


Civil Engineering Department
Port Works Division

Environmental Impact Assessment :
*Dredging an Area of Kellett Bank for
Reprovisioning of Six Government
Mooring Buoys*

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For and on behalf of Environmental Resources Management
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Position: <u>EXECUTIVE DIRECTOR</u>
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Environmental Impact Assessment: Dredging an Area of Kellett Bank for Reprovisioning of Six Government Mooring Buoys

- Executive Summary -

INTRODUCTION

This Executive Summary presents the main findings and recommendations of the Environmental Impact Assessment for the proposed dredging at Kellett Bank.

BACKGROUND

The 62 Government Mooring Buoys (GMBs) currently in operation in Hong Kong Harbour supply midstream mooring facilities for much of the break-bulk cargo, and approximately one quarter of the container vessels, entering Hong Kong. The buoys serve as a "safety valve" when land-based port facilities are congested, and are increasingly in demand as the current Container Terminals (CT8) reach capacity prior to the provision of further port facilities (CT10, CT11 and the River Trade Terminal).

Recently, a number of the buoys and anchorages have been removed to allow for reclamation and development of several sites around the harbour. These include the removal of four 'A' buoys and two 'B' buoys to allow the development of a Naval Base on the southern coast of Stonecutters Island. As the Port and Airport Development Strategy (PADS) policy states that affected buoys will be replaced on a one to one basis, the affected buoys are to be reprovisioned at Kellett Bank. This will involve the dredging of 105 ha of seabed, to depths of either -11.8 mCD (81 ha) or -8.8 mCD (24 ha), depending on location (*Figure 1*). The work will be conducted in three phases and will generate approximately 3.55 Mm³ of material. Sediment characterisation studies have indicated that contamination appears to be largely confined to the top 2 m of sediment. Contaminated dredged materials will be taken to Contaminated Mud Pit IV at East Sha Chau for disposal. Uncontaminated materials will be assigned capacity at a designated open water or a marine borrow area site at the discretion of the Fill Management Committee.

An Environmental Impact Assessment (EIA) was prepared to provide information on the nature and extent of potential environmental impacts arising from the proposed dredging operations. Key issues addressed include identification and evaluation of impacts on water quality, fisheries, marine ecology, air quality and noise. The EIA also recommends an operational design for the proposed dredging project which will minimise environmental impacts by incorporating mitigation measures.

THE PROPOSED PROJECT

The proposed dredging would involve the use of multiple grab dredgers working simultaneously, and sequentially, within one of the three dredging zones within the Kellett Bank works area (Zones A, B and C) (*Figure 2*). Programme estimates derived from information on dredging site characteristics and volumes to be dredged indicated that the proposed works can be accomplished within 48 weeks by employing two grabs for a period of 42 weeks

and three grabs for a period of 6 weeks⁽¹⁾. Using this preliminary operational design as a basis, the EIA explored whether further restrictions in the form of numbers of plant, or spatial or temporal limits, should be applied as mitigation measures to reduce potential impacts to acceptable levels. The details of the assessments are provided in the following sections. The resulting operational design for the project is presented below:

- Simultaneous dredging using three grab dredgers of combined capacity not exceeding 24 m³ is environmentally acceptable under all seasonal-tidal conditions and for all three dredging zones (Zones A, B and C).
- Due to concerns regarding the influence of elevated suspended sediment concentrations on water intakes in the immediate vicinity of the works areas, it is recommended that sediment loss rates are minimised, if possible as a project-specific sediment release control measure, by minimising the rate of dredging in Zone C. It is likely that the third grab dredger can be programmed to avoid dredging in Zone C.
- Contaminated sediments are to be dredged using grabs of no more than 8 m³ capacity in order to minimise overdredging volumes and thus conserve valuable disposal capacity.
- Assuming concurrent projects with the potential for unacceptable cumulative impacts (ie CT9 sand dredging and South Tsing Yi backfilling) are conducted with implementation of mitigation measures agreed in a previous EIA (CT9 sand dredging) or are conducted at rates similar to those in use at present (South Tsing Yi Backfilling), impacts are expected to be environmentally acceptable.
- In order to achieve compliance with the GW-TM night-time noise criterion for the period 2300-0700 hours, dredging shall either be prohibited within Zones B and C during this period, or alternatively, reduced to two dredger-tug boat combinations in Zones B and C and prohibited within a radius of 1350 m from the residential development at Shek Tong Tsui.

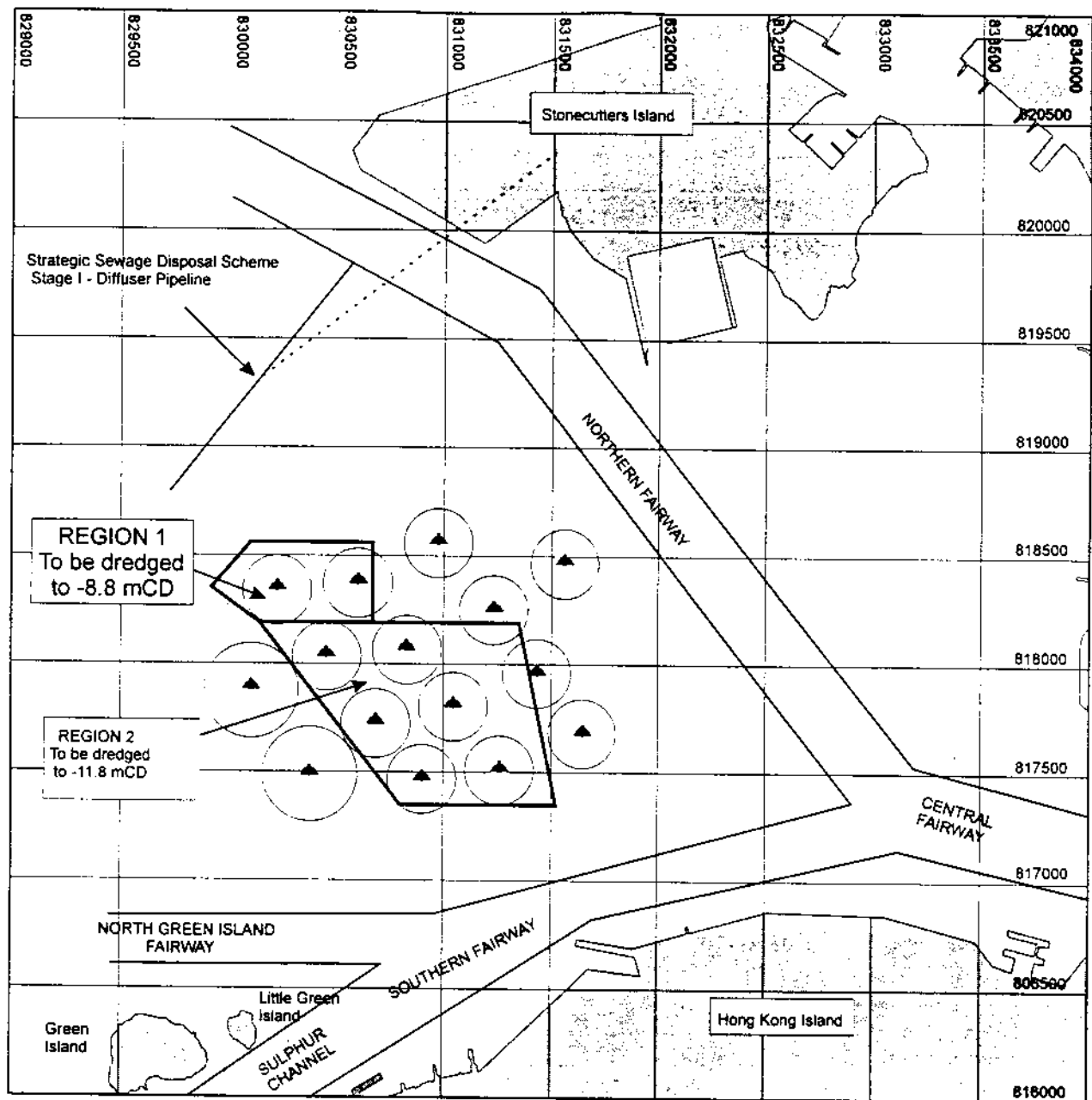
STUDY FINDINGS AND RECOMMENDATIONS


The EIA conducted assessments of water quality, fisheries, marine ecology, air quality and noise. The findings of the assessments are summarised below.

Water Quality

Water quality impacts associated with the proposed dredging at Kellett Bank were evaluated using the Delft 3D mathematical models. Predicted concentrations of suspended sediments and resulting dissolved oxygen (DO) depletions, elevations of nutrients and contaminants, and deposition rates for sediment were derived. These predictions were used to assess the impact of dredging operations on the water quality of the Study Area and on specific sensitive receivers. Modelling scenarios were designed to evaluate the maximum acceptable number of grab dredgers working under worst case

⁽¹⁾ Final Design Scenarios Working Paper, prepared under the EIA Study for Dredging an Area of Kellett Bank for Re-provisioning of Six Government Mooring Buoys, CED Port Works Division, November 1997.



 Government Mooring Buoy and Swinging Radius
(only those in and immediately adjacent to the dredging area are shown)

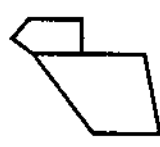
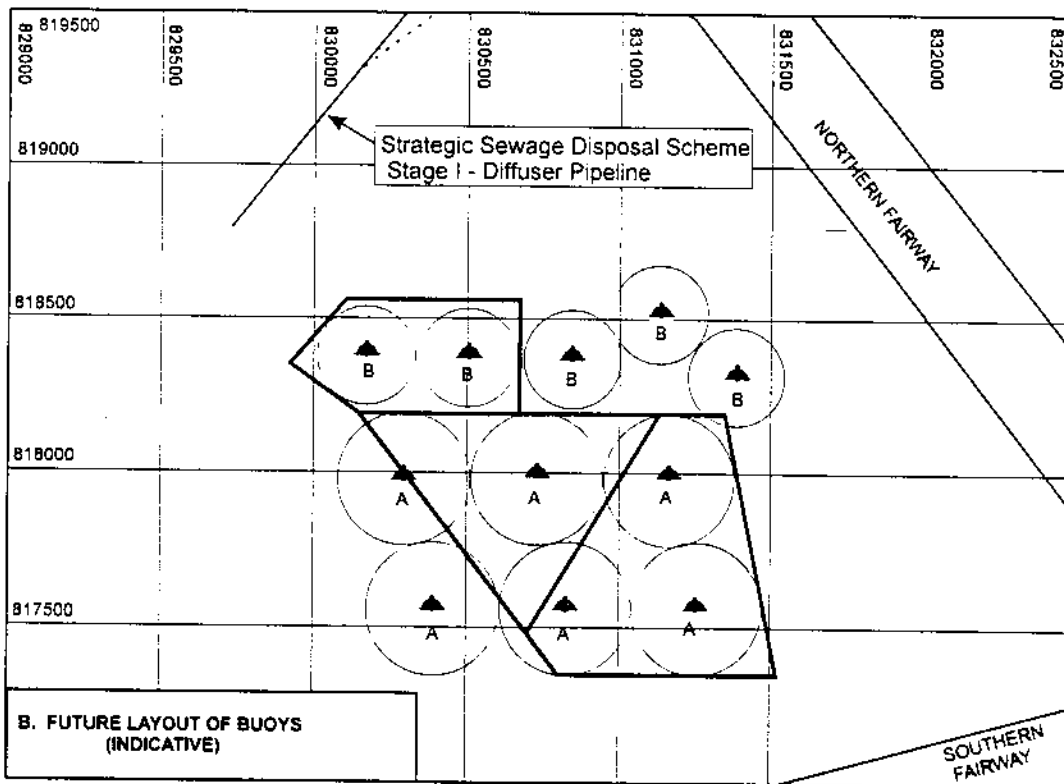
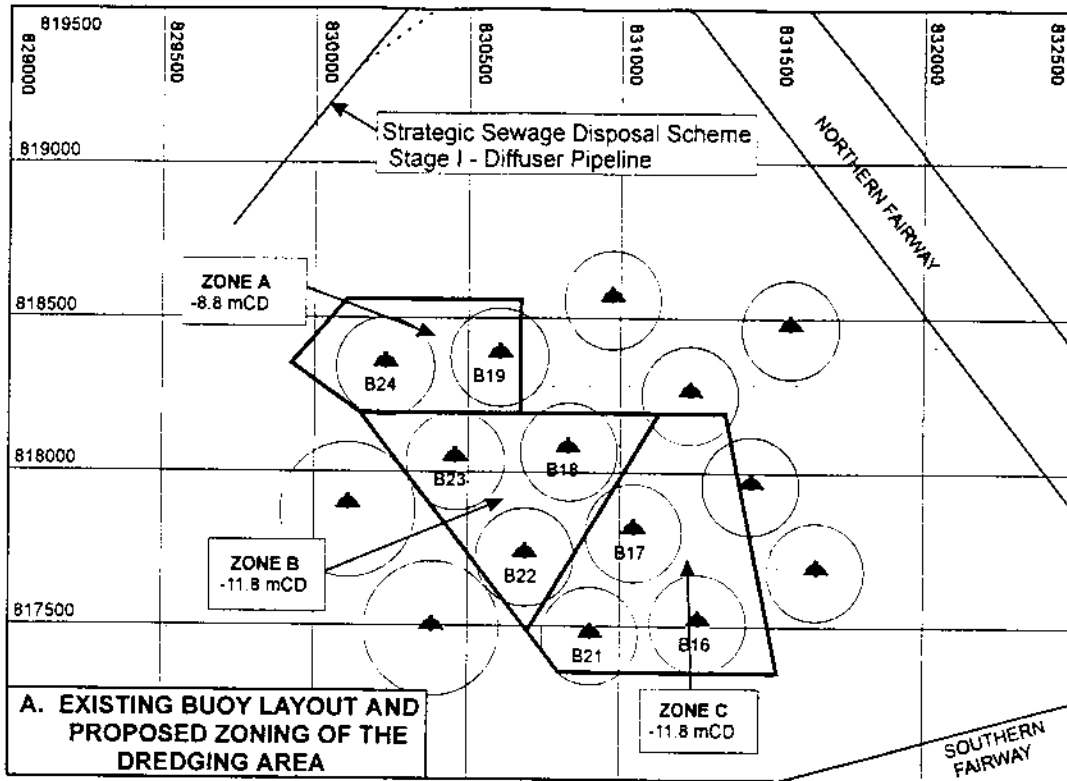
 Area to be dredged

FIGURE 1 SITE PLAN FOR DREDGING OF KELLETT BANK

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 Government Mooring Buoy and Swinging Radius
 (only those in and immediately adjacent to the dredging area are shown)

FIGURE 2 EXISTING AND FUTURE BUOY LOCATIONS AND PROPOSED ZONING OF THE DREDGING AREA

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conditions (neap tide, dry season and dredging Zone C) and to specify mitigation measures necessary to minimise adverse impacts.

The modelling of three grab dredgers working simultaneously under the worst case conditions (Scenario 8) resulted in predicted elevations of suspended solids (SS) at the sensitive receivers which are all below an assessment criterion of 10 mg L^{-1} (elevation). Application of the water quality objective for SS, defined as a 30% elevation above ambient (ie the 90th percentile), indicates that the WQO would be exceeded only at water intakes in the immediate vicinity of the works area. The magnitude of these exceedances is very small and ranges from 1.7 mg L^{-1} in the Wanchai area to 2.9 mg L^{-1} in the Central/Sheung Wan area. In addition, it is noted that these exceedances would occur only during a brief period (several hours) during each tidal cycle under the worst case season, tide and dredging zone scenario. Based on this information, the predicted elevations of SS resulting from proposed operations at Kellett Bank are considered environmentally acceptable.

Aside from the above environmental criteria, water intake operators may apply their own engineering-based criteria to protect their abstraction systems. In order to determine whether the minor predicted elevations were acceptable to water intake operators, potentially affected intake operators were consulted. While many of the operators do not apply fixed criteria for SS, the Water Supplies Department (WSD) advocates use of a criterion of 10 mg L^{-1} (total SS concentration) to protect its intakes at Kennedy Town and Sheung Wan. However, examination of ambient data in the vicinity of the Kennedy Town and Sheung Wan WSD water intakes indicates that ambient mid-depth SS concentrations already exceed this criterion (ie ambient of 14.9 mg L^{-1} at Kennedy Town and ambient of 13.7 mg L^{-1} at Sheung Wan). These data reveal that applying the criterion of 10 mg L^{-1} total SS concentration provides zero tolerance for SS elevations due to any other source and cannot be complied with even under normal ambient conditions. Given that the predicted elevations are low, transient and are not likely to exceed the range of concentrations experienced under existing conditions, no special mitigation measures are recommended for immediate implementation. Nevertheless, in order to minimise all unnecessary influence of SS on water intakes it is recommended, if possible as a project-specific sediment release control measure, to minimise sediment loss within Zone C (nearest the intakes) by avoiding use of the third grab dredger in this area. In addition, the EM&A programme will provide for periodic monitoring at both WSD intakes and specify additional mitigation measures (eg silt curtains) if SS elevations are observed at unacceptable levels.

Depletions of dissolved oxygen, elevations of nutrient and contaminant concentrations, and deposition for the scenario involving three grab dredgers operating at once are predicted to be minimal. Resulting dissolved oxygen and nutrient concentrations comply with the applicable WQOs, and maximum resulting elevations of contaminants represent, in all cases, less than 4% of mean ambient levels. The hydrodynamic assessment indicated that the proposed dredging will have a negligible effect on current speeds and directions in the Study Area.

In the cumulative impact assessment, it was predicted that the water quality impacts of the Kellett Bank dredging activities, in conjunction with other concurrent projects would in some cases be substantial if the concurrent projects are pursued without mitigation. However, since concurrent projects will be mitigated either through contractual/operational requirements and/or through

their own EM&A programme, a further assessment of potential effects was conducted. These further assessments utilised the results of previous EIAs for concurrent projects to determine cumulative impacts. Under these mitigated scenarios, cumulative impacts to water quality are predicted to be environmentally acceptable. Cumulative impacts will be monitored and controlled under the Kellett Bank EM&A programme and under EM&A programmes for all concurrent projects.

Commercial Fisheries Resources

A review of existing information, supplemented with the results of recently undertaken field surveys, on commercial fisheries resources located within and around the Kellett Bank dredging area has identified the area as supporting low abundances of fisheries resources. Information from a recent study on fishing operations in Hong Kong indicates that fisheries production from the area is low and few vessels depend on the area for their catches.

Potential impacts to fisheries resources and operations may arise from disturbances to benthic habitats, changes in water quality and contaminant release. Disturbances to benthic habitats are predicted to be largely confined within the dredging area. Sediment deposition outside of the dredging area is minimal and not anticipated to impact fisheries resources. As changes in water quality will be minimal and transient, adverse impacts to fisheries resources are not predicted to arise. Assessment of contaminant release has indicated minimal concentrations will be released and are not predicted to impact fisheries resources.

As impacts arising from the proposed dredging works are thus predicted to be largely confined to the dredging area, they are not expected to cause adverse impacts to any fishing grounds or species of importance to the fishery. While no special mitigation measures are required for fisheries resources, constraints on dredging operations recommended to control impacts to water quality to within acceptable levels are also expected to mitigate impacts to fisheries resources. Cumulative impacts predicted to arise from the proposed dredging operations in conjunction with concurrent projects are not expected to result in greater adverse impacts to fisheries resources than impacts arising from the concurrent projects independently.

Marine Ecology

A review of existing information supplemented with the results of recently undertaken field surveys indicate that the Study Area supports soft benthos, subtidal and intertidal hard surface assemblages. Information on baseline conditions suggests that no species of conservation importance have been recorded from the area, with the exception of soft corals in the Sulphur Channel.

The intertidal assemblages found on man-made seawalls in the Study Area were of low ecological value. The natural intertidal assemblages in the Study Area at Green Island, Little Green Island and Kau Yi Chau were abundant and diverse, though typical of semi-exposed shores in Hong Kong, and considered to be of medium ecological value. Information concerning subtidal hard surface assemblages indicated that the shores of Green Island and Little Green Island supported abundant assemblages of soft corals. The soft shore assemblages were, however, depauperate and composed mainly of polychaetes. From the literature review, the Study Area was not considered as important to marine mammals.

Based upon the assessment of baseline marine ecological conditions in the Kellett Bank Study Area, marine ecological sensitive receivers which may be affected by the proposed dredging works included the intertidal and subtidal hard surface assemblages on Green Island and Little Green Island. Potential impacts to marine ecological resources from the Kellett Bank dredging operations may arise either indirectly, eg through perturbations of the surrounding water quality, or directly as a result of habitat loss during dredging. Indirect impacts during the dredging phase, such as an increase in suspended sediment concentrations and decrease in dissolved oxygen in the water column may impact intertidal and subtidal filter feeders, soft corals and other marine organisms. Water quality modelling indicated that increases in SS will occur in the vicinity of the marine ecological sensitive receivers. The increases, however, fall within the natural range of SS levels, do not exceed the WQO and are thus not predicted to impact these assemblages. Sediment deposition in the Study Area is not anticipated to impact the sensitive receivers as levels are below critical concentration thresholds obtained from the literature. Direct impacts will occur through habitat loss in the area that is to be dredged and will affect the soft benthos assemblages. These assemblages are of low ecological value and thus the predicted impacts are considered to be acceptable.

Impacts arising from the proposed dredging works are predicted to be largely confined to within the dredging area and will not cause adverse impacts to any habitats or species of conservation importance. Constraints on dredging operations recommended to reduce impacts to water quality to acceptable levels are expected to also mitigate for effects on ecology. Therefore, no special mitigation measures are recommended for ecological sensitive receivers. Cumulative impacts predicted to arise from the proposed dredging operations in conjunction with concurrent projects are not expected to result in greater adverse impacts to ecological sensitive receivers than impacts arising from the concurrent projects independently.

Air Quality

The assessment has indicated that no exceedances of the AQOs are anticipated and thus no unacceptable impacts to air quality are expected during the dredging operations involving three grab dredgers/tug boat combinations. In addition, cumulative impacts from the concurrent projects are also predicted to comply with the AQO criteria. Mitigation measures and an air quality monitoring programme for the dredging operations are not necessary.

Noise

The noise assessment indicates that the noise impacts of the proposed dredging operations at Kellett Bank alone or with concurrent projects will not lead to

exceedance of either the daytime or evening criteria (EIAO-TM) at the identified noise sensitive receivers. For the night-time period, exceedance of 1-5 dB(A) at residential developments along Shek Tong Tsui is predicted when dredging works within Zones B and C of Kellett Bank are considered alone or in combination with concurrent projects. In order to achieve compliance with the night-time noise criterion (GW-TM), mitigation measures were developed and incorporated into the operational design. Dredging works in accordance with this revised operational design are not predicted to result in unacceptable noise impacts.

OVERALL CONCLUSIONS

The detailed assessment of environmental impacts upon water quality, fisheries, marine ecology, air quality and noise arising from the dredging activities at Kellett Bank indicates that there are unlikely to be any insurmountable or unacceptable residual environmental impacts associated with the proposed operations.

The Study included the development of an operational design which consists of appropriate mitigation measures to control and minimise environmental impacts to acceptable levels. Actual impacts during the dredging operations will be monitored through an EM&A programme which is specified in an EM&A Manual released as a separate document to the EIA. The EM&A programme will provide management actions and supplemental mitigation measures to be employed should impacts arise, thereby ensuring the environmental acceptability of the project.