Dredging Program
Dampier Port Upgrade

Hamersley Iron Pty Ltd

Report and recommendations
of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
Bulletin 1225
August 2006

Environmental Impact Assessment Process Timelines

Date	Progress stages	Time (weeks)
17/03/06	**Referral received**	
13/06/06	**Final referral document for assessment**	**12.4**
7/08/06	**Assessment on Referral Information (ARI) Level of Assessment set and EPA report to the Minister for the Environment; Racing and Gaming**	**7.6**

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Contents

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 Hamersley Iron Pty Ltd (HI) to undertake both capital and maintenance dredging within the Port of Dampier in the vicinity of the Company's Parker Point and East Intercourse Island iron ore export loading facilities (see Figure 1).

The purpose of the program is to improve the approaches and swing basin areas, increase the number of berth pockets, remove recent siltation in existing areas and provide for relocation of the existing tanker unloading facilities from the Service Wharf at Parker Point to allow for increased tonnage to be shipped from the port.

The proposal involves dredging of approximately 3.4 million cubic metres of material from the ocean floor and disposal of the dredged material on land near Parker Point and to the established East Lewis and Northern ocean disposal grounds (see Figure 2). It is proposed that dredging and disposal activities will take 8–10 weeks within a 3–4 month period, commencing in Quarter 3 - 2006.

The proponent has submitted a referral document setting out the details of the proposal, potential environmental impacts and commitments to manage those impacts (SKM 2006). The EPA considers that, based on the information provided in the referral document, the proposal as described can be managed in an acceptable manner, subject to the proponent's commitments and the EPA's recommended conditions being made legally binding.

The EPA has therefore determined under Section 40(1) of the *Environmental Protection Act 1986* that the level of assessment for the proposal is Assessment on Referral Information, and this report provides the EPA advice and recommendations in accordance with Section 44(1).

The proposal is also subject to a permit application for the disposal of dredge material at sea from the Department of Environment and Heritage under the *Environment Protection (Sea Dumping) Act 1981* (Commonwealth).

Background

In 2003 the EPA assessed a proposal by HI for the construction, deepening and extension of shipping channels, a swing basin and berth pockets for the passage and docking of ships. This involved dredging approximately 3.1 million cubic metres of material from the sea bottom, and disposal of the materials obtained from dredging to designated sites on land and in the East Lewis Island and Northern spoil grounds.

At the same time, the EPA assessed a proposal by Dampier Port Authority (DPA) to expand port facilities near the existing Dampier Cargo Wharf in Mermaid Sound. The proposal included 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.

The EPA assessed both proposals as Assessment on Referral Information and the EPA's Reports and recommendations were released in October 2003 (Bulletins 1117 and 1116 respectively).

In its Reports and recommendations on these two proposals, the EPA recognised that there was limited information concerning the historic cumulative loss of corals and on the current distribution and biodiversity of corals in the port environs. The EPA also accepted that there was a lack of certainty regarding the relationship between coral health and water quality. In view of the above, the EPA recommended a precautionary approach to monitoring and management of the potential impacts from dredging and spoil disposal.

In summary, the EPA's management framework recommended that a robust sampling methodology be established to monitor coral health. It was recommended that water quality criteria would be used as the initial trigger for intensive coral health monitoring. In the event that monitoring detected that the water quality criteria were not being achieved, coral health criteria were then to be used to initiate management actions to be undertaken by the proponent to control dredging and disposal operations within defined management areas. If coral health criteria were not met following implementation of management options, the proponent was required to stop dredging and disposal operations within the relevant management area.

The EPA recommended sub-lethal threshold criteria for initial management actions (such as moving the dredge and deployment of silt curtains) to be set at 5% (bleaching or coral injury) and the limit criteria requiring the proponent to cease dredging to be set at 10% (bleaching or coral injury). In addition the EPA recommended conditions requiring the historic cumulative loss of corals to be established.

As a result of matters raised in appeals with the then Minister for the Environment, the management framework was varied. The recommended condition which used water quality criteria as the trigger for management responses was modified such that it became a condition to collect data only. The appeal decision recognised the intention to use the collected data for the purposes of contributing to a further understanding of the relationship between water quality and coral health. In addition, the then Minister for Environment also recognised that there were practical limitations of applying the recommended sub-lethal criteria and amended the threshold criteria to 10% coral mortality and the limit criteria to 30% coral mortality respectively.

The dredging program was undertaken in 2004. The EPA notes that HI monitoring did not detect any exceedences of either the threshold level of 10% coral mortality or the limit level of 30% coral mortality and consequently the management measures as specified (such as dredge relocation or cease dredging) were not required and therefore remain untested.

However, the EPA also notes that the dredging program undertaken at the Dampier Port by the Dampier Port Authority, just prior to the HI dredging program, did result in an 80% loss in live coral cover at one site (Supply Base). Coral cover stabilised at approximately 9% remaining cover after falling from approximately 49% live coral cover in the baseline surveys.

The exact time and sequence of the observed mortality is not known because turbidity levels were too high for coral health monitoring to be undertaken for the 3 months of dredging that occurred prior to a 5 day break in mid April. Water quality improved sufficiently over the 5 day break in dredging for monitoring to take place.

As a result of the previous dredging campaigns and the monitoring undertaken during their implementation, further information is now available on the historic cumulative loss of coral habitat in the port environs and on the diversity of the inshore coral communities. This proposal has been assessed with this additional information in mind. This is discussed further in section 4.1.

2. The proposal

The major components of the proposed dredging program (capital and maintenance) are to:

- extend the existing northern and southern berth pockets at the Parker Point wharf and to enable four vessels (two on the north side and two on the south side) to moor alongside the wharf at any one time, although only two vessels can be loaded at any one time;
- widen and deepen the southern swing basin to provide safe approaches for 220,000 DWT vessels using the southern berths;
- widen the northern approach route to provide safe navigation for arriving vessels and provide an escape route to the north of Parker Point in the event of immobilisation of a departing vessel in the channel;
- dredge a new berth pocket east of the existing Parker Point Wharf to allow for new, upgraded tanker unloading facilities;
- remove recent siltation in the existing northern approach route and approaches to the Service Wharf facility at Parker Point;
- remove under wharf spillage from Parker Point and East Intercourse Island berths; and
- remove a high spot adjacent to the main shipping channel (east of Beacon 7E, Area H) to provide safe navigation for vessels. The channel is essentially a departure channel for loaded vessels requiring additional under-keel clearance. There is insufficient width to the channel to allow vessels to pass one another in opposite directions. With the additional traffic expected in the departure channel from Parker Point and, with the added traffic from the other berths in the Port, removing the high spot reduces the risk of a vessel running aground.

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

Table 1: Summary of key proposal characteristics

Element	Description / Quantity
Amount of material to be dredged and disposed	Maximum of 3.45 million cubic metres (estimated).
Major components (as shown in Figure 2):	
Dredging of material within areas A – D, G and H (capital) to the East Lewis and Northern spoil grounds.	Combined maximum of approximately 2.47 million cubic metres
Dredging of material within areas A and B (capital) to onshore disposal.	Approximately 0.44 million cubic metres
Dredging of material within areas E, F, PP and EII (maintenance) to the Northern spoil ground	Approximately 0.54 million cubic metres
Period of dredging and disposal	Dredging duration of approximately 8–10 weeks within a 3–4 month period, commencing in Quarter 3 - 2006

The potential impacts of the proposal are discussed by the proponent in the referral document *Dredging Program for the Dampier Port Upgrade, Referral Document and Dredging and Spoil Disposal Management Plan* (SKM, 2006).

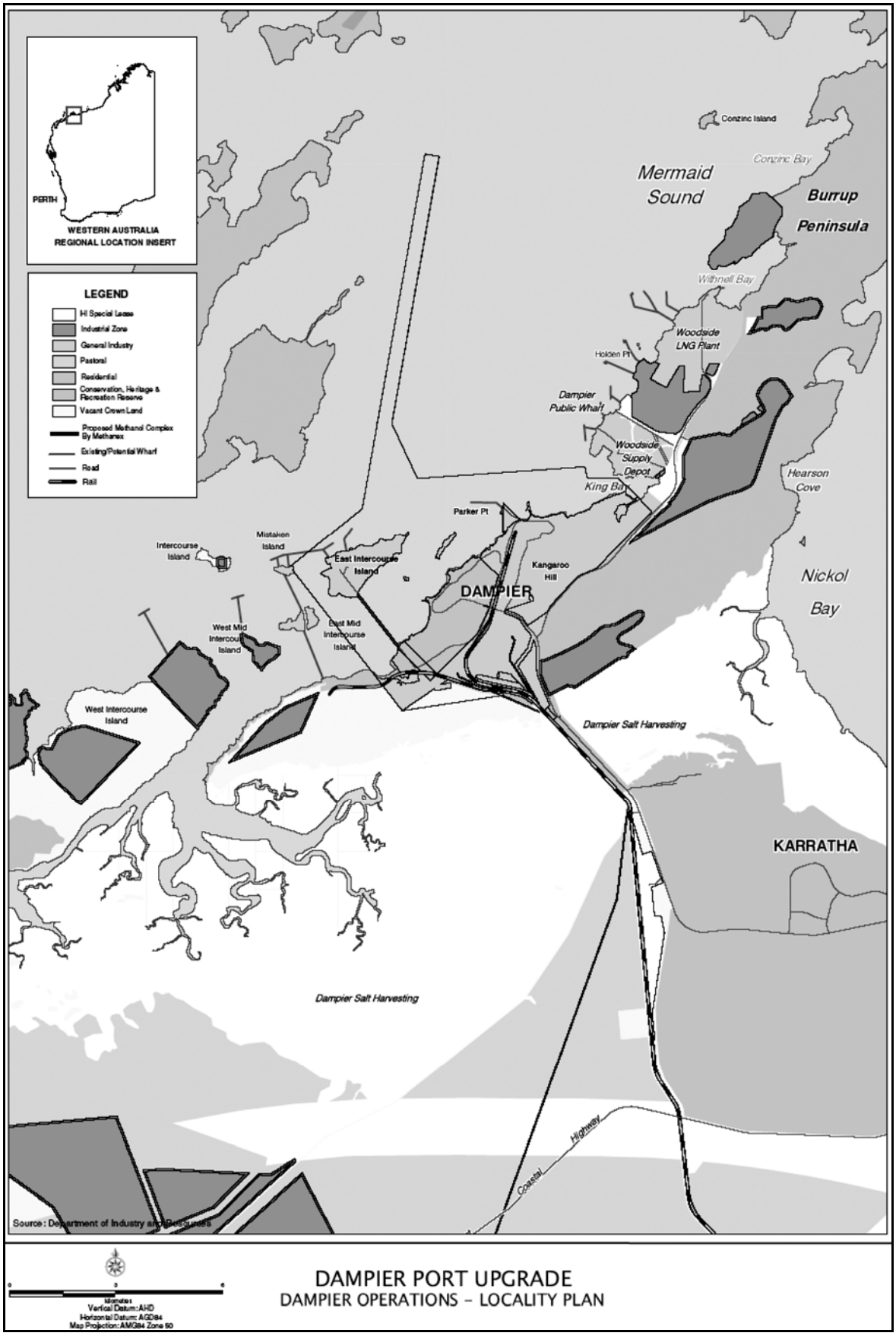

Figure 1: Locality of Proposal

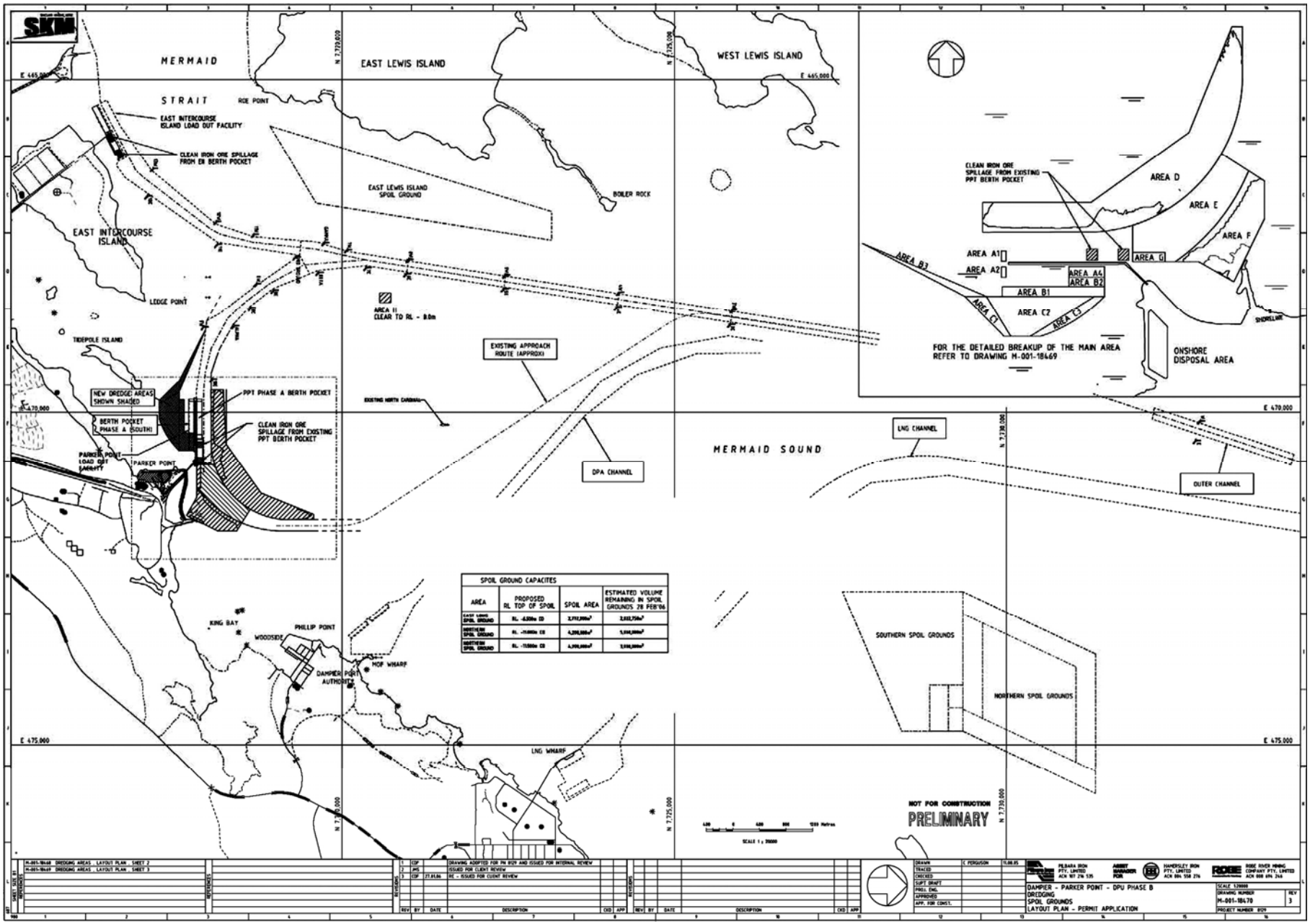

Figure 2: Proposed Dredging

3. Consultation

The proponent has advised that consultation has occurred with:

- Dampier Port Authority;
- Dampier Spoil Ground Management Group;
- Shire of Roeburne;
- Department for Planning and Infrastructure (Karratha);
- Environmental Protection Authority Service Unit;
- Department of Environment Marine Group (now Environment and Conservation);
- Department of Conservation and Land Management (now Environment and Conservation); and
- Commonwealth Department of the Environment and Heritage.

HI has advised that it has conducted open days including advertised public information displays at Dampier and Karratha shopping centres to provide the community with information on the progress of the construction activities (including dredging) for the Dampier Port Upgrade Project. Public information days were held in October 2005 and February 2006. In addition regular meetings held with the Dampier Community Advisory Group have included briefings and updates on the dredging program provided. Further consultation details are provided in Section 6 of the referral document.

4. Relevant environmental factors

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)' and 'Coral Spawning' are the environmental factors relevant to the proposal requiring evaluation in this report.

Details of the relevant environmental factors and their assessment are contained in Section 4.1 and 4.2. The description of this factor shows why it is relevant to the proposal and how it will be affected by the proposal. The assessment of each factor is where the EPA decides whether or not a proposal meets the environmental objective set for that factor.

4.1 Marine benthic habitats and biodiversity

Description

The EPA is aware that the Port of Dampier itself (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 cannot therefore be regarded as a pristine environment.

However, recent studies on the inshore coral communities in the area of the Dampier Port have identified 5 different coral assemblages with very high species diversity. At least 120 species of scleractinian coral have been recorded. This is considered a relatively high species count for an inshore reef system, and represents a significant contribution to the region's marine biodiversity (MScience, 2005).

The distribution of the coral communities is patchy and they appear to be composed of adult corals of only a few age classes 10 years or more apart. Available evidence also suggests that the coral recruitment rate is very low in these communities under current conditions.

As part of the conditional approval of the previous dredging program, HI was required to investigate cumulative loss of corals within its management area. A study undertaken by MScience (2005e) on behalf of HI compared the quantity of present day coral habitat with that of Dampier in 1957 prior to the major developments of the 1960's. The study area was comprised of the HI Sea Lease (East Intercourse Island to the Service Wharf) totalling approximately 40 km^2. The study found the:

- present habitat colonised by coral at greater than 10% cover was 55.9 ha in 2004; and
- estimated loss of coral since 1957 ranged between 23–35 %.

Information collected to fulfil conditions on the 2003 HI Dredging program has also revealed an apparent downward trend in coral cover in both Reference and Impact sites monitored in the inner Dampier Archipelago.

The EPA acknowledges that there is insufficient information available to determine whether the results that show a downward trend in coral cover are indicative of natural variation or are a response to anthropogenic influences such as dredging. Available information does suggest, however, that currently the majority of the monitored sites are experiencing a decrease in live coral cover.

The values of this area have been further recognised in the recently released Pilbara Coastal Water Quality Consultation report to the EPA (Department of Environment May 2006), where areas in and around the port have been assigned a Moderate level of protection and the wider area such as the shipping channels assigned a High level of protection.

The EPA is also aware of the Dampier Archipelago-Cape Preston (DACP) Marine Conservation Reserve Proposal. This area is recognised as containing the richest area of marine biodiversity known in Western Australia, with a biodiversity comparable with that of northern Queensland. The EPA therefore considers that the waters of the Dampier Archipelago surrounding the proposal area are of high environmental value, with some areas already designated as nature reserves and consideration being given to the establishment of a marine conservation reserve in the vicinity.

In the recently released Indicative Management Plan for the proposed DACP Marine Conservation Reserve, it is acknowledged that although Port areas are excluded from the proposed reserve, port operations have the potential to impact on values in the proposed reserve.

The proponent has not proposed any direct loss of coral communities. 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); and / or
- other forms of pollution (eg. hydrocarbon spills, introduced marine organisms).

Assessment

As indicated above, the EPA recognises that the Dampier Port is an active port and cannot be regarded as pristine. The EPA, in bulletins 1116 (Dampier Port Authority) and 1117 (Hamersley Iron Pty Ltd) regarding previous dredging campaigns in the Dampier Port, outlined its view that the absence of information about the historic cumulative losses of corals meant a precautionary approach was required to ensuring there were no further significant losses of coral communities. This was based on the EPA's approach to protection of coral habitat set out in the EPA's Guidance Statement No. 29 *Benthic Primary Producer Habitat Protection* (EPA, 2004). The Guidance defines Category E Development Areas to be applied to areas identified as having moderate conservation significance and where land use has been designated for heavy industry and related purposes such as ports. In these areas it is the EPA's expectation that a cumulative loss threshold of 10% would apply for benthic primary producer habitat (BPPH).

The subsequent Ministerial conditions applied to the Dampier Port Authority and Hamersley Iron Pty Ltd required surveys to be completed to establish a baseline for assessing losses of coral reef habitat resulting from human activity (dredging, land reclamation, interrupted recruitment processes etc).

The results of those surveys now indicate that within the HI Sea Lease (East Intercourse Island to the Service Wharf) totalling approximately 40km^2, the estimated loss of coral since 1957 ranges between 23% and 35%. In circumstances where the cumulative loss threshold (10%) has been significantly exceeded, the proposal is assessed against Category F of the EPA's Guidance. For Category F, the EPA's environmental objective is to ensure no further net loss of Benthic Primary Producer Habitat (BPPH) and where possible to generate a net gain in the area of BPPH and/or their associated BPPH communities.

The EPA notes that HI has predicted no further direct loss of BPPH as part of this proposal. However, in relation to managing the potential indirect losses from turbid plumes, the proponent has proposed that the 10% coral mortality threshold criterion (implement management actions) and 30% coral mortality limit criterion (stop dredging) applied in Ministerial Conditions to the previously implemented dredging campaigns should also apply to this current proposal.

The EPA recognises the desire of the proponent to retain the 10% coral mortality threshold criteria and the 30% coral mortality limit criteria afforded the previous dredging campaigns based on practical limitations of dredging and concerns about precedents for the future. However, the EPA also notes that the previous dredging campaign did not trigger the initial 10% threshold where management actions were required to be implemented and that the proposal to dredge for 8-10 weeks over a 3-4 month period introduces a degree of flexibility which should enable a better outcome to be even more readily achieved.

In view of information now available indicating that the cumulative loss thresholds have been significantly exceeded, the EPA does not support the approach to retain the previously approved 10% threshold and 30% limit criteria in a situation where these criteria were not triggered last time and there is more flexibility to achieve a better outcome. The EPA is also concerned about the precedent set in the past and believes that the existence of new data showing 25-35% of corals have been lost warrants a precautionary approach. Additional losses of this magnitude through individual and successive dredging campaigns cannot be supported, as it will lead to continued decline of the coral communities.

Accordingly, the EPA has recommended Condition 6 which requires that dredging should cease if 10% coral mortality is detected through the monitoring program noting that this level of mortality was not triggered last time.

In circumstances where the cumulative loss thresholds have been exceeded, the EPA has also outlined its expectation that mitigation measures should be employed with a goal of achieving a net gain in the area of BPPH and/or their associated communities. In this regard the EPA notes and is supportive of HI's contribution to research on coral recovery, reproductive processes and patterns of larval settlement as an integral step in understanding the science needed for enhancing recovery of coral communities in the Dampier Port.

Summary

Having particular regard to:

- the proponent is not proposing any direct loss of BPPH;
- the estimated cumulative loss within the area of proposed dredging is already between 25% and 35%;
- cumulative loss has exceeded the recommended threshold loss of 10% of BPPH for a port as stated in EPA Guidance Statement No. 29.
- the potential for indirect impacts on coral communities from dredging activities such as increased turbidity to cause a further loss of corals;
- the proposed monitoring and management framework, which is considered sufficiently robust to detect changes of 10% coral cover;
- HI's commitment to undertake research on coral recovery, reproductive processes an patterns of larval settlement as an integral step in recovery of coral communities,

it is the EPA's opinion that if a limit criterion of 10% coral mortality as recommended in Condition 6 is applied, the proposal can be managed to meet the EPA's environmental objective for this factor.

4.2 Coral Spawning

Description and Assessment

In the Dampier Archipelago there is a well described mass spawning event that occurs over the autumn period in the months March to May. Recent surveys around Australia, including the Dampier Archipelago, have found that there are two mass spawning events evident, one in autumn and one in spring (September to October).

In the Dampier Archipelago the primary spawning event is thought to be the autumn event with a minor event occurring in the spring. The participation rate of the different coral species and the ecological significance of the spring spawning are poorly understood, although there is some evidence that some species may primarily spawn in the spring.

The proposed dredging program potentially impacts on the spring spawning event. The proponent has indicated its intention to continue dredging through this event if it can demonstrate that significant spawning is unlikely to occur during the predicted spawning dates of September 13 to 19, October 11 to 17 and November 9 to 15.

The EPA understands that it is possible to monitor corals leading up to the predicted spawning periods and reliably predict if they are likely to spawn or not. Acknowledging that there is currently limited understanding of the importance of the spring coral spawning event, and the ability of the proponent to predict reliably whether or not corals will spawn, the EPA concurs with this approach and has recommended Condition 6-2 which allows for the continuation of dredging and spoil disposal during the spring period on the basis of the results of the investigations relating to the timing, participation of coral species and the extent of coral mass spawning indicating that such an event is unlikely to occur.

Summary

Having particular regard to:

- the ecological significance and relative importance of the spring mass coral spawning event is not well known;
- the proponent can undertake investigations to demonstrate the relative importance of this spawning event ahead of time; and
- the EPA's recommended condition which requires the proponent to demonstrate that corals within the area of influence of dredging and disposal activities are unlikely to significantly participate in the spawning event,

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

5. Conditions and Commitments

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.

In developing recommended conditions for each project, the EPA's preferred course of action is to have the proponent provide an array of commitments to ameliorate the impacts of the proposal on the environment. The commitments are considered by the EPA as part of its assessment of the proposal and, following discussion with the proponent, the EPA may seek additional commitments.

The EPA recognises that not all of the commitments are written in a form which makes them readily enforceable, but they do provide a clear statement of the action to be taken as part of the proponent's responsibility for, and commitment to, continuous improvement in environmental performance. The commitments, modified if necessary to ensure enforceability, then form part of the conditions to which the proposal should be subject, if it is to be implemented.

5.1 Proponent's commitments

The proponent's commitments as set out in the Referral document and subsequently modified, as shown in Appendix 2, should be made enforceable.

5.2 Recommended conditions

Having considered the proponent's commitments and the information provided in this report, the EPA has developed a set of conditions that the EPA recommends be imposed if the proposal by Hamersley Iron Pty Ltd to undertake both capital and maintenance dredging within the Port of Dampier is approved for implementation.

These conditions are presented in Appendix 2. Matters addressed in the conditions include the following:

(a) that the proponent shall fulfil the commitments in the Consolidated Commitments statement set out as an attachment to the recommended conditions in Appendix 2;

(b) Control and Management of Dredging and Spoil Disposal including during coral spawning;

(c) Dredging and Spoil Disposal Management Plan;

(d) Coral Health Monitoring;

(e) Long term Coral Habitat Monitoring and Management;

(f) Water Quality Monitoring; and

(g) Introduced Marine Pests and Ballast Water.

6. Other Advice

In the wider Dampier area, the EPA has formally assessed a total of 22 proposals by various companies and the Dampier Port Authority of both a marine and terrestrial nature. With current trends indicating continued growth in the resources sector in the foreseeable future, the Dampier Port will come under increasing pressure from new developments. Once new marine infrastructure including channels is constructed,

there is a need for maintenance activities to occur including ongoing dredging campaigns.

The combined effect of new developments and maintenance programs along with extreme natural events such as cyclones increases the stressors on the coral communities and limits their capacity for recovery. As has already been established, the EPA's guideline for the cumulative loss threshold for the Dampier Port area has been exceeded. The further proliferation of infrastructure developments and the consequential requirements for maintenance activities in an environment where historic losses are already known to be significant and where there is limited understanding of the ecological role and value of the coral communities, requires careful consideration of the potential environmental impacts.

The Pilbara Coastal Water Quality Consultation Outcomes – Marine Report Series 1 (2006) details that while the community was evenly divided on whether the effects on marine life would be acceptable in some areas in return for important uses such as ports, there was strong community feedback in favour of the protection of environmental values and on the need for environmental baseline data, effective environmental monitoring and reporting systems. These were viewed as essential to characterise the natural biodiversity and environmental quality, in particular, to manage areas potentially subject to impacts from human uses and activities. The Marine Report 1 report outlines the need for coordinated monitoring and reporting systems and the key elements to be addressed in an integrated strategy. The report also outlines the next steps in development of an environmental monitoring strategy which include:

- review existing environmental quality monitoring programs;
- develop a set of priority environmental indicators appropriate to the environmental setting and the threatening processes;
- establish environmental quality criteria for the priority environmental indicators;
- set up cooperative agreements to coordinate monitoring and share monitoring data;
- establish guidelines for public reporting of shared data;
- institute a set of environmental quality reference sites in un-impacted areas; and
- encourage and support further research to underpin the development of indicators and criteria along key ecological cause - effect pathways.

This coordinated approach to monitoring and research will lead to an understanding of the pressures the port environment and opportunities to arrest and potentially reverse the decline of the coral communities in the Dampier Port can then be developed. The EPA now recommends that studies continue to better understand these issues.

7. Conclusions

The EPA has considered the proposal by HI to undertake both capital and maintenance dredging within the Port of Dampier in the vicinity of the Company's Parker Point and East Intercourse Island iron ore export loading facilities.

The proposal involves dredging of approximately 3.4 million cubic metres of material from the ocean floor and disposal of the dredged material on land near Parker Point

and to the established East Lewis and Northern ocean disposal grounds. It is proposed that dredging and disposal activities will take 8–10 weeks within a 3–4 month period.

As a result of the previous dredging campaigns and the monitoring undertaken during their implementation, further information is now available on the historic cumulative loss of coral habitat in the port environs and on the diversity of the inshore coral communities. The results of these surveys now indicate that within the HI Sea Lease (East Intercourse Island to the Service Wharf) totalling approximately 40km^2, the estimated loss of coral since 1957 ranges between 23% and 35%. In circumstances where the EPA's guideline for cumulative loss threshold (10%) has been significantly exceeded, the proposal is assessed against Category F of the EPA's Guidance Statement No. 29 *Benthic Primary Producer Habitat Protection*. For Category F, the EPA's environmental objective is to ensure no net loss of BPPH and where possible to generate a net gain in the area of BPPH and/or their associated BPP communities.

In view of new knowledge showing the significant loss of coral habitat the EPA does not support the approach to retain the 10% threshold coral mortality criteria and the 30% coral mortality limit criteria previously applied to dredging programs in the Dampier Port. Additional losses of this magnitude through individual and successive dredging campaigns cannot be supported, as it will lead to continued decline of the coral communities.

Accordingly, while the management framework recommended in the conditions largely remains the same as that previously applied to dredging programs in the Dampier Port, the EPA has recommended a condition which requires that dredging should cease if 10% coral mortality is detected through the monitoring program.

The proposed dredging program potentially impacts on the spring spawning event. The proponent has indicated its intention to continue dredging through this event if it can demonstrate that significant spawning is unlikely to occur during the predicted spawning dates of September 13 to 19, October 11 to 17 and November 9 to 15.

The EPA understands that it is possible to monitor corals leading up to the predicted spawning periods and reliably predict if they are likely to spawn or not. Acknowledging that there is currently limited understanding of the importance of the spring coral spawning event, and the ability of the proponent to predict reliably whether or not corals will spawn, the EPA concurs with this approach and has recommended Condition 6-2 which allows for the continuation of dredging and spoil disposal during the spring period on the basis of the results of the investigations relating to the timing, participation of coral species and the extent of coral mass spawning indicating that such an event is unlikely to occur.

The EPA has also provided Other Advice about the need for a coordinated approach to monitoring and research that will lead to an understanding of the stressors on the marine ecosystem in the port environment so that opportunities to arrest and potentially reverse the decline of the coral communities in the Dampier Port can then be developed.

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

objectives would be compromised, provided there is satisfactory implementation of the recommended conditions and proponent's commitments set out in Section 5.

8. 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 Hamersley Iron Pty Ltd to undertake both capital and maintenance dredging within the Port of Dampier;
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, including the proponent's commitments; and
4. That the Minister imposes the conditions and procedures recommended in Appendix 2 of this report.

Appendix 1

References

CALM (2005) Indicative Management Plan for the Proposed Dampier Archipelago Marine Park and Cape Preston Marine Management Area. Government of Western Australia.

DoE (2006). *Pilbara Coastal Water Quality Consultation Outcomes — Environmental Values and Environmental Quality Objectives*. Department of Environment, Government of Western Australia, Marine Series Report No. 1.

EPA (2003). Dampier Port Authority – Port Expansion And Dredging Program. Bulletin 1116 Report and recommendations of the EPA. EPA, Western Australia.

EPA (2003). Hamersley Iron - Dredging Program for the Dampier Port Upgrade. Bulletin 1117 Report and recommendations of the EPA. EPA, Western Australia.

EPA (2004). *Guidance for the Assessment of Environmental Factors Statement No. 29 Benthic Primary Producer Habitat Protection for Western Australia's Marine Environment.* EPA, Western Australia.

Sinclair Knight Merz (2006). *Dredging Program for the Dampier Port Upgrade.* Prepared for Hamersley Iron. Western Australia.

Appendix 2

Recommended Environmental Conditions and Proponent's Consolidated Commitments

Statement No.

RECOMMENDED ENVIRONMENTAL CONDITIONS

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

HAMERSLEY IRON DREDGING PROGRAM FOR THE DAMPIER PORT UPGRADE

Proposal: The dredging of approximately 2.9 million cubic metres (for capital dredging) and approximately 0.54 million cubic metres (for maintenance dredging), as documented in schedule 1 of this statement.

Proponent: Hamersley Iron Pty. Limited

Proponent Address: Level 22, Central Park, 152-158 St George's Terrace, PERTH WA 6837

Assessment Number: 1645

Report of the Environmental Protection Authority: Bulletin 1225

The proposal referred to in the above report of the Environmental Protection Authority may be implemented. The implementation of that proposal is subject to the following conditions and procedures:

1 Proposal Description

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

2 Proponent Environmental Management Commitments

2-1 The proponent shall fulfil the environmental management commitments contained in schedule 2 of this statement.

3 Proponent Nomination and Contact Details

3-1 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.

3-2 If the proponent wishes to relinquish the nomination, the proponent shall apply for the transfer of proponent under section 38(6a) and provide the name and address of the person who will assume responsibility for the proposal, together with a letter from that person which states that the proposal will be carried out in accordance with the

conditions and procedures of this statement, and documentation on the capability of that person to implement the proposal and fulfil the conditions and procedures.

3-3 The nominated proponent shall notify the Department of Environment and Conservation of any change of the name and address of the proponent within 30 days of such change.

4 Time Limit of Approval to Commence

4-1 The proponent shall provide evidence to the Department of Environment and Conservation that the proposal has been substantially commenced within five years from the date of this statement or the approval granted in this statement shall lapse and be void.

4-2 The proponent shall make an application for any extension of approval for the substantial commencement of the proposal to the Minister for the Environment prior to five years from the date of this statement, which shall demonstrate that:

1. the environmental factors of the proposal reported in Bulletin 1225 have not changed significantly;
2. new, significant, environmental factors have not arisen; and
3. all relevant decision-making authorities and stakeholders have been consulted.

5 Compliance Reporting

5-1 The proponent shall submit compliance reports in accordance with a schedule approved by the Department of Environment and Conservation and with the compliance monitoring guidelines, and shall:

1. describe, or update, the state of implementation of the proposal;
2. provide verifiable evidence of compliance with the conditions, procedures and commitments;
3. review the effectiveness of corrective and preventative actions contained in the environmental management plans and programs;
4. provide verifiable evidence of the fulfilment of requirements specified in the environmental management plans and programs;
5. identify all confirmed non-conformities and non-compliances and describe the related corrective and preventative actions taken; and
6. identify potential non-conformities and non-compliances and provide evidence of how these are being considered for corrective action.

6 Control and Management of Dredging and Spoil Disposal

6-1 Irrespective of the requirements of conditions 6-4 to 6-9, the proponent shall not conduct dredging and/or spoil disposal activities during the predicted autumn coral mass spawning periods of March to May.

6-2 Irrespective of the requirements of conditions 6-4 to 6-9, the proponent shall not conduct dredging and/or spoil disposal activities during the predicted spring coral mass spawning periods of September to November, unless the proponent can demonstrate to the requirements of the Minister for the Environment acting on advice of the

Department of Environment and Conservation (Conservation Division) that the corals within the area of influence of the dredge or spoil plumes are not significantly participating in a spring coral spawning.

Note: The 2006 predicted spring coral spawning periods are September 13 to 19, October 11 to 17 and November 9 to 15.

6-3 Prior to the predicted spring coral spawning, the proponent shall prepare a Coral Spawning Monitoring Plan to demonstrate whether corals will spawn.

This Plan shall include:

1. identification of dominant coral species in the area of the zone of influence of dredging and spoil disposal;
2. identification of other less dominant corals using genus level grouping in the area of the zone of influence of dredging and spoil disposal.
3. the protocols for preliminary investigations to determine the sex of corals.
4. protocols and procedures for sampling of corals to determine if they will spawn.
5. methodolgy to identify, and if required, to relocate corals monitored;
6. establishment of a definition of significance which will be used as a basis for determining whether corals are deemed to be spawning.
7. the reporting of results; and
8. the timing of the reporting of results.

6-4 Prior to the predicted spring coral spawning, the proponent shall prepare a report analysing the results arising from the monitoring of coral required by condition 6-3 and submit this report to the Department of Environment and Conservation.

6-5 At least 14 days prior to the commencement of dredging and/or spoil disposal activities, the proponent shall commence a fortnightly coral health monitoring programme as set out in the Coral Health Monitoring Plan required by condition 10-1 to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

This monitoring programme shall also include prior baseline measurements of coral health for:

1. potential impact monitoring sites likely to be affected by dredging or disposal; and
2. appropriate reference sites outside the zones of influence of dredging and spoil disposal activities.

6-6 The proponent shall continue the implementation of the coral health monitoring programme referred to in condition 6-5 during dredging and/or spoil disposal activities and for at least two months after cessation of all dredging and spoil disposal activities.

6-7 Subject to condition 6-8, the proponent shall report the results of each fortnightly coral health monitoring survey to the Department of Environment and Conservation for the duration of coral health monitoring, at monthly intervals on the same day of each successive calendar month, with the first report being submitted one month after the commencement of monitoring.

6-8 If at any time during dredging and/or spoil disposal activities, net coral mortality at any potential impact monitoring site exceeds the 'limit' level of 10 percent specified in condition 10-5, the proponent shall immediately cease all dredging and/or spoil disposal activities which are contributing to the observed mortality at the site(s) where that 'limit' level is exceeded, and shall report the exceedence to the Department of Environment and Conservation within 24 hours.

6-9 The proponent shall not recommence dredging and/or spoil disposal activities following any cessation required by condition 6-8 until such time as it can be demonstrated to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority that:

1 the recommencement of such activities will not contribute to further net mortality of corals at any potential impact monitoring site at which the 'limit' level of 10 percent specified in condition 10-5 has been exceeded; and

2 the ambient environmental conditions at any potential impact monitoring site at which the 'limit' level of 10 percent has been exceeded are such as to not prevent recovery.

6-10 If for any reason, the fortnightly coral health monitoring surveys have not been undertaken during any four-week period (ie. two consecutive coral health monitoring surveys) at any potential impact monitoring site, the proponent shall immediately cease dredging and disposal activities which may affect water quality at that site until such time as the level of net coral mortality at that site can be assessed and demonstrated to be below the 'limit' level of 10 percent specified in condition 10-5.

6-11 The proponent shall report any cessation of dredging and/or disposal activities and subsequent recommencements which occur as a result of meeting the requirements of conditions 6-8 and 6-10 to the Department of Environment and Conservation within 24 hours.

7 Dredging and Spoil Disposal Management Plan

7-1 Prior to commencement of dredging and/or 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 for the Environment, the Environmental Protection Authority expects that advice of the following agencies will be obtained:

- Commonwealth Department of the Environment and Heritage;
- Department for Planning and Infrastructure (Maritime Division); and
- Department of Fisheries.

The objectives of this Plan are to:

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

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

1. address monitoring requirements and management measures to protect sensitive marine ecological attributes and social values of Mermaid Sound consistent with the operational requirements of the Port, and any other areas within the potential zone of influence of the environmental effects of dredging and spoil disposal;
2. identify the ecological and social values to be protected as described in the Pilbara Coastal Water Quality Consultation Outcomes;
3. identify and spatially define appropriate environmental quality objectives to be met during dredging and spoil disposal activities;
4. establish the environmental quality criteria to protect social values in the long term;
5. describe the type of dredge(s) to be used and mode of operation;
6. determine most probable and worst-case timing and duration of dredging and spoil disposal activities and contingencies for unforseen delays;
7. contain a description of the potential zones of influence of dredging and spoil disposal activities on water quality, and explain the rationale underpinning the predictions;
8. using information gathered to meet the requirements of point 7 above, specify appropriate reference sites outside the potential zones of influence of dredging and spoil disposal activities on water quality and coral health;
9. specify potential impact sites adjacent to and between the source(s) of turbidity and sensitive marine ecological attributes which require protection from the effects of dredging and spoil disposal activities;
10. set out procedures, including frequency, probable flight paths and methods of recording information (e.g. 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;
11. set out the procedures for monitoring water quality at appropriate reference sites and potential impact sites;
12. set out the procedures for the deployment of an in-situ data logger throughout the dredging period at the TDPL site and King Bay coral impact sites, calibrated to

provide an estimate of suspended sediment or sedimentation for continuous monitoring;

13. set out the procedure for the monitoring of sediment particle size at a network of sites adjacent to and at increasing distances from the dredging area;

14. specify the management actions and contingency measures to be implemented in the event of exceedance of the levels specified in condition 10-5; and

15. specify reporting procedures.

7-2 The proponent shall implement the Dredging and Spoil Disposal Management Plan required by condition 7-1.

7-3 The proponent shall make the Dredging and Spoil Disposal Management Plan required by condition 7-1 publicly available, in a manner approved by the Department of Environment and Conservation.

8 Water Quality Monitoring

8-1 During dredging and spoil disposal activities, at intervals not exceeding three days between measurements, the proponent shall undertake water quality monitoring at potential impact sites and appropriate reference sites as specified in the Dredging and Spoil Disposal Management Plan required by condition 7-1, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

The objectives of this monitoring are to:

- calibrate relevant numerical models of turbidity generated through dredging and spoil disposal;
- validate the calibrated relevant numerical models;
- establish and document the extent and severity of turbidity plumes resulting from dredging and spoil disposal associated with this proposal in Mermaid Sound;
- facilitate the establishment of relationships between coral health and dredging and spoil disposal-induced turbidity; and
- establish a relationship between total suspended solids and light attenuation coefficient in dredging and spoil disposal induced turbidity plumes.

8-2 The proponent shall take water quality measurements at “near surface”, “near bottom” and at other appropriate depths within the water column, and the parameters to be measured shall include:

1. turbidity (in NTUs);
2. total suspended solids (mg/L);
3. light attenuation coefficient;
4. dissolved oxygen (mg/L);
5. pH; and
6. depth in the water column at which each measurement is taken.

8-3 The proponent shall report the results of monitoring required by condition 8-1 to the Department of Environment and Conservation for the duration of dredging and spoil disposal activities, at monthly intervals on the same day of each successive calendar

month, with the first report being submitted one month after the commencement of dredging.

8-4 The proponent shall prepare a report analysing the results of water quality monitoring referred to in condition 8-1 against the objectives outlined in condition 8-1 which shall be submitted to the Department of Environment and Conservation.

9 Introduced Marine Pests and Ballast Water

9-1 Prior to 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 to be carried out by an appropriately qualified marine scientist to ensure that;

1. there is no sediment in the dredging equipment; and

2. 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 Environment and Conservation on the results of the inspection referred to in condition 9-1.

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 transferred to another location within Western Australia's territorial waters, the proponent shall undertake an investigation employing an appropriately qualified marine scientist to identify the presence of / the potential for introduced marine pests, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

9-5 In the event that any introduced marine pests are detected, the proponent shall put in place a Marine Pests Management Strategy to ensure that introduced marine pests are not transferred to other locations within Western Australia's territorial waters, 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 actions required by conditions 9-3 to 9-5, the Environmental Protection Authority expects that advice of the following agencies will be obtained:

- Department of Fisheries; and

- Australian Quarantine Inspection Service.

10 Coral Health Monitoring

10-1 Prior to the commencement of dredging or 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:

- establish the baseline health condition of coral prior to any dredging or spoil disposal activities undertaken as part of this proposal as indicated by the extent of living coral at appropriate reference and monitoring sites;
- monitor and assess any changes in the health of corals, as indicated by the net extent of coral mortality which occurs subsequent to the commencement of dredging and/or spoil disposal activities; and
- compare net coral mortality at potential impact monitoring sites with the 10 percent limit level for net coral mortality set out in condition 10-5, within the zones of influence of dredging and spoil disposal activities.

This Plan shall include the following:

1. the location of appropriate coral health potential impact monitoring sites and reference sites;
2. protocols and procedures for monitoring and quantitatively determining the extent of coral mortality using fortnightly coral health monitoring surveys at all of the potential impact monitoring sites;
3. calculations of statistical power of the monitoring procedures referred to in point 2 above to demonstrate that the procedures are appropriate to determine the extent of mortality against the 'threshold' and 'limit' levels set out in condition 10-5;
4. reporting of the results of pre-dredging field surveys at appropriate potential impact and reference sites to be conducted at least two weeks prior to the commencement of this proposal, establishing the baseline conditions in terms of live coral cover at those sites;
5. reporting procedures for the regular fortnightly coral health monitoring surveys required by condition 10-1; and
6. the results of pre-dredging juvenile recruitment surveys at all potential impact sites and related reference sites.

10-2 During dredging and spoil disposal activities, notwithstanding conditions 6-6 to 6-10, the proponent shall undertake regular fortnightly coral health monitoring at all potential impact sites and appropriate reference sites, in such a manner as set out in the Coral Health Monitoring Plan required by condition 10-1.

10-3 Within three days following each coral health survey required by condition 10-2, the proponent shall determine the gross extent of coral mortality at each potential impact monitoring site and at each reference site, based on the survey data, to the requirements

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

The gross extent of coral mortality shall be calculated as the total reduction in cover of living coral at a site occurring after the date of establishment of the original extent of live coral cover (see condition 10-1), expressed as a percentage of the established original extent of live coral cover at that site.

10-4 In the event that gross coral mortality at any potential impact monitoring site, as determined in accordance with condition 10-3, is greater than 10 per cent, the proponent shall determine the net extent of coral mortality at each potential impact monitoring site, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

The net extent of coral mortality at each potential impact monitoring site shall be calculated by subtracting the gross percentage of mortality measured at the appropriate reference site(s) from the gross percentage of mortality at the potential impact monitoring site.

The fortnightly coral health surveys at potential impact sites shall then continue for the duration of dredging and spoil disposal, and for at least two months after completion of dredging and spoil disposal.

10-5 Within twenty-four hours of calculating the net extent of coral mortality referred to in condition 10-4, the proponent shall compare the net extent of coral mortality at each potential impact monitoring site with the 10 percent limit level for net coral mortality, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

11 Long Term Coral Habitat Monitoring and Management

11-1 Prior to the commencement of dredging and spoil disposal activities, the proponent shall prepare a Long Term 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
- the Department of Environment and Conservation (Conservation Division).

The objectives of this Plan are to:

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

- monitor the effects of dredging and spoil disposal activities on the biodiversity, structure, health and reproductive success of coral reef habitats which occur within predicted zones of influence of dredging and spoil disposal activities; and
- 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. the management response(s) to be implemented in the event that criteria established in point 3 above are not met;
8. completion criteria for management response(s) in point 7 above; and
9. 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 Long Term Coral Habitat Monitoring and Management Plan required by condition 11-1.

11-3 The proponent shall make the Long Term Coral Habitat Monitoring and Management Plan required by condition 11-1 publicly available, in a manner approved by the Department of Environment and Conservation.

12 Liaison with Port Authority

12-1 At all stages of the proposal, including post-dredging monitoring, the proponent shall liaise with the Dampier Port Authority and provide to the Port Authority the following:

1 the results / summaries of fortnightly monitoring;
2 reports of environmental significance; and
3 notice of any events or occurrences of environmental concern.

Procedures

1 The Environmental Protection Authority may seek advice from other agencies or organisations, as required, in order to provide its advice to the Minister for the Environment.

2 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 Environment and Conservation.

3 Due to the requirement for adaptive management in the implementation of this proposal, the Minister for the Environment, following advice from the Environmental Protection Authority, may vary the 'threshold' and 'limit' levels referred to in condition 10 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.

4 The Environmental Protection Authority may vary:

- the requirement for;
- the area of application of; and
- the start and finish dates of,

the cessation of dredging and spoil disposal during the coral spawning periods (specified in condition 6) 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 6.

Notes

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

Schedule 1

The proposal (Assessment No. 1645)

The proposal, which is located near the Town of Dampier and within Mermaid Sound (see figure 1) involves dredging a total of approximately 3.44 million m^3 as follows:

1. Dredging
    - extend the existing northern and southern berth pockets a the Parker Point wharf and to enable four vessels to moor alongside the wharf at any one time;
    - widen and deepen the southern swing basin to provide safe approaches for vessels using the southern berths;
    - widen the northern approach route to provide safe navigation for arriving vessels and provide an escape route to the north of Parker Point in the event of immobilisation of a departing vessel in the channel;
    - dredge a new berth pocket east of the existing parker Point Wharf to allow for new, upgraded tanker unloading facilities;
    - remove siltation in the existing northern approach route and approaches to the Service Wharf facility at Parker Point;
    - remove under wharf spillage from Parker Point and East Intercourse Island berths; and
    - remove a high spot adjacent to the main shipping channel to provide safe navigation for incoming vessels.

2. the disposal of the materials obtained by the above dredging to designated sites on land and on the ocean floor as set out in Table 2 below; and

3. environmental monitoring of water quality and coral communities within Mermaid Sound.

The key proposal characteristics are presented in Table 1.

Table 1 – Key Proposal Characteristics

Element	Description / Quantity
Amount of material to be dredged and disposed	Maximum of 3.45 million cubic metres (estimated)
Major components (as shown in Figures 1 & 2)	
• Dredging of material within areas A – D, G and H (capital) to the East Lewis and Northern spoil grounds.	Combined maximum of approximately 2.47 million cubic metres
• Dredging of material within areas A and B (capital) to onshore disposal.	Approximately 0.44 million cubic metres
• Dredging of material within areas E, F, PP and EII (maintenance) to the Northern spoil ground	Approximately 0.54 million cubic metres
Period of dredging and disposal	Dredging duration of approximately 8–10 weeks within a 3–4 month period, commencing in 3rd Quarter 2006.

Tables attached

Table 2 - details of dredging and disposal volumes.

Figures attached

Figure 1 - locality plan; and
Figure 2 - location of dredging and spoil disposal areas.

Table 2 - Estimated dredging volumes and depths for dredging areas identified in Figure 2.

	Parameters							
Location	**Existing sea bed level (RL-m CD)**	**Dredge depth level (RL-m CD)**	**Depth of dredging (m)**	**Area to be dredged (ha)**	**TBT material for offshore disposal (m^3)**	**Clean material for offshore disposal (m^3)**	**Material for onshore disposal (m^3)**	**Total material to be dredged (m^3)**
A	11.0 - 15.4	19.5	4.2 - 8.5	3.2	28,000	52,000	182,000	262,000
B	6.5 - 11.0	15.4	4.4 - 8.9	10.9	54,000	556,000	258,000	868,000
C	6.5 - 8.0	10	2.0 - 3.5	21.5	0	749,000	0	749,000
D	7	8	1	71.8	41,000	880,000	0	921,000
G	8	12	4	2.1	0	95,000	0	95,000
H	7	8.5	1.5	1	0	15,000	0	15,000
E	7.5	8.5	1	30	70,000	230,000	0	300,000
F	6.5	8	1.5	15	0	225,000	0	225,000
PP	19.5	21	1.5	0.3	5,000	0	0	5,000
EII	19	19.7	0.7	0.3	5,000	0	0	5,000
Total								**3,445,000**

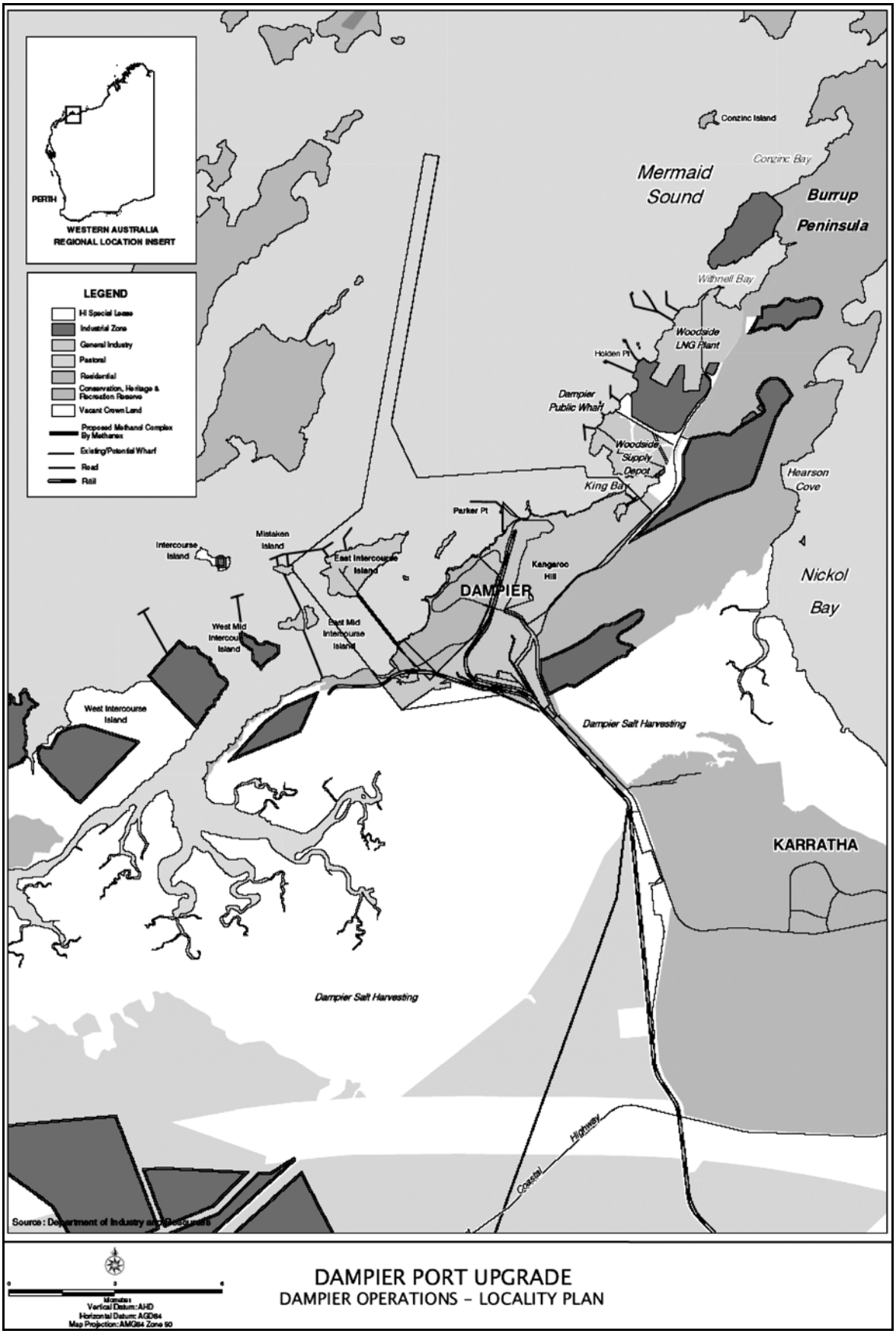

Figure 1: Locality plan

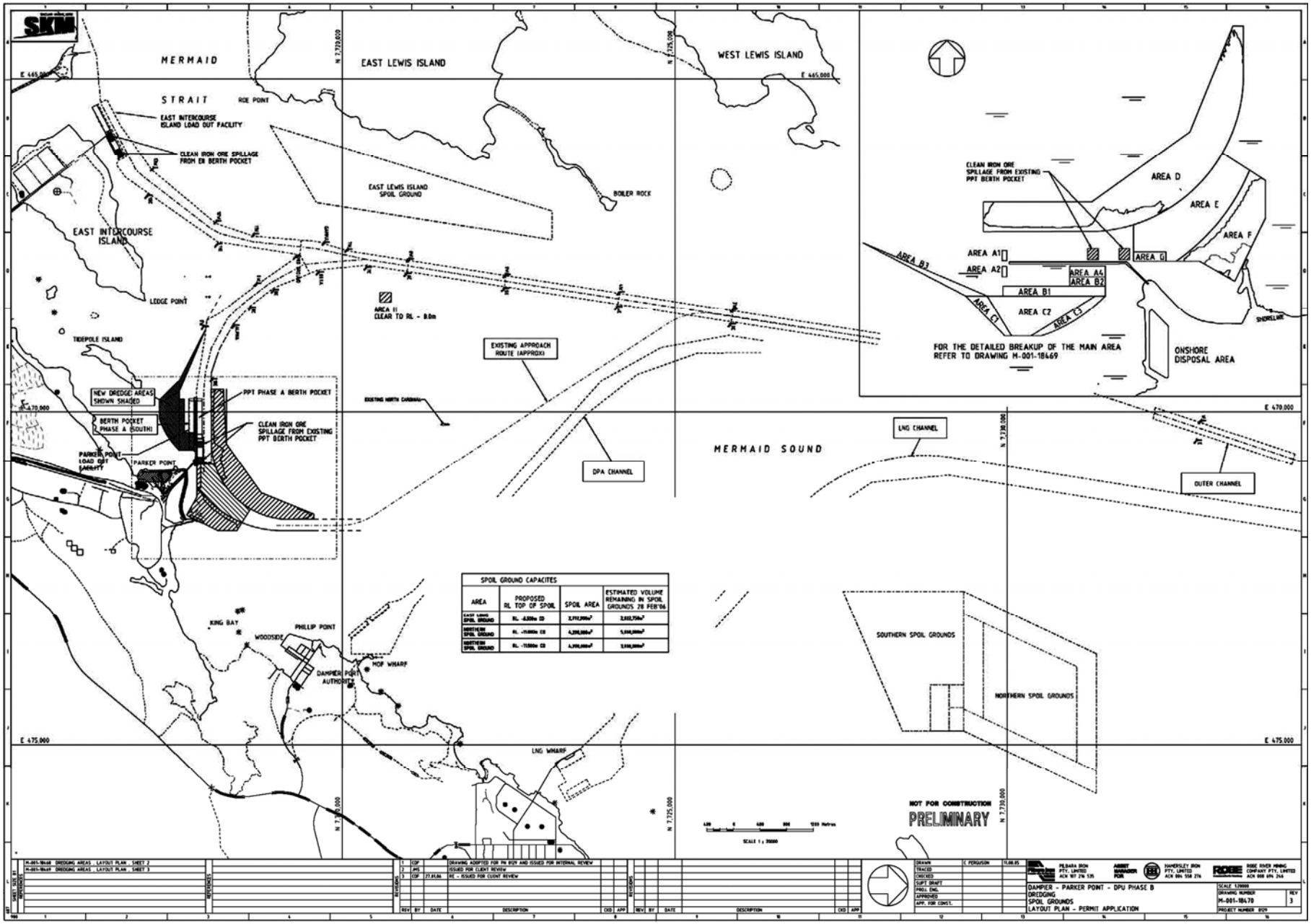

Figure 2: Location of dredging and spoil disposal areas.

Schedule 2

Dredging Program for the Dampier Port Upgrade
Hamersley Iron Pty. Limited (Assessment No. 1645)

Possible management measures required by condition 7-5

Possible Management Measures (Any combination of at least one of the following management actions.)
• Relocate dredge; • Relocate position for spoil disposal within spoil ground; • Use alternative spoil ground; • Reduce dredge overflow; • Deploy silt curtain barrier between dredging and/or disposal areas and coral sites; • Reduce dredging to single shift.

Schedule 3

Proponent's Environmental Management Commitments

June/July 2006

HAMERSLEY IRON DREDGING PROGRAM
FOR THE
DAMPIER PORT UPGRADE

(Assessment No. 1645)

Hamersley Iron Pty. Limited

Proponent's Environmental Management Commitments

HAMERSLEY IRON DREDGING PROGRAM FOR THE DAMPIER PORT UPGRADE – HAMERSLEY IRON PTY. LIMITED (Assessment No. 1645)

Note: The term "commitment" as used in this schedule includes the entire row of the table and its six separate parts as follows:

- a commitment number;
- a commitment topic;
- the "action" to be undertaken by the proponent;
- the objective of the commitment;
- the timing requirements of the commitment; and
- the body/agency to provide technical advice to the Department of Environment.

Commitment No.	Topic	Action	Objective	Timing	Advice
1	Environmental Management	Develop an Environmental Management Plan (EMP) that will address the management of: 1. Hydrocarbons 2. Wastes 3. Ballast Water and Marine Pests; and 4. Vessel Movements.	Manage all relevant environmental factors associated with the maintenance and capital dredging.	Pre-dredging	Dampier Port Authority Dept of Fisheries
		Implement the approved EMP	To achieve outcomes of commitment 1.	During dredging	