral whitening).

Stage 1: If monitoring shows that water quality at reference sites has not achieved defined water quality criteria, but coral is not showing any signs of whitening above a defined threshold level (<5%), 'Stage 1' management actions such as dredge or spoil ground relocation or reducing dredge overflow are to be applied and intensive coral health monitoring is to be commenced.

Stage 2: If following 14 days of Stage 1 management, water quality does not return to levels that achieve criteria, or coral health monitoring shows that corals are showing levels of whitening above the defined threshold level (>5%), other (more intensive) management measures referred to as 'Stage 2' would be implemented, such as deployment of silt curtains or reducing dredging to a single shift.

If following Stage 2 management as referred to above, water quality did not result in the defined water quality criteria being achieved, or the proponent's coral monitoring showed that coral whitening was occurring at a level significantly above 'natural' levels in the area (as measured at reference coral health monitoring sites), further

management actions would be implemented and dredging continued unless a limit level of coral health change (whitening or coral death) had been reached. If the predefined limit of coral health impact is reached (approximately 10% above any natural levels of health change) dredging and/or disposal would stop or be relocated to an area where impacts on coral had not reached the predefined limit.

In the event that coral monitoring was rendered impracticable for an extended period (one month) by low water visibility or other factors, non achievement of the water quality criteria would trigger a stoppage of dredging operations until the water quality returned to within criteria levels or coral monitoring was able to be resumed.

Coral Health Criteria and Monitoring

Recommended Condition 10 requires the proponent to undertake regular fortnightly coral health monitoring and evaluate the results of this monitoring with reference to coral health criteria. Coral health criteria compare the change in coral health (compared to baseline) at impact sites, with the change in coral health (compared to baseline) at reference sites.

This comparison is to be based on the measurement of the extent of coral whitening for selected individual coral colonies at both impact and reference sites. The extent of coral whitening is the area of living coral tissue that has expelled its zooxanthellae or has died within each individual marked coral colony since the baseline condition of area of living coral was established for that colony.

The method of comparing the results of coral whitening measurements involves the calculation of an index of coral health change, described in Recommended Condition 10, which is comparable to an overall percentage change in coral health.

The EPA considers that a 5% overall change in coral health is the (threshold) trigger for the implementation of 'Stage 2' management options, as described above. If a 10% change in coral health is measured, dredging and/or disposal would stop or be relocated to a Management Area where impacts on coral had not reached the predefined limit.

Summary

Having particular regard to the:

- recommended environmental conditions proposed by the EPA in order to apply a precautionary approach to management; and
- the EPA's recommended approach to control and management of the proposed dredging and disposal operations based on water quality and coral health monitoring as a trigger for management actions,

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor.

4.2 Coral Survey

During the assessment it became apparent that the proponent was unable to estimate the cumulative loss of corals in proximity to the proposal. This was required in order to assess the extent to which any loss of coral resulting from the proposal would meet the intent of the EPA's approach to protection of coral habitat as set out EPA's draft Guidance Statement No. 29 *Benthic Primary Producer Habitat Protection* (EPA, 2003b).

The EPA recommends that the proponent undertake a field study of the current distribution of coral reef habitat (greater than 10% cover) within the DPA Port Limit to provide information on the integrity and biodiversity of the marine ecosystems of the Dampier Archipelago (Recommended Condition 5). This requirement is consistent with a recommended condition for Hamersley Iron in EPA Bulletin 1114 (EPA, 2003c)

The main objective of the survey should be to establish a baseline for assessing losses of coral reef habitat resulting from human activity, such as dredging, land reclamation, interrupted recruitment processes etc.

The EPA also recommends that the proponent estimate the original historical (pre-development) distribution of coral reef habitat within the DPA Port Limit to estimate cumulative loss of coral reef habitat to date. Development associated impacts on coral reef habitat in the Dampier Archipelago are unlikely prior to the 1950s. The information sources should include historical aerial photographic records, marine monitoring programs and previous environmental review documents.

The EPA is aware that there will be future developments in the Dampier Port area. Information obtained from benthic habitat surveys referred to is important and will be required prior to referral to the EPA of future development proposals that may impact on coral communities in the area.

4.3 Port Management

The EPA has recommended Condition 12, which provides for the establishment of interim environmental values and objectives for the Port environs to guide the monitoring and management of the expanded Port facility. To ensure consistency of marine environmental quality management in Dampier, the EPA has recommended a similar condition for the operation of Hamersley Iron's port facility in Dampier in Bulletin 1114 (EPA, 2003c).

The environmental values and objectives established under Recommended Condition 12 should be considered interim until values and objectives are formally established for the broader marine waters of the Pilbara coast, including Mermaid Sound, through an independent and public consultative process to be conducted during 2004. The EPA expects that the Port Authority would adapt the Marine Management Program required by Recommended Condition 12 as necessary to be consistent with the environmental values and objectives set through the formal public consultation process.

5. Conditions

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

5.1 Recommended conditions

Having considered the information provided in this report, the EPA has developed a set of conditions that the EPA recommends be imposed if the proposal by Dampier Port Authority to expand port facilities near the existing Dampier Cargo Wharf is approved for implementation.

These conditions are presented in Appendix 2. Matters addressed in the conditions include the requirement that the proponent shall (Recommended Environmental Condition number in brackets):

(a) determine the current and historical distribution of coral reef habitat within the Dampier Port area, and determine the cumulative coral loss resulting from human activity (5);

(b) undertake monitoring and evaluation of water quality criteria (6);

(c) control and manage dredging and spoil disposal operations, including Stage 1 and Stage 2 management options (7);

(d) prepare and implement a dredging and spoil disposal management plan (8);

(e) ensure that the potential for introduced marine organisms on the dredging equipment does not present a risk to the ecosystem integrity of the marine waters of the Dampier Archipelago (9);

(f) undertake coral health criteria analysis and monitoring (10);

(g) undertake coral habitat monitoring and management (11); and

(h) prepare and implement a Marine Monitoring and Management Program for protection of the environment associated with the management and maintenance of the Port facility (12).

6. Conclusions

The EPA has considered the proposal by Dampier Port Authority to expand port facilities near the existing Dampier Cargo Wharf. The proposal includes the improvement and extension of the current Dampier Cargo Wharf, the construction of a new jetty and associated shipping infrastructure and the dredging, loading and disposal of up to 4.5 million cubic metres of sediments.

While recognising that episodic large scale dredging has taken place in Mermaid Sound over a considerable period and taking into account the limited available knowledge, information and certainty about:

- the current spatial extent and biodiversity significance of coral communities in Mermaid Sound;

- cumulative losses of coral that have occurred as a result of industrial expansion in the Dampier/Burrup area;
- the degree of risk posed to environmental values from dredging and disposal and the ecological consequences of those risks; and
- the behaviour of turbid plumes, the zone of influence from increased sedimentation and the stability of spoil,

the EPA has taken a precautionary approach to evaluating the proposal and considering related environmental management requirements.

The EPA has recommended a series of Environmental Conditions, which provides a management framework that recommends that water quality criteria be used as the initial trigger for intensive coral health monitoring. Coral health criteria, in conjunction with water quality criteria, are then used to initiate control and management of dredging and disposal operations within defined management areas. If coral health criteria are not met following implementation of management options, the proponent is required to stop dredging and disposal operations within the relevant management area.

The EPA has concluded that the proposal is capable of being managed in an environmentally acceptable manner such that it is most unlikely that the EPA's objective for 'Marine benthic habitats and biodiversity (coral communities)' would be compromised, provided there is satisfactory implementation of the Recommended Environmental Conditions set out in Appendix 2.

7. Recommendations

The EPA submits the following recommendations to the Minister for the Environment:

1. That the Minister notes that the proposal being assessed is for Dampier Port Authority's expansion of port facilities near the existing Dampier Cargo Wharf.
2. That the Minister considers the report on the relevant environmental factors as set out in Section 4.
3. That the Minister notes that the EPA has concluded that it is unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 2.
4. That the Minister imposes the conditions and procedures recommended in Appendix 2 of this report.

Appendix 1

References

ANZECC (2000) *Australian and New Zealand guidelines for fresh and marine water quality. National Water Quality Management Strategy Paper No.4.* Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand. Canberra, ACT.

ENV Australia (2003) *Dampier Port Authority: Proposed Port Expansion and Dredging Program*, Referral Document to the EPA prepared for Dampier Port Authority. Perth, Western Australia.

Environmental Protection Authority (2003a) *Hamersley Iron Dredging Programme for the Dampier Port Upgrade*, Report and recommendations of the EPA, Bulletin 1117. Perth, Western Australia.

Environmental Protection Authority (2003b) *Draft Guidance Statement No. 29 Benthic Primary Producer Habitat Protection for Western Australia's Marine Environment.* Perth, Western Australia.

Environmental Protection Authority (2003c) *Hamersley Iron – Dampier Port Upgrade to 95Mtpa Capacity,* Report and recommendations of the EPA, Bulletin 1114. Perth, Western Australia.

Forde, M.J. (1985) *Technical Report on Suspended Matter in Mermaid Sound, Dampier Archipelago*, Department of Conservation and Environment Bulletin 215. Perth, Western Australia.

Appendix 2

Recommended Environmental Conditions

Statement No.

RECOMMENDED CONDITIONS AND PROCEDURES

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

DAMPIER PORT AUTHORITY – PORT EXPANSION AND DREDGING PROGRAM

Proposal: To expand port facilities near the existing Dampier Cargo Wharf including the improvement and extension of the current Dampier Cargo Wharf, the construction of a new jetty and associated shipping infrastructure and the dredging, loading and disposal of up to 4.5 million cubic metres of sediments, as documented in schedule 1 of this statement.

Proponent: Dampier Port Authority

Proponent Address: PO Box 285, Dampier WA 6713

Assessment Number: 1495

Report of the Environmental Protection Authority: Bulletin 1116

The proposal referred to above may be implemented by the proponent subject to the following conditions and procedures:

1 Implementation and Changes

1-1 The proponent shall implement the proposal as documented in schedule 1 of this statement subject to the conditions of this statement.

1-2 Where the proponent seeks to change any aspect of the proposal as documented in schedule 1 of this statement in any way that the Minister for the Environment determines, on advice of the Environmental Protection Authority, is substantial, the proponent shall refer the matter to the Environmental Protection Authority.

1-3 Where the proponent seeks to change any aspect of the proposal as documented in schedule 1 of this statement in any way that the Minister for the Environment determines, on advice of the Environmental Protection Authority, is not substantial, the proponent may implement those changes upon receipt of written advice.

2 Proponent Nomination and Contact Details

2-1 The proponent for the time being nominated by the Minister for the Environment under section 38(6) or (7) of the *Environmental Protection Act 1986* is responsible for the implementation of the proposal until such time as the Minister for the Environment has exercised the Minister's power under section 38(7) of the Act to revoke the nomination of that proponent and nominate another person as the proponent for the proposal.

2-2 If the proponent wishes to relinquish the nomination, the proponent shall apply for the transfer of proponent and provide a letter with a copy of this statement endorsed by the proposed replacement proponent that the proposal will be carried out in accordance with this statement. Contact details and appropriate documentation on the capability of the proposed replacement proponent to carry out the proposal shall also be provided.

2-3 The nominated proponent shall notify the Department of Environmental Protection of any change of contact name and address within 60 days of such change.

3 Commencement and Time Limit of Approval

3-1 The proponent shall substantially commence the proposal within three years of the date of this statement or the approval granted in this statement shall lapse and be void.

Note: The Minister for the Environment will determine any dispute as to whether the proposal has been substantially commenced.

3-2 The proponent shall make application for any extension of approval for the substantial commencement of the proposal beyond three years from the date of this statement to the Minister for the Environment, prior to the expiration of the three-year period referred to in condition 3-1.

The application shall demonstrate that:

1. the environmental factors of the proposal have not changed significantly;

2. new, significant, environmental issues have not arisen; and

3. all relevant government authorities have been consulted.

Note: The Minister for the Environment may consider the grant of an extension of the time limit of approval not exceeding three years for the substantial commencement of the proposal.

4 Compliance Audit

4-1 The proponent shall prepare an audit program and submit compliance reports to the Department of Environmental Protection which address:

1. the status of implementation of the proposal as defined in schedule 1 of this statement;

2. evidence of compliance with the conditions and commitments; and

3. the performance of the environmental management plans and programs.

Note: Under sections 48(1) and 47(2) of the *Environmental Protection Act 1986*, the Chief Executive Officer of the Department of Environmental Protection is empowered to audit the compliance of the proponent with the statement and should directly receive the compliance documentation, including environmental management plans, related to the conditions, procedures and commitments contained in this statement.

4-2 The proponent shall submit a report prepared by an auditor approved by the Department of Environmental Protection under the "Compliance Auditor Accreditation Scheme" to the Chief Executive Office of the Department of Environmental Protection on each condition/commitment of this statement which requires the preparation of a management plan, programme, strategy or system, stating that the requirements of each condition/commitment have been fulfilled within the timeframe stated within each condition/commitment.

5 Port-wide Coral Reef Field Surveys

5-1 Prior to 31 December 2005, the proponent shall conduct a field survey of the current distribution of coral reef habitat* within the Dampier Port area, as defined in the *Port Authorities Act 1999*, outside periods when water clarity is affected by dredging in the vicinity of the survey area, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

In the survey, the proponent shall:

1 Identify the location, spatial extent and percentage cover of the different scleractinian coral communities in the area; and

2 Record existing scleractinian corals observed within the communities to species level.

*Note: "Coral reef habitat" is defined as "areas of the seafloor that support scleractinian corals at a density of greater than 10 percent cover".

5-2 Prior to 31 December 2005, the proponent shall determine the original historical* distribution of scleractinian coral reef habitat within the Dampier Port area, as defined in the *Port Authorities Act 1999*, and determine the cumulative coral loss resulting from human activity, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

The above shall:

1 employ historical aerial photographic records, previous environmental review documents, management plans, monitoring programs and other relevant information to assist in determining the original extent of coral habitat and historical losses; and

2 provide best, most probable and worst case estimates of coral reef habitat loss and the assumptions used for each estimate.

*Note: "Historical distribution of scleractinian coral reef habitat" is defined as "the original distribution of coral reef habitat with a density of greater than 10 percent cover of the seafloor prior to European impact".

6 Water Quality Monitoring and Criteria

6-1 During the dredging and spoil disposal phase of the proposal, the proponent shall undertake monitoring at water quality potential impact sites and appropriate reference sites twice daily during daylight hours, at mid-water depth, during a three-hour period centred on the time of both high water and low water predicted for Dampier (King Bay) in the *Australian National Tide Tables*, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

The proponent shall conduct monitoring at water quality potential impact sites within each of the management areas shown in figure 3 of schedule 1 and at appropriate reference sites (with similar environmental characteristics to the potential impact sites) that are unaffected by dredging and spoil disposal activities.

Monitoring data from potential impact sites shall be compared to data at appropriate reference sites. The boundary of the inner management area is shown in figure 3 of schedule 1 whilst the boundary between the eastern and western outer management areas is the line from the boundary of the inner management area to the limit of State Waters as shown in figure 3 of schedule 1. These management areas apply to this proposal only.

6-2 For the duration of the dredging and spoil disposal phase of the project, but outside the periods 14-26 March 2004 and 12-24 April 2004, the proponent shall undertake and evaluate the results of monitoring required by condition 6-1 against the following criteria for the specified management area (see procedure 4):

Eastern Outer Management Area

- five-day running median for turbidity measured in nephelometric turbidity units (NTU) at each water quality potential impact site is less than the five-day running 80th percentile of background turbidity measured at the appropriate reference site(s) in NTU;
- five-day running median for dissolved oxygen at each water quality potential impact site is above the five-day running 20th percentile of background dissolved oxygen measured at the appropriate reference site(s) or greater than 90 percent saturation; and
- five-day running median for pH at each water quality potential impact site is between the five-day running 20th and 80th percentiles of the reference site(s) or within the range pH 8.0 – 8.4.

Western Outer Management Area

- five-day running median for turbidity measured in nephelometric turbidity units (NTU) at each water quality potential impact site is less than the five-day running 80th percentile of background turbidity measured at the appropriate reference site(s) in NTU;
- five-day running median for dissolved oxygen at each water quality potential impact site is above the five-day running 20th percentile of background dissolved oxygen measured at the appropriate reference site(s) or greater than 90 percent saturation; and
- five-day running median for pH at each water quality potential impact site is between the five-day running 20th and 80th percentiles of the appropriate reference site(s) or within the range pH 8.0 – 8.4.

Inner Management Area

- The mean of two measurements of turbidity (measured in NTU) taken at each water quality potential impact site on one day is less than twice the mean of two turbidity measurements taken at the appropriate reference site(s) on the day of sampling;
- five-day running median for dissolved oxygen at each water quality potential impact site is above the five-day running 20th percentile of background dissolved oxygen measured at the appropriate reference site(s) or greater than 90 percent saturation; and
- pH at each water quality potential impact site is between the five-day running 20th and 80th percentiles of the reference site(s) or within the range pH 8.0 - 8.4.

6-3 During the periods 14-26 March 2004 and 12-24 April 2004, the proponent shall undertake and evaluate the results of the monitoring required by condition 6-1 against the following criteria for the specified management area (see procedure 4):

Eastern Outer Management Area

- five-day running median for turbidity (measured in NTU) at each water quality potential impact site is less than the five-day running 60th percentile of background turbidity measured at the appropriate reference site(s) in NTU;
- five-day running median for dissolved oxygen at each water quality potential impact site is above the five-day running 40th percentile of background dissolved oxygen measured at the appropriate reference site(s) or greater than 90 percent saturation; and
- five-day running median for pH at each water quality potential impact site is between the five-day running 40th and 60th percentiles of the pH of the appropriate reference site(s) or within the range pH 8.0 - 8.4.

Western Outer Management Area

- five-day running median for turbidity (measured in NTU) at each water quality potential impact site is less than the five-day running 60th percentile of background turbidity measured at the appropriate reference site(s) in NTU;
- five-day running median for dissolved oxygen at each water quality potential impact site is above the five-day running 40th percentile of background dissolved oxygen measured at the appropriate reference site(s) or greater than 90 percent saturation; and
- five-day running median for pH at each water quality potential impact site is between the five-day running 40th and 60th percentiles of the pH of the appropriate reference site(s) or within the range pH 8.0 - 8.4.

Inner Management Area

- The mean of two measurements of turbidity (measured in NTU) at each water quality potential impact site is less than 1.5 times the background turbidity measured at the appropriate reference site(s) on the day of sampling;
- five-day running median for dissolved oxygen at each water quality potential impact site is above the five-day running 40th percentile of background dissolved oxygen measured at appropriate reference site(s) or greater than 90 percent saturation; and
- The five-day running median of pH at each water quality potential impact site is between the 20th and 80th percentiles of the pH of the appropriate reference site(s) or within the range pH 8.0 - 8.4.

7 Control and Management of Dredging and Spoil Disposal

In order to protect the environmental values of marine ecosystems, particularly coral, communities within Mermaid Sound, the proponent is required to manage and control dredging and spoil disposal activities within each of the management areas identified in Figure 3 of Schedule 1 based on the results of water quality and / or coral health monitoring within the respective management area.

7-1 Irrespective of the requirements of conditions 7-2 to 7-11, the proponent shall not conduct dredging and spoil disposal activities during the four-day coral mass spawning periods of 14-17 March 2004 and 12-15 April 2004.

The requirement for, and the area of application and start and finish dates for these periods may be varied by the EPA in consultation with the proponent on the basis of the results of investigations relating to the timing and extent of coral mass spawning required by condition 11-1 and the results of monitoring of water quality and coral health.

7-2 Subject to conditions 7-3 to 7-11, the proponent shall implement Stage 1 management in the relevant management area, as set out in schedule 2, immediately following any two consecutive days of non-achievement, at any potential impact site within that management area, of any water quality criterion specified in conditions 6-2 and 6-3.

7-3 The proponent shall commence an intensive coral health monitoring program as set out in the Coral Health Monitoring Plan required by condition 10-1 in the relevant management area within four days following two consecutive days of non-achievement at potential impact sites in that management area, of any water quality criterion specified in conditions 6-2 and 6-3, in order to assess "coral whitening", and shall continue this program for 14 days.

7-4 Subject to conditions 7-1 to 7-3 and 7-5 to 7-11, if within 18 days following the commencement of coral health monitoring in accordance with condition 7-3, water quality at potential impact sites within a management area achieves the criteria specified in conditions 6-2 and 6-3 and "coral whitening" for all monitored species is less than the threshold level defined in condition 10-5, the proponent may:

a) within that period, cease Stage 1 management and continue dredging and spoil disposal activities within the management area; and

b) following the 14 days of intensive coral health monitoring required by condition 7-3, revert to the regular fortnightly coral monitoring as set out in the Coral Health Monitoring Plan required by condition 10-1.

7-5 If, after 18 days following the commencement of Stage 1 management within a management area in accordance with condition 7-2, water quality at any potential impact site within that management area does not achieve criteria specified in conditions 6-2 and 6-3 or "coral whitening" of any monitored species at potential

impact sites within the management area is greater than the threshold level defined in condition 10-5, the proponent shall, within that management area:-

a) immediately implement Stage 2 management; and

b) continue intensive coral health monitoring,

and may continue dredging and spoil disposal activities within that management area.

7-6 If at any time "coral whitening" for any monitored species is identified from regular fortnightly coral health monitoring to be greater than the threshold level, but less than the limit level, at a potential impact site within a management area, the proponent shall, within that management area:-

a) immediately implement Stage 2 management; and

b) commence intensive coral health monitoring,

and may continue dredging and spoil disposal activities within that management area.

7-7 If at any time during the period of dredging and disposal operations, "coral whitening" for any monitored species at a potential impact site within a management area exceeds the limit level, the proponent shall immediately cease dredging and spoil disposal activities and commence and / or continue intensive coral health monitoring as required. The proponent shall continue the intensive coral health monitoring until either:

- water quality at potential impact sites in that management area achieves each criterion specified in conditions 6-2 and 6-3; or
- "coral whitening" for all monitored species at potential impact sites in that management area is below the threshold level set out in condition 10-5.

7-8 The proponent shall not recommence dredging and spoil disposal activities in the affected management area following any stoppage required by condition 7-7, until such time as "coral whitening" for all monitored species is below the limit level set out in condition 10-5.

7-9 The proponent shall report non-achievement of any criterion specified in conditions 6-2, 6-3, and 10-5 to the Department of Environmental Protection immediately following detection.

7-10 If, for any reason, the proponent is not able to undertake the regular fortnightly coral health monitoring in any management area during any four-week period, the proponent shall:

a) immediately advise the Department of Environmental Protection; and

b) if water quality at potential impact sites in that management area, as determined by monitoring in accordance with condition 6, does not achieve any water quality criterion specified in conditions 6-2 and 6-3 for

two consecutive days, immediately cease dredging and disposal activities within that management area.

7-11 The proponent shall not recommence dredging and disposal activities in the affected management area following a stoppage required by condition 7-10 unless either :

a) water quality at all potential impact sites in the management area monitored in accordance with condition 6 achieves all water quality criteria specified in conditions 6-2 and 6-3, for not less than two consecutive days; or

b) coral health monitoring is able to be undertaken in accordance with the Plan required by condition 10-1 and demonstrates that coral whitening for all monitored species at all potential impact sites within the management area is below the limit specified in condition 10-5.

7-12 Each week for the duration of the dredging and spoil disposal phase of the project, the proponent shall report the following information to the Department of Environmental Protection:

a) water quality data;

b) management actions undertaken as required by conditions 7-2 to 7-11; and

c) coral health monitoring results.

Note: The term "coral whitening" as referred to in conditions 7 and 10 of this statement is defined as "the area of living coral tissue that has expelled its zooxanthellae or has died within each individual marked coral colony since the baseline condition of area of living coral was established for that colony."

8 Dredging and Spoil Disposal Management Plan

8-1 Prior to the commencement of dredging and spoil disposal activities, the proponent shall prepare a Dredging and Spoil Disposal Management Plan, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

Note: In preparation of advice to the Minister, the Environmental Protection Authority expects that advice of the following agencies will be obtained:

- Commonwealth Department of the Environment and Heritage;
- Department of Planning and Infrastructure (Marine);
- Department of Fisheries; and
- Department of Conservation and Land Management.

The objectives of this Plan are to:

a) evaluate the zone of influence of turbidity plumes generated by dredging and spoil disposal; and

b) protect the sensitive marine ecological attributes (ecological values) from the effects of sedimentation, deterioration in light climate, contamination and other forms of pollution associated with dredging and spoil disposal; and

c) protect the long term values of seafood quality, aquaculture production, recreational values and existing industrial water supply (social values) from the environmental effects of dredging and spoil disposal.

Note: The term sensitive marine ecological attributes means coral reefs, seagrass meadows and mangrove forests, and the biota associated with these habitats.

This Plan shall address monitoring requirements and management measures to protect sensitive marine ecological attributes and social values of Mermaid Sound consistent with the operational requirement of the Port, and any other areas within the potential zone of influence of the environmental effects of dredging and spoil disposal and shall:

1. identify the ecological and social values to be protected;
2. identify and spatially define appropriate environmental quality objectives to be met during dredging and spoil disposal phase of the project;
3. establish the environmental quality criteria to protect social values in the long term;
4. describe the type of dredge(s) to be used and mode of operation;
5. assess most probable and worst-case timing and duration of dredging and spoil disposal activities and contingencies for unforseen delays;
6. contain the potential zones of influence of dredging and spoil disposal activities on water quality, and explain the rationale underpinning the predictions;
7. using information gathered in point 6 above, specify appropriate reference sites outside the potential zones of influence of dredging and spoil disposal activities on water quality and coral health;
8. specify potential impact sites adjacent to and between the source(s) of turbidity and sensitive marine ecological attributes that require protection from the effects of dredging and spoil disposal activities;
9. set out procedures, including frequency, probable flight paths and methods of recording information (eg. photography), for routine aerial monitoring of the plume and the appropriateness of reference sites for the duration of dredging and spoil disposal activities and for a period after the completion of dredging and spoil disposal to confirm the time taken and area required for dispersion of residual turbidity;
10. set out the procedures for monitoring water quality at appropriate reference sites and potential impact sites against the criteria specified in condition 6;
11. specify the management actions and contingency measures to be implemented in the event of initial non-achievement of criteria specified in condition 6; and
12. specify reporting procedures.

8-2 The proponent shall implement the Dredging and Spoil Disposal Management Plan required by condition 8-1, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

8-3 The proponent shall make the Dredging and Spoil Disposal Management Plan required by condition 8-1 publicly available, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

9 Introduced Marine Species and Ballast Water

9-1 Prior to the commencement of dredging and within 48 hours following entry of the dredging equipment and other vessels associated with the proposal into the Port of Dampier, the proponent shall arrange for an inspection by an appropriately qualified expert to ensure that;

a) there is no sediment in the dredging equipment; and

b) any fouling organisms on the dredging equipment and other vessels associated with the proposal and any organisms in the ballast waters of the equipment and vessels do not present a risk to the ecosystem integrity of the marine waters of the Dampier Archipelago,

to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

9-2 Prior to the commencement of dredging, the proponent shall report to the Department of Environmental Protection on the inspection referred to in condition 9-1, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

9-3 The proponent shall manage any sediment or fouling organisms found as a consequence of the inspection required by condition 9-1, to the timing and other requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

9-4 If, following the completion of dredging and disposal activities, the dredging equipment is to be relocated to another location that is within Western Australia's territorial waters, the proponent shall ensure that the dredging equipment is free of marine organisms and sediment, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

Note: In the preparation of the report required by condition 9-2, and in the development of any management actions required by condition 9-3, the Environmental Protection Authority expects that advice of the following agencies will be obtained:

- Western Australian Department of Fisheries; and
- Australian Quarantine Inspection Service.

10 Coral Health Criteria and Monitoring

10-1 Prior to the commencement of dredging and spoil disposal activities, the proponent shall prepare a Coral Health Monitoring Plan, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

The objectives of this Plan are to:

a) establish the pre-dredging baseline health condition of living coral, as indicated by the extent of whitening, of individually marked scleractinian corals at appropriate reference and monitoring sites; and

b) monitor and assess any changes in the health of the individually-marked corals, as indicated by the extent of whitening compared to threshold and limit criteria set out in conditions 10-3 to 10-5, within predicted zones of influence of dredging and spoil disposal activities.

The Plan shall include the following:

1. the location of appropriate coral health impact monitoring sites in each management area and reference sites for each management area;
2. the identification of a minimum of four species of scleractinian corals from a range of taxonomic groups to be monitored, including individual species that are particularly susceptible to turbidity-induced stress and species that of high relative abundance;
3. protocols and procedures for monitoring and quantitatively assessing the health of individually-marked coral colonies in terms of the extent of "coral whitening" in order to establish their baseline health condition and to monitor health over time;
4. calculations of statistical power of the monitoring procedures referred to in point 3 above to demonstrate that the procedures are appropriate to establish pre-dredging baseline coral health condition and to assess the extent of "coral whitening" against the threshold and limit criteria set out in condition 10-5;
5. the results of pre-dredging field surveys describing baseline conditions in terms of area of living coral and whitening of individually marked colonies of the selected species of scleractinian corals;
6. the timing and frequency of coral health monitoring for the regular fortnightly monitoring and any intensive monitoring that may be required under condition 7-3; and
7. reporting procedures for the regular fortnightly monitoring and any intensive monitoring that may be required under condition 7-3.

10-2 Throughout the implementation of the proposal, the proponent shall undertake regular fortnightly coral health monitoring at potential impact sites and appropriate reference sites in all management areas in accordance with the Coral Health Monitoring Plan required by condition 10-1.

10-3 The proponent shall establish the gross extent of "coral whitening" for each coral species at each potential impact monitoring site and reference site as an index calculated as the cumulative total of the products of percentage "coral whitening" of each individual coral colony of that species and the percentage of colonies of that species at the site exhibiting that level of "coral whitening".

10-4 The proponent shall establish the net extent of "coral whitening" at each potential impact monitoring site by subtracting the gross extent of "coral whitening" measured at the reference sites from the gross extent of "coral whitening" at the potential impact monitoring site.

10-5 For the purposes of condition 7, the proponent shall apply the following criteria for net extent of "coral whitening" for each species at any potential impact monitoring site:

a) threshold level criterion of 500; and
b) limit level criterion of 1,000.

(see schedule 3).

Note: The term "coral whitening" as referred to in conditions 7 and 10 of this statement is defined as "the area of living coral tissue that has expelled its zooxanthellae or has died within each individual marked coral colony since the baseline condition of area of living coral was established for that colony."

11 Coral Habitat Monitoring and Management

11-1 Prior to the commencement of dredging and spoil disposal activities, the proponent shall prepare a Coral Habitat Monitoring and Management Plan, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

Note: In preparation of advice to the Minister, the Environmental Protection Authority expects that advice of the following agencies will be obtained:

- Commonwealth Department of the Environment and Heritage;
- Department of Fisheries; and
- Department of Conservation and Land Management.

The objectives of this Plan are to:

a) establish pre-dredging baseline conditions of coral reef location, spatial extent biodiversity and community structure (e.g. community composition and percent cover of coral communities) the different scleractinian coral communities currently present at appropriate reference and monitoring sites;

b) monitor the effects of dredging and spoil disposal activities on the biodiversity, structure, health and reproductive success of coral reef habitats that occur within predicted zones of influence of dredging and spoil disposal activities; and

c) maintain the ecological integrity and biodiversity of coral reef habitats consistent with the operational requirements of the Port.

This Plan shall include the following:

1. the location of appropriate potential impact sites and reference sites;
2. the results of pre-dredging field surveys describing baseline conditions at all sites specified in point 1 above in terms of the species of scleractinian corals present and community structure;
3. criteria for spawning success and coral health against which to report monitoring data and to evaluate environmental performance;
4. protocols and procedures for monitoring coral reef health;
5. calculations of statistical power of the monitoring procedures in point 4 above to demonstrate that the procedures are appropriate to detect impacts associated with dredging and spoil disposal activities, in the event that impacts occur;
6. the timing and frequency of coral reef health monitoring;
7. procedures for monitoring individually-marked coral colonies to assess the extent and timing of the coral mass spawning events of March and April 2004;
8. the management response(s) to be implemented in the event that criteria established in point 3 above are not met;
9. completion criteria for management response(s) in point 8 above; and
10. reporting procedures.

11-2 Prior to the commencement of dredging, and for at least two years following the completion of dredging and disposal activities, or until completion criteria required by condition 11-1 have been met the proponent shall implement the Coral Habitat Monitoring and Management Plan required by condition 11-1, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

11-3 The proponent shall make the Coral Habitat Monitoring and Management Plan required by condition 11-1 publicly available, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

12 Marine Monitoring and Management

12-1 Prior to the completion of dredging and reclamation activities, the proponent shall prepare a Marine Monitoring and Management Program, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

Note: In preparation of advice to the Minister for the Environment, the Environmental Protection Authority expects that advice of the following agencies will be obtained:

- Department for Planning and Infrastructure (Maritime);
- Department of Fisheries; and
- Department of Conservation and Land Management.

The Program shall addresses the following:

1. the environmental values to be protected;
2. the environmental quality criteria to be met;
3. water and sediment quality surveys (eg. contaminants, turbidity, dissolved oxygen, pH);
4. contaminant accumulation in biological tissues (eg. deployed oysters);
5. benthic habitat health surveys, including clear objectives to measure spatial and temporal changes/variation;
6. spatial changes to distribution of coral habitat;
7. regular marine pest surveys (every 3 years);
8. oil and chemical spill response; and
9. a management framework that can be implemented to prevent or mitigate any identified environmental impacts.

12-2 Following the completion of the dredging and spoil disposal activities, the proponent shall implement the Marine Monitoring and Management Program required by condition 12-1 to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

12-3 The proponent shall make the Marine Monitoring and Management Program required by condition 12-1 publicly available, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

Procedures

1 Where a condition states "to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority", the Environmental Protection Authority will provide that advice to the Department of Environmental Protection for the preparation of written advice to the proponent.

2 The Environmental Protection Authority may seek advice from other agencies or organisations, as required, in order to provide its advice to the Department of Environmental Protection.

3 Where a condition lists advisory bodies, it is expected that the proponent will obtain the advice of those listed as part of its compliance reporting to the Department of Environmental Protection.

4 Due to the requirement for adaptive management in the implementation of this proposal, the Environmental Protection Authority may vary the criteria referred to in Condition 6 from time to time, provided that the result of any such changes is unlikely to lead to unacceptable impacts on the environmental values of local marine ecosystems.

5 The Environmental Protection Authority may vary:

a) the requirement for; and
b) the area of application and start and finish dates of,

the stoppage of dredging and spoil disposal during the coral spawning periods (specified in condition 7-1) in consultation with the proponent, on the basis of the results of investigations relating to the timing and extent of coral mass spawning and the results of monitoring of water quality and coral health.

Notes

1 The Minister for the Environment will determine any dispute between the proponent and the Environmental Protection Authority or the Department of Environmental Protection over the fulfilment of the requirements of the conditions.

2 Within this statement, to "have in place" means to "prepare, implement and maintain for the duration of the proposal".

Schedule 1

Dampier Port Authority – Port Expansion and Dredging Program (Assessment No. 1495)

The proposal by Dampier Port Authority to expand its port facilities located near the town of Dampier within Mermaid Sound, includes the following (Figure 1):

- the improvement and extension of the current Dampier Cargo Wharf;
- the construction of a new jetty and associated shipping infrastructure; and
- the dredging, loading and disposal of up to 4.5 million cubic metres of sediments to the Northern Spoil Ground and East Lewis Island Spoil Ground from the deepening of the harbour area and the associated approach channel (Figure 2).

Table 1: Key proposal characteristics

Element	Description
Dampier Cargo Wharf	Extension of the wharf and deepening the Dampier Cargo Wharf berthing pocket and turning basin. • 85,000 cubic metres to be dredged for confined disposal at the East Lewis Island disposal ground due to contamination with tributyltin (TBT); and • the balance of the inner harbour requires 1,542,000 cubic metres to be dredged and disposed at the Northern Spoil Ground.
Jetty	Construction of a jetty with additional berthing areas and turning basin west of the Dampier Cargo Wharf which would attach to a load-out and lay-down facility. • 212,000 cubic metres to be dredged and disposed at the Northern Spoil Ground.
Channel	Creating a channel (160 metres wide and 6 kilometres long) that would link the Dampier Port to deeper water. • 2,145,000 cubic metres to be dredged and disposed at the Northern Spoil Ground.
Timing	Dredging for four to six months from commencement of dredging (nominally November 2003), followed by construction of the jetty to be completed by June 2005.
Dredging and Disposal	TOTAL 4,512,000 cubic metres: • 3,899,000 cubic metres as described above suitable for unconfined disposal to the Northern Spoil Ground; • 85,000 cubic metres of TBT contaminated material for confined disposal at the East Lewis Island disposal ground; and • 528,000 cubic metres allowance for over-dredge.

Figures

Figure 1: Location of proposal
Figure 2: Proposal dredging and disposal locations
Figure 3: Management Areas for the purposes of the statement

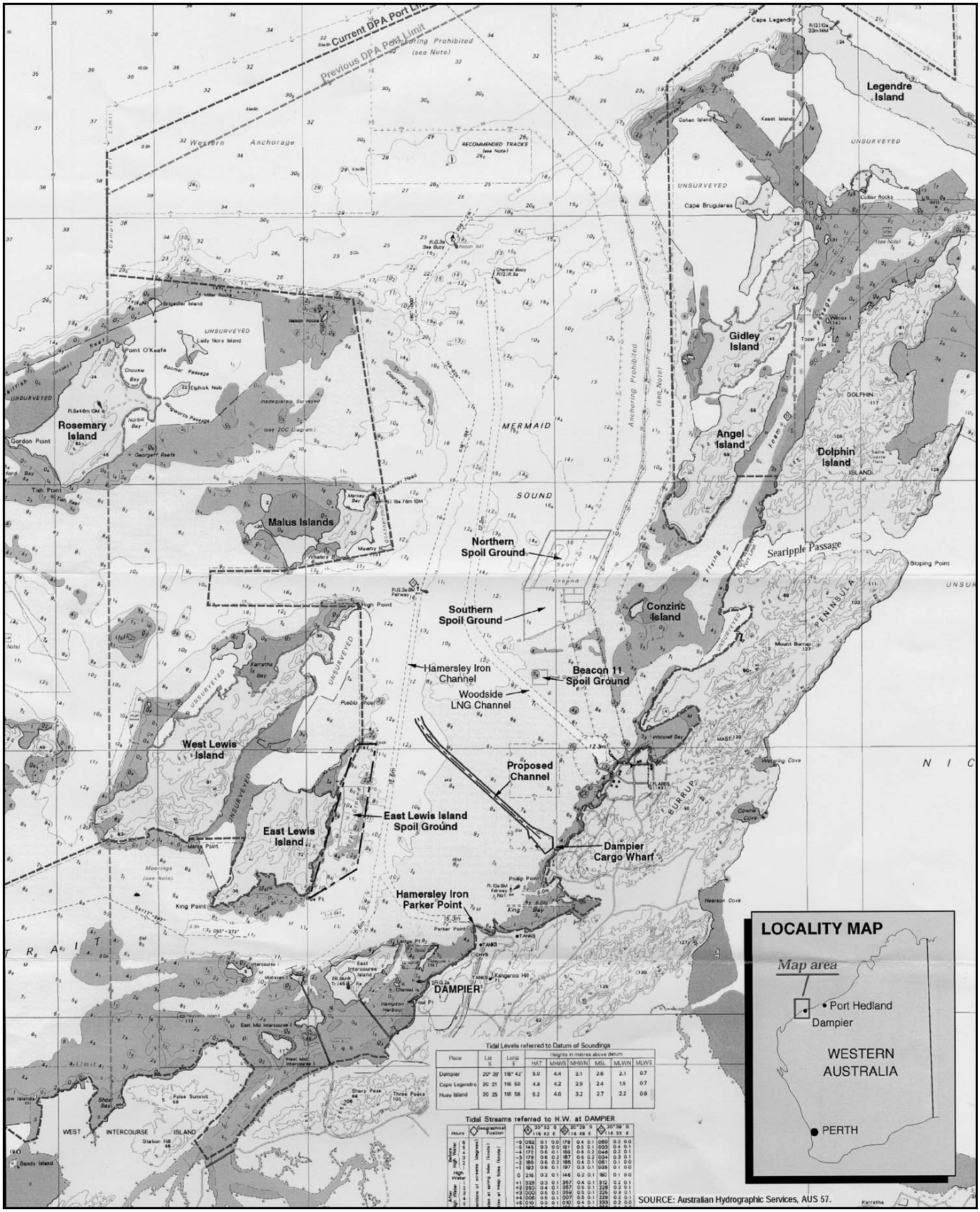

Figure 1: Location of proposal

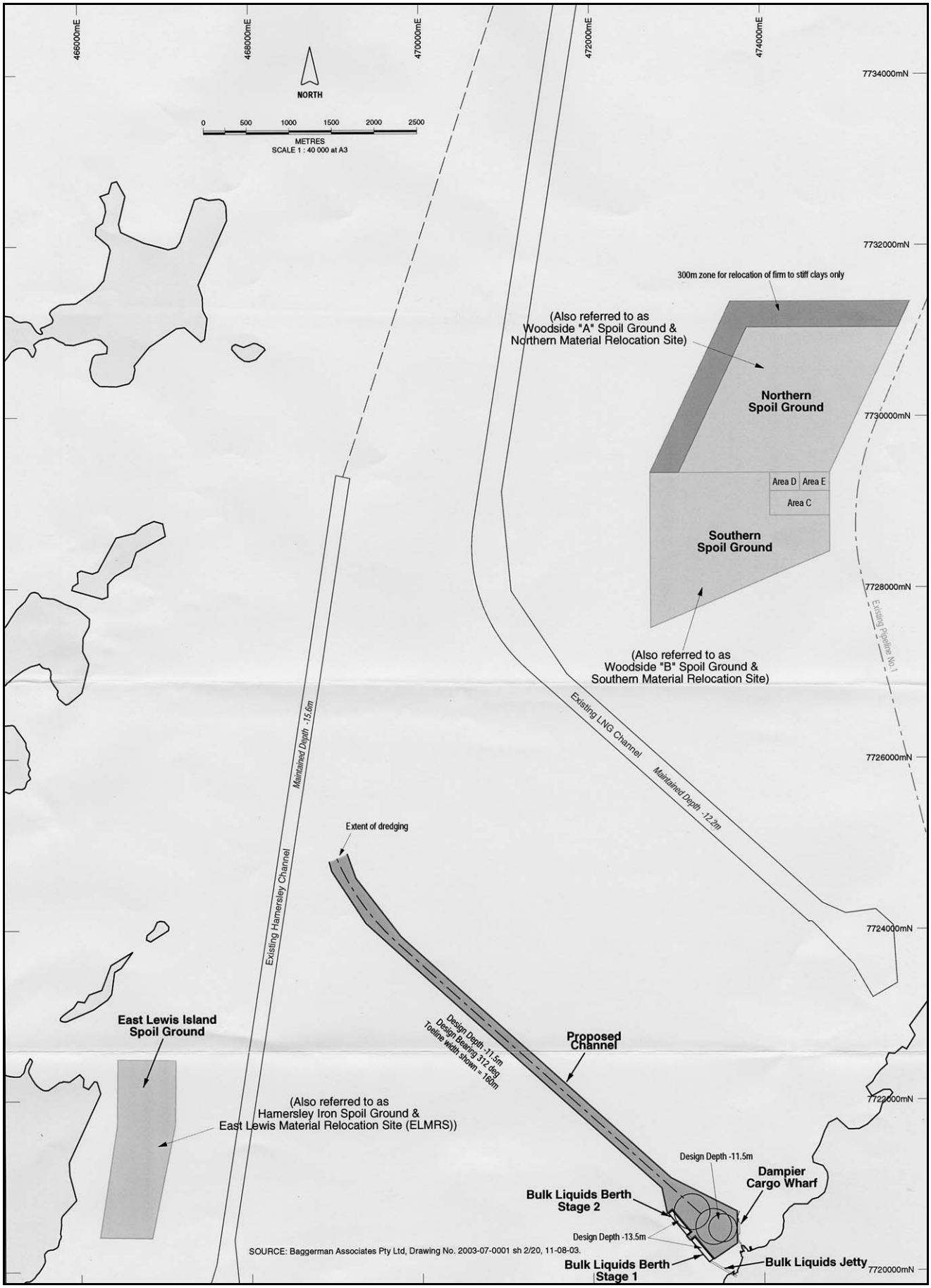

Figure 2: Proposal dredging and disposal locations

Management Areas

For the purposes of environmental management of this proposal, Mermaid Sound has been partitioned into three management areas referred to as the Inner Management Area, the Eastern Outer Management Area and the Western Outer Management Area. These areas are shown in Figure 3 and their boundaries are described in Table 2.

Table 2: Location of management areas

Boundary Lines	Description
Boundary between the Inner Management Area and the two Outer Management Areas	a) Outer boundary running from north-east to south-west through a line between the Beta marker (E0467893 N7719650) and Mid Ground marker (E0467652 N7719306). b) South-western boundary running north from the northernmost tip of West Intercourse Island to the intersection of the Outer Boundary. c) North-eastern boundary terminating with the eastern margin of the Woodside channel.
Boundary between the Eastern and Western Outer Management Areas	d) A line running north of Parker Point commencing from the Inner-Outer Management Area boundary and ending at the Channel Buoy at the end of the Woodside Channel.

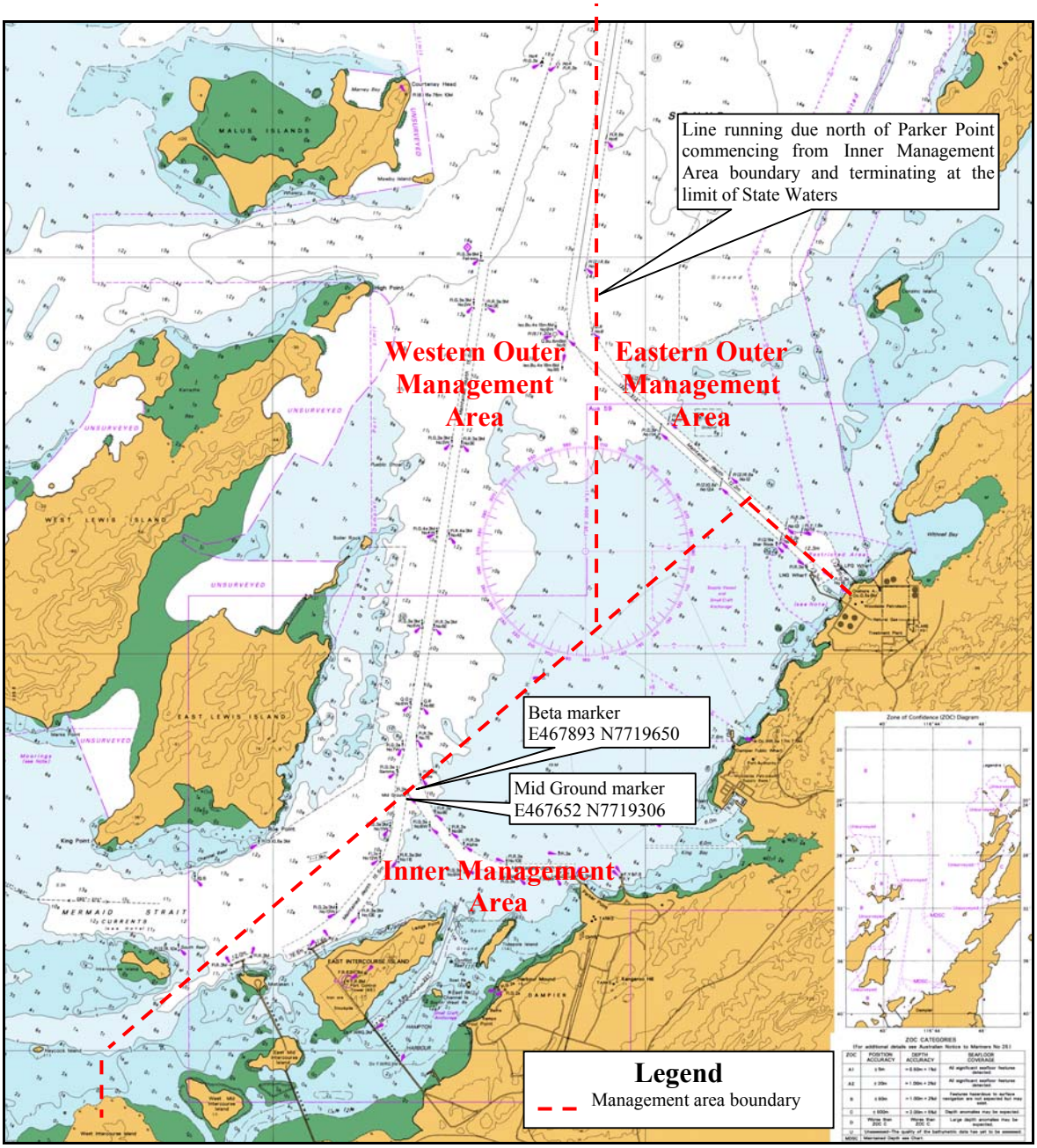

Figure 3: Management areas for the purposes of the statement

Schedule 2

Dampier Port Authority – Port Expansion and Dredging Program

Stages of Management referred to in Environmental Condition 7

Management Stage	**Actions required** (any combination of at least one of the following management actions)
Management Stage 1	• Relocate dredge • Relocate position for spoil disposal within spoil ground • Use alternative spoil ground • Reduce dredge overflow
Management Stage 2	• Deploy silt curtain barrier between dredging and/or disposal areas and coral sites • Reduce dredging to single shift

Schedule 3

Indicative levels of coral whitening in relation to coral health criteria