Appendix C

Spoil Disposal Options Assessment

Spoil Ground Site Selection Port of Hay Point (WBM 2004)

Assessment for Land Disposal Options for Dredge Spoil at the Port of Hay Point (WBM 2004)

Spoil Ground Site Selection
Port of Hay Point

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ABN 54 010 830 421 002

Document:	R.B15109.001.02.final report.doc
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Client Reference:	EM-78-148-HP001
Synopsis:	Selection of new spoil disposal site for the Port of Hay Point

REVISION/CHECKING HISTORY

REVISION NUMBER	DATE	CHECKED BY		ISSUED BY	
0	12 May 2004	D Richardson		C Witt	
1	28 May 2004	D Richardson		C Witt	
2	4 June 2004	D Richardson		C Witt	

DISTRIBUTION

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EXECUTIVE SUMMARY

Background

Ports Corporation of Queensland (PCQ) is responsible for the maintenance and establishment of navigable waters within the Port of Hay Point. Spoil from this dredging is currently disposed of at a designated spoil ground approximately three kilometres to the north-west of the Port facilities. As this spoil ground is approaching maximum capacity, a new spoil disposal site is required to enable the continuation of capital and maintenance dredging campaigns at the Port. PCQ anticipates that the new spoil ground/s will need to have an overall capacity of approximately 15 million m^3.

This study represents the first stage of a multi-stage process seeking to initially identify a new spoil disposal site for the Port of Hay Point, and eventually gaining the required environmental approvals for the selected spoil ground. For the purposes of this initial assessment phase, PCQ required a preliminary desk-top assessment of potential spoil ground areas in ocean waters. The overall objectives of this study, as defined by PCQ were:

- Following the consideration of a number of alternate solutions, identify a preferred spoil ground site with sufficient capacity for PCQ's needs.
- Provide PCQ with the relevant information to support agency consultation on the preferred spoil ground site
- Identify any relevant legislation and approvals that may be required should PCQ proceed with development of the chosen spoil ground site.

Scope and Methodology

This study comprises a general scoping study based on a comprehensive desk-top review, analysis and interpretation of all available information pertaining to the existing environment within and adjacent to the Hay Point Port limits. The study was done in four phases as follows:

- Phase 1 – Development of Criteria for the Selection of Potential Spoil Ground Areas;
- Phase 2 – Assessment of the environmental attributes of the study area relevant to criteria developed in Phase 1;
- Phase 3 – Assessment and selection of preferred spoil ground site/s, based on the outcomes of Phase 1 and 2 investigations; and
- Phase 4 – Identification of regulatory mechanisms that may be triggered if PCQ proceed with the development of the preferred spoil ground/s.

Criteria Development for Assessment of Potential Spoil Ground

The National Ocean Disposal Guidelines for Dredged Material (NODGDM) outlines key issues that should be considered when selecting new spoil grounds. In addition, there are numerous functional, planning and ecological constraints that must also be considered when selecting a new spoil ground. A set of criteria, which were used as a basis for Phase 2-4 investigations, was developed in association with PCQ.

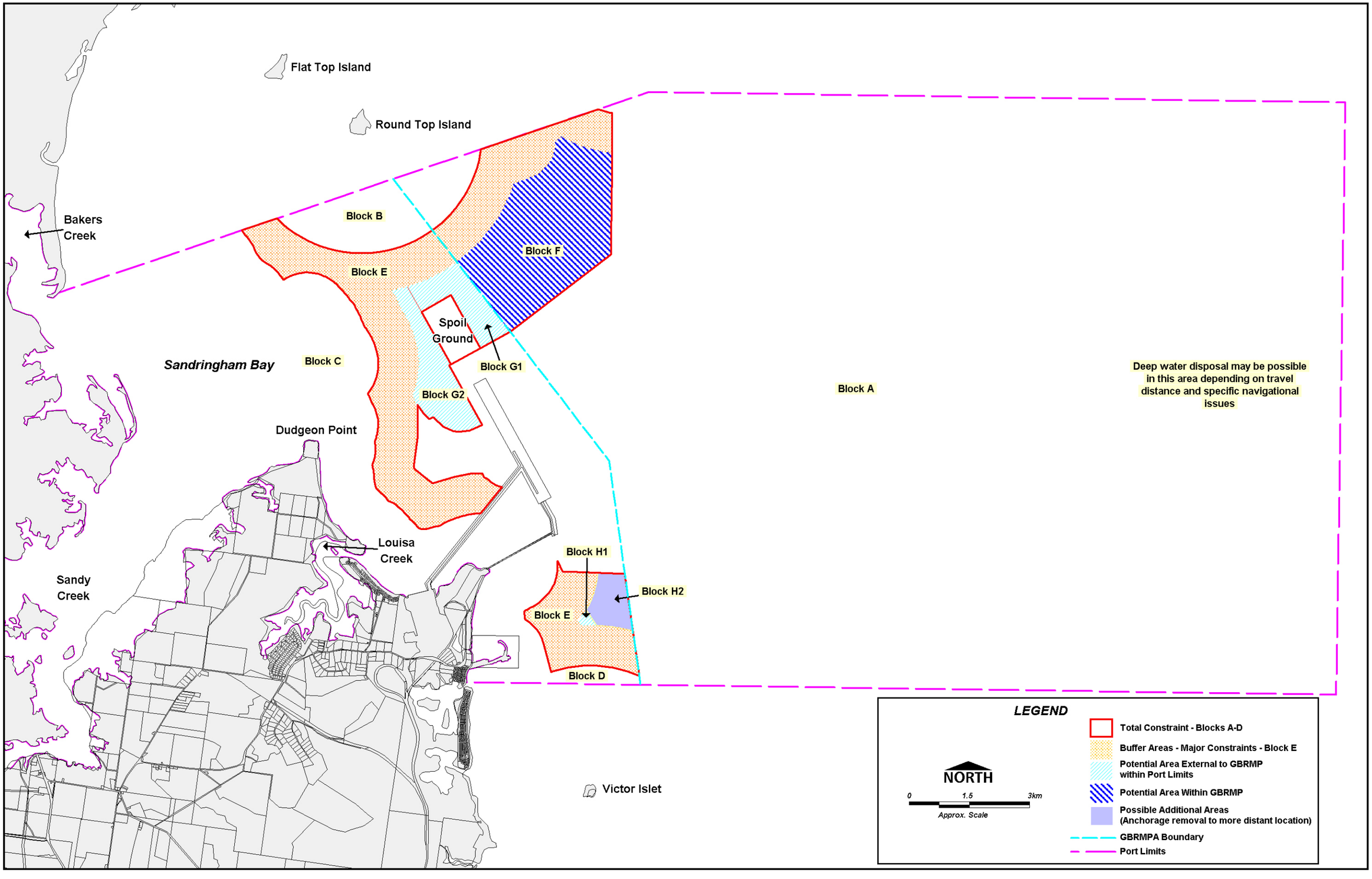
These criteria included:

- Ecological resources and planning constraints: intertidal flats, reefs, marine plants, Dugong Protection Areas, Conservation/National Parks, Fish Habitat Areas, turtle nesting areas, Ramsar wetlands, Great Barrier Marine Park, Wetlands of National Importance;
- Social constraints: important fishing areas and heritage sites;
- Technical/economic constraints: history of impacts from past dredging, navigation areas, moorings, anchorages, water depth, distance from dredge area (economic radius of travel), spoil ground area/life, dredge manoeuvrability, sediment granulometry relative to spoil ground, spoil volume and hydraulic factors.

Assessment of Criteria and Selection of Preferred Spoil Ground

On the basis of a desk-top review, key ecological, tenural/administrative and technical constraints to the establishment of a new spoil ground within the study area were identified and mapped. From this, areas with similar constraints/issues were identified, allowing the study area to be separated into 10 distinct 'blocks'. Each of these blocks form the basis for the discussion of major management issues within potential future spoil disposal areas, as summarised below and shown in Figure 1:

- **Blocks A-D**. Most of the study area is situated within waters where either spoil disposal is unlikely to gain the requisite approvals because of waters identified as having navigational constraints (Block A) or environmental regulations (i.e. Blocks B, C and D). Note that should dredging be undertaken in offshore waters for the purpose of channel alignment works, PCQ may consider the disposal of spoil in deeper waters, separate from the main spoil ground. However, such a site would be within the Great Barrier Reef Marine Park (GBRMP) area. Furthermore, disturbing another area would not be desirable from an impact assessment and management perspective, and therefore was not further considered.
- **Block E**. A large proportion of the study area (2,666 ha) is situated within regulatory authority imposed buffer areas. This block includes areas where management requirements or compliance targets set by agencies would be unlikely to be met unless extremely high levels of management control were implemented, likely resulting in a reduction in functional efficiency. This block is not considered a viable alternative and is not further considered in this study.
- **Block F**. The total seafloor area within the GBRMP area, but outside navigation areas, is approximately 1,046 ha. This Block is within the General Use Zone of the Marine Park and has an estimated capacity of 36.2 million m^3, which far exceeds PCQ's requirements in the foreseeable future. Spoil dumping in this block is considered to be the least likely to result in impacts to sensitive ecological resources. As currents run in a predominantly north-north-west / south-south-east direction, turbid plumes would tend to move past (eastwards of) Flat Top and Round Top Islands, reducing the risk of impacts to sensitive environments. To further reduce the likelihood of impacts to Flat Top and Round Top Islands, it would be preferable for any spoil disposal in this block to be in the eastern sections. An area of approximately 430 ha (a circle with a radius of 1.17 km) would be required to accommodate 15 million m^3 at an average placement depth of 3.5m.



Potential Spoil Disposal Areas/Blocks **Figure 1**

- **Block G**. This potential spoil disposal area is external to GBRMP boundaries and existing anchorages in the northern sectors of the study area and has a total area of 493.4 ha. Based on existing bathymetry charts and survey data, this block has a potential volume[1] of 11.3 million m^3, assuming:
  - the area seaward of the western boundary of the existing spoil ground (G1) is filled to an average bed level of –10m LAT; and
  - the area landward of the western boundary of the existing spoil ground (G2) is filled to an average bed level of –9m LAT.

  The total capacity of this area is approximately 8.6 million m^3 if it was all filled to an average level of –10m LAT.
- **Block H**. This block is situated near the Tug Harbour in the southern sectors of the Port. Assuming that anchorage *S8* was removed, this block would have an estimated capacity of 1.9 million m^3.

From an administrative/approvals perspective, Block G is the preferred area for future spoil disposal activities. However, while it has sufficient capacity to cater for likely future capital dredging (up to 9.5 million m^3 of material), it will not accommodate the full 15 million m^3 required for both capital and maintenance material. Therefore, an alternative site is likely to be required for future maintenance dredging activities.

There are some caveats on using this area, as follows:

- This area could contain terrigenous patch reefs. Further surveys would be required to address this issue; and
- The northern portions of this block are situated closer to the GBRMP and reef environments (at Round Top and Flat Top Islands) than the existing spoil ground. The risk of environmental impacts to these areas is therefore greater for Block G compared to the existing spoil ground. The risk of impact could be further compounded given the larger relative spoil volume of potential future dredging campaigns (e.g. as part of channel alignment capital dredging) compared to existing dredging episodes.

Spoil dumping in Block F is the least likely to result in impacts to sensitive ecological resources compared to dumping in the other three Blocks. However, Block F has a higher level of administrative constraints being within the GBRMP area.

Approvals

Depending on the preferred area and the timing of the application, the approvals that are likely to be required are as follows.

Commonwealth

If the selected site is not in the GBRMP Area (or in close proximity), then:

1 Note that this volume calculation assumes that disposal occurs in waters directly adjacent to, but not within, the GBRMP boundary. The GBRMPA can require a Marine Parks Permit if it considers there are likely to be indirect impacts (i.e. impacts associated with turbid plumes or spoil dispersal) to the GBRMP (see Section 5).

- a Sea Dumping Permit from the Department of Environment and Heritage (DEH) will be required; and
- a referral under the Environmental Protection and Biodiversity Act 1999 (EPBC Act) will automatically be made by DEH to determine whether it will be a 'controlled action' . Subsequent processes for the assessment of the action would then apply.

If the site is within the GBRMP, then an application for a Marine Parks Permit will need to be made to GBRMPA. However a referral to DEH under the EPBC Act will not be required.

State

Given that it is likely that the *Fisheries Act 1994* permitting requirements will have been rolled into the *Integrated Planning Act 1997* by the time an application is to be made, an application would then be made to the EPA under the IPA procedures. This application would cover approvals under the *Coastal Management and Protection Act 1995*, the *Fisheries Act 1994* and the *Environmental Protection Act 1994*. Applications under other legislation are unlikely to be requested. Should the *Fisheries Act 1994* not have been rolled into IPA by the time applications are to be made, then a permit under Section 51 of the Act will need to be sought should marine plants be likely to be disturbed. The rolling in of the *Fisheries Act* 1994 is proposed in late 2004.

Recommended Further Studies

This study represents Stage 1 of a multi-stage process. The following additional investigation stages are recommended:

- *Stage 2* - Initial presentation of preferred options with relevant stakeholders (including government agencies and, if established in the future, a Technical Advisory Consultative Committee TACC- refer Section 5).
- *Stage 3* - Detailed environmental studies at Blocks F, G and H. This would be expected to involve, as a minimum, the following (pending advice from stakeholders/TACC in Stage 2):
  - Seabed surveys (e.g. diver, underwater video assessments).
  - Grain size analysis studies of sediments to be dredged and within each of the three blocks.
- *Stage 4* - Additional liaison with regulatory authorities and seek approvals based on outcomes of Stages 1, 2 and 3 investigations.

This process should be coordinated and managed within a Long Term Dredge Spoil Management Strategy (LTDSMS). The NODGM outlines the process that should be followed in the development of a LTDSMS.

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1 INTRODUCTION

1.1 Background

The Port of Hay Point services the Dalrymple Bay Coal Terminal (DBCT) and Hay Point Services Terminal (HPST) through off-shore wharves and associated jetty-mounted conveyors which allow ship-loading in deeper water. Dredging of the Port area to facilitate access to the wharves by large ocean-going vessels is undertaken by PCQ. Spoil from this dredging is currently disposed of at a designated spoil ground approximately three kilometres to the north-west of the Port facilities. As this spoil ground is approaching maximum capacity, a new spoil disposal site is required to enable the continuation of capital and maintenance dredging campaigns at the Port.

As part of the initial process of determining a new suitable location for future spoil disposal, PCQ engaged WBM Oceanics to undertake an analysis of potential alternative sites. The current site has been approved for use under a Sea Dumping Permit (see below) and substantial environmental monitoring of it and adjacent control sites has been undertaken to date. PCQ have indicated that, because a significant amount of information is held regarding this area and there has been no demonstrated significant environmental impact, any new spoil disposal area would ideally be created through augmentation of the existing area. This option was to be considered in addition with a full appraisal of any alternatives.

This report thus presents the findings of this review of potential spoil disposal sites. It also identifies:

- a recommended area for spoil disposal and possible staging of this disposal;
- the approval processes that may need to be followed in order to gain approval for the new spoil disposal area; and
- the gap-filling studies that may need to be undertaken to supplement existing technical information in order to meet the requirements of the approval agencies.

1.2 Objectives of Investigation

PCQ is committed to the determination of an appropriate spoil disposal site that meets the objectives of its Environmental Policy and complies with the requirements of the various agencies that regulate the activities of PCQ in regard to spoil disposal. Of primary importance are the National Ocean Disposal Guidelines for Dredged Material – NODGDM (Environment Australia 2002) which outline generic guidelines on the process to be followed when selecting a new spoil ground site. The types of investigations to be considered include:

1 Assessments of the physio-chemical characteristics of potential spoil ground sites (currents, water quality, sediment quality);

2 Assessments of marine communities of potential spoil ground sites (sensitive communities and species, baseline conditions, etc.);

3 Development of baseline conditions of contaminants in the tissues of long-term resident species;

4 Determination of other uses of the potential spoil ground area;

5 Assessments of the suitability of the site for sea disposal (based on the capacity of the potential site and nature of the spoil to be dumped).

At this stage, PCQ required a preliminary desk-top assessment of potential spoil ground areas in ocean waters. However, this assessment will involve consideration of the required investigation areas as outlined in Section 4 of Environment Australia (2002). It is understood that this preliminary assessment will be used by PCQ to support agency consultation on preferred spoil ground site/s, and to identify relevant legislation and approvals that may need to be considered if the development of the new spoil ground is undertaken.

Accordingly, the objectives of the study as defined by PCQ were:

- Following the careful consideration of a number of alternate solutions, identify a preferred spoil ground site with sufficient capacity for PCQ's needs. This task is to be undertaken in accordance with Section 4.0 of Environment Australia (2002) and consultation with PCQ staff.
- Provide PCQ with the relevant information to support agency consultation on the preferred spoil ground site.
- Identify any relevant legislation and approvals that may be required should PCQ proceed with development of the chosen spoil ground site.

1.3 Area of Investigation

The area of investigation for the spoil disposal site is essentially limited by the economic distance for the cartage of spoil from the dredging areas. Main areas proposed for capital and operational dredging in the future and likely spoil volumes are as follows:

- Departure channel (five options for channel location and configuration are currently under consideration by PCQ); potentially 5.5 to 7.5 million m^3 of material;
- Stage 7 Port berth development: 1 million m^3;
- Hay Point Services berth: 1 million m^3; and
- On-going maintenance dredging and contingency: 5.5 million m^3 over a 20 year period.

The likely total volume that will require disposal over the next 20 years is thus estimated to be up to 15 million m^3. Based on a total settled depth of 3m, for example, this is equivalent to an area of approximately 500 ha. The area permitted for spoil disposal (as defined under the most recent Sea Dumping Permit and environmental approvals) is approximately 125 ha and had an approved dumping capacity of 1.7Mm^3.

The primary area of investigation has been within the limits of the Port of Hay Point plus areas within approximately four kilometres to the north and south of the Port boundary. This is equivalent to a maximum distance of approximately 10 km from potential dredging locations. Distances in excess of this are considered to be uneconomical in terms of travel distance and corresponding time lost. The most eastern extremity of the Port is approximately 18 km from the wharves. Figure 1.1 indicates the area of investigation in relation to the Port and Port limits.

Land disposal options were not considered as part of this investigation but will be addressed by PCQ in investigations at a later stage.

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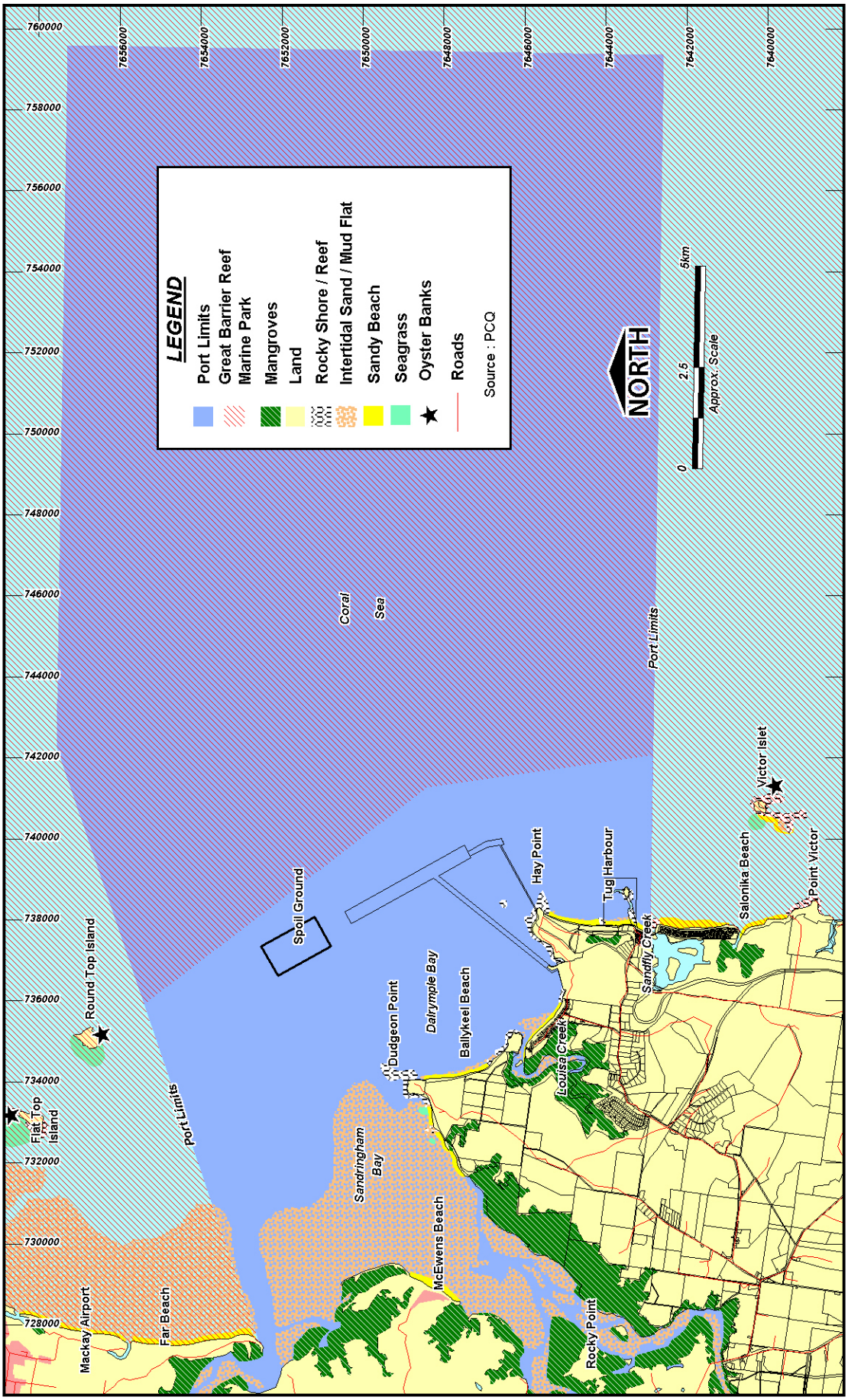
Figure 1.1 Port of Hay Point – Area of Investigation



Port of Hay Point - Area of Investigation **Figure 1-1**

1.4 Scope and Methodology

This study comprises a general scoping study based on a comprehensive desk-top review, analysis and interpretation of all available information pertaining to the existing environment within and adjacent to the Hay Point Port limits. The study was done in four phases as follows:

Phase 1 - Development of Criteria for the Selection of Potential Spoil Ground Areas

An initial set of criteria for spoil ground selection was developed by WBM Oceanics Australia, based primarily on elements in the site selection guidelines (Section 4.2 of the guidelines) in the NODGDM (Environment Australia 2002). These criteria included a range of technical, economic, social, environmental risks and legislative requirements. These initial criteria were forwarded to PCQ for comment, and a final set of criteria was then developed (refer Section 2).

Phase 2 – Environment Assessments

A desk-top review of existing information was undertaken, primarily to collate information necessary to assess the criteria developed in Phase 1 of the study. Information and data were sourced from literature searches of published and non-published material as well as liaison with PCQ representatives, and included the following:

- Existing reports, including previous environmental studies commissioned by PCQ, in addition to academic and government reports;
- Dredge permit conditions and other legislative requirements relevant to dredging and spoil disposal in the study area;
- Spatial data, including 'PCQ-Map' spatial data, conservation zone boundary spatial data, nautical charts;
- Government databases (Environmental Protection and Biodiversity Act database, Heritage register, Register of the National Estate);
- Liaison with researchers (non-government) that have worked in the study area, and the Mackay Regional Harbour Master (Captain John Ellyett).

As this is a preliminary investigation, no liaison was undertaken with State or Federal government agencies or the community. The relevant agencies will be consulted at a later date. Literature reviewed that is of relevance to the spoil disposal operations is discussed in Section 3 of this report.

Phase 3 - Assess and Select Preferred Spoil Ground Site/s

The preferred spoil ground site/s were identified on the basis of these results. The process of selection of a preferred area was initially based on the development of criteria that addressed all environmental, planning, administrative and operational/ logistical issues associated with dredging operations and impacts at the Port.

On the basis of criteria developed in Phase 1, and the information collated in Phase 2 investigations, a preliminary opportunities and constraints map was developed and presented to PCQ. Discussions

were then held between WBM and PCQ study team members to further refine the spoil ground selection criteria, and clarify key Port operational issues relevant to the study.

The constraints map was then further refined. Based on the results of this Phase 2 review and the constraints mapping, a range of potentially suitable spoil ground sites were identified. These results were input into a matrix showing the area under consideration, the major constraints, and an assessment of the overall suitability as a spoil disposal site.

Phase 4 – Environmental Approvals and Recommended Staging of Spoil Disposal Activities

A review was undertaken of the regulatory mechanisms that may be triggered if PCQ proceed with the development of the preferred spoil ground/s. In this assessment it was assumed that legislation and approvals for capital and maintenance dredging had already been considered, thus the review concentrated on mechanisms relevant to the disposal of dredge spoil at sea.

Based on the outcomes of this review, recommendations were provided on the staging of potential future spoil disposal activities.

2 SITE SELECTION PARAMETERS & CONSTRAINTS

2.1 Basis for Criteria Selection

In general terms, the selection of spoil grounds over the years is likely to have been based on (among other factors) the following considerations:

- The characteristics of the dredged material and the material at the spoil ground site;
- Proximity to sensitive environmental resources;
- The need to minimise impacts on marine and intertidal habitats and fauna, including seagrasses and benthic fauna;
- The depth and capacity for ongoing use of the spoil ground site;
- Minimising the risk of placed material being remobilised to nearby sensitive areas;
- Minimising the risk of placed material being remobilised to the navigational channel;
- Logistical and economic considerations, including optimisation of dredge cycle times;
- Safety considerations in the operation of dredging equipment at the spoil ground site; and
- Specific legislative requirements.

Consistent with PCQ requirements, this investigation only considers sea disposal options. In the selection of a preferred site for spoil disposal, there are a number of approvals and permits that need to be gained and, for each of these, evidence will need to be provided that the site is the most appropriate for this purpose (refer Section 5 for approvals required).

As noted in Section 1, the National Ocean Disposal Guidelines for Dredged Material (Environment Australia 2002) describe the criteria that need to be considered in the selection of a new disposal site to comply with an application for a permit under the *Environment Protection (Sea Dumping) Act 1981* (see Section 5.1.1). In broad terms, the information to be provided should include the following:

- Physical and chemical characteristics of the proposed disposal site and its surroundings;
- Existing marine communities at and near the proposed disposal site;
- Contaminant levels within biota at the site prior to disposal of dredged material (if material is not pristine); and
- Other resources and users that may be affected by the proposal.

The Department of Primary Industries and Fisheries (in Hopkins, *et al* 1998) describe the issues that will require consideration in permitting dredging and spoil disposal activities in relation to the provisions of the *Fisheries Act 1994*.

The Great Barrier Reef Marine Park Authority (GBRMPA) also has a draft policy relating to dredging and spoil disposal. These documents as well as Environment Australia (2002) provide the main guidance in the process for selection of a suitable spoil ground.

2.2 Criteria for Selection Process

Taking into account the above factors, a range of criteria were developed as part of the initial assessment for selection of the preferred site. These criteria were divided into ecological/ administrative and planning constraints and technical/ economic constraints that may apply to the area of investigation.

Table 2-1 presents the selection criteria used as the basis for determining a suitable site for spoil disposal and level of risk to each criteria that may be posed by spoil disposal operations. These criteria were developed by WBM with input from PCQ representatives. A description of each of the criteria and relevance to the Hay Point area are listed below.

2.2.1 Ecological Constraints/Values

Ecological factors or values that were considered important for protection were noted as follows:

- Intertidal flats;
- reefs/rocky shores;
- marine plants (primarily seagrass, saltmarsh and mangroves were noted as highest priority for protection);
- turtle nesting areas and
- important fishing areas.

As noted in Table 2.1, spoil disposal operations were considered as incompatible should any of the above factors be located within the spoil disposal grounds. There is the expectation that an acceptable buffer distance would be defined that would minimise the indirect effects of spoil disposal on such areas, particularly in relation to water quality/ turbidity effects from dredge plumes. In this regard, it was considered unacceptable should possible spoil contaminant concentrations exceed guideline levels at the boundary of such areas. Furthermore, a high level of management intervention was considered to be necessary should contaminant concentrations be likely to exceed screening level (although this would depend on the particular contaminant under consideration). The monitoring that has been conducted in proximity to the existing spoil ground would provide an important baseline on which to determine the potential impacts of contaminants released from new spoil grounds.

Issues associated with each of the above factors or values in relation to the study area are addressed in Section 3.3 of this report.

Table 2-1 Selection criteria used to determine suitable spoil disposal sites

Constraint	Important ecological community	Environmental approvals required	Social constraint	Economic constraint	Technical constraint	Control on magnitude of impact
a) Intertidal Flats	*	1				
b) Reefs/rocky shores	*					
c) Marine plants (seagrass, saltmarsh, mangroves)	*	2				
d) Dugong Protection Areas	*	3				
e) Conservation/National Parks	*	3				
f) Fish Habitat Areas	*	2				
g) Dugong Protection Areas	*	1/3				
h) Turtle nesting areas	*	1/3				
i) Ramsar wetland	*	1				
j) Great Barrier Reef Marine Park	*	4				
k) Queensland Heritage (incl. cultural heritage) site		5	*			
l) Places on Register of National Estate	*	1				
m) Wetlands of National Importance	*					
n) History of impacts from dredging and spoil disposal					*	*
o) Important Fishing Areas			*			
p) Navigation areas/moorings/anchorages					*	
q) Hay Point Port limits					*	
r) Spoil contaminant concentrations						*
t) Water depth					*	*
u) Distance from dredge area (economic radius for travel)				*		
v) Spoil ground area/life					*	*
w) Dredge manoeuvrability (currents,etc)					*	
x) Sediment granulometry relative to spoil ground					*	*
y) Spoil volume					*	*
z) Currents, waves and sediment mobility					*	*

1 = EPBC Act, 2 = Fisheries Act, 3 = Nature Conservation Act, 4 = GBRMP Act, 5 = Heritage Act

* applicable constraint

2.2.2 Administrative / Planning constraints

Administrative constraints that were identified as potentially affecting the options for spoil disposal were as follows:

- **Dugong Protection Areas**: These areas have been designated along the Queensland coastline (under the *Nature Conservation Act 1992* and *Fisheries Act 1994)* for the protection of dugong. Such areas generally have high ecological values associated with seagrass communities which provide the foraging resource for dugong.
- **Conservation/ National Parks**: Such areas (under *Nature Conservation Act 1992*) are clearly recognised as being of significant environmental value.
- **Fish Habitat Areas**: areas so designated by the Department of Primary Industries and Fisheries and protected under the *Fisheries Act.* Such areas generally have significant expanses of marine plants also protected under this Act.
- **Ramsar wetlands**: Areas designated under the Ramsar convention provide for the protection of wetlands both from direct and indirect impacts. Ramsar wetlands are protected under the Commonwealth's *Environmental Protection and Biodiversity Conservation* (EPBC) *Act 1999*.
- **Great Barrier Reef Marine Park (GBRMP)**: This constraint refers to the particular administrative processes associated with the gaining of approvals within the park area and on-going management responsibilities. Activities within the GBRMP are controlled under the Commonwealth's *Great Barrier Reef Marine Park Act 1975*. The different zonings of the Park impose different levels of acceptable use and management control.
- **Queensland Heritage Register:** established under the *Queensland Heritage Act 1992*, is a list of places, trees, natural formations, and buildings of cultural heritage significance. Places entered in the Register require approvals under Queensland Heritage Council prior to be being altered.
- **Places on the Register of the National Estate**: The Register of the National Estate is Australia's national inventory of significant natural and cultural heritage places, and is maintained by the Australian Heritage Commission. Under Section 30 of the *Australian Heritage Commission Act 1975*, the Commonwealth Government is prohibited from taking any action that would adversely affect a place in the Register, unless there are no feasible and prudent alternatives to the action. The activities of private and state government landholders are not controlled through listing under the Register.
- **Wetlands of National Importance**: The States and Territories, and the Commonwealth Government, have jointly compiled a Directory of Important Wetlands in Australia. The Directory identifies and recognises Australia's nationally important wetlands, and it provides information about the different wetland types and the flora and fauna that are dependent on these wetland ecosystems. Listing on the Register does not provide specific protection under state or Commonwealth legislation.
- **Hay Point Port Limits**: While Table 2.1 indicates that spoil disposal outside the Port limits would have an unacceptable level of risk, further review has indicated that this should not be considered to be a total constraint. However, as identified in Section 4, other issues preclude consideration being given to areas external to the Port limits.

- **Prescribed navigation area**: This includes all areas where shipping lanes, swing basins, anchorages and tug transfer/ pilot boarding grounds impose risks to operation of the dredger and other vessels.

2.2.3 Technical / Economic Constraints

Technical and economical constraints that were identified as potentially affecting the options for spoil disposal were as follows:

- **Water depth**: The minimum depth necessary for spoil disposal depends on a number of factors. Should the prospective spoil disposal area be within an area potentially traversed by ships, then the minimum acceptable depth of the disposed spoil should not exceed 10m below surface level (as defined by the Port Harbour Master). Should the spoil disposal area be away from shipping lanes, then the minimum depth would be determined primarily by the draught of the dredger or other sediment mobility constraints. Consideration also needs to be given to an allowance for spoil displacement with some variability in final placement levels. In this case, it is understood that the dredger '*Brisbane'* would be likely to be used which has a maximum draught of approximately 6.5m. The minimum water depth prior to spoil disposal could thus be greater than 8m below surface level. It needs to be recognised however that the shallower the depth below surface, the greater the potential for spoil dispersal through current and wave action.
- **Distance from dredge area**: As indicated in Section 1.3, the maximum economic distance for carriage of spoil from the dredge area to the disposal area has been identified as 10km. There are significant advantages in minimising the carriage distance, although given the varied locations within the Port area where dredging is likely to be required in the future, it is difficult to define the economic radius of operations.
- **Spoil ground area/ life**: Section 1.3 indicates the requirement for a potential spoil ground area of up to 500 ha based on a spoil volume of 15 million m^3 and an average placement depth of 3m. As is noted in Section 1.1, there are advantages in establishing new spoil disposal areas immediately adjacent to the existing area and gradually expanding in blocks from this area. However, while a less desirable outcome, there is also the potential for future spoil disposal to be located in a number of areas discrete from the existing area.
- **Dredge manoeuvrability**: Related to the manoeuvrability of the particular dredger and the associated effects of local current and wave patterns at the spoil disposal site.

3 EXISTING CHARACTERISTICS AND VALUES AND EFFECTS OF EXISTING SPOIL DISPOSAL

3.1 Information Sources and Literature Review

This investigation into determining a preferred spoil ground site for the Port of Hay Point has been based on the following:

- Liaison with PCQ and Queensland Transport representatives both in Brisbane and in Mackay;
- A review of existing PCQ information for the general area of the Port; and
- A review of published technical literature of relevance to the Port.

Studies have been desk-top with no field investigations. Similarly, no liaison has been undertaken with other State or Commonwealth government agencies or the community as this will be undertaken at a later stage. It is expected that, following determination of the preferred site/s, detailed field investigations, liaison and reporting will be carried out.

In general terms, there is a relative absence of relevant biophysical information away from the immediate vicinity of the Port operations and existing spoil ground. The main data sources used as the basis for the evaluation are outlined in Appendix A, and are fully referenced in Section 7.

3.2 Physio-chemical Environment Characterisation

3.2.1 Hydraulic/Sediment Mobility Issues

The potential movement of sediment from the spoil ground is a key consideration which is affected by factors including:

- the nature of the sediments;
- the water depth;
- current speed and direction; and
- wave height and period.

The available water depth at potential spoil grounds is also influenced by the type and draft of the dredger as well as other navigation constraints.

Substantial information is available with respect to these factors from previous investigations and monitoring associated with the existing spoil disposal ground including:

- Berth #2 Extension Dredging in 1993 –
    - Attachment to the CEPA Sea Dumping Application (WBM 1993a);
    - Dredge Spoil Monitoring (WBM 1993b).
- Dalrymple Bay Expansion Stages 6 and 7 in 2000/01 –
    - Coastal Process Investigations (WBM 2000);

- Aerial Surveillance (WBM 2001);
- Macroinvertebrate Monitoring (WBM 2001);
- Macroinvertebrate Sampling (Hydrobiology 2004).

These previous investigations included various data collection, modelling and assessment of sediment mobility. Key findings of these are outlined below.

3.2.1.1 Wave Climate

The site is exposed to a varying wave climate which is influenced by the Great Barrier Reef, the Northumberland Isles and associated shoals to the south-east and the occurrence of tropical cyclones.

The general wave climate for the region in which the berth and spoil grounds are located has been reliably determined by the Beach Protection Authority (Beach Protection Authority 1990). This is based on 10 years of recording from March 1977 to May 1987. This period included occurrences of several cyclones in the region as listed in the Authority's report.

Key wave characteristics of relevance to the mobility and transport of bed sediments in the area are as follows (refer WBM 2000 for diagrams):

- The site is subject to both sea and swell, with spectral peak periods ranging from about 2 seconds to 13 seconds. Locally generated sea waves predominate and are typically of period 3 to 6 seconds, ranging up to 7-8 seconds during major cyclone events. Swell waves are generally lower in height (less than 1.0 m) and range in period typically from 7 seconds to 13 seconds.

  Overall, waves affecting the area are predominantly in the range 3 to 7 seconds, most commonly around 4 seconds.

- Waves of significant height up to about 1.0 m affect the area relatively frequently (exceeded about 10% of the time), with a height of 0.5 m being exceeded 50% of the time. The highest recorded significant wave height is about 2.5 m. Heights up to about 5.0 m could be expected in severe cyclone events affecting the immediate area.

Consideration of design wave conditions for berth facilities has been carried out previously by Connell Wagner in 1992 as part of the DBCT Berth 2 assessments. A conservative approach was adopted in determining a 50 year return period significant wave height (all directions) of 5.7m.

3.2.1.2 Astronomical Tides

The tidal behaviour in the Mackay-Broadsound region is unusual with respect to the abnormally high tidal range. The reasons for this have been investigated in a number of modelling studies (Bode and Stark 1983, Spelt and Richter 1985).

Results of both studies suggest that ocean tide propagation through gaps in the Great Barrier Reef lagoon area have the predominant influence on tidal amplification and the resulting current patterns. The phase of the tidal wave progresses almost uniformly from the south-east through the Capricorn Channel, as well as from the north-west. The phases of the tides are such that these tend to reinforce each other in the central part of the lagoon. The resulting pattern is basically that of a standing wave, with almost uniform phase over this large central portion lagoon. Broad Sound is in the area where

these two tidal streams converge. The tide subsequently progresses up Broad Sound, with the highest tides there.

The tidal planes at Hay Point as documented by Queensland Transport (2000) are presented in Table 3-1.

Table 3-1 Hay Point Tidal Planes

Tidal Plane	Tidal Level (m LAT)
Highest Astronomical Tide (HAT)	7.14
Mean High Water Springs (MHWS)	5.78
Mean High Water Neaps (MHWN)	4.46
Australian Height Datum (AHD)	3.34
Mean Low Water Neaps (MLWN)	2.22
Mean Low Water Springs (MLWS)	0.90
Lowest Astronomical Tide (LAT)	0.00

3.2.1.3 Tidal Currents

The large tide range variation affects the tidal currents in the region. As part of the earlier 1993 investigations, current measurements were carried out at the spoil ground and near Sandringham Bay (WBM 1993 a and b). This included fixed (bottom-mounted) measurements with Interocean S4 current meters over various times and drogue tracking.

Previously available data on currents at the berth area was limited to drogue tracking undertaken for the initial development of the coal export facilities at Hay Point (refer WBM 1993a for details).

To provide additional and up-to-date data on current patterns, further current measurements were undertaken as part of the coastal process investigations for the DBCT Expansion Stages 6 and 7 (WBM 2000). The data collection included measurements at the proposed new berth site, the spoil ground and in the inner part of Dalrymple Bay using a range of techniques. This data was used to provide direct input into the assessments as well as to calibrate a hydrodynamic model of the area.

Typical characteristics of the tidal currents are as follows:

- Peak current velocities vary from about 0.20 m/s during the neap range periods to about 0.50 m/s for the spring tides.
- The tides generally flood towards the south-southeast (165° true) and ebb towards the north-northwest (345° true), with slight variations from tide to tide.
- The wind can have an effect on current speeds and directions.

The relative influence that the wind has on the overall current patterns is dependent on the magnitude and direction of the primary tidal currents as well as the wind itself. For nearshore coastal waters, the wind-induced current is typically around 1-2% of the wind speed. The available data, which includes periods of strong winds from the east to southeast sectors, indicates that current components can be

generated generally in the direction of the wind. This can result in the normal tidal currents being enhanced, retarded and/or deflected. Therefore during periods of high tidal velocities, strong onshore winds may result in the currents being deflected slightly towards the northwest and south for the ebb and flood tides respectively. During neap tides and around slack water when tidal velocities are normally low, strong onshore winds may result in weak current components towards the shore (of the order of 0.1 m/s).

3.2.1.4 Sediment Characteristics

Data on the nature of the seabed sediments and those likely to be dredged have been obtained through previous investigations (WBM 1993a and b, URS 2000, WBM 2001 and Hydrobiology 2003).

The records from the inner sector of the shipping channel show that the surficial layers comprise a veneer of mostly silts and silty fine sands of variable thickness (1-30cm) overlaying very stiff layers of yellow, grey and occasionally orange-coloured clays and sandy clays >30cm thick. The seafloor characteristics in the Stage 6 and 7 berth pocket and approach area are very similar, although diver coring revealed the underlying stiff clay layer to be more uniformly grey with a marked crumbly structure (refer URS 2000 for details).

Sediment sample analyses undertaken as part of the macroinvertebrate monitoring (WBM 2001; Hydrobiology 2004) indicate that the general seabed in the control areas to the north of the existing spoil ground are predominantly sands and small gravel with less than 2% fine silts and clays.

Prior to the 2001 dredging, the bed sediments found at the spoil ground were clearly the remnants of the dumping which took place during the earlier dredging. The material was fine to coarse sand with a substantial amount of clay material still in cohesive lump form. Intermixed with these were small quantities of loose silts and clays (WBM 1993a, URS 2000).

Samples from the existing berth pockets are predominantly fine to very fine silts.

With respect to the nature of the material to be dredged, the results of the various borehole and coring studies undertaken for the Stage 6 and 7 Expansion point to a high level of variability in the relative proportions of the sands, clays and rocky fractions that occur across the dredging area and with sub-surface depth. Dry weight percentage ranges of the particle size classes in the main depth zones sampled by borehole at the DBCT terminal have been listed in Table 3-2 (from URS 2000):

Table 3-2 Particle size classes – Stages 6 and 7

Depth	Clays	Silts	Sands	Gravel/Rock*
0-1m	14-24%	8-23%	39-71%	3-12%
1-3m	11-20%	11-26%	26-34%	12-39%
3-5m	3-32%	3-26%	39-69%	2-34%

* weathered bedrock from the deepest horizons (>RL -18m).

The macroinvertebrate sampling reports indicate a wide range of variation in the sediments within the spoil ground following dredging. As expected, there was a general increase in the amount of fine silts in the disposal area immediately after dredging. The gravel content reduced at most sites with the sand content increasing in some and decreasing in others. This reflects the variability of the sediments dumped. The 2003 sampling indicates a general reduction in the percentage of fines within the spoil ground but they still remain higher than at the control sites.

3.2.1.5 Sediment Mobility

The dredged material is likely to be a mixture of gravels, sands and silts/clays.

Mobilisation and transport of bed sediments may occur by the combined action of waves and currents. The influence of wave action is affected by the depth of water. Wave orbital velocities decrease with depth in a manner which depends directly on the wave period (and thus wave length). Shorter period waves have less influence at greater depths.

The water depth at the existing spoil ground is typically about 11.5 metres below LAT, that is about 14.8 metres at mean tide datum. The water depth progressively increases further offshore and decreases inshore.

Waves of period less than 4 seconds will have no influence at the bed over essentially all of the spoil ground and further offshore. Waves of greater period will increasingly "feel" the seabed and contribute to the bed shear stress, in combination with the tide/wind induced currents.

There is a threshold or critical bed shear stress which needs to be exceeded before the sediments will be mobilised either into suspension or to allow bed load transport. This critical shear stress depends on the nature and properties of the bed sediments. For sands, the critical bed shear stress ranges from about 0.18 to 0.20 N/m^2 for fine sand of median size (0.1-0.3mm) to typical values of about $0.5N/m^3$ for 1 mm sand and $1.3N/m^2$ for 2 mm sand.

Analysis of historical hydrographic survey data of the existing spoil ground (WBM 2000) indicates very little movement of material over time. Spoil ground surveys carried out recently (February 2004) have also been compared with the last post-dredging survey (July 2001). There is again negligible change since the last major disposal indicating general stability of the material. The highest, lowest and average levels within the spoil ground are listed in Table 3-3.

Table 3-3 Existing Spoil Ground Levels

	Bed Level (m LAT)		
	Minimum	**Maximum**	**Average**
July 2001 (post dredging)	-9.10	-12.42	-10.93
Feb 2004 (present)	-9.01	-12.46	-10.98

To further assess the potential for sediment mobilisation and the influence of changing depth (eg. shallower due to spoil disposal), sediment transport calculators were undertaken for a large number of wave, current, water depth and sediment characteristics as documented in WBM (2000).

Tidal currents alone are insufficient to remobilise the sediments. Therefore, the sediment transport potential was assessed for a typical current speed of 0.3m/s with:

- three (3) different wave conditions:
  - Hsig = 0.5m ; Tp = 6.0s (Exceeded approx 50% of time)
  - Hsig = 0.8m ; Tp = 7.0s (Exceeded approx 25% of time)
  - Hsig = 1.5m ; Tp = 8.0s (Exceeded approx 1.5% of time)
- two (2) different sediment grain sizes:
  - d50 = 0.3 mm
  - d50 = 0.1 mm
- seven (7) different water depths at 1 m increments between 15 m and 9m.

The results are presented in Figure 3.1. Interpretations of this and the general current/wave conditions lead to the following conclusions:

- The coarser sandy material would be relatively stable within and around the existing spoil ground and at greater depths, with infrequent transport by wave/current action in extreme events. Such transport would be as bed load and would be directed with the predominant longer period wave direction, typically towards the west.
- For the majority of time, suspended sediment loads will be low and water clarity relatively high in the absence of sediment influx from other surrounding areas.
- Transport of any loose fine silt/clay material in the dumped spoil would be as suspended load, directed with the tide/wind induced currents in the lower part of the water column. These currents have been measured as part of earlier studies, and indicate predominant north-northwest/south-southeast directions of movement. Wave heights in excess of about 0.5 m Hsig would be required to initiate transport of such transport.
- Cohesive clay material evident as clay lumps on the seabed may break down slowly over time and become entrained in the water column. This would take place slowly, such that it has little effect on turbidity or sedimentation elsewhere.

- Suspended fine sediments will both disperse and settle out and their concentration in the water column and deposition on the bed will become extremely low with distance from the immediate spoil ground area. Over time, the process of bed sediment sorting by wave/current action will tend to move this fine material to those areas where such material is in equilibrium with prevailing conditions, generally places where significant silt content in the bed sediment is found naturally.
- For the generation of substantial suspension and transport of the material, waves in excess of about 1.5 m (Hsig) are needed. Such waves occur for less than 2% of the time.
- The shallower the water depth, the greater the potential for remobilisation and transport of sediments.

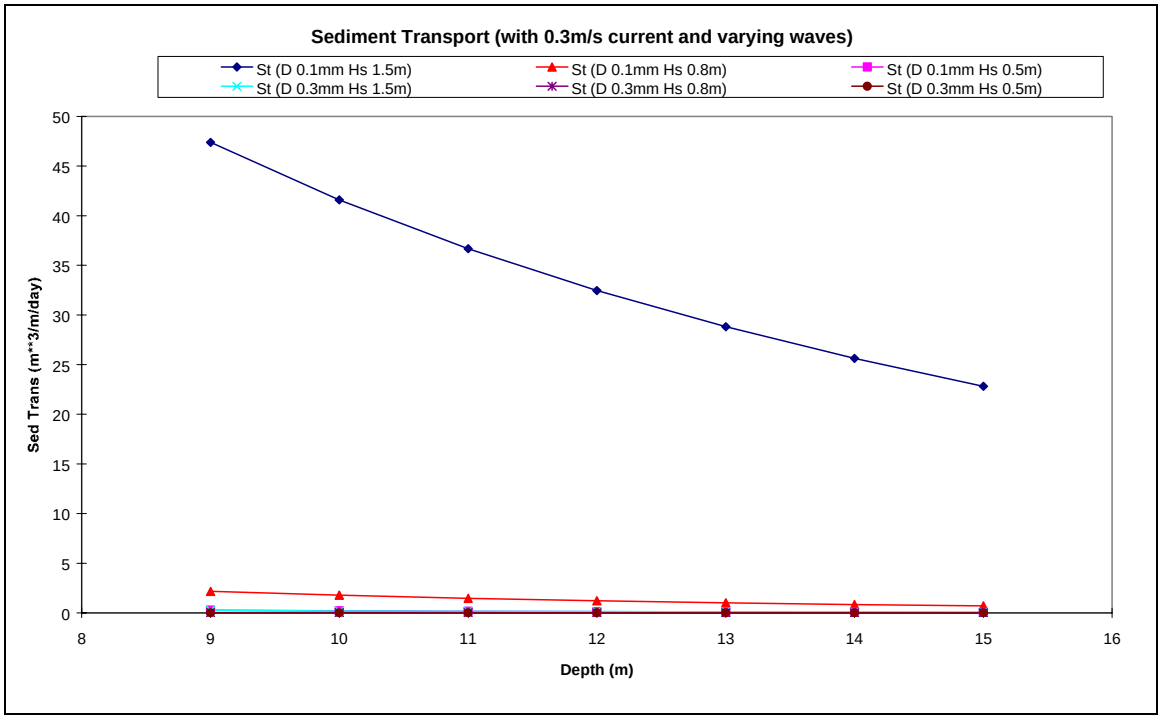


Figure 3.1 Sediment Transport Potential Comparison

3.2.2 Water Quality

Existing water quality characteristics in areas in proximity to the Port and critical levels and impacts associated with the existing spoil disposal operations can be broken into a) turbidity and suspended solid levels and b) other potential contaminants. Above all other criteria, the water quality effects of the existing and any proposed spoil disposal operations are most likely to be the primary determinant for the location of the disposal site relative to areas of ecological sensitivity.

The following is a description of each based on previous investigations and on-going monitoring programs.

3.2.2.1 Turbidity and suspended solid levels

Various studies have been undertaken in recent years regarding baseline turbidity/suspended solid levels and the effects of spoil disposal on these levels. Of critical importance has been the need to demonstrate compliance with environmental criteria established by the DEH and Queensland EPA due to agency concerns with the potential effect of either dredging on marine fauna or dredge plumes on environmentally significant areas in proximity to the Port. Criteria of relevance (as applied to the DBCT Stage 6 Expansion dredging and spoil placement program in 2001) are as follows:

- The planned dredging period was between 1 May and 30 September 2001 in order to minimise possible marine impacts on turtles.
- The dredging activities shall not cause the dredge plume from the dredge head and the deposition site to be either 1) within 3km of Round Top Island or Victor Islet, or 2) more than 1km from the location of the dredging activities towards the coastline of Dalrymple Bay.
- Aerial surveillance of the dredge plume will be undertaken at the commencement of the dredging operation and any other critical time. The holder of this development approval must inform the EPA at least five business days in advance of the aerial surveillance so that the EPA may provide an observer if required.
- Aerial surveillance will be carried out on three days during the operation of the dredge during the first two weeks of each dredging to confirm the modelling of turbidity plumes. This will take place during a range of tidal and wind conditions. If this surveillance indicates that any light sensitive organisms (corals or seagrass) could be affected by the dumping then turbidity gauges will be deployed, as agreed with DEH at the sensitive sites. Using data from these turbidity gauges and further qualitative monitoring by aerial surveillance, PCQ will manage the dumping activities so that turbidity at sensitive sites does not exceed 25% above ambient background levels (ambient being the best estimate for the relevant area) for 90% of any ten-day period. Should turbidity exceed those levels, then all dumping activities authorised under this permit must be immediately suspended, and the matter reported to DEH.

These criteria have significant implications for the prospective location of the spoil ground. The study by WBM (2001, a and b) evaluated the actual dispersal of dredge plumes associated with spoil disposal in 2001 and the relationship to ambient background levels. The determination of what was an appropriate background level for the general locale was also investigated in the reports.

There were no identified significant impacts from dredging in 2001 and the conditions imposed on capital dredging at that time may not necessarily reflect future conditions as more information on dredging at Hay Point is gained.

Of the references cited (eg. WBM 1993, QDEH 1993), none contained measurements specifically from the environmentally sensitive areas, including near Round Top Island or Victor Islet. None of the references have long term (i.e. one month or greater) continuous measurements of turbidity likely to span the range of seasonal weather and tidal conditions, which can be influential on the water turbidity. WBM Oceanics Australia (1993a, 1993b) reports contain short term (1-2 weeks) continuous measurements or spot turbidity measurements or suspended solids analyses. Baseline turbidity measurements and suspended solids analyses were undertaken by WBM in the vicinity of

the dredged material placement area (approximately 5 km south of Round Top Island) offshore from Dalrymple Bay in winter (1993) and summer (1992).

Turbidity and suspended solids measurements were also compiled by the former Queensland Department of Environment and Heritage (now EPA) for locations at the mouths of some of the local rivers and creeks, located some 6-8 km west of the environmentally sensitive areas at Round Top Island (see QDEH, 1993).

The continuous turbidity records from December 1992 illustrated an elevated range of turbidities coinciding with moderate to strong onshore (south-easterly) winds over the period 19-23 December 1992 and spring range tides over the period 20-25 December 1992. The median turbidity during the period of strong winds was approximately 15 NTU with peaks routinely to 30 NTU. Similar average turbidities were tabled in WBM Oceanics Australia (1993a), based upon the range of spot profiling measurement locations shown in Table 3-4.

Table 3-4 Baseline (Summer) Spot Turbidity Measurements at the Dredged Material Placement Area and Adjoining Areas (20-21/12/1992)

Water Depth (m)	Number of Measurements (n)	Range (NTU)	Mean (NTU)
0-5	58	10.1-18.4	14.2
5-10	45	12.1-22.7	15.6
>10	62	20.1-86.3	49.4

The range of turbidity measurements identified within the WBM reports during winter and summer months was therefore influenced by the wind and wave conditions at the times of measurement.

Sediment transport investigations (WBM, 2000) indicated that tidal currents alone were insufficient to remobilise the bed sediments in the depth of water in the vicinity of the dredged material placement area. Significant wave heights in excess of 0.5m were required to initiate resuspension of the very fine bed sediments (silt and clay fractions) at this depth. Larger waves would result in higher rates of resuspension of the fine bed sediments and the combined action of large waves and spring tidal currents in extreme events could result in the infrequent transport of coarse sandy material (this aspect is addressed in further detail in Section 3.2.1).

With reference to the compliance criteria, the application of a percentage increase (eg. 25%) above the assumed median baseline turbidity conditions at either of the environmentally sensitive sites based upon the adoption of a median (or mean) turbidity derived from short term, calm weather measurements would result in inappropriate limits for compliance. As an example, during the calm conditions in the first week of the Stage 6 dredging and aerial surveillance monitoring, the background turbidity measured in the surface waters in the vicinity of the environmentally sensitive sites was in the range 0.2 – 0.5 NTU (WBM, 2001). Applying an allowable 25% increase to this

range would have imposed an impossibly low limit on the dredging which would have precluded compliance. This was acknowledged by EPA and DEH after field inspections which concluded that no significant environmental impact was occurring and the condition was removed for the remainder of the dredging program.

WBM (2001 a) concluded that in winter, whilst the percentage of time that more turbid waters are likely to exist is on average less than the period of that likely in summer, the range of turbidities to be encountered is likely to be the same. This is because there is still a reasonably high occurrence (approximately 44% of the time) of strong wind and wave conditions likely to result in turbid water conditions during the winter months. The expected range of turbidity measurements at the dredged material placement area and in the surrounds of Dalrymple Bay and Sandringham Bay in winter is therefore the same as those identified for summer, though the frequency of occurrence of higher turbidity conditions will on average be approximately 2/3 that of the summer months. A range of turbidity could be expected between 0 and 30 NTU close to the seabed, subject to the prevailing weather conditions. On average, it is expected that the median turbidity concentration in winter will be lower than in summer because the occurrence of strong winds and the associated waves, which result in resuspension of the bed sediments, is lower.

An estimate of the seasonal (winter) mean turbidity at the placement area was thus derived based upon the measured range of turbidities and the Beach Protection Authority (BPA) long term wave climate for the area as follows: Mean seasonal turbidity = (2NTU*0.56+25NTU*0.44) = 12NTU.

3.2.2.2 Effects of Spoil Disposal on Turbidity

Studies by WBM (2001b) indicated the following in regard to dredge plumes:

- The visible plume evident from the overflowing of the dredge's hoppers was larger and more turbid than the plumes derived from material placement. Peak concentrations measured in the overflow plume were up to 150 NTU, compared with peak turbidities of approximately 80 NTU in the placement plumes (at a depth of 2m).

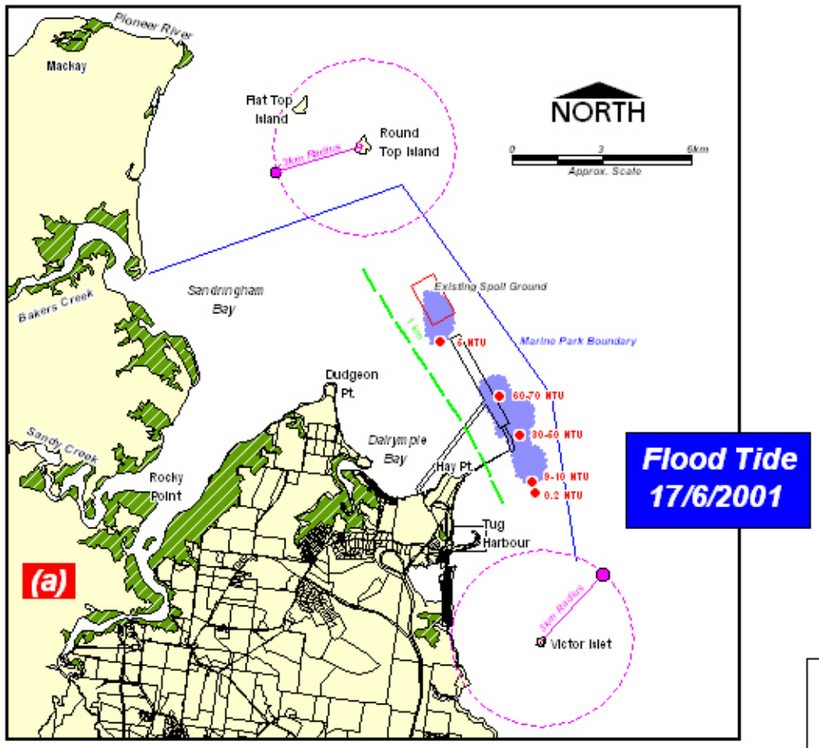
- Individual dredging and placement related plumes visually evident on the first day of dredging were small and confined to the localised areas adjoining the dredging and placement activities. On the second day, after 24 hours of continuous dredging and placement activities, the visible plume had encompassed both areas and grown substantially in size extending within the 3km radius of Round Top Island on the ebbing tide. By the third day, the visible plume was again enlarged to encompass waters to the north of both Round Top and Flat Top Islands on the ebbing tide. The visible plume had extended within the 3km radius of Victor Islet on the flooding tide.

- Whilst the plumes were quite visible from the air, the absolute turbidity values within the bulk of the visible plume were still low (less than 10 NTU). The typical turbidity concentrations measured within the environmentally sensitive areas were often of the order of or less than 1 NTU. The reason that the plumes were highly visible was because the ambient turbidity was very low (typically 0-0.2 NTU). The turbidity concentrations in the visible plume were well within the range of previous background turbidity measurements for the Dalrymple Bay area.

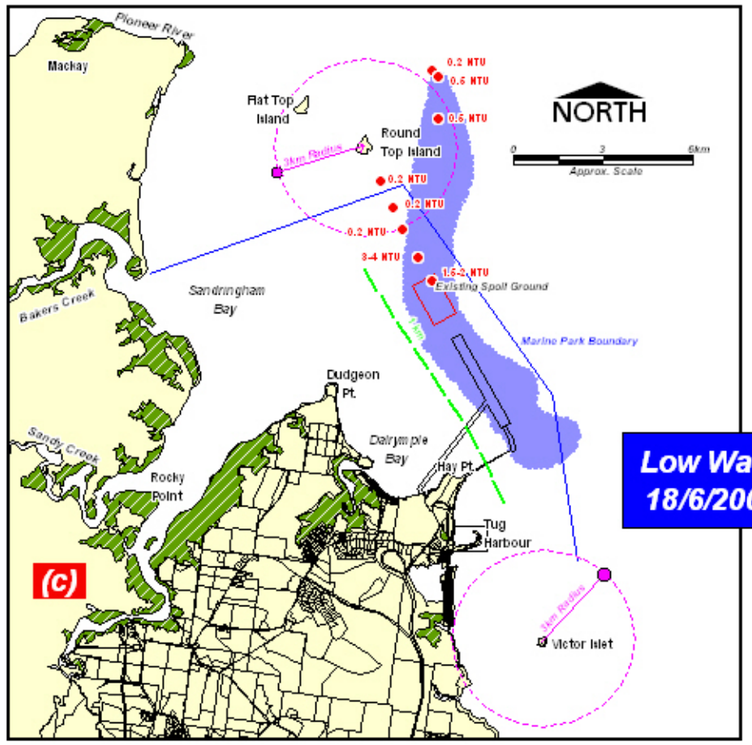
Figure 3.1 a to d (from WBM 2001b) indicates the extent of visible dredging and placement plumes. These demonstrate that while plumes were clearly evident, turbidity levels within the 3km radius of the designated environmentally sensitive areas were well within the designated background level.

These plumes nevertheless have significant implications for the prospective location of the new spoil disposal area. It is clearly not possible for the turbidity levels from spoil disposal to meet background at the 3km/1km separation distances set by the agencies due to concentrations in the over flow and placement plumes.

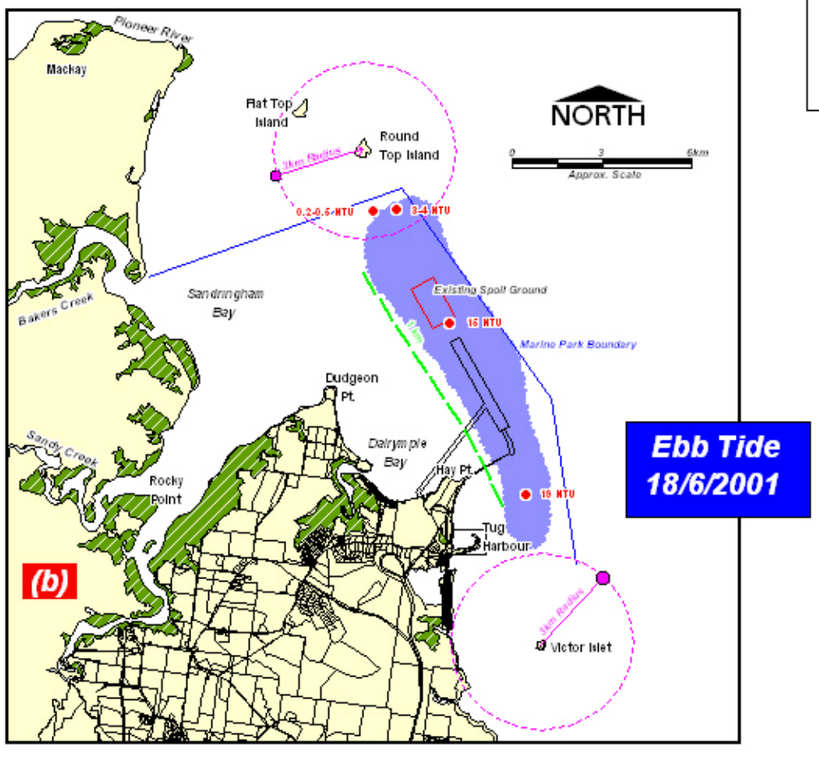
Numerical modelling and data collection as reported in WBM (2000) confirmed the above observation and predicted that plumes would travel in the prevailing NNW/SSE current directions (generally parallel to the shore). The modelling and data also confirmed that current directions and hence plume movement may be modified by wind action (refer Section 3.2.1). Furthermore, it indicated that suspended sediment concentrations would reduce to 10-15% of the initial concentration with about 0.5hrs (approx 600m travel in spring tides) and about 1% within 3 hours.



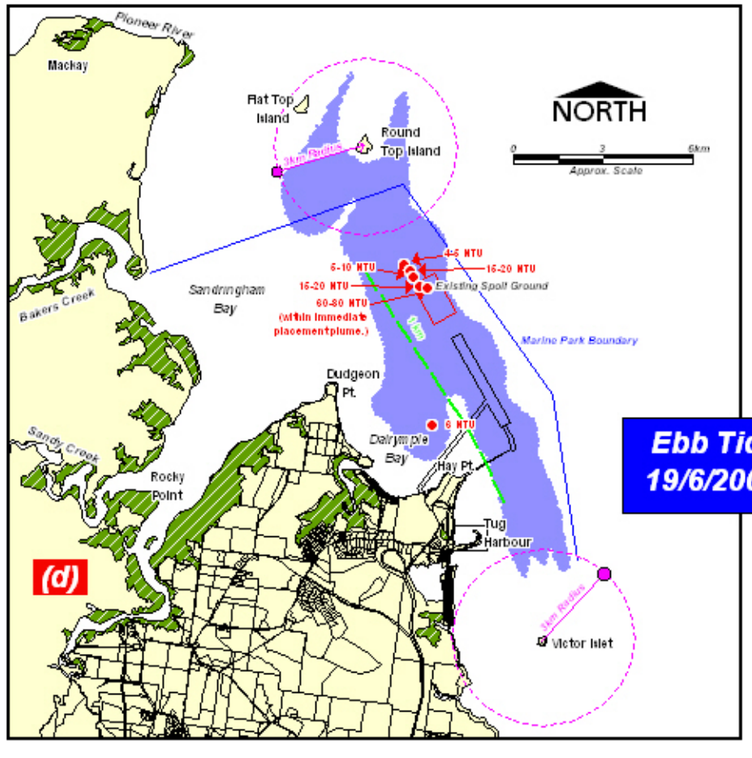
Flood Tide 17/6/2001



Low Water 18/6/2001



Ebb Tide 18/6/2001



Ebb Tide 19/6/2001

LEGEND

Area of Visible Plume

10 NTU — Turbidity Measurement at a depth of 2m

Source : WBM (2001)

Visible Dredging and Placement Plumes - Aerial Surveillance June 2001

Figure 3.2 (a to d)

WBM OCEANICS AUSTRAL

3.2.2.3 Contaminant levels

Characterisation of the dredge spoil has been undertaken by WBM (1992), Terrasearch (1995) and Le Provost Dames and Moore (2000). Results for the analyses are summarized in Table 3-5.

Table 3-5 Dredge Spoil Contaminants

Parameter	WBM (1992)	Terrasearch (1995)	Le Provost Dames and Moore (2000)
Radioactivity	No risk	NA	NA
Pesticides (OC/OP)	BDL	BDL	BDL
Petroleum Hydrocarbons	Low Levels and no risk	Low levels and no risk	BDL
Oil and Grease	Low Levels and no risk	Low Levels and no risk	Low Levels and no risk
Sediment Oxygen Demand	Levels typical and no risk	NA	NA
Mercury	TB – no risk	BDL	TB – no risk
Cadmium	TB – no risk	BDL	BDL
Lead	TB – no risk	TB – no risk	BDL
Arsenic	Levels higher than expected but no risk	NA	BDL
Copper	TB – no risk	TB – no risk	TB – no risk
Zinc	TB – no risk	TB – no risk (one sample slightly elevated)	TB – no risk
TBT	NA	NA	Well below guideline level (see comment below)

BDL = below detection limit; NA = not analysed; TB = typical background

Investigations by Le Provost Dames and Moore (2000) indicated that samples taken from the berth pockets show that coal particles from spillages at the coal loaders contribute between 0-7% of the total sediment. TBT was present at all sites within the berth pocket and between the DBCT and HPS terminal. With the measured TBT concentrations normalised to 1% organic carbon content, the Environment Australia (2002) screening level of 5 ng Sn/g was reached or exceeded at two of the berth pocket sites and in one of the field replicate samples collected from between terminals. TBT concentrations were well below the Environment Australia (2002) maximum level of 72ng Sn/g. Much of this TBT was probably sourced from the flaking of anti-fouling paints as the hulls of loading bulk carriers move up and down against the berth piles in response to local wave action. Sampling in

the new northern area requiring dredging indicated that it has received relatively small amounts of TBT compared to the sites further south and closer to the HPS terminal. This pattern fits prevailing currents, which are known to exert a net southward transport regime in the vicinity of the berths. Sediment sampling and analysis in Half Tide Harbour found no evidence of the presence of sediment contaminants at levels above the Environment Australia (2002) ocean disposal guidelines.

Based on the above investigations, it would appear that there is minimal risk of contamination of the environment from the disposal of dredge spoil. Nevertheless, a further investigation by WBM (2002) into the effects of abrasive blasting at the BMA Hay Point trestle (Berth 9) indicated some elevated concentrations of arsenic, copper, lead and zinc. It was found that, based on the nature of the blasting material used (no elevated levels of arsenic and copper in this material were found), the source of these elements was from another past or existing contamination source. Such results indicate that further investigations may be necessary into the trace metal levels in the seabed in the berth areas. TBT monitoring was undertaken prior to the bed levelling of the spoil ground in 2003. TBT levels were below detection limits.

3.3 Biological Characterisation

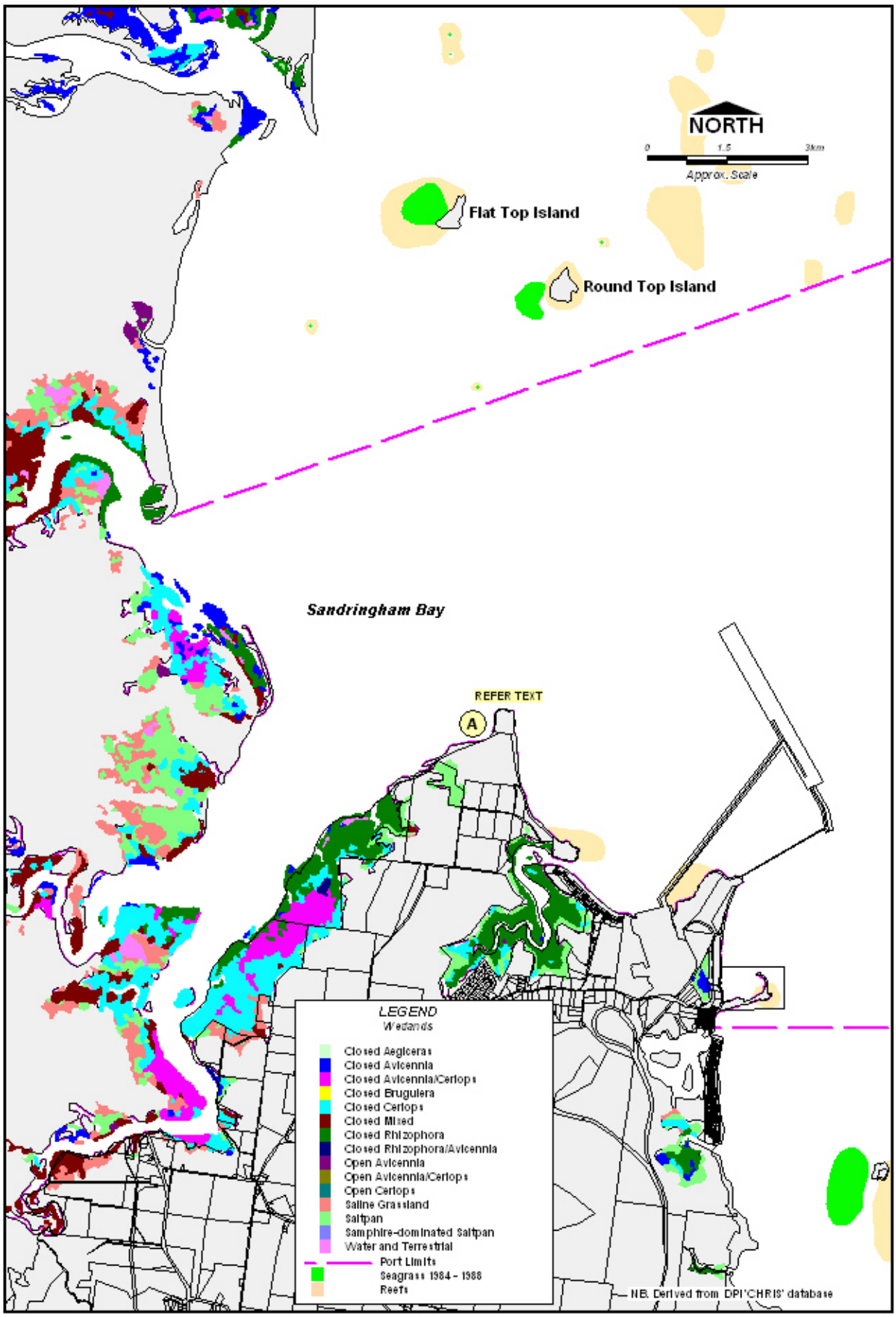
3.3.1 Habitats

3.3.1.1 Intertidal Vegetation and Unvegetated Habitats

Figure 3.3 shows the extent and type of intertidal vegetation in proximity to the Hay Point area derived from DPI Fisheries information. Much of the Hay Point shoreline comprises rectilinear revetments armoured with concrete hanbars. The main areas of intertidal vegetation near the Port shoreline are as follows:

- Louisa Creek- a small area feeding into Dalrymple Bay and Breens Creek further to the south of Tug Harbour. Some small stands have colonised rocky shoreline areas on the north-western and south-eastern shores of the Hay Point Peninsula. Mangroves are mainly *Avicennia* species.

- Sandy and Bakers Creek estuaries contain extensive stands of intertidal wetland vegetation. Both of these creeks flow into Sandringham Bay, which has an extensive area of intertidal sand and mudflats. These flats are located approximately 4 km from the existing spoil ground at the closest point. Most of the mangrove community is contained within the Mouth of Bakers Creek Environment Park, which cover an area of 46ha, 25ha of which is tidal (Cramer, 2000). The upper reaches of the Bakers Creek tidal zone is the site for the proposed Mackay Water Resources Project which involves the recycling of almost all of the Mackay City effluent with the aim to reduce the nutrient loads entering off-shore areas. The Sandringham Bay flats provide seasonally important feeding habitats for waders and other shorebirds, particularly between August and April (WBM 1993, PCQ 1995) and are listed as nationally important wetlands (ANCA 1996).



Map of Marine Vegetation Communities in the Study Area

Figure 3-3

- The Pioneer River mouth/ Bassett Basin area, located approximately 9 km to the north west of the existing spoil ground. Murphy (unpublished report, 1994) recorded 16 species of mangroves in the Bassett Basin area, with *Rhizophora* and *Avicennia* dominating near-shore areas, while *Brugeria* and *Ceripos* tended to dominate the more landward areas. In recognition of the inherent habitat values of this stand, DPI Fisheries has listed this area as a Fish Habitat Area under the *Fisheries Act 1994* (see Section 4.1.2). This is the closest fisheries reserve to the existing spoil disposal site. There has been recent severe mangrove dieback in this area, and investigations are in progress by the DPI to determine the cause/s of the problem, but may be related to sewage effluent and other urban disturbances (Duke *et al.* 2001).

3.3.1.2 Subtidal and Off-Shore habitats

Several surveys have been made for sediment sensitive communities in the Hay Point/ Dalrymple Bay region, including surveys by Coles *et al* (1993), WBM (1993), PCQ (1995), Dames and Moore (1996) and URS (2000). No seagrass beds were identified in this region by the regional survey of Coles *et al* (1993) but a small patch of *Halophila* seagrass was found of the north-east side of Dudgeon Point (Point A on Figure 3.3). Investigations conducted for the DBCT Expansion EIS (URS 2000) included a search for the closest seagrass grounds to the existing spoil ground. This survey did not detect seagrass beds at Dudgeon Point, although scattered patches of seagrasses (*Halophila* and *Halodule*) were found on the northern side of Round Top Island, approximately 5km from the existing spoil ground.

The mapping of intertidal and subtidal vegetation by the DPI Fisheries shown on the CHRIS database (interpreted onto Figure 3.3) also indicates that the nearest seagrass beds are those located on the west/ north-west side of Round Top and Flat Top islands and, to the south of the Port, to the immediate west of Victor Islet, approximately 10km from the existing spoil ground. DPI Fisheries mapping indicates areas of reef adjacent to these seagrass beds as well as within Dalrymple Bay in proximity to the Port infrastructure. These would comprise mainly soft corals and isolated small communities of sediment-tolerant hard corals (mainly *Goniastrea* spp.) on some of the lowermost exposed parts of the intertidal platforms and inshore rocky shoals. There is no coral reef development in the Hay Point area with the nearest off-shore reefs being those at Viscount Shoals and Prudhoe Reefs approximately 25km to the south-east at the northern end of the Northumberland Islands (URS 2000).

Rasheed *et al* (2001) undertook a survey of seagrass, algae and macroinvertebrate communities within the bounds of the Port of Mackay limits and confirmed the seagrass beds consisting of a *Halophila ovalis/Halodule uninervis* low biomass coastal meadow on the north west of Round Top Island (an area of approximately 2.2 ha). These were found within a high density benthic community approximately 50 ha in area, dominated by alcyonarians, ophiuroids and sponges with low numbers of other benthic fauna. A reef community with hard coral, gorgonians and a high density of diverse benthic fauna was found between the meadows and Round Top Island and on the north-west side of Flat Top Island. However, the seagrass community previously mapped by the DPI Fisheries on the north-west side of Flat Top Island were not recorded by Rasheed *et al* (2001). Aside from these areas on the north west side of these two islands, no other significant communities were recorded in areas in close proximity to the Port of Hay Harbour Limits. Other areas near the boundary were mapped as

either 'a low percentage cover of sub-tidal mixed micro-algae species' or' open substrate with benthic micro algae cover'. Two large seagrass beds, comprising *Halophila* meadows were found approximately 7 km east (273 ha) and 12 km east (294 ha) of Mackay Harbour but these are >12km from the existing spoil ground at the closest point. These beds are approximately 3km and 6km to the south east and east of the Port of Mackay spoil ground respectively. It is likely that a combination of elevated water turbidity, resuspension of sediments by wave and current action, large tidal range and large water depths limits prevents the establishment of more substantial seagrass beds in the study area.

Algae distribution was found to be mainly sparse and varies from an open substrate with benthic micro-algae cover to a low percentage cover of *Galaxaura marginata*. The shallow reefs adjacent to Flat Top and Round Top Islands have a high percentage cover of *Sargassum* sp. Dominated mixed micro-algae species. All species of algae are considered to be marine plants under the *Fisheries Act 1994*. Consequently, any activity (including dredged material placement) that may result in the disturbance or destruction of macroalgae (in addition to other species) will require a permit from DPI Fisheries (see Section 5.2).

3.3.2 Marine Fauna

3.3.2.1 Benthic Macroinvertebrates

A number of investigations have surveyed benthic macroinvertebrate populations within or in proximity to the study area including WBM (1992, 2001) and Hydrobiology (2004). The two later studies were undertaken to address the impacts of dredge spoil disposal at Mackay Harbour and Port of Hay Point respectively whilst the former was undertaken as a basis for gaining a Sea Dumping Permit from the (then) Commonwealth EPA. Unfortunately, none of the three studies provide an accurate baseline of conditions that may have existed prior to the development of harbour activities and the associated spoil disposal operations. However, the Hydrobiology (2004) study has evaluated the macroinvertebrate populations of the existing dredge spoil areas with two undisturbed control sites to the north/north-west of the existing spoil disposal site. The investigation by Rasheed *et al* (2001) also provides information on macroinvertebrate populations in the general area.

As indicated above in Section 3.3.1.2, the benthic communities over most of the area are typical of unvegetated subtidal habitats in the study region. For water depths mainly below 15 m, the area was mapped by Rasheed *et al* (2001) as 'occasional isolated benthic individual with a habitat dominated by open/bare substrate'. Polychaete worms typically numerically dominated the infauna, whereas crustaceans and bivalves were typically less abundant (WBM 2001, Hydrobiology 2004). Investigations by LeProvost Dames and Moore (2000) indicate that the area in proximity to the spoil disposal site is a regularly used prawn trawling ground with surface dwelling organisms both inside and outside the spoil ground not overly abundant or large in size, but comprised a range of mostly unattached or partly attached species including some encrusting forms on stones and rubble. These included coralline red algae, grey and white sponges, hydroids, burrowing anemones, soft corals, calcareous worms (serpulids), black crinoids (feather stars), urchins, sea stars, holothurians (sea cucumbers), whelks and cone shells, plus more commonly purple and orange bryozoans and solitary ascidians. Observed bottom fish were cardinal fishes, gobies and goat fish.

The Hydrobiology (2004) investigations, following on from the WBM (1992 and 2001) surveys, suggest that there had been no significant long-term impact of dredge spoil disposal on the Hay Point benthic community. Surveys indicated that there was no significant difference between the spoil ground benthic assemblage and those of the two locations in terms of abundance, diversity or species composition.

3.3.2.2 Significant and Threatened Marine Species

Dugongs

Dugongs are marine mammals that are listed as Vulnerable to extinction by the International Union for the Conservation of Nature and Natural Resources and under the EPBC Act. Dugong populations may be impacted by pollution, hunting, entanglement in fishing nets and loss of seagrass habitat. The conservation of dugongs is managed under the *Nature Conservation (Dugong) Conservation Plan 1999.*

The status of dugong populations in the study region has been examined by Marsh *et al*. (1996). No dugongs were recorded during aerial surveys undertaken in 1987, 1992 and 1994. This result was not unexpected considering the lack of seagrass food resources in this region. Relatively small populations were recorded in areas to the north (near Port Newry) and south (Ince Bay, approximately 20 km to the south) of the study region. Dugong Protection Areas (as declared under the Queensland *Nature Conservation Act 1992* and the Queensland *Fisheries Act 1994)* have been declared for Llewellyn Bay (Llewellyn Bay Dugong Sanctuary- Type B) and Ince Bay (Ince Bay Dugong Sanctuary –Type A).

Sea Turtles

Six species of turtles are known to occur in the study region. These species and their conservations status are as follows:

- Loggerhead (*Caretta caretta*)-Endangered (EPBC and Nature Conservation Act);
- Flatback (*Natattor depressa*)- Vulnerable (EPBC and Nature Conservation Act);
- Green (*Chelonia mydas*)- Vulnerable (EPBC and Nature Conservation Act);
- Leatherback (*Dermochelys coriacea*)- Endangered (EPBC Act) and Vulnerable (Nature Conservation Act);
- Olive Ridley (*Lepidochelys olivacea*); and
- Hawksbill (*Eretmochelys imbricata*) - Vulnerable (EPBC and Nature Conservation Act);

Green turtles are the most common in the region, and are known to frequent the harbour on occasions. The Flatback Turtle is the predominant species nesting on local beaches in the area (L Gallagher, Mackay Turtle Watch, pers comm.), whereas the Green Turtle is a sporadic nester on local beaches. Recent surveys by Mackay Turtle Watch indicate that the most heavily utilised beaches for nesting are Hay Point Beach and Salonika Beach. Limited nesting is found on McKewans, Louisa, Ballykeel and Far Beaches, and no nesting has been recorded on Half Tide Beach. The major rookeries of Flatback Turtles are at Crab Island and Wild Duck Island, which are located 80 km south-east of Hay Point (PCQ 2002).

The adult Green turtle is herbivorous and dependent upon seagrass. No established seagrass beds have been identified in the vicinity of the wider port area. The remaining species are carnivorous. With the exceptions of aggregations of breeding females that occur in nearshore waters off nesting beaches during the nesting season, marine turtles are generally solitary. The abundance of turtles in the Port area is anticipated to be relatively low (URS 2001).

Recent studies by the Queensland Park and Wildlife Service (QPWS, 2003) into turtle population dynamics in the Hay Point area found the following:

- Five green turtles were observed during transect surveys of the Hay Point port area;
- No turtles were captured within Hay Point port limits;
- The inshore areas of Hay Point area support a small foraging population of *C. mydas*;
- It is likely that *C. mydas* are foraging on algal covered rocky substrates; and
- Anecdotal observations indicate that green turtles may also be feeding on deep-water seagrass or algae off shore from the coal-loading terminal.

Whales and Dolphins

Several species of dolphins are known to occur within the study region. These include bottlenose (*Tursiops truneatus*), Indopacific humpback (*Sousa chinensis*) and common (*Delphinus delphis*) dolphins. Several whale species are also known from the study region, although they generally move along the coast well offshore and unlikely to affect the site selection for the disposal ground. Sei whale (*Balaenoptera musculus* – listed as Vulnerable under the EPBC Act) and the Fin whale (*Balaenoptera physalus* – listed as Vulnerable under the EPBC Act) are reported to be occasional visitors to the area. The conservation of whales and dolphins is managed under the *Nature Conservation (Whales and Dolphins) Conservation Plan 1997.*

Intertidal Avifauna

A variety of shorebirds are likely to frequent the intertidal areas within the study area, many of which are protected under the JAMBA and CAMBA agreements, which provide for the protection of migratory burds. The Beach-Stone Curlew *Esacus neglectus*, which is classified as Vulnerable under the *Nature Conservation Act* 1992, has been recorded in foreshore areas and in mangrove areas near the Hay Point Coal Terminal site.

3.3.3 Fisheries

Commercial Fishing

The Mackay region supports a large commercial fishery targeting a variety of fish and crustacean species. Major landings include fish, scallops, prawns (dominated by king prawns) and crabs (dominated by spanner crabs). There is likely to be periodic prawn trawling in the general area of the Port.

Queensland Boating and Fisheries Patrol officers (in URS 2000) stated that there was limited fishing by the commercial fisheries within the inner areas of the Great Barrier Reef, as well as within the areas currently excluded from the GBR Marine Park. The outer areas of the GBR were more popular

for commercial fisheries. The effects of spoil dumping on commercial fishing activities in the general area is unlikely to be a significant consideration in the selection of the new spoil disposal site.

Recreational Fisheries

There is no available data on recreational fishing effort and catches from the Mackay/ Hay Point region. Previous discussions with Queensland Fisheries and Queensland Boating and Fisheries Patrol officers (refer URS 2000) indicate that:

- the main species caught in the region are snapper, cod, grunter, mackerel and trevally; and
- recreational fishing occurs throughout the General Use and other zones of the Great Barrier Reef Marine Park (except where excluded) and in the areas not yet gazetted as within the Great Barrier Reef Marine Park. It is understood most sites that are fished close to the existing disposal area are adjacent to small reefs, most particularly in the north-west side of Round Top and Flat Top islands where protected from the prevailing winds.

3.4 Economic Factors

As discussed in Section 1.3, it has been assumed that the spoil ground should be within 10km of the dredge area to be economically viable.

3.5 Environmental Zonings

Section 4.1.2 outlines environmental zonings in and adjacent to the study area. In summary, protected areas within and adjacent to the study area include:

- Mouth of Bakers Creek Environment Park, situated near the mouth of Bakers Creek.
- Bassett Basin Fish Habitat Area FHA is located near the mouth of the Pioneer River, approximately 7 km from Hay Point Port limits at its closest point.
- No Dugong Protection Areas occur in the study area, the closest being at Ince Bay, approximately 20km to the south of the Port.
- There are no Ramsar wetlands in proximity to the Port limits, the nearest such wetland being at Shoalwater and Corio Bays in Central Queensland.
- The Great Barrier Reef Marine Park boundaries intersect the Hay Point Port limits. Areas of the GBRMP within the Port of Hay Point limits are designated as General Use 'A' zone while areas near the coastline immediately to the north and south of the boundary are designated as General use 'B' zone. As of 1st July 2004, changes to the Zoning Plan for the GBRMP will involve revoking these zonings, amending the General Use 'A' classification to the General Use Zone and amending the General Use 'B' Zone to the Habitat Protection Zone. The General Use zone applies to the total area of the GBRMP within the Port limits.
- There are no heritage sites as listed on the EPA Heritage Register in proximity to the Hay Point Port area.
- Areas or features on the Register of the National Estate, in addition to the Great Barrier Reef (which is on the World Heritage Register), include Flat Top Island lighthouse, Freshwater Point Area (to the east of Sarina on the coast) and the Mouth of Baker's Creek Environmental Park.

- The *Sandringham Bay – Bakers Creek Aggregation* is listed as a Wetland of National Importance. This area includes all intertidal areas associated with the Sandy Creek and Bakers Creek inlets as well as the Louisa Creek wetlands to the immediate west of the Hay Point Port infrastructure. The *Sarina Inlet- Ince Bay Aggregation* is also listed as a Wetland of National Importance.

3.6 History of Impacts from Dredging & Spoil Disposal

Two areas within the Port have been used for ocean disposal. The current spoil ground is located approximately 4 km north-northwest of the DBCT berths. It is rectangular in shape with dimensions of 1500 m x 850 m giving a total surface area of 1,275,000m^2. It is situated in an area where the natural seabed is at a level of about 11.5m to 12.5m below LAT. The current spoil ground has been used primarily for capital dredging programs in 1981, 1993 and 2001, and is proposed to be used for spoil disposal from maintenance dredging in 2004.

The older spoil ground is situated approximately 0.5 km north-northwest of the DBCT berths. It is rectangular in shape with dimensions of 800 m x 500 m giving a total surface area of 40ha. It is situated in an area where the natural seabed is at a level of about 11 m.

Investigations by WBM (2001 a and b) and Hydrobiology (2004) have indicated that the spoil disposal operations to date have had no significant long-term impact on the Hay Point benthic community. This has been demonstrated with comparison with two control sites to the north/north-west of the existing dump site[2]. The turbidity levels described in the WBM (2001) reporting indicated that, while dredge plumes were clearly evident, actual turbidity values were very low. Based on these outcomes, it is clearly desirable in terms of prediction of potential impacts, for the new disposal areas to be located as close as possible to the existing ground .

[2] These control sites are located approximately 1 to 1.5km to the north of the existing spoil ground. Depending on the proposed location of the new site, a revision to these control sites may be required.

4 DEVELOPMENT OF OPPORTUNITIES AND CONSTRAINTS FOR SPOIL GROUND SITE

4.1 Development of Constraints Map

Figure 4.1 presents the various ecological, tenural/administrative and technical constraints to establishment of a new spoil ground within the study area based on the issues identified in Sections 2 and 3. The following is a description of the main identified issues and constraints.

4.1.1 Ecological Constraints

Intertidal Flats

Intertidal flats associated with Sandringham Bay and the flats on the northern side of the Bakers Creek Estuary have been identified as being of major ecological value. In view of this significance, a broad buffer is considered to be necessary. The 1 km buffer width determined by the EPA/DEH as part of meeting the water quality compliance criteria would be appropriate.

Reefs/Rocky Shores

As identified in Section 3.3.1, several reef areas are known to occur within and adjacent to the study area, with the largest and most well known being those associated with Flat Top and Round Top islands (northern section of study area), and on the north-west of Victor Islet (southern section of study area). As above, the EPA/DEH have stipulated a buffer width of 3 km in order to meet water quality objectives based on the existing spoil ground location (refer below for additional buffer deemed necessary over and above this separation distance).

In addition to these islands, several terrigenous rock platforms and reefs fringe the coastline, most notably being Dudgeon Point, the mouth of Louisa Creek, Hay Point, Tug Harbour and Point Victor. As above, the EPA/DEH have stipulated a buffer width of 1 km in order to meet water quality objectives based on the existing spoil ground location.

The distribution and extent of small subtidal patch reefs is not well known or documented. Small terrigenous patch reefs were once known to occur at the existing spoil ground, and it is possible that reefs would occur in adjacent areas. Underwater surveys would be required prior to the finalisation of a selected spoil ground site.

Marine Plants

Spoil disposal can impact on marine plants through a range of processes, including direct burial, modification to sediment types and reductions in ambient light concentrations due to increased suspended solid concentrations). Seagrasses and subtidal algae are perhaps the most susceptible to these impacting processes, whereas it is unlikely mangroves and saltmarsh would be directly affected unless spoil was placed on or immediately adjacent to intertidal flats.

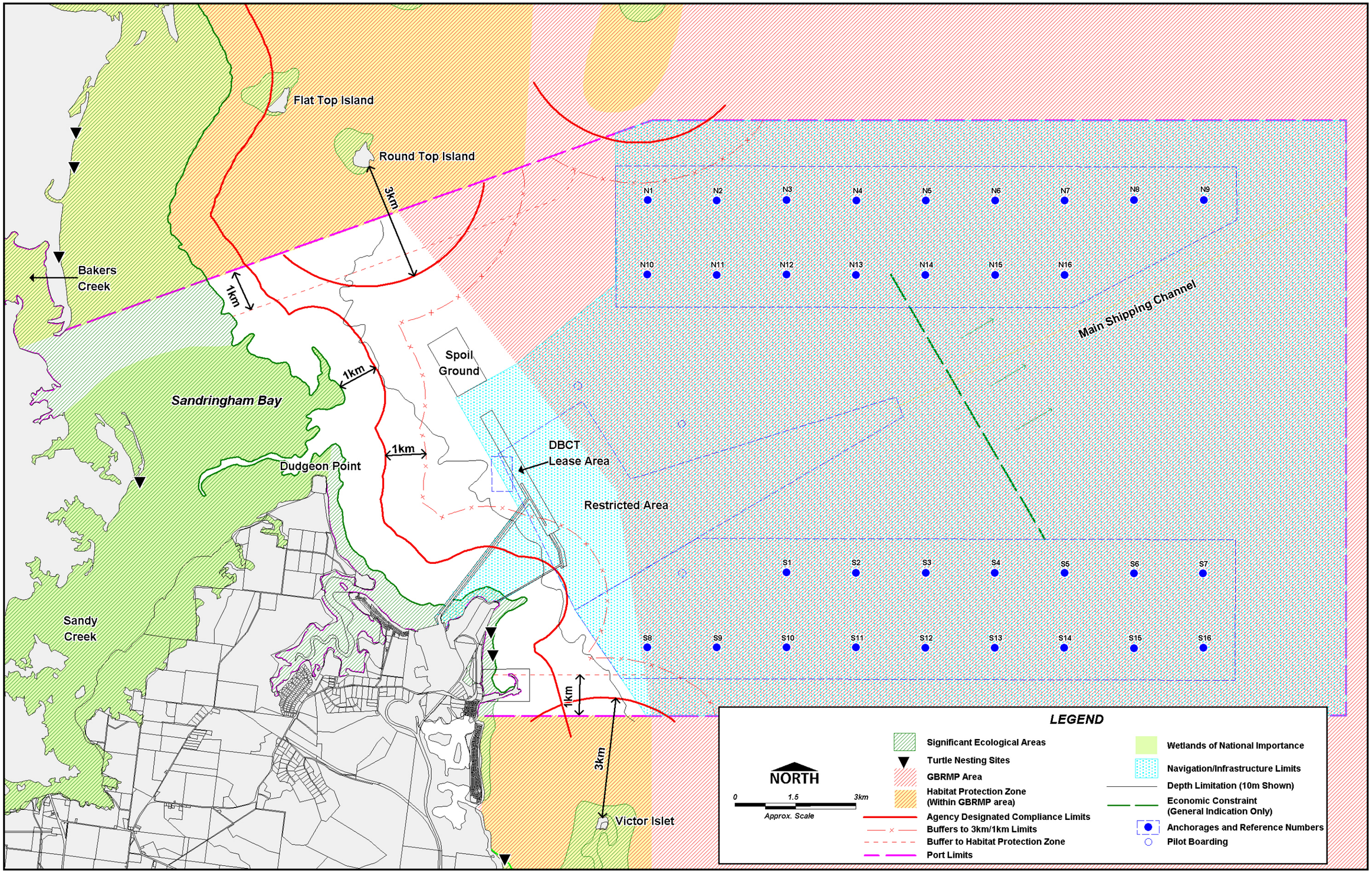
The potential impact of offshore spoil disposal on seagrasses is likely to be the key marine plant management issue. Most recent information (e.g.URS 2001) indicates that there were no seagrass beds within the Port limits, with the nearest known beds occurring at Round Top and Flat Top

Islands, approximately 1.3 km and 3.2 km, respectively from the Port limits at the closest point. A small patch of the seagrass *Halophila* was recorded on the north-west side of Dudgeon Point in 1993, but was not recorded in this same area during 2000. Many species in the genus *Halophila*, particularly *H. ovalis* and *H. ovata*, are highly ephemeral, and it is possible that patches of *Halophila* occur within the shallow sections of the study area from time to time, depending on ambient environmental conditions (i.e. turbidity, wave climate etc.).

The nearest known seagrass beds in the southern sections of the study area occur in the vicinity of Victor Islet, located approximately 2.5 km from the Port limits. Establishment of an appropriate buffer distance obviously depends on the potential for sediment mobility from the spoil site. The 3 km buffer width described above combined with an additional buffer width described below should be adequate for protection of these beds.

Turtle Nesting Areas

The local beaches at and adjacent to Hay Point have been identified as nesting grounds for the Flatback Turtle and, to a lesser extent, the Green Turtle (refer Section 3.3). A buffer distance of 1km from these nesting grounds (as identified by Mackay Turtle watch) would appear to be appropriate.



Ecological, Fenuval, Administrative and Technical Constraints Figure 4-1

Water quality /Bioaccumulation constraints

Section 3.2.2.2 has identified the considerations relating to the turbidity impacts of the current spoil disposal and potential compliance with EPA/DEH criteria. As noted above, it would not be possible to meet the criteria by dredging immediately adjacent to the 3km buffer strip around Round Top Island and Victor Islet. Turbidity levels in the initial plume immediately adjacent to the dredge have been noted as being around 100 NTU, obviously substantially in excess on the prescribed background turbidity level of 12 NTU plus 25% for 90% of any ten-day period. Consequently, there needs to be an additional buffer width to allow for the further diffusion of the dredge plume to meet the prescribed levels as it progresses near to the 3km and 1km buffer widths stipulated by the agencies. Based on the decay of the plume demonstrated in previous studies (eg WBM 2001a), it would appear that an additional width of 1 km would be the minimum acceptable and desirably should be greater than this. Figure 4.1 thus shows additional buffers around the ecologically significant areas described previously.

In regard to potential impacts from contaminants within the spoil, Section 3.2 has indicated that no significant levels of contaminants are present within the spoil although further testing of samples from the berth areas may be required to confirm this. At this stage, no special constraints regarding contaminants are foreseen with spoil disposal.

4.1.2 Administrative / Planning Constraints

Conservation/ National Parks

The nearest area of conservation tenure to the Hay Point area is the Mouth of Bakers Creek Environment Park. Because this area incorporates intertidal wetlands addressed in a separate criterion, there is no need to give further consideration to protection of this area.

Fish Habitat Areas

The nearest Fish Habitat Area (FHA) to the Port limits is the Bassett Basin FHA, located near the mouth of the Pioneer River. This FHA is sufficiently distant from the Hay Point Port limits (approximately 7 km away at the closest point) that no further consideration needs to be given to this criterion.

Dugong Protection Areas

As indicated in Section 3.3.2.2 the study area is unlikely to be frequented by dugong and the nearest Dugong Protection Area is at Ince Bay, approximately 20km to the south of the Port. This criterion thus requires no further consideration in the assessment.

Ramsar Wetland

There are no Ramsar wetlands in proximity to the Port limits, the nearest such wetland being some 120 km south at Shoalwater and Corio Bays in Central Queensland. No further consideration thus needs to be given to this criterion.

Great Barrier Reef Marine Park

The GBRMP boundaries intersect the Hay Point Port limits such that approximately 80% of the port is within the Marine Park. The constraint imposed by this criterion is essentially an administrative one, particularly the additional complexities associated with the approval and regulatory processes (refer Section 5). The existing spoil ground is located approximately 610 m from the boundary of the GBRMP at the closest point, however, for the Sea Dumping Permit granted for the 2001 capital dredging campaign, the area permitted by the DEH was double the current designated area and extended into the existing GBRMP (see Figure 4.2). This occurred because the GBRMP boundary was amended in June 2001 to a line further to the west of the previous alignment.

Areas of the GBRMP within the Port of Hay Point limits are designated as General Use 'A' zone while areas near the coastline immediately to the north and south of the boundary are designated as General Use 'B' zone. However, forthcoming changes to the Zoning Plan for the GBRMP on the 1st July 2004 will involve revoking these zonings, amending the General Use 'A' classification to the General Use Zone and amending the General Use 'B' zone to the Habitat Protection Zone (as shown on Figure 4.1). The General Use zone applies to the total area of the GBRMP within the Port limits.

While the new zoning scheme does not preclude activities such as dredging and spoil disposal (but excludes 'as of right' usage by shipping other than designated shipping areas) within the Habitat Protection Zone, the amendment to the scheme inherently imposes a higher conservation status to the zone. This is reflected in the objectives of this zone, i.e.:

a) to provide for the conservation of areas of the Marine Park through the protection and management of sensitive habitats, generally free of potentially damaging activities; and

b) *subject to (a), to provide for reasonable use.*

The areas zoned as Habitat Protection encompasses areas identified as having significant ecological values including the Flat Top and Round Top Island and Victor Islet areas and high density benthic communities to the east of Mackay Harbour as identified in Rasheed *et al*. (2001). The implications are thus likely that spoil disposal would not be permitted within this zone and the GBRMPA would be likely to require a designated buffer area separating this zone from any spoil disposal that may be proposed within the General Use Zone. As is shown on Figure 4.1, a buffer width of 1km may be considered to be adequate.

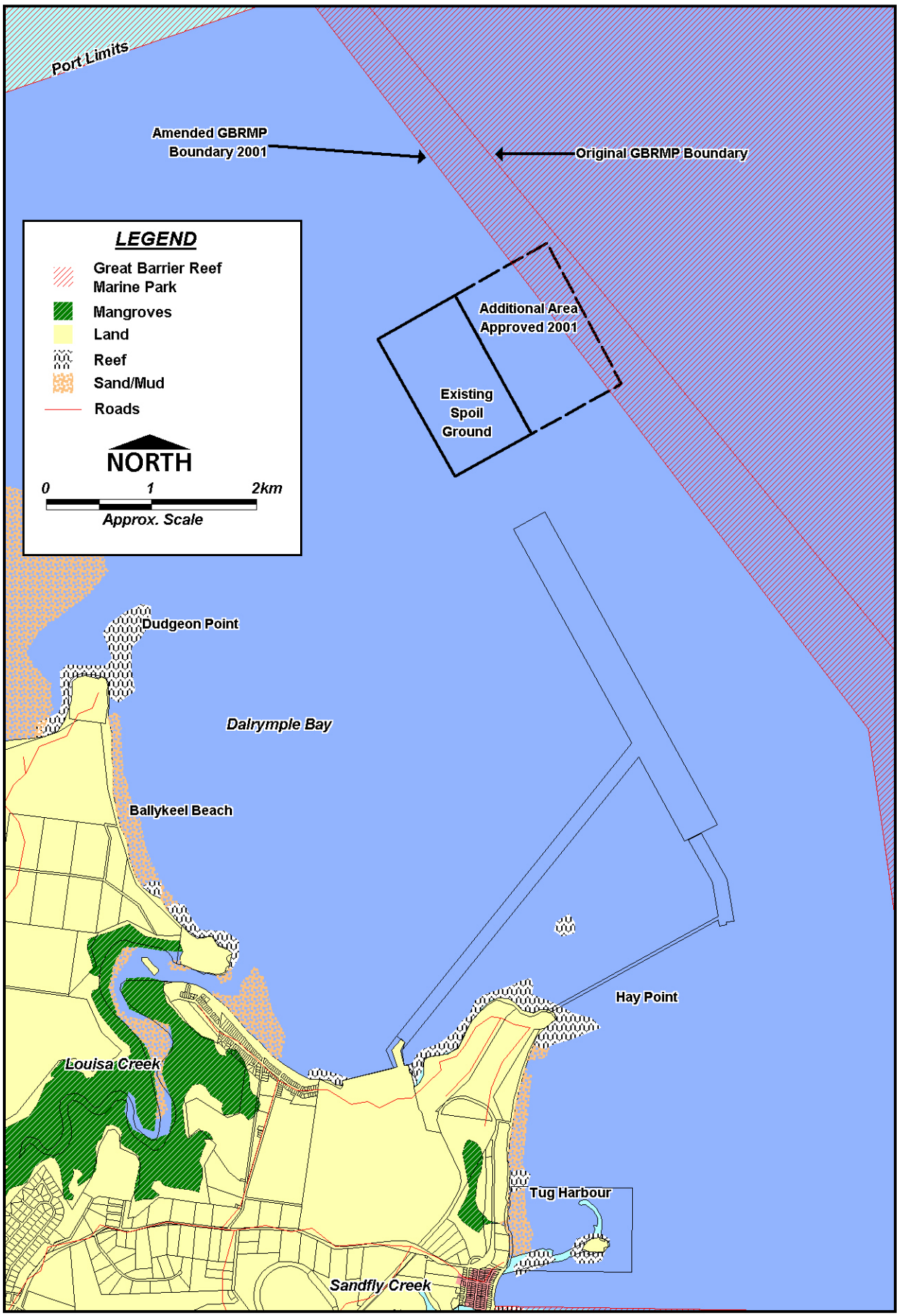
Queensland Heritage Site

There are no European heritage sites as listed on the EPA Heritage Register in proximity to the Hay Point Port area. Accordingly, this criterion was not further considered. There is no publicly available register regarding items or places of Aboriginal cultural heritage significance but it is considered unlikely that there would be any items within the study area that could potentially be affected by spoil disposal operations.

Places on the Register of the National Estate

Areas or features on the Register of the National Estate, in addition to the Great Barrier Reef (which is on the World Heritage Register) are as follows:

- The Flat Top Island lighthouse;



Spoil Ground in Relation to GBRMP Boundary

Figure 4-2

- The Freshwater Point Area (to the east of Sarina on the coast); and
- The Mouth of Baker's Creek Environmental Park (Note: this has been removed from its original listing).

None of these criteria should affect the prospective location of the dredge spoil area and accordingly require no further consideration.

Wetlands of National Importance

The *Sandringham Bay – Bakers Creek Aggregation* is listed as a Wetland of National Importance. This area includes all intertidal areas associated with the Sandy Creek and Bakers Creek inlets as well as the Louisa Creek wetlands to the immediate west of the Hay Point Port infrastructure. The listing of the Sandringham Bay area highlights the recognised ecological importance of this area and the need to provide an adequate buffer from any development that may adversely impact on its values. The buffer indicated on Figure 4.1 is considered to be adequate.

The intertidal wetlands situated to east/south-east of Sarina, known as the *Sarina Inlet- Ince Bay Aggregation*, are also listed as a Wetland of National Importance. This wetland is outside the potential zone of influence of the proposed spoil dumping activities, and is not further considered.

History of Impacts from Dredging and Spoil Disposal

As indicated in Section 3.5, because spoil disposal has been carried out at two sites within the Port limits, there is a valuable baseline on which to assess the potential impacts of a new disposal site and provide a basis for determining appropriate buffer distances between the disposal site and areas of ecological significance. This is of particular relevance to the estimation of current and wave action, consequent sediment mobility and water quality/ turbidity effects. The effects of existing disposal operations has been discussed in Section 3.2 .

Important Fishing Areas

Information from DPI-Fisheries CHRIS database, as well as previous assessments by URS (2001), indicates that the general environs of the port do not contain any areas of particular importance for commercial or recreational fishing. Consequently, this criterion does not require further consideration.

4.1.3 Technical/Economic Constraints

Hydraulic/Sediment Movement Constraints

The potential for sediment to be remobilised and transported from the disposal site is dependent on the nature of the sediments, the water depth and the prevailing current and wave conditions. Generally the tidal currents alone are insufficient to cause substantial sediment transport. The potential for sediment remobilisation increases with increasing wave height and decreasing water depth.

For the prevailing wave climate in the area, the dominant sand fractions will be stable for the majority of time at water depths in excess of 8m. At such depths, the finer sediments may become mobile

during larger wave events (>0.5m Hsig) with substantial resuspension and transport limited to extreme wave events (>1.5m Hsig) which occur less than 2% of time on average.

There is a gradual increase in sediment transport potential with decreasing water depth and hence the deeper the water at the disposal site, the less likely the potential for remobilisation and transport. This is a gradual transition and it is considered that as a minimum, spoil should not be placed to a level higher than –8m LAT to minimise the potential for remobilisation and transport. Allowing for a practical minimum of 2m placement depth, it is therefore considered that the spoil ground should not be located shallower than the –10m LAT contour.

Prescribed Navigation Area Requirements

The Mackay Regional Harbour Master at Mackay (Captain John Ellyett) was contacted regarding areas potentially constrained within the Port of Hay limits associated with shipping operations. These operational constraints included shipping lanes, navigational areas, anchorages, pilotage and other operational requirements. Using the map "Approaches to Hay Point and Mackay" as a basis, Captain Ellyett indicated an area that would not face significant constraints based on current usage patterns.

Areas excluded due to navigational/operational issues were as follows:

- The Restricted Area – the area where unauthorised vessels are prohibited from mooring, anchoring or manoeuvring in the Ship Loading Facility Area.
- The main shipping channel for port access plus pathways to specific anchorages – this excludes the major portion of the eastern areas of the Port boundary.
- The 32 anchorages in the northern and southern areas of the Port.
- The pilotage areas incorporating the three pilot boarding places (Alpha, Bravo and Charlie) and pilot transfer from anchorages to the berths.
- No areas to the west of the alignment of the existing spoil ground and wharf area were shown as suitable due primarily to depth limitations. The depth of the spoil grounds were noted by the Regional Harbour Master to not be below 10m LAT.

Subsequent to the above, PCQ environmental representatives advised that there may be opportunities to relocate the most western anchorages (two northern – Anchorages N1 and N10 and one southern – Anchorage S8[3] to locations in the eastern limits of the Port, thus potentially expanding the area available for spoil disposal closer to the dredge areas. Furthermore, PCQ advised that the depth limitation of 10m LAT may be too conservative for areas to the immediate west of the spoil ground and wharf facilities, as deep draught vessels should have no requirement to pass through this area. The main depth limitation was the depth of the dredge vessel "*Brisbane*" which is understood to draw 6.25m fully laden. A minimum depth of 8m may thus be appropriate in this area, allowing for sufficient depth to permit disposal of the spoil from the vessel.

Future Port Development Issues

Liaison with the Mackay Regional Harbour Master indicated that an area to the immediate north-west of the existing wharves should be excluded from consideration to allow for possible expansion of Port infrastructure in the future. This area has been confirmed through discussions with PCQ representatives. This area extended up to the southern limits of the existing spoil ground.

[3] There may also be opportunities to relocate Anchorage S9 – this has not been explored in this report.

A buffer strip of 200m wide immediately to the west of the potential port expansion has been included. It is clearly not appropriate for the spoil ground to be located immediately adjacent to the Port Restricted Area and potential future infrastructure areas due to navigational issues and possible migration of spoil into berthing areas.

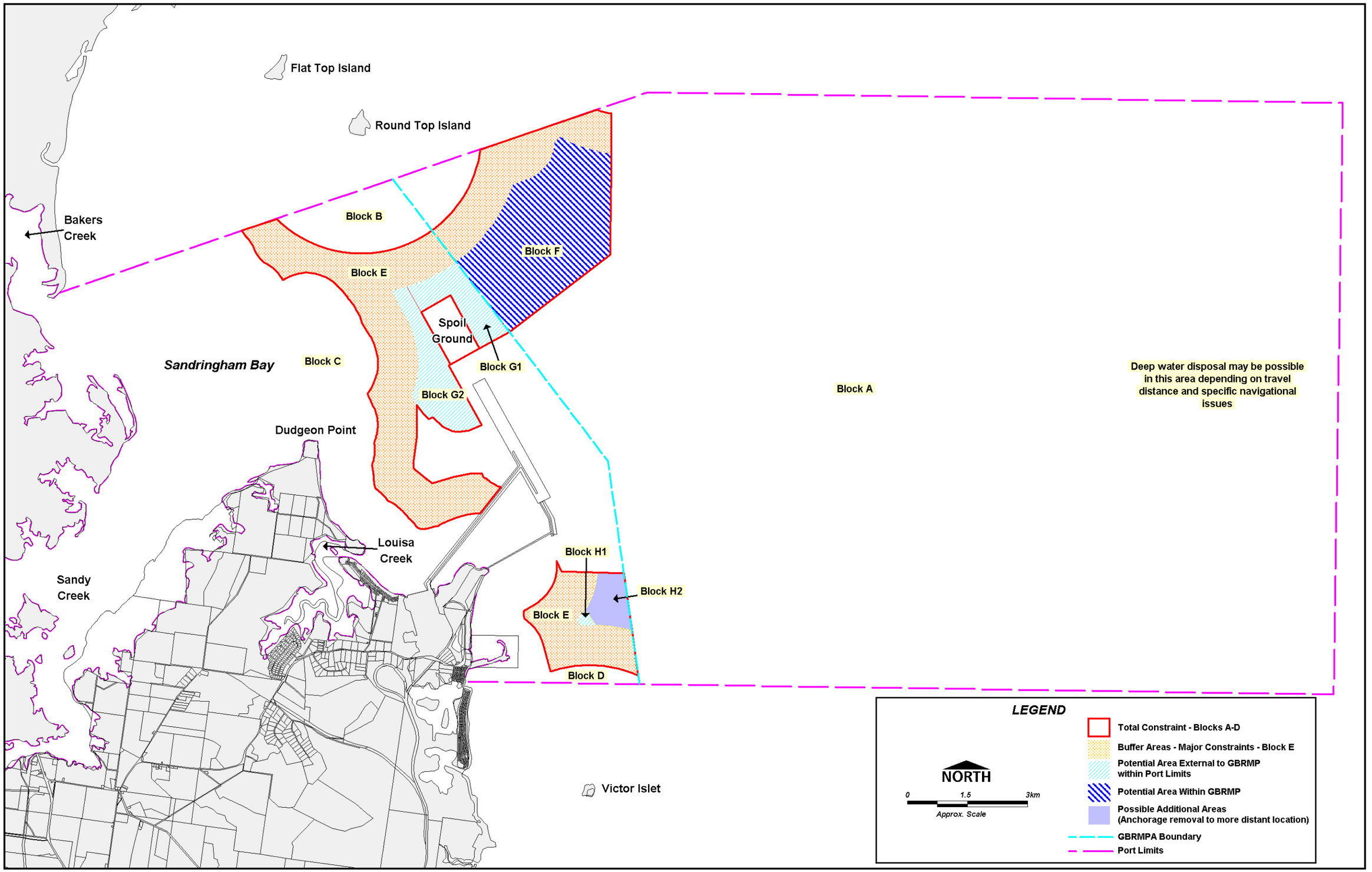
4.1.4 Dredge Type and Disposal Constraints

PCQ has advised that the dredging will be most likely carried out by a trailing arm section hopper dredge. Furthermore, it is probable that the dredger '*Brisbane*' which is operated by the Port of Brisbane Corporation will be used. This vessel has a laden draft of 6.25m and bottom dumping occurs through valves. Therefore, this dredge or similar vessels will not be constrained by the minimum process related depth of –8m LAT as outlined above.

Modern dredgers such as the '*Brisbane*' are also designed and equipped to minimise turbidity generated during dredging and placement.

4.2 Identification of Preferred Spoil Ground Area

The environmental, technical and administrative issues defined in Section 4.1 were used to identify key spoil disposal issues and management constraints within the study area. Areas with similar constraints/issues were identified, allowing the study area to be separated into 10 distinct 'blocks'. Each of these blocks form the basis for the discussion of major management issues within potential future spoil disposal areas.



Potential Spoil Disposal Areas/Blocks Figure 4-3

Table 4-1 Potential Spoil Disposal Areas

Block	Location	Area (ha)	Average Bed Level (m LAT)	Volume to –10m LAT (million m^3)
F	Potential Area Within GBRMP (General Use Zone Only)	1046	-13.5	36.2
G1	Seaward portion of North Area external to GBRMP & anchorages	211.2	-12.5	5.2
G2	Landward portion of North Area external to GBRMP & anchorages	282.2	-11.2	3.4 (or 6.1 to –9m LAT)
H1	South Area External to GBRMP & anchorages	10.0	-11.0	0.1
H2	South Area External to GBRMP but within existing anchorages	120.9	-11.5	1.8

Based on the above constraints, the Port Area has been divided into blocks as defined in Figure 4.3 and discussed below with respect to potential use for spoil disposal. Table 4.1 also summarises the surface area, average depth and potential capacity within key blocks, while Table 4.2 presents associated opportunities and constraints. The average bed level within each block has been determined from digital survey data where available and Admiralty chart levels elsewhere. The volume was determined based on filling to an average level of –10m LAT (and –9m LAT in block G2). In practical terms, the actual bed level may vary by about ±1m (i.e. about –9m LAT and –11m LAT). Filling within the total area of each block has been assumed with an allowance for a batter slope of 1 in 5 (within the block) from external edges. This slope will be dependent on the nature of the dredge material, which varies considerably, but does not significantly affect spoil quantities.

No specific allowance has been made for variations in the long term *in situ* bulk density of the dredge material relative to its pre-dredge condition. Further detailed survey will be required in some areas, particularly the outer portion of Block F and Blocks H1 and H2 to confirm bed levels and hence available capacity. In summary, the results presented in Figure 4.3 indicate the following:

- **Blocks A-D**. Most of the study area is situated within waters where either spoil disposal is unlikely to gain the requisite approvals because of environmental regulations, or waters identified as having navigational constraints. Note that should dredging be undertaken in offshore waters for the purpose of channel alignment works, PCQ may consider the disposal of spoil in deeper waters, separate from the main spoil ground. However, such a site would be within the GBRMP area. Furthermore, disturbing an additional area would not be desirable from an impact assessment and management perspective, and therefore it is not further considered here.

- **Block E.** A large proportion of the study area (2,666 ha) is situated within regulatory authority imposed buffer areas. This block includes areas where management requirements or compliance targets set by agencies would be unlikely to be met unless extremely high levels of management control were implemented, likely resulting in a reduction in functional efficiency[4]. This block is not considered a viable alterative and is not further considered.

- **Block F.** The total seafloor area within the GBRMP area, but outside navigation areas, is approximately 1,046 ha. This block is within the General Use Zone of the Marine Park and has an estimated capacity of 36.2 million m^3, which far exceeds PCQ's requirements in the foreseeable future. Spoil dumping in this block is considered to be the least likely to result in impacts to known sensitive ecological resources. As currents run in a predominantly north-north-west / south-south-east direction, turbid plumes would tend to move past (eastwards of) Flat Top and Round Top islands, reducing the risk of impacts to reef environments. To further reduce the likelihood of impacts to Flat Top and Round Top Islands, it would be preferable for any spoil disposal in this block to be placed in the eastern sections. An area of approximately 430 ha (a circle with a radius of 1.17km) would be required to accommodate 15 million m^3 at an average placement depth of 3.5m.

- **Block G**. This potential spoil disposal area is external to GBRMP boundaries and existing anchorages in the northern sectors of the study area and has a total area of 493.4 ha. Based on existing bathymetry charts and survey data, this block has a potential volume[5] of 11.3 million m^3, assuming that works are staged as follows:

  - Area seaward of the western boundary of the existing spoil ground (G1) – filled to an average bed level of –10m LAT; and
  - Area landward of the western boundary of the existing spoil ground (G2) – filled to an average bed level of –9m LAT.

  The total capacity of this area is approximately 8.6 million m^3 if it is all filled to an average level of –10m LAT.

- **Block H**. This block is situated near the Tug Harbour in the southern sectors of the Port. Unless the western-most anchorage (S8) was removed, this block is too small (H1 = 10 ha, 0.1 million m^3) to be further considered for spoil disposal. Assuming that this anchorage was removed, a total additional seafloor area of 120.9 ha (1.8 million m^3) would be available (Block H2). The overall area of Block H (i.e. Blocks H1 and H2) would have an estimated capacity of 1.9 million m^3.

Table 4-2 is a matrix of the major opportunities and constraints associated with each of the blocks, together with an overall preference/feasibility ranking. From an administrative/approvals perspective, Block G is a preferred area for future spoil disposal activities, given the following:

- Extensive environmental monitoring data has been collated from sections of this block in past dredging campaigns;

4 It needs to be recognised that the designated 1km width buffer is a coarse estimate calculated from the background turbidity criterion described in this report. Accordingly, there is an inherent degree of uncertainty in the designation of this buffer width. A comprehensive water quality monitoring program could be implemented to establish a firmer basis to the background turbidity levels in proximity to Round Top Island and Victor Islet, although the costs of such a program would need to be carefully evaluated in comparison to the benefits.

5 Note that this volume calculation assumes that disposal occurs in waters directly adjacent to, but not within, the GBRMP boundary. The GBRMPA can require a Marine Parks Permit if it considers there are likely to be indirect impacts (i.e. impacts associated with turbid plumes or spoil dispersal) to the GBRMP (see Section 5).

- The area is situated outside the GBRMP;
- Has sufficient capacity to meet PCQ capital dredging requirements; and
- Meets other technical and economic criteria.

There are also some caveats on using this area, as follows:

- This area could contain terrigenous patch reefs. Further surveys would be required to address this issue; and
- The northern portions of this block are situated closer to the GBRMP and reef environments (at Round Top and Flat Top Islands) than the existing spoil ground. The risk of environmental impacts to these areas is therefore greater for Block G compared to the existing spoil ground. The risk of impact could be further compounded given the relatively larger spoil volume of potential future dredging campaigns (e.g. as part of channel alignment capital dredging) compared to past dredging episodes.

Although Block G has sufficient capacity to cater for likely future capital dredging, it will not accommodate the full 15 million m³ required. Therefore, an alternative site is likely to be required for future maintenance dredging activities.

Block H has the same set of administrative issues as Block G, with the following additional constraints:

- There is an absence of environmental monitoring data for the area; and
- This block does not have sufficient capacity to meet PCQ requirements.

Similar to Block G, Block H is situated closer to the GBRMP and reef environments (Victor Islet) than the existing spoil ground is to these areas. The risk of environmental impacts to these areas is therefore greater for Block H compared to the existing spoil ground. Given that Block G has sufficient capacity to meet PCQ spoil disposal requirements for capital dredging, spoil disposal in Block H is neither justified, nor desirable from an impact assessment and management perspective.

As discussed above, spoil dumping in Block F is the least likely to result in impacts to sensitive ecological resources compared to dumping in the other two Blocks, particularly with respect to fine maintenance dredging material. While this Block has a higher level of administrative constraints (being within the GBRMP area), consideration may need to be given to its use for future maintenance dredging when Block G reaches capacity.

4.3 Staging Process

The staging of spoil disposal activities will depend on a number of factors. It should be recognised that environmental constraints could be identified in latter stages of the spoil ground selection process (see Section Table 4-1), which could limit or prevent spoil dumping in Block G. Consequently, it is not possible at this stage to provide a detailed account of the disposal of dredge spoil staging process.

Consideration will need to be given to the nature of spoil requiring disposal. Material gained from capital dredging campaigns is expected to have a predominantly coarser material fraction than that gained from maintenance dredging and, accordingly, would have a lower potential for adverse water quality impacts. Block G is preferred from an administrative approvals perspective and use of this area would be more suited to coarser capital dredging material given the proximity of the reef

environments at Round Top and Flat Top Islands. When this Block reaches capacity and/or monitoring indicates an increased risk of environmental impacts, consideration would need to be given to alternatives such as Block F which is least likely to result in impacts associated with the disposal of fine maintenance dredging material.

Table 4-2 Matrix showing opportunities and constraints to spoil disposal in different zones within the study area

Block	Key Feature	Environmental	Technical	Administrative	Feasibility/preference ranking
A	Areas with navigational/technical constraints		High economic constraint for offshore areas	• Navigation/berthing areas - no disposal allowed	No
B	Agency imposed limits - north	Seagrass, reefs at Round Top & Flat Top Islands	Moderate economic constraint	• GBRMP Habitat Protection Zone to north • No allowable impact in this zone • Mackay Port limits	No
C	Agency imposed limits - west	Intertidal flats (incl. turtle nesting areas)	Shallow, limited carrying capacity	• No allowable impact in this zone	No
D	Agency imposed limits - south	Reefs at Victor Island		• No allowable impact in this zone	No
E	Set-back buffers for B, C and D	See B, C and D	See B, C and D	See B, C and D	No
F	Great Barrier Reef Marine Park outside B-E	-	-	• GBRMP - General Use Zone	**2** Possible option, but high level of administrative constraints. Least potential of the 3 preferred options to result in impacts to sensitive ecological resources.
G	Northern area adjacent to current spoil ground	-	-	• Adjacent to GBRMP General Use Zone • Anchorage removal possible for H2	**1** Priority option. Limited constraints but indirect impacts to GBRMP likely. Some areas have history of impacts from past dumping. Possible reef areas present.
H	Southern nearshore areas, external (H1) and within (H2) navigational limits	-	Limited area within H1	• Anchorage removal possible • Adjacent to Port limits	**3** Possible option. Limited constraints but indirect impacts to GBRMP likely. No history of impacts from past dumping. Small area.

5 ENVIRONMENTAL APPROVALS

5.1 Applicable Commonwealth Legislation

Environmental Protection (Sea Dumping) Act 1981

The loading for the purposes of dumping and dumping of material at sea in Australian waters is regulated by the Commonwealth under the *Environment Protection (Sea Dumping) Act 1981* (Sea Dumping Act). Australian waters extend from the low water mark to the outer edge of the Exclusive Economic Zone (EEZ), to those parts of the continental shelf that are beyond the limit of the EEZ and waters above the Australian continental shelf beyond the limit of the EEZ.

The Sea Dumping Act was amended on 16 August 2000 to incorporate the 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Waste and Other Matter, 1972 (the 1996 Protocol to the London Convention).

The DEH administers the Sea Dumping Act and issues permits for all sea dumping activities from vessels, aircraft and platforms in Australian waters, and all dumping activities from Australian vessels and aircraft anywhere at sea.

Since the Sea Dumping Act has jurisdiction to the low water mark, a permit from the DEH is required for sea dumping. For applications for new permits (as will be the case for this project), the *National Ocean Disposal Guidelines for Dredged Material* (NODGDM – Environment Australia 2002) provides guidance for applications in addressing those issues which need to be considered in the disposal of dredge spoil. This includes guidance in the selection of appropriate disposal sites, the parameters of which have been addressed within this document. Section 19 of the Act sets out the range of considerations which the Minister is bound to consider when assessing an application.

While most permits are issued on an annual basis, the DEH has provisions for obtaining longer term permits up to a five year limit. The NODGDM indicate, in such a circumstance, the procedures required to gain a long term permit through the approval of a Long Term Dredge Spoil Management Strategy (LTDSMS), evidence of regular TACC meetings, and appropriate documentation of long term monitoring programs. In such a case, a five year dredging permit for sea dumping activities may be considered. Agreement regarding longer term permits include assurances by both parties: DEH undertakes to duly process successive annual permit applications in accordance with the Sea Dumping Act; while the port authority agrees to keep DEH fully informed of sea dumping operations and the outcomes of long term monitoring and undertakes to fully comply with any permit conditions. Such long term agreements will only apply to ongoing or recurring dredging activities and do not apply to one off or capital dredging projects.

Any long term permit would revert to Stage 2 if permit, reporting or monitoring requirements were considered unsatisfactory by DEH. The primary objectives of a LTDSMS for the Port of Hay Point would be:

- To establish an agreed framework for the long term environmental management of dredged material disposal activities;

- To provide greater financial, operational and scientific planning certainty to the Port in relation to dredged material disposal activities;
- To facilitate long term Port development and management plans; and,
- To establish longer term predictability for Port sea dumping arrangements.

For the above reasons, there are advantages in proceeding with a LTDSMS to provide the basis for on-going permitting. Otherwise, if the annual permitting procedure is to be continued, then the process outlined in Section 1.5 of the Ocean Disposal Guidelines would need to be followed.

Environmental Protection and Biodiversity Conservation Act 1999

For all sea dumping activities that are the subject of a permit application under the Sea Dumping Act, DEH will make a determination (in accordance with Section 160 of the EPBC Act) whether approval is also required under Part 9 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Minister will consider whether the action will have an impact on a matter of national environmental significance. Under the EPBC Act, matters of national environmental significance (NES) are:

- World Heritage property
- National Heritage places
- Ramsar wetlands of international importance
- listed threatened species and communities
- migratory species protected under international agreements
- nuclear actions, and
- the Commonwealth marine environment

If the project is determined to be a 'controlled action' under Section 67 of the Act, then the various levels of assessment under the EPBC Act will apply. Three of the above matters of NES ie. World Heritage property (the site is in the Great Barrier Reef World Heritage Area), listed threatened species and communities (certain marine mammal and turtle species may occur in the area) and migratory species may trigger the determination of controlled action. Any application for a sea dumping permit will act as a referral under the EPBC Act and a separate referral is not required.

It should be noted that if the proposed disposal site was located inside the Great Barrier Reef Marine Park, then assessment under the EPBC Act would not be required (see below). However, the requirement for a Marine Parks permit will necessitate addressing issues that would need to have otherwise been covered under the EPBC Act process in any event.

Great Barrier Reef Marine Park Act 1975

The Great Barrier Reef Marine Park (GBRMP) extends to the low water mark for much of the Queensland coastline however the Port of Hay Point lies within an exclusion zone. The Marine Park lies approximately 5km off-shore from the Hay Point Terminal while the existing disposal area lies approximately 610m from the boundary at the closest point. As indicated previously in Section 4.1.2 however, the 2001 permit for the Stage 6 and 7 dredging included areas within the GBRMP through a change in boundary.

A Marine Parks permit may be required where the activity has potential direct or indirect impacts on the GBRMP. Within the GBRMP, it is an exception to the general rule that DEH is the determining authority. GBRMPA has delegated authority under the Sea Dumping Act *w*ithin the boundary of the GBRMP. Where an application is made to the GBRMPA for a Marine Parks permit, in addition to the *GBRMP Act*, the authority will consider the Sea Dumping Act, National Ocean Disposal Guidelines, *Great Barrier Reef Marine Park Regulations 1983* (GBRMP Regulations) and the GBRMPA's draft policy on Dredging and Spoil Disposal. It should be noted however, that the onus is on the proponent making the application to show that all environmental impacts are acceptable. Should approval be sought for a Sea Dumping Permit outside of but in proximity to the Park boundary, there is a possibility that a Marine Parks Permit may be required due to consideration of potential indirect impacts.

Other legislation

Other Commonwealth legislation that may be relevant to dredging and disposal of spoil in marine waters includes:

- *Australian Heritage Commission Act 1975.*
- *Native Title Act 1993.*
- *Native Shipwrecks Act 1976.*
- *Aboriginal and Torres Strait Islanders Protection Act 1983.*

In this case, it is unlikely that these four pieces of legislation will apply.

5.2 State Legislation

There is a plethora of Queensland legislation, regulations, policies and guidelines which govern the issuance of permits for both dredging and the disposal of dredge spoil, and the effects these activities will have on the biological, chemical and physical nature of the environment. While the primary piece of legislation in Queensland with regard to pollution of the environment is the *Environment Protection Act 1994 (Qld)* (EP Act), the regulatory mechanisms which must be taken into account when examining the impacts of a dredge spoil disposal episode and the issuance of a permit, are many and varied. It should be noted that the mechanisms in Queensland do not consider disposal separately to dredging activity. Permits obtained in Queensland cover both dredging and disposal, and thus consider the impacts of both activities in the assessment processes.

At a State level, the main regulatory mechanisms that may be triggered in relation to the disposal of dredge spoil at sites offshore from Hay Point may include, but are not necessarily limited to:

Fisheries Act 1994

The DPI - Fisheries administers the Fisheries Act. If dredged material placement activities involve the removal or disturbance of marine plants (as defined under the *Fisheries Act* 1994 (Fisheries Act)) within State waters or the lands of a declared Fish Habitat Area, a permit under Section 51 of the Fisheries Act must be obtained. There is no Fish Habitat Area within or adjacent to the Port of Hay Point (the nearest is the Bassett Basin Fish Habitat Area near the mouth of the Pioneer River),

however macroalgae (which is defined as marine vegetation) is likely to be affected by dredged material disposal activities although this would need to be confirmed through field survey. Under current procedures, an application under Section 51 may thus be required to be made to the DPI Fisheries.

It is possible that by the time an application is to be made, certain approval processes within the Fisheries Act will have been rolled into the *Integrated Planning Act 1997* (see below). However there are two categories of approval processes that are undertaken under the Fisheries Act – these being a 'resource allocation' and a 'development approval'. The latter will occur through the Integrated Development Assessment System (IDAS) process and be integrated into the forthcoming amendment to IPA procedures. It is probable that in such a case, that the EPA would become the Assessment Manager (through its jurisdiction of the Coastal Act and the Environmental Protection Act) and DPI Fisheries would become a Concurrence Agency.

Coastal Protection and Management Act 1995 **(including the State and Regional Coastal Management Plans)**

The *Coastal Protection and Management Act 1995* (Coastal Act) was amended recently to ensure that all developments in the coastal zone are assessed with regard to coastal ecosystems and to be integrated into the IDAS process under the *IPA.* These include any approvals as previously required under the *Beach Protection Act 1968, Canals Act 1958* and *Harbours Act 1955* (within the *Transport Infrastructure Act 1995).*

The State Coastal Management Plan, (the State Plan) has been developed under the Coastal Act. The State Plan describes how the coastal zone and its resources are to be managed. 'Coastal zone' is defined as coastal waters (s9 Coastal Act- Qld waters to the limit of the Highest Astronomical Tide - HAT), and all areas to the landward side of coastal waters in which there are physical features, ecological or natural process that affect, or potentially affect, the coast or coastal resources (s11 Coastal Act). Thus, the recommended area for the dumping of dredged material is likely to be covered under the State Plan. However, as is the case with the Fisheries Act and the Environmental Protection Act, Queensland's jurisdiction can only extend for a distance of three nautical miles seaward of the HAT boundary along the coastline. Depending on the area applied for under the Sea Dumping Permit, it is possible that in some locations within the Port area, especially within the GBRMP boundary, that Queensland legislation has no direct jurisdiction.

The State Plan outlines management policies for dredging (2.1.7 State Plan). The State Coastal Plan aims to achieve the best environmental outcome for the dumping of dredge spoil.

Regional Coastal Management Plans (Regional Plans) are also required as part of the Coordinated Management objective of the State Plan. Three regional plans have been prepared to date. Currently there is no plan, in either final or draft form, for the Whitsunday Coast Region, which includes the Mackay/ Hay Point area.

Current spoil disposal operations are regulated under a permit under section 86 of the repealed *Harbours Act* (issued on 12 June 2001). The main provision in the permit relating to spoil disposal limits is the requirement for spoil placement to be limited to a maximum height of RL –9m. Note that this was an amendment to the previous limit of RL –10m.

Integrated Planning Act 1997

The Integrated Planning Act (IPA) outlines the assessment and approval (IDAS) which is used for licences and permits required under, *inter alia*, the EP Act (see below), the Coastal Act (see above) and the Fisheries Act *(*see above). In terms of the Coastal Act and the recent integration into IPA, the change has introduced a new item of assessable development in Schedule 8 of the act. Local government is normally the Assessment Manager for development applications but, in this case, the EPA is likely to be the Assessment Manager as dredging in tidal/ off-shore waters is not assessable development under a local authority planning scheme. Schedule 1 of the Act will be triggered which indicates the assessment process for the application under IDAS i.e. code assessment or impact assessment. In this case, the development will be code assessable. This means that there will be no requirement for public notification and a third party cannot appeal the decision on an application. The code for the purposes of the assessment refers to the relevant laws and policies administered by the EPA such as the Coastal Act and the State and Regional Coastal Management Plan (when developed).

When the Fisheries Act is rolled into IPA (expected in late 2004), it is likely that the Department of Primary Industries and Fisheries will be a Concurrence Agency to the EPA in the situation of dredge spoil disposal in tidal/ marine areas. As indicated above, for applications for spoil disposal at locations in excess of three nm from HAT, the IPA would not apply.

Environmental Protection Act 1994

Specifically ERA 19, which in consideration of the action of dredging, requires the EPA to consider the disposal of the spoil. This comes under the IDAS process within *IPA.* The EPA would also be required to consider the *Environmental Protection Regulation 1998, Environmental Protection (Water) Policy 1997* (which refers to the *Australian New Zealand Guidelines for Fresh and Marine Water Quality 2000*) and the *Environmental Protection (Waste Management) Policy 2000.*

An amendment to the existing Environmental Authority covering dredging activity at the Port will be required. This amendment would be likely to be covered under the application to be made under the provisions of the IPA.

***Marine Parks Act 1982* (and the *Marine Parks Act Regulations 1990*)**

A Marine Parks permit is required where certain activities may impact on a State Marine Park. This permit would be issued in the same permit as the Marine Parks permit for the GBRMP. The nearest State marine park to the recommended site is the Mackay/ Capricorn Marine Park- Broadsound Management Area which is some 20km to the south at the nearest point on the boundary. Accordingly, a permit under this act will not be required.

Nature Conservation Act 1992

This Act aims to conserve nature (protected areas and protected wildlife) through integrated management and conservation. Under the Act, areas requiring protection include National Parks, Conservation Parks, World Heritage Management Areas and International Agreement Areas. The associated Regulation categorises species of conservation significance ie. Endangered wildlife, Vulnerable wildlife, etc., and for each category there is a management intent. There are various

offences under this Act for interfering with protected plants or animals located within areas of major interest. There are a number of species of conservation significance that may occur in the general area (refer Section 3.3.2.2).

No applications are required under this legislation in this case.

Other Legislation and policies

Other Queensland legislation that may be relevant to dredged material disposal activities includes:

- the *Aboriginal Cultural Heritage Act 2003.* This act has recently (16 April 2004) replaced the *Cultural Record (Landscapes Queensland and Queensland Estate) Act 1987.* The act seeks to protect and manage Aboriginal cultural heritage through the use of cultural heritage management plans, which may be prepared voluntarily or are required for certain high impact activities. The implications for the proposed new spoil site are unlikely to be significant at this stage however it may be an expectation that at some time in the future, an overall cultural heritage plan be prepared that addresses all of the Port's activities.
- the *Queensland Heritage Act 1992* applies to protection of areas, relics, etc listed on the State's Heritage Register. This act does not apply to the recommended spoil placement area.
- the Environmental Policy for Queensland Ports will apply to the spoil disposal and would be implemented under the framework of the Port of Hay Point Environmental Management Plan. With the new spoil disposal area, a minor amendment to the Plan (mainly Section 4.9) would be necessary.

5.3 Summary and Approval Implications

Depending on the area to be applied for and timing of the application, the approvals that are likely to be required are as follows:

Commonwealth

If the selected site is not in GBRMP Area (or in close proximity), then:

- a Sea Dumping Permit from the DEH will be required; and
- a referral under the *EPBC Act* will automatically be made by DEH to determine whether it will be a controlled action. Subsequent processes for the assessment of the action will then apply.

If the site is within GBRMP, then an application for a Marine Parks Permit will need to be made to GBRMPA. However a referral to DEH under the EPBC Act will not be required.

State

The Fisheries Act permitting requirements will be rolled into the Integrated Planning Act in late 2004 and, after this time an application is to be made, an application would be made to the EPA under the IPA procedures. This application would cover approvals under the Coastal Act, the Fisheries Act and the Environmental Protection Act. Applications under other legislation are unlikely to be requested. Should the Fisheries Act not have been rolled into IPA by the time applications are to be made, then a permit under Section 51 of the act will need to be sought should marine plants be likely to be disturbed.

6 CONCLUSIONS & RECOMMENDATIONS FOR SPOIL GROUND SITE

6.1 Key Conclusions

- PCQ requires a new spoil ground with a capacity of 15 million m^3.
- Most of the study area (Port Limits) is situated within waters where either spoil disposal is unlikely to gain the requisite approvals because of environmental regulations or waters identified as having navigational constraints.
- The study area also includes large areas of seafloor which is located within the General Use Zone of the GBRMP area. The GBRMP area that does not have significant navigation/ environmental constraints has an approximate area of 1046 ha, and has a total capacity of 36.2 million m^3. This far exceeds PCQ's requirements in the foreseeable future.
- Spoil dumping in this GBRMP area (Block F) is considered to be the least likely to result in impacts to sensitive ecological resources. As currents run in a predominantly north-north-west / south-south-east direction, turbid plumes would tend to move past (eastwards of) Flat Top and Round Top Islands, reducing the risk of impacts to reef environments. To further reduce the likelihood of impacts to Flat Top and Round Top Islands, it would be preferable for any spoil disposal in Block F to be in the eastern sections. An area of approximately 430 ha would be required to accommodate 15 million m^3 at an average placement depth of 3.5m.
- There are significant potential administrative constraints associated with spoil disposal in the GBRMP. An area outside GBRMP, situated directly adjacent to the existing spoil ground, has been identified (referred to as Block G). Based on existing bathymetry charts and survey data, this block has a potential volume[6] of 11.3 million m^3, assuming (i) the area seaward of the western boundary of the existing spoil ground (G1) is filled to an average bed level of –10m LAT; and (ii) the area landward of the western boundary of the existing spoil ground (G2) is filled to an average bed level of –9m LAT. The total capacity of this area is approximately 8.6 million m^3 if it is all filled to an average level of –10m LAT.
- From an administrative/approvals perspective, Block G is the preferred area for future spoil disposal activities however it does not have sufficient capacity to accommodate the full 15 million m^3 required. There are some caveats on using this area as follows:
  - This area could contain terrigenous patch reefs. Further surveys would be required to address this issue; and
  - The northern portions of this block are situated closer to the GBRMP and reef environments (at Round Top and Flat Top Islands) than the existing spoil ground. The risk of environmental impacts to these areas is therefore greater for Block G compared to the existing spoil ground. The risk of impact could be further compounded given the larger relative spoil volume of potential future dredging campaigns (e.g. as part of channel alignment capital dredging) compared to existing dredging episodes.

6 Note that this volume calculation assumes that disposal occurs in waters directly adjacent to, but not within, the GBRMP boundary. The GBRMPA can require a Marine Parks Permit if it considers there are likely to be indirect impacts (i.e. impacts associated with turbid plumes or spoil dispersal) to the GBRMP (see Section 5).

- Depending on the area to be applied for and timing of the application, the approvals that are likely to be required are as follows:
  - If the selected site is not in GBRMP Area (or in close proximity), then a Sea Dumping Permit from the DEH will be required; and a referral under the EPBC Act will automatically be made by DEH to determine whether it will be a 'controlled action' and subsequent processes for the assessment of the action.
  - If the site is within GBRMP, then an application for a Marine Parks Permit will need to be made to GBRMPA. However a referral to DEH under the EPBC Act will not be required.
  - Approvals will be required under the Integrated Planning Act, which by the time the application is made should cover approvals under the Coastal Act, the Fisheries Act and the Environmental Protection Act. Should the Fisheries Act not have been rolled into IPA the time applications are to be made, then a permit under Section 51 of the act will only need to be sought should marine plants be likely to be disturbed.

6.2 Further Studies

This study represents Stage 1 of a multi-stage process. The following additional investigation stages are recommended:

Stage 2. Initial presentation of preferred options with relevant stakeholders and government authorities (Technical Advisory Consultative Committee TACC, if established).

Stage 3. Detailed environmental studies at Blocks F, G and H. This would be expected to involve, as a minimum, the following (pending advice from stakeholders/TACC in Stage 2):

i. Modelling in turbid plume behaviour for each option.

ii. Seabed surveys (e.g. diver, underwater video assessments).

iii. Grain size analysis studies of sediments to be dredged and within each of the three blocks.

Stage 4. Additional liaison with regulatory authorities and seek approvals based on outcomes of Stages 1, 2 and 3 investigations.

This process should be coordinated and managed within a Long Term Dredge Spoil Management Strategy (LTDSMS). The NODGDM (Environment Australia 2002) outlines the process that should be followed in the development of a LTDSMS.

7 REFERENCES

ANCA (1996). A Directory of Important Wetlands in Australia. Australian Nature Conservation Agency, Canberra.

ANZECC (2001). *Ocean Disposal Guideline for Dredged and Excavated Materials.* ANZECC Publication.

Beach Protection Authority (1990)

Beumer, J., Carseldine, L. and Zeller, B. (1997). *Declared Fish Habitat Areas in Queensland,* Fisheries Group, Queendland Department of Primary Industries, QI 97004. Brisbane. February 1997.

Coles, R.G., and W. Lee Long, S.A. Helmke, R.E. Bennet, K.J. Miller and K.J. Derbyshire (1993). *Seagrass Beds and Juvenile Prawn and Fish Nursery Grounds,* Bowen to Rockhampton. Information Bulletin, DPI, Brisbane.

Coles, R.G., Mellors JE, Bibby JM & Squire BA (1987). *Seagrass Beds and Junvenile Prawn Nursery Grounds between Bowen and Water Park Point.* Queensland Department of Primary Industries Information Series No. QI-87021, Brisbane.

Cramer V. (2000). *Bakers Creek Conservation Park Management Plan,* QPWS, Rockhampton.

Dames & Moore (1996). *Port of Hay Point Draft Impact Assessment Study (IAS). Dalrymple Bay Coal Terminal Stage 3 Expansion, Hay Point Coal Terminal Upgrade.* Public Report prepared for the Ports Corporation of Queensland.

Duke, N. and Bell, A. (2003). *Serious Dieback of Mangroves around Mackay*, Centre for Marine Studies, University of Queensland.

Environment Australia (2002) *National Ocean Disposal Guidelines for Dredged Material,* Department of Environment and Heritage, Canberra.

Gallagher, Lee. Turtle Watch Co-ordinator – personal communication.

GBRMPA (2002). Draft Policy – Dredging and Spoil Disposal, GBRMPA April 2002.

Hopkins, E. and White, M. (1998). Dredging, Extraction and Spoil Disposal Activities – Departmental procedure for provision of fisheries comments. Fish Habitat Management Operational Policy FHMOP004, Department of Primary Industries, Brisbane

Hydrobiology (2004). *Macroinvertebrate Sampling – Port of Hay Point (September 2003).* Report for Ports Corporation of Queensland.

Le Provost Dames and Moore (2000). *Port of Hay Point Sea Floor Survey for Stage 6 and 7 Expansions, DBCT Terminal.* Report for Ports Corporation of Queensland.

Marsh, H., Corkeron, P., Lawler, I., Lanyon, J. and Preen A. (1996). *The Status of the Dugong in Southern Great Barrier Reef Marine Park*, GBRMA Public No. 41, 1996, ANZECC (2000).

Murphy, D. (1994). *Land Based Sewage Effluent Disposal Options for Mackay: A Preliminary Investigations of Wetlands in the Bassett Basin.* Unpublished report for Mackay City Council November 1994

PCQ (1995).*Oil Spill Contingency Plan.* Prepared by Response Tech and WBM March 1995

Ports Corporation of Queensland (2002). *Port of Hay Point Environmental Management Plan.*

Ports Corporation of Queensland (2003). *Port of Hay Point – Land Use Strategy.*

Qld Department of Environmental Heritage (1993) (QDEH). Water Quality Data Report Queensland, January 1988 to December 1991. Data Report No 4, Division of Environment.

Queensland Department of Transport (2000). *The Official Tide Table and Boating Safety Guide* DoT 2000.

Queensland Parks and Wildlife Service (QPWS) 2003. *Turtle Population Dynamics in the Hay Point, Abbot Point and Lucinda Port Areas.* Report for Ports Corporation of Queensland June 2003.

Rasheed, M., Roder, C. and Thomas R.: (2001). *Port of Mackay – Seagrass, Algae and Macro-Invertebrate Communities* - February 2001. Report to the Mackay Port Authority. Qld Fisheries Services, Cairns.

Terra Search (1995). *Sediment Sampling and Analysis to support a Sea Dumping Permit Application – Port of Hay Point.* Unpublished report to the Ports Corporation of Queensland by Terra Search Pty Ltd, Charters Towers, Queensland, May 1995.

URS (2000). *Dalrymple Bay Coal Terminal Expansion Draft EIS*, prepared for Ports Corporation of Queensland.

WBM (1992a). *Environmental Studies associated with proposed maintenance dredging at DBCT Wharf.* Unpublished Report (fro Job No. 7510) to the Harbours Corporation of Queensland (now Ports Corporation of Queensland), by WBM Oceanics, Spring Hill, Brisbane, Queensland, August 1992.

WBM (1993a). *Attachment to CEPA Sea Dumping Application Form – Proposed Capital Dredging DBCT Berth Extension and Appendix I,* prepared for Ports Corporation of Queensland, by WBM Oceanics, Spring Hill, Brisbane, Queensland, January 1993.

WBM (1993b). *Coal spillage at Hay Point, Environmental Issues.* Unpublished Report (Job No. 7711) to the Ports Corporation of Queensland, by WBM Oceanics, Spring Hill, Brisbane, Queensland, July 1993.

WBM (1993c). *Dredge Spoil Monitoring Dalrymple Bay Coal Terminal Berth #2 Extension Dredging.* Report prepared for Ports Corporation of Queensland, November 1993.

WBM (2000). *Dalrymple Bay Coal Terminal Expansion Coastal Process Investigations.* Unpublished Report to the URS Australia; WBM Oceanics July 2000.

WBM (2001, (c)). *Hay Point Macroinvertebrate Monitoring* – 2001 Surveys. Report to Ports Corporation of Queensland.

WBM (2001,(a)). *Seasonal Turbidity Measurements in the Dalrymple Area.* Report to Ports Corporation of Queensland.

WBM (2001, (b)). *Aerial Surveillance of Dredging Plumes Associated with the Expansion of the Dalrymple Bay Coal Terminal, Hay Point.* Report to Ports Corporation of Queensland.

APPENDIX A: KEY DATA SOURCES USED TO ASSESS CRITERIA

Constraint	DATA SOURCE
a) Intertidal Flats	PCQ map/QDPI
b) Reefs/rocky shores	PCQ map, QDPI CHRIS, Rasheed 2001
c) Marine plants (seagrass, saltmarsh, mangroves,etc)	PCQ map and QDPI CHRIS, Coles 1993, 2001
d) Dugong Protection Areas	QPWS, GBRMPA
e) Conservation/National Parks	EPA
f) Fish Habitat Areas	QDPI CHRIS
g) Turtle nesting areas	EPA/Turtle Watch
h) Ramsar wetland	WBM/DEH
i) Great Barrier Reef Marine Park	PCQ map/GBRMPA
j) Queensland Heritage (incl cultural heritage) site	EPA
k) Places on Register of National Estate	DEH
l) Wetlands of National Importance	DEH
m) History of impacts from dredging and spoil disposal	PCQ liaison, Existing reports
n) Important Fishing Areas	CHRIS database, existing reports
o) Prescribed navigation area (mooringsand anchorages, shipping channel,approach and departure paths)	Regional Harbour Master
p) Hay Point Port limits	PCQ Map
q) Spoil contaminant concentrations	PCQ reports, WBM, existing reports
r) Water depth	DEM - nautical charts
s) Distance from dredge area (economic radius for travel)	PCQ liaison
t) Spoil ground area/life	PCQ liaison
u) Dredge manoeuvrability (currents,etc)	Regional Harbour Master/PCQ
v) Sediment granulometry relative to spoil ground	Existing reports
w) Spoil volume	PCQ liaison