

**Civil Engineering
Department**

Civil Engineering Office

Agreement No. CE 50/94

Lantau Port Development Stage 1

Design of Reclamation and Edge Structures
for Container Terminals 10 and 11
and Back-up Areas


Environmental Impact Assessment Executive Summary

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1 INTRODUCTION

1.1 BACKGROUND

This assignment is referred to as Agreement CE 50/94 Lantau Port Development Stage I - Design of the Reclamation and Edge Structures for Container Terminals (CT) 10 and 11 and Back-up areas. The Project Brief identifies the objective of this assignment as the design and preparation of complete sets of contract documents to provide two reclamation designs for CT10 and for CT11. Earlier studies were conducted under the assumption that during the construction the majority of the seabed sediments would be left in place and consolidated by the weight of reclamation above. Environmental Impact Assessment (EIA) forms a distinct element of the assignment and the requirements of the EIA are clearly defined in the Project Brief.

1.2 EARLIER EIA STUDIES

Earlier EIA studies have investigated construction and operation of the terminals, refining assessment as more detailed information on construction and operation activity has become available. A brief description of the investigations which have preceded this report follows.

In mid 1991 two studies, collectively referred to as the Lantau Port and Western Harbour Development Studies (LAPH), investigated the feasibility of developing land and marine based port facilities on the north-eastern coast of Lantau and in the Western Harbour. The LAPH studies recommended that the Lantau Port be developed in four phases, each phase comprising one terminal and the four phases collectively comprising seventeen berths.

In April 1993 the Land Development Policy Committee recommended that detailed planning and design for the first stage of the Lantau Port development should include the first 8 container berths as identified in LAPH studies. Two separate studies were

commissioned as :

- (i) Lantau Port Development - Stage 1 - Container Terminals 10 and 11 - Preliminary Design; and
- (ii) Lantau Port Development - Stage 1 - Container Terminals 10 and 11 - Ancillary Works.

Both studies included environmental impact assessments and the production of final EIA reports which have been discussed at the Advisory Council on the Environment (ACE). The Lantau Port Stage I Preliminary Design Study modified the later phases of Container Terminal development (CT12 & 13) whilst retaining the initial phases (CT10 & 11) as proposed in the LAPH studies, but incorporated additional noise attenuation structures to mitigate operational noise and visual impacts on sensitive uses to the west.

1.3 THE PRESENT EIA STUDY

This present EIA study represents the third phase of environmental assessment for Container Terminals to be sited adjacent to Penny's Bay on Lantau Island. This EIA document follows on from the earlier reports investigating construction phase impacts of two reclamation techniques, namely :

- dredging the marine sediments prior to reclamation (referred to as the dredged option); and
- updating earlier studies of reclamation with sediments left in-situ (referred to as the drained option).

The principal construction activities which have been considered in this EIA are :

- dredging;
- placing of sandfill below sea water level;
- placing of sandfill above sea water level; and

- moving surcharge.

In broad terms the fully dredged option will necessitate the removal of over five times the quantity of mud (43 Mm³) as the drained option (8 Mm³) and dredging would require a longer period (27 months as opposed to 9 months). The extended period of dredging and its intensity raises concerns over water quality impacts. The drained option relies on consolidation of the underlying marine mud by surcharging. A 12 metre high mound of surcharge would be needed for the drained option whilst the dredged option would require a 4 metre high mound of surcharge. The movement of the surcharge for the drained option necessitates a large fleet of trucks working over an extended period which raises concerns over noise and air quality impacts.

The key areas of concern in this EIA are therefore :

- water quality impact of dredging and filling;
- construction noise, particularly during the movement of surcharge; and
- construction air quality, particularly during the movement of surcharge.

1.4 ELEMENTS EXCLUDED

There are two areas which are specifically excluded from the project brief for this EIA. These are :

- the source of fill material to be used in the reclamation; and
- the disposal site for the marine mud to be dredged in advance of reclamation activity.

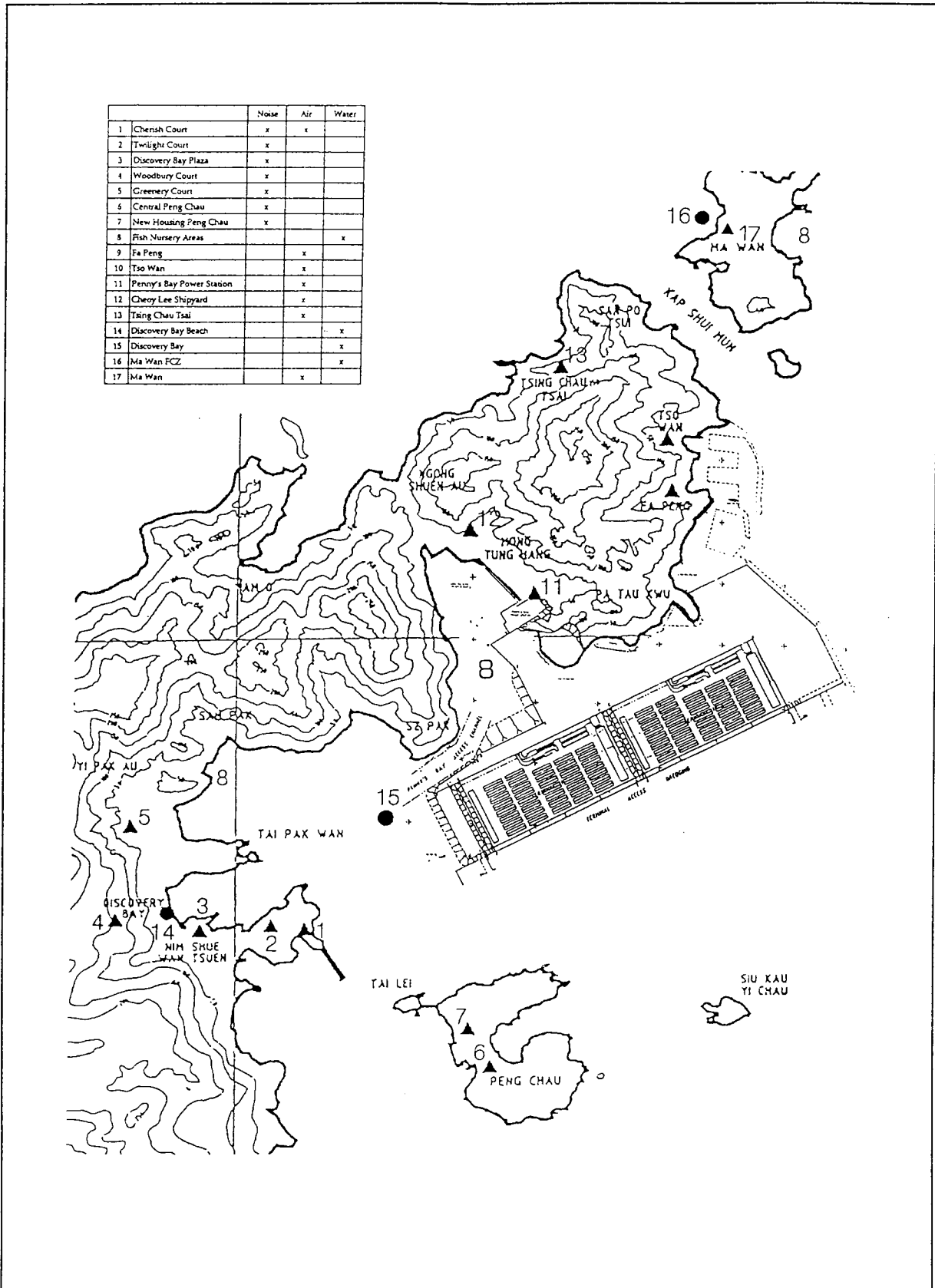
Sources and disposal sites are currently being investigated as part of ongoing work by Government.

1.5 OTHER STUDIES

Additional studies are currently being conducted on the impact from development of the terminals on marine ecology and fisheries. The Civil Engineering Department (CED) have instigated :

- (i) a survey of the Chinese White Dolphin;
- (ii) a fishing catch and effort survey; and
- (iii) a fish fry survey.

These studies will be reported separately.



General Arrangement of Container Terminals 10 & 11

2 SENSITIVE USES

2.1 INTRODUCTION

The terminals will be sited on reclamation adjacent to a relatively isolated area of Hong Kong which has been identified for major change to commercial/industrial usage in the future. This subsection identifies the sensitive receivers chosen as being most susceptible to impact from construction of the terminals. For impacts on water quality a number of sensitive uses have been chosen to reflect the area influenced by tidal excursions. To assess noise impact the closest residential developments to the activity areas have been chosen. While for air quality assessment closest development to the terminal boundary has been selected.

2.2 DISCOVERY BAY

Discovery Bay is a mix of low, medium and high rise housing with limited commercial development situated approximately 2.5 km to the west of CT11. The closest sensitive receivers which are at Peninsula Village, are sited on a promontory south of Discovery Bay ferry terminal. Peninsula Village represents the southern boundary of the Discovery Bay development, other residential areas occupy bays and lower slopes of hillsides further north. The ungazetted beach at Discovery Bay is used for recreational swimming, sailing and fishing.

Discovery Bay is represented as being noise and water quality sensitive.

2.3 PENG CHAU

Peng Chau is an island off the east coast of Lantau approximately 3.0 km south west of CT10 and 11. The population is concentrated in low and medium rise residential areas in the centre of the island. Water quality impacts on Peng Chau have been assessed by selection of indicative modelling points on the north and west side of the island.

Peng Chau is represented as being noise and water quality sensitive.

2.4 MA WAN ISLAND

Ma Wan Island sustains two small communities on the west side of the island, and one of the 26 gazetted fish culture zones in the Territory. It is noted that there has been future major residential development proposed for the island. The residential areas are over 3.0 km from the terminals and topographic shielding is provided from the Tsing Chau Tsai peninsula and the southern uplands of Ma Wan.

Ma Wan is represented as being water quality sensitive.

2.5 PENNY'S BAY

Penny's Bay is located immediately north of the terminals CT10 and 11. The two existing users within Penny's Bay are Cheoy Lee Shipyard and Penny's Bay Power Station, operated by China Light and Power. Penny's Bay will be reclaimed as part of the Lantau Port Development projects and commercial/industrial development will be encouraged. The Cheoy Lee Shipyard will have to close prior to completing the reclamation of Penny's Bay. The Power station has been chosen as an air quality assessment point since it represents the closest occupied site to the terminals.

Penny's Bay is represented as being air and water quality sensitive.

2.6 MARINE WATERS

Marine water quality around the Tsing Chau Tsai (TCT) peninsula is dominated by the effects of the Pearl River which forms a major source of sediment, nutrients and industrial effluent in the area. Discovery Bay itself is a relatively shallow bay with low water velocities.

Residential developments at Discovery Bay

and Peng Chau discharge domestic effluent into Discovery Bay and Cheoy Lee Shipyard and the Power Station discharge into Penny's Bay.

Mariculture is carried out at Ma Wan Island to the north east of the TCT peninsula and there is local fishing activity south of Penny's Bay.

3 ASSESSMENT

3.1 WATER QUALITY

The impact of dredging and filling has been assessed based on mathematical modelling output, with priority given to worst case scenarios.

The impact from release of suspended solids for the two reclamation techniques was evaluated with respect to the Water Quality Objective (WQO), which is defined as a 30% increase over background levels. Using the annual average of data collected by EPD in 1992 as an indication of background levels, it has been concluded that suspended solids at Ma Wan would exceed the WQO for both reclamation techniques. The fully dredged option produced a greater exceedance of this environmental objective (60%) than the drained option, the latter exceedance being marginal (34%). This same Objective was exceeded at Peng Chau for the fully dredged option (50%) but not for the drained option. WQO exceedances were limited to a few hours per day. However, if seasonal values are used as an indication of background levels, based on recent monitoring data for the Ma Wan Mariculture area, then the WQO will be met at all times. Suspended solids at Discovery Bay were low for all scenarios. As this assessment has been conducted on worst case assumptions it is concluded that the real effects will probably be less than predicted and that increases in suspended solids at sensitive receivers will not exceed water quality objectives. This study has not carried out any assessment of the far field issues of fill material source and

marine mud disposal. Conclusions may be altered when these are taken into account.

A secondary area of concern was nutrient introduction into Discovery Bay. Again the worst case scenario was adopted for the predictions and on this basis, it was concluded that there should not be any measurable impact resulting from nutrients desorbed from sediments during dredging. However, to minimise potential for impact it is a recommendation of the EIA that dredging proceeds in such a way as to minimise sediment losses to the water column at all times.

It is recommended that the position of the proposed stormwater outfalls to the west of the Terminals be reviewed. If relocation or diversion of the first flush does occur then positions to either the east or seaward edge of CT10 are preferred to avoid potential eutrophication problems in the Sz Pak embayment and outer Discovery Bay.

Relating water quality to marine resource utilisation, the drained option is preferable in all respects except for the duration and method of fill placement. The drained option requires only approximately one fifth of the dredging and mud disposal, and approximately 70% of the fill requirement as that required by the fully-dredged option. The volumes of contaminated mud which would need to be disposed of are virtually equal. Given that dredging would probably generate more suspended solids in the water column than filling, the drained option offers a reduction of 66% on the duration of this activity for the fully-dredged scheme. The duration of filling is similar at just over two years, but the drained option necessitates the use of rainboring to construct thin layers of fill over the retained mud. Rainboring is a technique of laying sandfill where the sand can be pumped and sprayed from the dredger due to its high water content.

In view of the fact that dredging will be required for 18 months longer for the fully-dredged option, and that rainboring will

not be used to place all the fill for the drained option, it is concluded that in overall terms the drained option offers the least impact to the marine environment.

3.2 NOISE

The assessment has indicated that night-time (23.00 hrs to 07.00 hrs) dredging work can be conducted and remain within the 45 dB(A) criterion. The daytime (07.00 hrs to 19.00 hrs) and evening (19.00 hrs to 23.00 hrs) noise assessment for the drained reclamation option differs from the LPD Stage I Preliminary Design assessment in that surcharge height has been increased to 12 metres, whereas earlier studies had assumed a height of 9 metres, resulting in an increase in the levels of construction activity and associated noise impact. For the fully dredged option only 4 metres of surcharge are needed. Unmitigated peak construction noise impacts have been predicted of 61.3 dB(A) and 64.6 dB(A) for the dredged and drained options respectively. The duration of the noise criteria exceedance would be approximately six months for the dredged option and approximately twenty one months for the drained option.

The assessment has identified mitigation that is capable of reducing the construction noise impact to below the 60 dB(A) daytime and evening criteria. It is believed that with sympathetic programming the noise impacts of the dredged option could be reduced to within the assessment criteria. The criteria for the drained option could be achieved if the number of operating dumptrucks were halved, however this would disrupt the construction programme. In view of the fact that unmitigated construction activity for the drained option would exceed the assessment criteria for fifteen months longer than the fully-dredged option would, and that noise impacts from the former option are less readily mitigated it is concluded that in overall terms the dredged option offers the least noise impact to the environment.

3.3 AIR QUALITY

The results of the modelling study carried out for this assessment have indicated that exceedances of the 1-hour TSP guideline level and 24-hour and annual average TSP Air Quality Objectives may occur during construction of the drained option. However, if haul roads are kept permanently wet, the AQO's will be met at the Power Station in Penny's Bay as well as other air sensitive receivers identified in the EIA. No exceedances of the AQO standards are predicted for the fully dredged option if the mitigation measures identified in the EIA are implemented. The dust generating activities would be identical for the two methods of construction and the difference in air quality impacts arises mainly from the duration and intensity of these activities for the respective options. Hence it has been concluded that the dredged reclamation option offers the least impact on air quality.

3.4 MARINE ECOLOGY

No additional marine ecological studies have been carried out as part of this study. Benthic resources on the reclaimed site will be permanently lost, although the previous LAPH studies have identified that the whole of the area between east Lantau and the proposed Port and Cheung Chau is of low benthic diversity. A survey of the activities of the Chinese White Dolphin (*Sousa chinensis*) was undertaken as part of the Ancillary Works studies but due to the time constraints given, the study was only a cursory investigation that documented the presence of the dolphins in the study area. The Ancillary Works studies concluded that the number of dolphins sighted in the area was small and the area appeared to be less utilised by the dolphins than the waters to the north of Lantau Island. Sighting records up to December 1993 held by the World Wide Fund for Nature (Hong Kong) and data collected during the Swire Institute of Marine Science Study suggested that the area does not appear to be of major significance to the dolphins. Earlier EIA studies carried concluded that the Lantau

Port Development is likely to have minimal impact on the dolphins. Monitoring of dolphin movements during the construction phase has been recommended and has been incorporated into the Environmental Monitoring & Audit Manual produced as part of this study. Civil Engineering Department are currently undertaking a longer term study, to be reported separately.

3.5 WASTE MANAGEMENT

Wastes generated by CT construction works are likely to include: general site wastes such as residues, packaging and containers; workforce wastes from site offices, works canteen and approximately 2000 construction workers; arisings from vehicles, plant equipment servicing and repair facility including wastes classified as Chemical Waste; and arisings from accidental spillage. Formalised site collection, storage and transport to approved disposal facilities will be required. Effluent discharges will need to be licensed and it is anticipated that a treatment system including screens, primary sedimentation, Rotating Biological Contactor (RBC) plant and final sedimentation would be the most appropriate. Effluent discharge points should avoid embayment and areas of low water movement. Discharge to the east where waters are deeper and faster flowing would be the preferred option.

4 MONITORING

An environmental monitoring and audit manual (EM&A) has been produced detailing systematic procedures for the monitoring and audit of impacts on environmental parameters, caused by the construction and operation of CT10 and CT11 and associated developments. This is to ensure that the environmental impacts are maintained within specified limits and if exceedances of limits occur, that appropriate corrective measures can be applied to minimise the impact of pollution events and prevent reoccurrence. The EM&A provides a system for periodic audit compliance

checks, review of monitoring schedules, recording of anomalies and identification of areas for remedial action.

Hong Kong environmental legislation for air quality, noise and water quality and the Hong Kong Planning Standards and Guidelines, as well as the "Environmental Monitoring and Audit - Guidelines for Dust Monitoring" issued by the EPD have been used for the preparation of the EM&A Manual.

Due to the number of simultaneous developments occurring in the area, it will be problematic to monitor and assess the environmental impact caused by a single Contractor or particular operation in isolation. Activities within the terminals, ancillary works area and other infrastructure projects will all contribute to the environment of Northeast Lantau. It is proposed that an independent environmental office is set up, in an arrangement similar to the one adopted on the West Kowloon reclamation (Environmental Protection Office - ENPO).

Data would be collected from a sufficient number of locations, chosen for their ability to identify impact; that is either close to potentially environmentally detrimental activity or close to sensitive uses. The environmental office would monitor site activity on a daily basis, recording where construction activity was concentrated, time of activity, type of activity, plant involved, and a qualitative assessment/ description of the activity. In the event of monitoring detecting an exceedance, the records could be reviewed to identify the potential source of impact. The activities would then be assessed to determine if the cause was a "one off" situation or a general deterioration due to cumulative impact. Focused monitoring could then be investigated to quantify levels of impact from particular activities. This information could be forwarded to EPD and could be used when formulating requirements for Construction Noise Permits (CNP) issue or renewal.

Cumulative operation noise is a particular area of concern, the EM&A Manual proposes that the operators would be required to monitor the plant operating within their terminal and report the details to EPD. This information could be compared with the findings of the noise impact assessment to give assurance that assumptions on activities and plant made in the EIA were not exceeded.