



Government of Hong Kong
Civil Engineering Department
Civil Engineering Office

**LANTAU PORT DEVELOPMENT
- STAGE 1
CONTAINER TERMINALS NO. 10 & 11
ANCILLARY WORKS (DESIGN)**

Environmental Impact Assessment

Executive Summary

December 1994

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EXECUTIVE SUMMARY

1. INTRODUCTION

- 1.1 The Port & Airport Development Strategy Study recommended that the primary area for expansion of Hong Kong's port facilities should be along the north east shore of Lantau Island.
- 1.2 The Lantau Port Peninsula Development Study and the Western Harbour Development Study (LAPH studies) were subsequently commissioned in 1991 to investigate the feasibility of developing land and marine based port facilities in this location. Environmental Impact Assessments were carried out during these studies.
- 1.3 The LAPH studies recommended that the port should be developed in four phases. Stage 1 comprises the following works elements of Phases I and II :
 - (a) Container Terminals Nos. 10 and 11 (CT10 and 11);
 - (b) container back up areas (CBA) for CT10 and 11;
 - (c) serviced land for industrial development, business parks, open space and G/IC facilities;
 - (d) a breakwater;
 - (e) dredged access channels; and
 - (f) road links and utility services.
- 1.4 The scope of Stage 1 in relation to the whole development is shown on Figure 1. Items (b), (c) and (f) from the above list are referred to as the Ancillary Works in this Report.
- 1.5 The present study was commissioned in August 1993 by the Civil Engineering Office of the Civil Engineering Department to carry out master planning for the CBA and serviced land together with detailed engineering designs for the latter. Engineering designs for the CBA are being undertaken by the Civil Engineering Department (CED) while a parallel study (the CT10 and 11 Preliminary Design, referred to in this report as the "container terminal study") is carrying out preliminary engineering design for CT10 and CT11. Figure 2 shows the interface between the two studies, the design of the container terminals and the Master Layout Plan for the Ancillary Works.

1.6 An environmental impact assessment (EIA) has been commissioned to consider the cumulative environmental impacts of certain aspects of Stage 1. The scope of work of the EIA includes the following:

(a) Construction Stage

(i) Air and Noise Pollution

The impacts from the Ancillary Works, breakwater and dredged access channel have been assessed in this Study while the impacts from CT10 and 11 have been assessed by the container terminal study consultants. Cumulative impacts from construction are included in this Study based on CT10 and 11 data prepared by the container terminal study consultants.

(ii) Water Pollution

Mathematical modelling studies have been used as a basis for assessment of impacts due to dredging and any changes in water quality in the Discovery Bay embayment during construction of Stage 1 of the port.

(iii) Ecology

The Study has included a survey of the use of the water body by the Chinese White Dolphin and an assessment of the water quality impacts of the development with reference to the impacts on marine habitats.

(b) Operation Stage

(i) Air Pollution

This study has used data from the container terminal study to prepare cumulative impacts, following the same approach as for air pollution during construction.

(ii) Noise Pollution

A noise impact assessment has been carried out for all Phases of the Lantau Port. The impacts for Phases I and II backup areas and the Ancillary Works have been assessed in this Study while the impacts of operational noise from CT10 to CT13 and the Phase III and IV backup areas have been assessed by the container terminal study consultants.

Cumulative impacts from noise pollution during operation of Stage 1 were compiled by the container terminal study consultants and are summarised in this report.

(iii) Water Pollution

Water pollution impacts during operation have been considered to have been assessed in sufficient detail in the LAPH studies. These have not been considered further in this Study except that predictions of nutrient loadings and dissolved oxygen in the Discovery Bay area have been carried out.

2. OBJECTIVES OF THE ENVIRONMENTAL ASSESSMENT STUDY

2.1 The EIA has the following objectives :

- (a) to describe the characteristics of the proposed project and related facilities and the requirements for their development;
- (b) to identify and describe the existing and proposed elements of the community and environment likely to affect or be affected by the proposed project;
- (c) to minimize pollution, environmental disturbance and nuisance arising from the project and related facilities and its construction and operation;
- (d) to identify, predict and evaluate the net environmental impacts and cumulative effects expected to arise due to the construction and operation of the project in relation to the existing and planned community and the neighbouring land uses;
- (e) to identify and specify cost-effective methods, measures and standards for the inclusion into the design, which are necessary to mitigate impacts to an acceptable level;
- (f) to recommend environmental monitoring and audit requirements necessary to ensure the effectiveness of the environmental protection measures adopted;
- (g) to identify the nature and extent of the potential environmental impacts associated with the mitigation measures recommended in the study e.g. placement of noise bunds and to propose methods to minimize identified impacts;
- (h) to identify other potential constraints associated with the mitigation measures recommended in the study, e.g. structural, visual, maintenance problems, and so recommend proposals to resolve the constraints; and
- (i) to identify additional studies where necessary to fulfil the objectives or requirements of this Assignment.

3. ENVIRONMENTAL STANDARDS

3.1 The assessment has used the Hong Kong Planning Standards and Guidelines (HKPSG) as a guide for the acceptability of environmental impacts. Air pollution impacts have been assessed against the Air Quality Objectives and water pollution impacts have been assessed against the Water Quality Objectives. Noise impacts during the operational stage have been assessed against the HKPSG (that is the planning standard which is 5 dB(A) below the appropriate NCO criteria) for the entire Lantau Port development. For assessing the night-time impacts from the Ancillary Works, the criterion of 35 dB(A) has been adopted. Construction noise has been assessed following the NCO criteria.

4. CONSTRUCTION IMPACTS

Air Pollution

Dust Sources and Sensitive Receivers

- 4.1 Sensitive receivers for air pollution during construction include the residential development at Discovery Bay, isolated housing on Peng Chau and at Fa Peng and Tso Wan, and the power station in Penny's Bay. These are shown on Figure 2.

Activities which could cause dust impacts are:

- (a) cutting of slopes around Penny's Bay and at the head of the bay to form a corridor for the access road from the North Lantau Expressway. There will be some (very limited) blasting of slopes but it has been assumed that the mega-quarry on north east Lantau will not be used for construction of CT10 and 11.
- (b) vehicles moving on the reclamation and haul roads;
- (c) handling materials; and
- (d) wind blown dust from open areas of the site.

The reclamation itself will be formed from marine fill which will be wet and will not cause any dust while being placed.

Dust Impacts and Mitigation

- 4.2 Dust levels during construction should be within the Air Quality Objectives at all receivers in the vicinity of the project so long as the contractors apply dust mitigation.
- 4.3 Practicable dust mitigation measures which have been recommended to reduce dust emissions from the site include :
- (a) watering haul roads and the surrounding site;
 - (b) water sprays during handling of fill;
 - (c) reducing haul road speeds; and
 - (d) paving of haul roads.

Noise Pollution

Noise Sources and Sensitive Receivers

- 4.4 Sensitive receivers for noise will be located at Discovery Bay and the residential areas on Peng Chau, Fa Peng and Tso Wan. The power station in Penny's Bay will not be a sensitive receiver for noise.
- 4.5 It has been assumed that the only construction activity that will need to proceed at night (2300 to 0700 hours) or on Sundays or public holidays will be sandfilling for the reclamation. Large volumes will need to be dredged and filled and extended working hours are inevitably required in order to complete the works within the required

timeframe. The maintenance of a reasonable steady sandfilling rate, for the sake of controlling water quality to within acceptable levels, practically translates to 24 hour operation. If the working hours for sand filling are reduced, the rate of sand filling work will have to be increased accordingly. Such increase in the sandfilling would more than likely impose additional undesirable impacts on the ambient water quality. Other activities (including dredging of marine mud) have been assumed to proceed in the day time and evening (0700 to 2300 hours) on normal working days.

Noise Impacts and Mitigation

- 4.6 Noise impacts from construction activities have been predicted to be within the HKPSG criterion for all unrestricted periods except at the isolated housing at Peng Chau where the limit will be exceeded for a short period of time.
- 4.7 Cumulative construction impacts during non-restricted periods (that is daytime from 0700 to 1900 hours on normal weekdays) could exceed the 60 dB(A) guideline by 7 dB(A) at the worst affected noise sensitive receivers, Fa Peng and Peng Chau, unless mitigation is applied. The major contribution to the noise will be from the CT10 and 11 works. Mitigation of noise from the Ancillary Areas should be applied but this alone will not reduce the cumulative noise impacts to within the 60 dB(A) guideline at all receivers. The container terminal study has considered mitigation of noise during construction and has concluded that these noise impacts can be reduced to acceptable levels. The cumulative noise assessment carried out for this Study has concluded that the cumulative noise levels will also be within the guideline so long as noise mitigation is applied.
- 4.8 The Study has recommended that noise mitigation should include :
- (a) use of silenced equipment;
 - (b) scheduling of activities to avoid parallel operations of several sets of powered mechanical equipment;
 - (c) siting of equipment as far as practical from noise sensitive receivers; and
 - (d) use of temporary enclosures and/or noise barriers placed close to the noise sources to screen specific receivers;

Water Quality

Pollution Sources and Sensitive Receivers

- 4.9 Sensitive receivers for water quality are the marine waters themselves (where the Water Quality Objectives will apply) and the fish culture zone at Ma Wan. The marine waters are used for fishing, secondary contact recreation in the area within and outside Discovery Bay and primary contact recreation from the beach in Discovery Bay. This beach is not gazetted but is nevertheless heavily used. Usage of the beach at Yi Pak, to the north of the existing Discovery Bay beach, can be expected to increase with the further development of residential areas.
- 4.10 Construction activities which could cause water quality impacts are dredging and reclamation and spills and runoff from works sites. The reclamations and the breakwater will cause changes in water circulation patterns and this could also have an impact on water quality. About 21.6 million cu m of marine deposits will need to be dredged, about sixty percent of this is for the access channel.

Pollution from Construction Activities

4.11 The Study has concluded that:

- (a) the sediment plumes from dredging will not be conveyed to the fish culture zone at Ma Wan due to the distance and current velocities which will combine to dissipate the sediments. The maximum increase in suspended sediments predicted at the Ma Wan fish culture zone is 3mg/l which will be acceptable;
- (b) the increases in suspended sediment loads in Discovery Bay are small in comparison with natural variations in levels of suspended solids (generally less than 5mg/l) and the impact on fisheries will be minimal;
- (c) releases of nutrients during dredging are expected to cause an increase of less than 5 percent above the ambient levels at about 100m from the dredgers. The impact will be undetectable about 250m from the dredging site. Water Quality Objectives for nutrients are already exceeded in the Study Area but the increase resulting from the construction works will be small;
- (d) dredging will cause an increase in suspended sediments in the water column. The impacts will be high close to the dredger but will reduce to close to ambient within about 200m of the dredger; and
- (e) water quality in Penny's Bay will be affected during the works. The impacts will be from suspended sediment levels and nutrient loads.

4.12 The Study has concluded that Water Quality Objectives for dissolved oxygen and suspended solids will be achieved outside Penny's Bay when marine works are being carried out except in the immediate vicinity of the marine plant. The Water Quality Objectives will probably be breached in Penny's Bay.

4.13 Mitigation measures which should be considered to reduce the water quality impacts are:

- (a) either build the seawalls before the reclamation and advance the reclamation programme from the head of the Bay seawards or place fill behind bunds with lagoons for settlement of suspended solids before the tailwaters discharge to the sea;
- (b) restricting the daily dredging rate will reduce the release rate of pollutants to the water column. Parts of the work must proceed at a fast rate in order to achieve the programme for opening CT10 but there is potential for dredging the approach channel at a slower rate to reduce the water quality impacts;
- (c) the dredging contracts should be phased to avoid all marine works commencing at the same time; and
- (d) provide drainage channels at the seaward edge of the reclamation to prevent overflow of surface drainage. Stormwater should be channelled through silt traps or settlement lagoons to reduce the silt load before discharge.

- 4.14 The water movement studies have concluded that there could be areas in the vicinity of the breakwater where water movements will be very slow and where there could be deposition of sediments while dredging for other parts of the port are in progress. This will not be a major impact but maintenance dredging could be needed in the future.

Pollution from Runoff and Effluent

- 4.15 A package treatment plant should be provided for construction effluents until such time as the sewerage connection for the port is made to the Siu Ho Wan Sewage Treatment Works. The facilities must be suitable to accommodate the maximum number of personnel who may be engaged on-site at a given time, and, the discharge point must not be into any embayment or sheltered water.

Contaminated Mud

- 4.16 About 165,000m³ of the mud to be dredged for the project has been classified as contaminated. Special dredging techniques to be applied prior to its disposal to the Contaminated Mud Pits east of Sha Chau will include:
- (a) dredging will need to be carried out in accordance with the requirements of the EPD and Fill Management Committee (FMC), using inter alia closed grabs;
 - (b) no material will be allowed to overflow while being lifted; and
 - (c) the Contractor will be required to apply for a licence to dispose of the marine mud at East Shau Chau and will need to provide details of timing of wastes arisings, volumes, levels of contamination to the FMC in his application.

Ecology

- 4.17 The Chinese White Dolphin, which is listed in the Bonn Convention on the Convention of Migratory Species and is protected in Hong Kong under the Wild Animals Protection Ordinance is known to use this area. A survey of the use of the waters off Discovery Bay by the Chinese White Dolphin has resulted in five confirmed sightings of individuals or groups during a 21 day survey period. Most groups were sighted several times but there was no evidence of feeding or breeding. After comparison with WWF data and data collected during the current Swire Institute of Marine Science study, it was concluded that the study area did not appear to be of significant importance to the Chinese White Dolphins.
- 4.18 It is unlikely that there will be impacts on the dolphins from suspended sediment loads since the dolphins are known to use waters further north in the Pearl River Estuary where suspended sediment loads are much higher. There will, of course, be a physical impact on the dolphins due to the presence of the construction plant and underwater noise should any stressful activities (eg underwater percussive piling) take place;
- 4.19 Fishing will be disrupted to some extent during both construction and operation of the port development, due to loss of fishing grounds and fish fry nurseries as a result of reclamation, increased marine traffic and associated marine pollution.
- 4.20 It is important in this situation that government amasses sufficient statistics on the existing fisheries in the study area to be in a position to adequately assess the potential impacts upon the fishing industry.

4.21 Dredging works may have an impact on the dolphins. Measures which are recommended for the protection of Chinese White Dolphins are:

- (a) the Contractors will be required to undertake dolphin spotting when operating in these waters;
- (b) the Contractors will be required to use predefined and regular routes, especially when disposing of spoil, as these will become known to dolphins and porpoises using these waters;
- (c) the Contractors should be required to provide a buffer/safety zone of at least 500m for the dolphin during stressful construction activities (eg percussive piling) should they take place;
- (d) the Contractor will be required to minimise the impacts of his works on water quality particularly with respect to dissolved oxygen and turbidity; and
- (e) the Contractor should be required to control and manage all effluent from vessels and worksites as described under the water quality recommendations.

5. OPERATION IMPACTS

Air

5.1 Sensitive receivers for air pollution during operation will be the residential areas at Discovery Bay and Peng Chau and the workers at the port itself. Sources of air pollution will be the vehicles and ships using the port and vehicles used for moving containers around the port.

5.2 Modelling of NO₂, CO and RSP emissions has predicted that the AQO's will not be exceeded in either 2001 or 2011 at any receivers.

Noise

5.3 Sensitive receivers for noise during operation will be the residential areas at Discovery Bay, Peng Chau, Fa Peng and Tso Wan . There will be no residential development on the port itself.

5.4 25m high noise bunds have been proposed at the western sides of CT10 and CT11 to reduce noise from terminal operations. The Study has recommended that the CT11 western bund should have a temporary extension to the Sz Pak headland. This may be removed at some time in the future when the lots in this area are released so long as the lessee erects buildings or some other form of barrier with a mitigation equivalent to the noise bund. Suitable buildings are shown on Figure 3. These noise barriers will reduce noise from the terminals to acceptable levels but cumulative impacts from all activities on the port could result in noise levels higher than allowed under the HKPSG. The assessment has shown that the noise planning criteria could be exceeded at Cherish Court and Twilight Court at Discovery Bay and at noise sensitive receivers on Peng Chau even with the extension of the CT11 western noise bund.

5.5 These noise impacts can be mitigated by noise barriers in the CBA, but these would need to be between 9m and 17m high to meet the criterion. Barriers of this height are quite impractical. However, noise can be mitigated at many of the sensitive receivers by using barriers of a more practical height (e.g. 5m) in a larger number of locations. This will be the best practical means of mitigation but planning criteria will still be exceeded Cherish Court, Twilight Court, New Housing and Isolated Housing at Peng Chau by up to about 5 dB(A). The Container Terminal study has taken this into account in assessing the cumulative impact. The locations proposed for the 5m high barriers in the CBA are shown on Figure 4.

- 5.6 Detailed planning of the commercial centre should take account of the clinic which is proposed so that the requirements of the HKPSG will be met.
- 5.7 Traffic noise levels experienced at all sensitive receivers from operation of the port road network within the scope of this study will not exceed the HKPSG level.

Water Quality (Impacts Subsequent to the Completion of Stage 1)

- 5.8 Water quality in the new embayment off Discovery Bay will not be affected during construction of Stage 1 of the port but could deteriorate after commissioning of Stage 1 when the presence of the port reclamations will reduce water movements and flushing of the water body. Measures to avoid this deterioration include the early implementation of the proposals made under the Sewerage Master Plan Study to divert all effluent from Discovery Bay and Peng Chau to the Sui Ho Wan Sewage Treatment Works is considered as a matter of priority and the implementation of that proposal is advanced at the earliest opportunity. Water quality should not deteriorate assuming these recommendations are implemented. The study has concluded that pollution from other contaminants should be within acceptable levels but there could be occasional high impacts from pollutants in stormwater. All possible measures to minimise pollution loads should be implemented and stormwater outfalls should discharge away from the Discovery Bay embayment wherever possible.

6. MONITORING AND AUDIT

- 6.1 Recommendations have been made for monitoring and audit during construction and operation and an Environmental Monitoring and Audit Manual has been prepared for the construction stages. Monitoring during construction and operation will use trigger, action and target levels, based on the appropriate legislation, to test the acceptability of the impacts. Action plans have been developed if impacts exceed the stated levels.
- 6.2 As there will be a number of contractors and terminal operators contributing to the overall impacts it is recommended that an area wide environmental project office be implemented to deal with any problems associated with cumulative environmental impacts.

Figure 1
Study Area

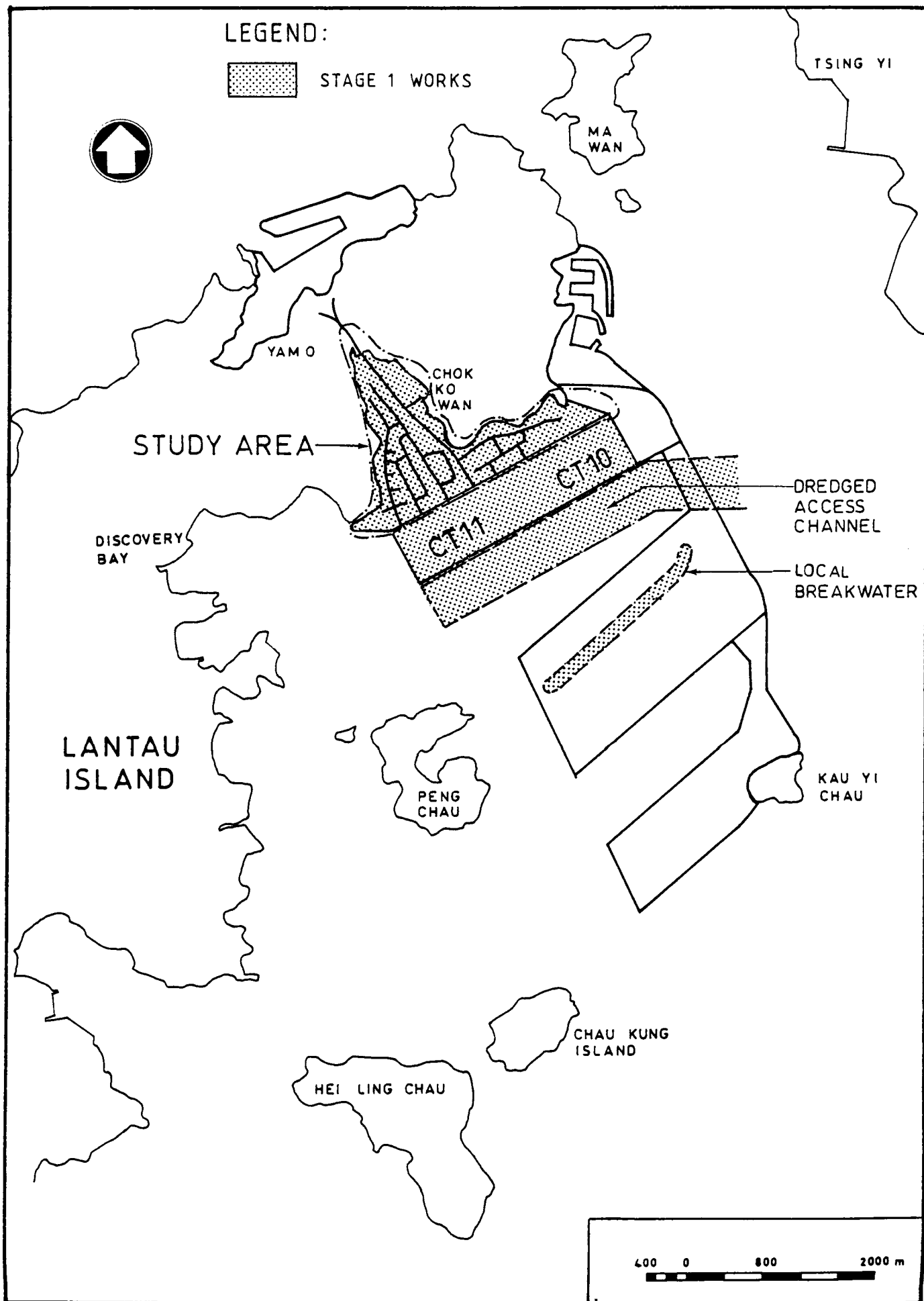


Figure 2
Location of Works and
Sensitive Receivers

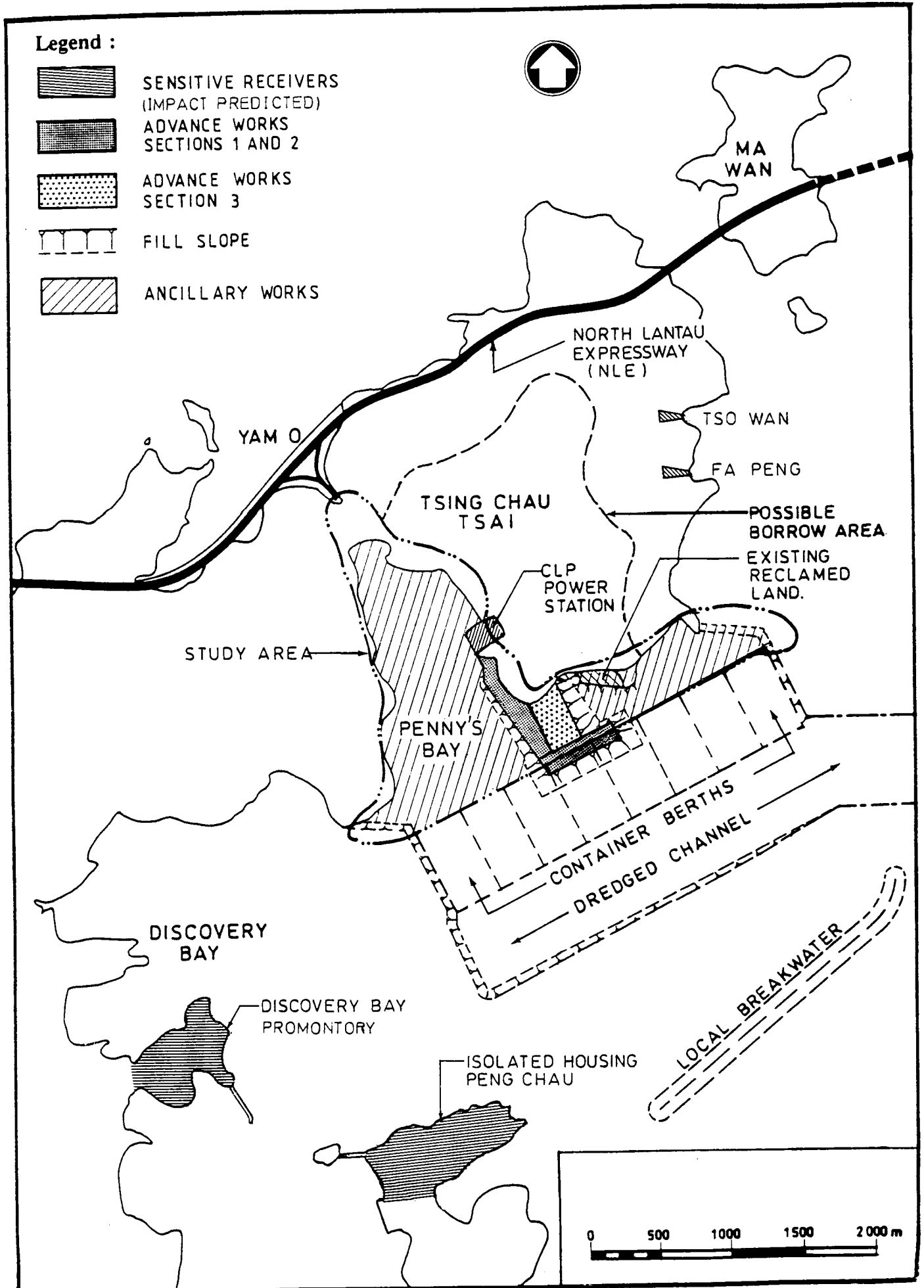


Figure 3
Buildings for Noise Mitigation

