EXECUTIVE SUMMARY

China Light & Power Co Ltd

Focused Environmental Impact Assessment (EIA) Study : *Laying a Second 132kV Submarine Cable Transmission Link from Lau Fau Shan to Shekou*

31 July 1996

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Reference C1505

For and on behalf of ERM-Hong Kong, Ltd

Approved by: [signature]

Position: Technical Director

Date: 31 July 1996

1 INTRODUCTION

1.1 BACKGROUND INFORMATION

The China Light and Power Company Limited, hereafter referred to as CLP, proposes to lay a second 132 kV submarine cable transmission link (No. 2) from Mong Tseng Wai near Lau Fau Shan to Shekou (People's Republic of China, PRC) in Deep Bay, to provide additional electricity supply and reinforce interconnection between Shekou and CLP.

The CLP submarine cable route would be situated within Deep Bay (Hau Hoi Wan), shown on *Figure 1.1a*, which is an environmentally sensitive area, due to the presence of a number of valuable ecological resources, including the Inner Deep Bay Sites of Special Scientific Interest and the Mai Po Nature Reserve, which is a designated Wetland of International Importance under the Ramsar Convention. Concerns have also been expressed about the potential effects of the project on fisheries and shell fisheries resources. EPD have therefore instructed CLP to undertake a Focused Environmental Impact Assessment (EIA) Study, to provide information on the nature and extent of environmental impacts arising from the installation of the cable. This information will contribute to decisions on:

i) the requirements for mitigation measures to be included in the detailed design and installation of the submarine cable; and

ii) the acceptability of any residual impacts after the proposed mitigation measures are implemented and the overall environmental acceptability of the installation of the submarine cable.

1.2 SITE LOCATION

1.2.1 *Sub-sections A-E*

The submarine cable, as illustrated on *Figure 1.1a*, may be subdivided into the following five sub-sections:

- Sub-section A: Lau Fau Shan Shore - the Lau Fau Shan land joint bay (comprising an underground junction box containing the electrical connection between the submarine cable and land based transmission system), length (approximately east-west) 60 m, width 1.2 m, depth 1.2 m. This dry land section is to be formed by land trenching via manual installation methods for 30 m from the land joint bay and thereafter via a combination of backhoe and manual cable installation methods;

- Sub-section B: Lau Fau Shan Shallow Water, length (approximately east-west) 1,700 m, width 0.5 m, depth 1.5 m. This intertidal sub-section is to be formed in part by marine trenching (mini grab dredger) and in part by land based trenching (via backhoe and manual installation) methods;

- Sub-section C: Deeper Water, length (approximately east-west) 6,620 m, width 0.5 m, depth 2 m which is to be formed by cable laying machine;

- Ferry Channel: The Deeper Water section additionally includes a section for a

ferry channel, length (approximately north-south) 480 m, width 2-3 m, depth 2m which is to be formed by a chain bucket dredger;

- Shipping Channel: The Deeper Water section additionally includes a section for a shipping channel, length (approximately north-south) 180 m, width 2-3 m, depth 7 m is to be formed by a chain bucket dredger;

- Sub-section D: Shekou Shallow Water, length (approximately east-west) 300 m, width 0.5 m, depth 2 m. This is to be formed by marine trenching using a mini grab dredger; and

- Sub-section E: Shekou Shore - land joint bay (described above), length (approximately east-west) 50 m, width 1.2 m, depth 1.2 m. This dry land section is to be formed by land trenching via backhoe and manual methods.

1.2.2 *Associated Land Joint Bay and Pressure Tank Installation Works*

In addition to the works described above there will be a small excavation of an underground land joint bay and pressure tank (PT) manhole at the easterly and westerly extent of the submarine cable. This comprises an underground junction box containing the electrical connection between the submarine cable and land based transmission system. The dimensions of this underground structure will be approximately 1.5 m x 1.5 m x 4 m and the construction is scheduled to be undertaken in approximately October 1996.

1.3 PROGRAMME AND CONSTRUCTION PHASING

1.3.1 *General*

It is anticipated that construction will commence in approximately September 1996, and proceed until approximately January 1997. Therefore, dry season has been simulated during the sediment transport (sedplume) and hydraulic modelling, as detailed in *Section* 2. The work will proceed in several phases, as can be seen from the *Figure 1.3a*, however, it should be noted that there will be only one mini grab dredger, cable laying machine and one grab bucket dredger to be employed for the works.

1.3.2 *Combined Activities*

Consideration of the construction programme, *Figure 1.3a*, indicates two separate periods when two activities could be undertaken during the same time period. During approximately week 15 the cable laying machine will be working in sub-section C whilst backfilling of either sub-section B or D could be underway. Additionally, in approximately weeks 4-6 the programme indicates the potential for dredger trenching of sub-section B or D at the same time as the bucket dredging of the shipping channel.

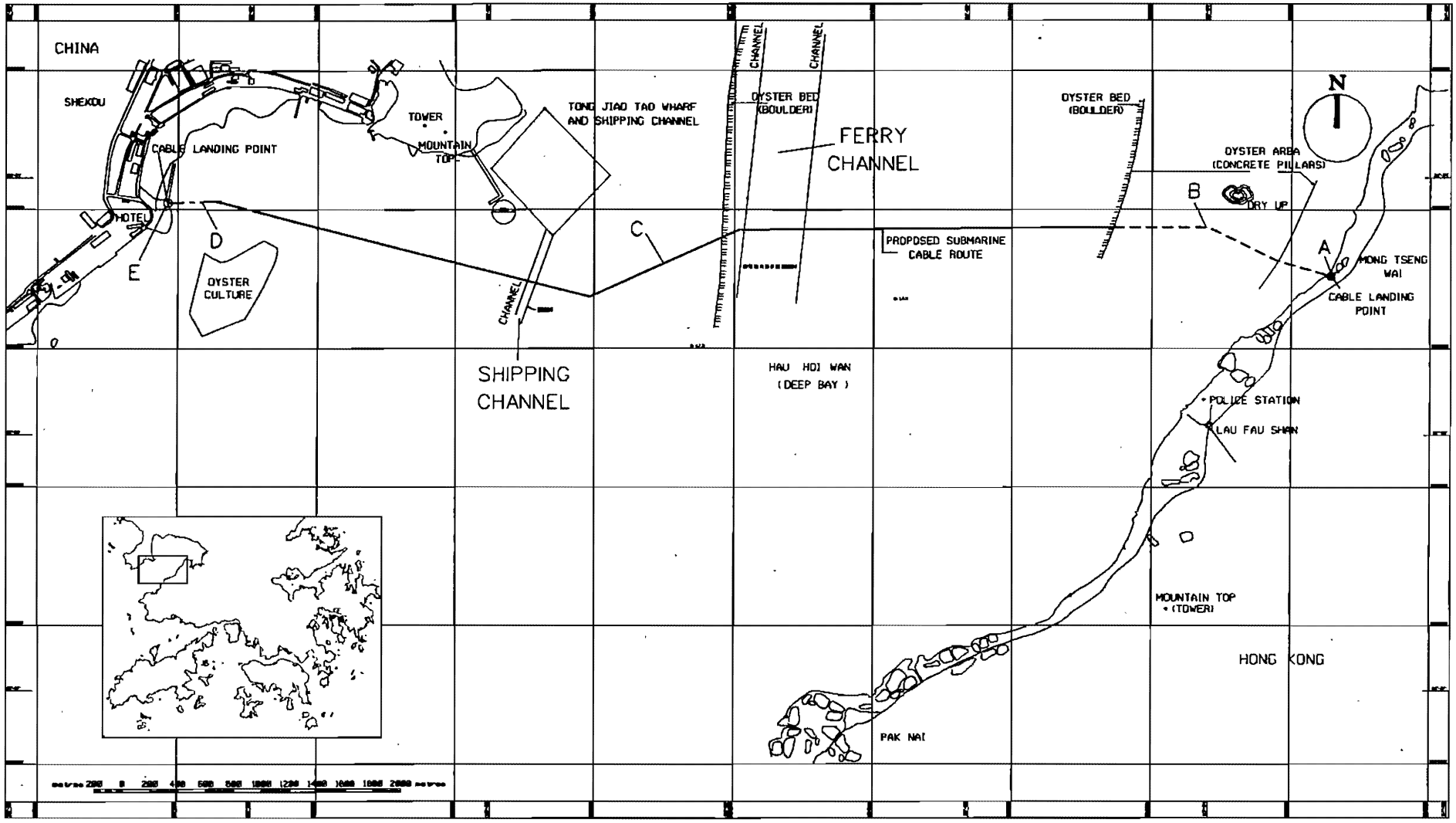

FIGURE 1.1a Proposed Route for 2nd 132kV Submarine Cable Shekou (PRC) - Lau Fau Shan

Date : 7 June 1996 | Drawing No.: /Contract/C1505/C1505_1

Sources : Base map - Lands Dept. 1:20k topo

Prepared by ERM's GIS & MAPPING Group

KEY

Proposed Submarine Cable Route

- Section A
- Section B
- Section C
- Section D
- Section E

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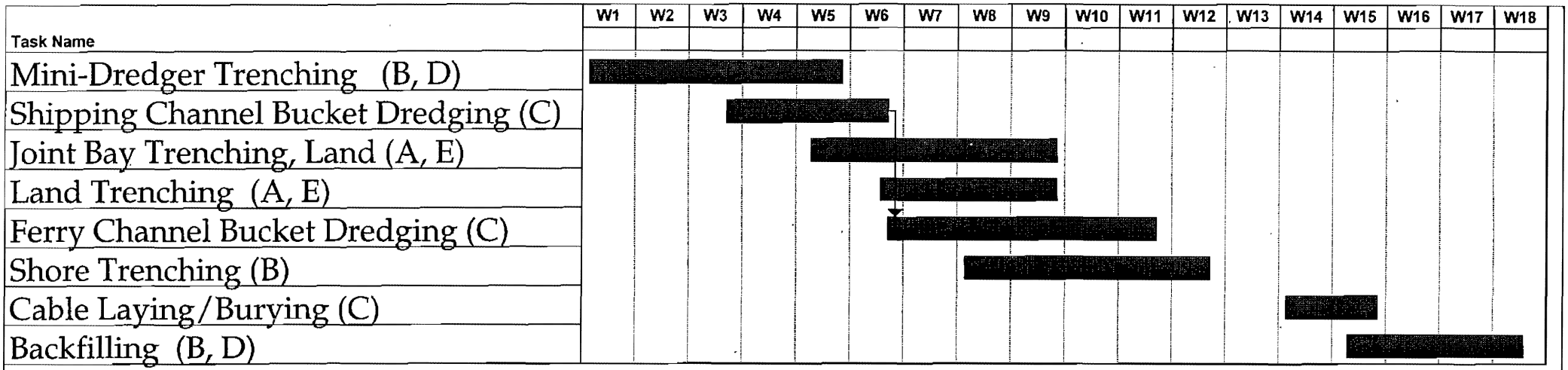

Project Programme, Figure 1.3a

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress

2 WATER QUALITY

2.1 INTRODUCTION

This section summarises potential water quality impacts associated with the proposed cable laying activities between Lau Fau Shan and Shekou. In order to examine potential impacts, sediment plume modelling simulations on the worst case scenarios (as described in *Section 1.3.2*) were carried out. The CLP submarine cable installation will take place in the dry season when Deep Bay waters are essentially unstratified. Such condition allows the application of WAHMO for sediment plume impact assessment with minimal model limitation. Impacts investigated include those associated with potential increases in suspended solids concentrations, and decreases in dissolved oxygen concentrations.

2.2 SUMMARY OF RESULTS

Review of the likely sediment quality in the Study Area indicates that the marine sediments which may be disturbed during the proposed cable laying will be uncontaminated (Class A). Thus, the main potential effects of the works on water quality will be the elevation of suspended solids and reduction in dissolved oxygen. Worst case cable laying scenarios were assessed using sediment plume modelling andthe results concluded that the cable laying in isolation, whilst temporarily elevating suspended solids in the immediate vicinity of the cable laying, would not lead to WQO exceedances outside the immediate cable laying area (for example, the SS increase and DO depletion at oyster bed areas will be less than 1 mg l^{-1} and 0.005 mg l^{-1}, respectively, in all scenarios). Compliance with the SS and DO standards of the WQOs at the sensitive receivers is predicted by the WAHMO model in all the worst case scenarios of the construction activities (including bucket dredging, jet-ploughing and backfilling, and pre-trenching along the cable route) at the spring tide or neap tide. It is therefore considered that water quality monitoring would not be necessary.

Marine disposal of dredged mud should follow the procedures of Works Branch *Technical Circular No. 22/92* for dumping permit application. As the data provided by the EPD indicate that the marine sediment at the Study Area is uncontaminated (Class A) marine sediment, EPD should accept the application and finalise the disposal allocation and contingent requirements. The permit holder should take responsibility to ensure that the permit conditions fully satisfy the Director of Environmental Protection. The amount of mud disposal during the cable laying process is small (with a total of about 7000 m^3) and, provided those suggested mitigation measures are properly implemented, the environmental impact of mud disposal should be minimal.

In addition, it must be noted that the worst case modelled results of the jetting of the cable laying process represent a highly conservative worst case as it assumes that all sediment within of the cable trench volume disturbed by the jetting technique will be put into suspension. However, this would not occur as the sediments in the Study Area do not solely comprise silt. In addition, those sediments fluidised at the bottom of the 2 m or 7 m trench may not actually leave the trench and thus may not enter the water column above the seabed, or become available for dispersion.

There will be no operational water quality impacts after the cable has been laid.

2.3 *MITIGATION MEASURES AND MONITORING REQUIREMENTS*

As compliance with the SS and DO standards of the WQOs at the sensitive receivers is predicted, it is considered that water quality monitoring would not be necessary during the CLP cable laying between Lau Fau Shan and Shekou.

The dredging requirement at either end of the cable route on Lau Fau Shan and Shekou is minor. However, it is recommended that appropriate dredging techniques are employed in each stage of cable laying works, to ensure that water quality impacts are minimised, wherever possible.

As the modelling result shows that jetting / ploughing of the cable laying process at spring tides would create a greater localised exceedance of the WQOs' SS standard along sub-section C as compared with neap tide, it is recommended that the jetting / ploughing process should avoid to be undertaken at spring tide as a practical mitigation to safeguard water quality. Open grab dredging including pre-trenching by chain bucket dredger will produce greater SS losses than by open grab or closed dredging and should be supplanted by closed grab dredging when practicable.

Oyster bed trenching at Lau Fau Shan should be undertaken at low tides by manpower using conventional tools to minimise disturbance to the seabed and loss of sediments to the water column. Methods involving water jetting in these shallow sensitive areas could potentially suspend considerably greater volumes of SS than manpower using conventional tools and are not therefore recommended.

3 TERRESTRIAL ECOLOGY

3.1 INTRODUCTION

In addition to the marine ecological impact assessment presented in *Section 4*, the potential impacts on the intertidal and land habitats associated with the proposed submarine cable from the low tide mark to the junction with Deep Bay Road are assessed in this section. Since the western end of the submarine cable lands at an urban commercial area of Shekou, no ecological impact is expected.

A field based ecological survey and a literature review were conducted with a view to assist in the definition of a preferred landing route for the proposed submarine cable based on the initial route given by CLP, to avoid ecologically sensitive sites in the Lau Fau Shan area. The proposed route alignment therefore avoids two main mangrove forest areas (mangals), woodlands and mature trees identified in the ecological survey, taking into account land ownership, engineering and traffic impact constraints. Based on this proposed route, an ecological impact assessment has been undertaken and mitigation measures recommended where necessary to minimise potential impacts.

3.2 BASELINE CONDITIONS

A field ecological survey and a literature review were undertaken to establish the existing ecological environment in the vicinity of the submarine cable landing route at Lau Fau Shan. The ecological habitat survey was conducted on 16 May 1996 from 1100hrs to 1800hrs. This time encompassed both high tide and low tide periods so the full intertidal habitat could be examined. A map illustrating all habitats, key species or areas of ecological interest was compiled from the ecologists' site observations. (*Figure 3.2a*). Additionally, a supplementary field visit was made on the afternoon of 21 May 1996.

3.3 IMPACT ASSESSMENT

3.3.1 *Shore Trenching*

The impacts of shore trenching will be temporary, short-term disturbance of mudflat and shallow water habitats. This may adversely and directly impact intertidal benthic fauna along the cable alignment through potential direct mortality of organisms and habitat disturbance. Birds which prey on the shore fauna will be affected indirectly through short-term, temporary loss of prey base from the corridor of the cable alignment. Because of the limited geographic extent of the shore trenching and the short-term duration of the project, impacts are considered to be slight. Habitats would be restored by backfilling following completion of cable laying, and recolonisation of the disturbed shoreline areas would be expected to take place within weeks to months after backfilling is completed (Anderson 1995[(1)]) as backfilling will replace materials removed to form the cable trench.

The primary impact of shore trenching would arise from the programming of the

(1) Anderson C.1995. Mudflat Manipulation Experiments. Report for the Shenzhen River Regulation Project: Environmental Impact Assessment. WWF.

operation. The Deep Bay Guidelines for Dredging, Reclamation and Drainage Works (ERL 1991) limit works within the Inner Deep Bay Special Measures Zone to the months between April and October. The purpose of this restriction is to avoid disturbance to water birds which visit or reside in Inner Deep Bay during winter. The entire proposed cable laying project site lies outside the Inner Deep Bay Special Measures Zone/Deep Bay Environmental Protection Buffer Zone boundaries (*Figure 3.2b)*, therefore, the project is not obliged to comply with the programming guidelines. However, programming of shore trenching and all subsequent surface disturbances between October 1996 and January 1997 will result in greater impacts to wintering birds than would result from carrying out these activities during any other season of the year. The small surface area to be affected, and the short duration over which disturbance will occur will combine to minimise the adverse impacts of the construction works. However, the most ecologically sensitive approach would be to re-programme shore trenching and all subsequent surface disturbance activities to avoid the October to March Period.

Isolated mangrove trees may need to be removed during shore trenching works. The impact is considered to be slight when placed in the context of the Deep Bay area with large areas of mangals. However it is important that the removal of mangrove trees be minimized when the cable alignment is refined and through strict construction practices as recommended later in this report.

3.3.2 *Land Trenching*

Impacts of land trenching would arise from temporary loss of small areas of grass and scrub habitats. Removal of small trees should be minimized when the alignment is refined. The trench would be filled on completion of cable laying, and the affected areas would be reseeded and thus no operation impacts are envisaged.

Comments in the above impacts section relating to the proposed shore trenching works programme are similarly relevant to the land trenching programme.

3.3.3 *Excavation of Land Joint Bay and PT Manhole*

Potential impacts will comprise the loss of vegetation within the works area of the excavation. However the works area is already disrupted and in close proximity to Deep Bay Road the existing levels of vehicle traffic and pedestrian disturbance are relatively high. Additional short-term disturbance due to the land joint bay excavation would not be expected to result in detectable changes in faunal communities. Based on the very limited extent of surface disturbance and the potential for local adjustment of the land joint bay location, the impacts to flora and fauna from this operation are considered to be minimal. Additionally, as this is a land operation, there would be no impacts to coastal or mudflat flora or fauna.

3.3.4 *Cable Laying and Burying*

Cable laying and burying would not result in habitat losses beyond those experienced due to trench excavation. The impacts of cable laying and burying would result from disturbance due to presence of equipment and labour. The works should be completed in approximately 10 days in the Lau Fau Shan area, and as there would be no additional surface disturbance, the impacts on flora and fauna would be minimal.

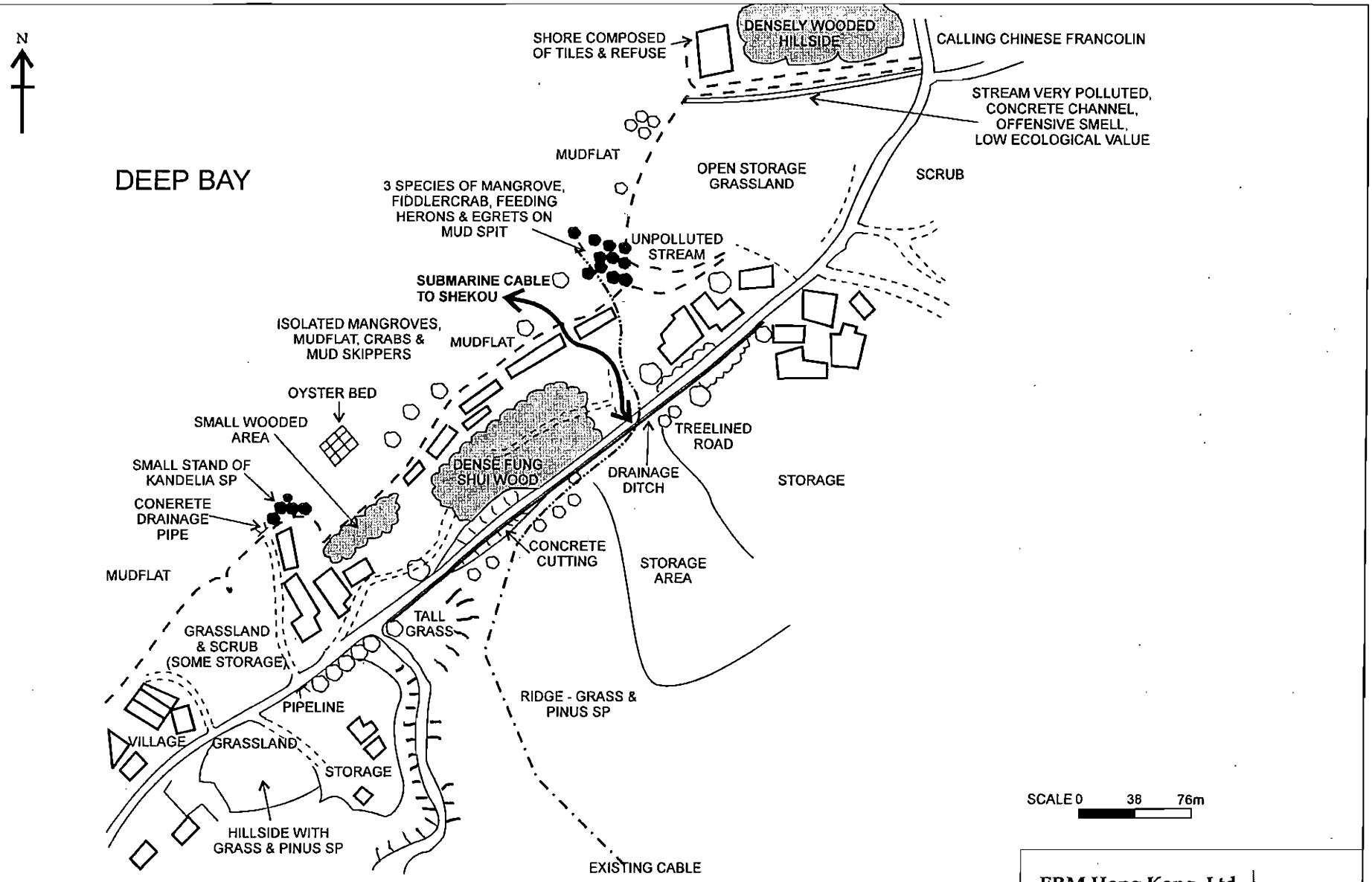

FIGURE 3.2a - HABITAT MAP OF PROPOSED LANDING SITE FOR SUBMARINE CABLE AT LAU FAU SHAN

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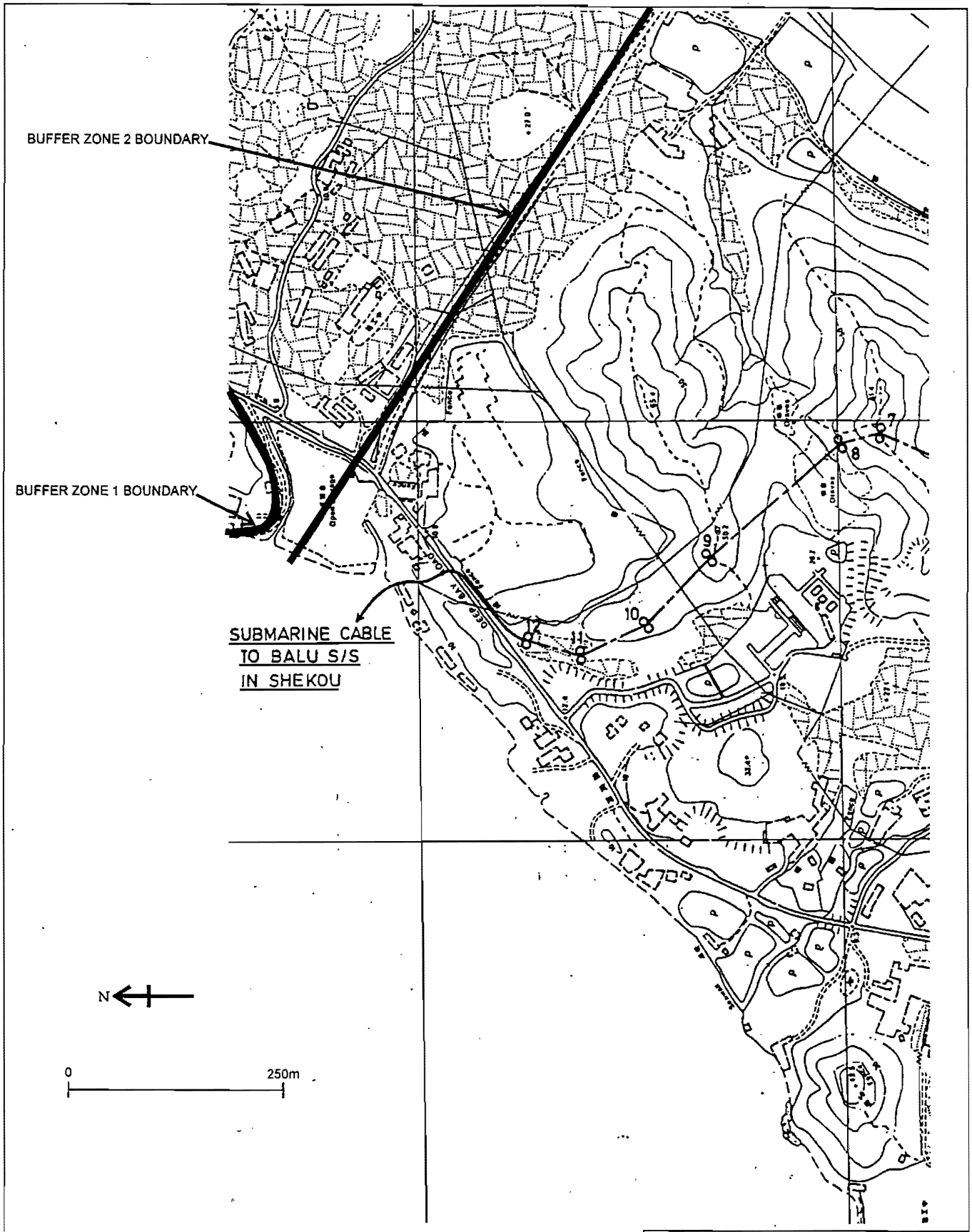

FIGURE 3.2b - LOCATION OF PROPOSED SUBMARINE CABLE LANDING ROUTE RELATIVE TO DEEP BAY ENVIRONMENTAL PROTECTION BUFFER ZONE BOUNDARIES

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3.3.5 *Backfilling of the Shore Trench*

Backfilling of the shore trench should not result in habitat losses beyond those experienced during trench excavation. The operation should not require more than 1 week in the Lau Fau Shan area, thus the duration of disturbance due to activities of equipment and labour would be limited. Impacts to flora and fauna due to habitat loss and duration of the operation would be minimal.

Comments on in the above impacts section on the programming of shore trenching are similarly applicable to backfilling of the shore trench.

3.4 *MITIGATION MEASURES*

3.4.1 *Habitat Loss*

The ecologically valuable mangrove and terrestrial woodland habitats, as well as mature trees, have been avoided by adjustments to the proposed cable alignment. However, for isolated small trees and mangrove plants which will require removal during construction, transplanting to nearby sites is recommended where possible. For each tree removed 20 trees should be planted on nearby sites to ensure the ecological function of the site is retained. It is anticipated that the number of trees to be destroyed will be small, therefore, replacement at a relatively high ratio will afford the opportunity for enhancement of existing mangrove habitat or woodlands. In addition, based on previous experience many of the planted trees may not reach maturity, necessitating the 20:1 replacement ratio. Trees should be replaced using seedlings or whips of the same species as those removed. A tree and mangrove survey should be conducted to identify and quantify trees to be lost immediately following field staking of the cable alignment.

Trees and mangroves to be planted for mitigation of those removed should be planted during the early summer season, preferably during May-June. This will avoid additional disturbance on the mudflat during the winter season, and will optimise seedling survival potential. Mangrove droppers (propagules) to be planted should be collected from the Lau Fau Shan coast.

3.4.2 *Project Programme*

Based on this ecological assessment, it is considered that the impacts of habitat loss are likely to be secondary to the impacts of the seasonality of the proposed disturbance. Project implementation during the winter months creates a potentially severe source of disturbance to wintering water birds in the Lau Fau Shan area.

The Deep Bay avifauna is locally important in that it represents an important conservation achievement, and an important conservation education and recreational resource. The international importance of this achievement is gaining increasing recognition due to the September 1995 designation of the Mai Po Ramsar site. Although there are no specific guidelines for programming construction projects in Deep Bay outside the Inner Deep Bay Special Measures Zone, it is generally ill-advised from a bird conservation perspective to implement any projects during winter when resulting disturbance could adversely affect bird migration through disruption of foraging or resting behaviours.

To minimise disturbance to wintering avifauna it was recommended that the project programme be adjusted to avoid shore and land trenching in the Lau Fau Shan area during the months of October to March. CLP have agreed to this change in the project programme, which will minimize impacts on most birds in the Lau Fau Shan area, particularly the Black-faced Spoonbill and the Relict Gull, both of which are addressed by international conventions to which Hong Kong, UK, and China are parties.

3.4.3 *Construction Practices*

The following specific construction practices are recommended to further minimise the potential cable installation impacts:

- Occupation of the smallest possible works area for the shortest possible duration. In particular the portion of the cable laying operation which affects the shore habitat should be compressed into as short a time horizon as is practicable;
- Proceed of cable backfilling as quickly as possible in the intertidal area, following which all equipment and workers should be excluded;
- Operation of backhoe restricted to the south of the cable alignment away from the northern mangal;
- Use of silenced backhoe to minimise disturbance to wildlife;
- All equipment and workers confined to the submarine cable alignment corridor;
- Explicit instructions to the workforce at the works sites concerning the importance of the area for wildlife and the limits of the construction work;
- Regular checks to ensure that the work site boundaries are not exceeded and that no damage is being caused to the surrounding areas;
- Prevention of the release of pollutants into adjacent water bodies, mudflats and woodlands;
- Restoration and aftercare of temporary construction sites to standards as good as, or better than, the original condition.

3.5 *Ecological Monitoring and Audit*

Trees and mangrove plantations will be monitored for seedling survival by annual sampling of fixed plots. Monitoring will be conducted during the fourth quarter of each calendar year following planting for 5 years. Should surviving stem density decline below 30% of the planted density, replanting will be recommended.

3.6 SUMMARY

Shoreline and terrestrial habitat impacts have been avoided or minimised by routing the cable alignment. In view of the limited duration of the project and the narrow corridor of works area impacts, the overall threat to ecological resources from the project is minimal as CLP has agreed that the shore and land trenching at Lau Fau Shan will not be implemented from October to March, when bird conservation in the Lau Fau Shan area is of local and international importance. Mitigation measures have been put forward to further reduce impacts, including specific site practice/guidance and replanting programmes. A key recommendation made was that the Lau Fau Shan area shore and land trenching programme be adjusted to avoid having to work in this area during the period from October to March, so as to avoid disturbance to wintering water birds in the Lau Fau Shan area. CLP has agreed that the shore and land trenching at Lau Fau Shan will not be undertaken during this sensitive period.

All trenches will be filled on completion of cable laying, and as the affected land areas would be reseeded and shore areas will naturally recolonise no operation impacts from the buried cable are envisaged.

4 MARINE ECOLOGY

4.1 INTRODUCTION

This section summarises existing data on the marine environment in Deep Bay, and seeks to identify potential impacts to marine ecological resources which may arise as a result of the proposed cable laying activities between Shekou, PRC and Lau Fau Shan, Hong Kong. In addition, this section describes mitigation measures necessary to reduce the scale, extent and severity of residual impacts to acceptable levels. Key concerns for this project include potential impacts to benthic fauna, oyster mariculture, capture fisheries and Chinese White Dolphins (*Sousa chinensis*).

4.2 EVALUATION OF IMPACTS

The scale of this project is relatively small and the area to be affected does not contain any rare or endangered marine species. In addition, the use of the jet-ploughing technique reduces the amount of conventional dredging needed, minimizes the actual trench width, therefore less of the marine environment should be affected than with conventional cable laying techniques. Jet-ploughing reduces the time required for cable laying, and most importantly, ultimately retains the majority of the original sediment in place. Maintaining sediment along the cable route, is desirable, since it will allow for recolonization of the area by a similar benthic assemblage. Specific impacts to each of the ecological sensitive receivers groups are detailed below.

4.2.1 *Benthic Communities*

All of the species to be disturbed during cable laying are typical examples of soft bottom communities in Hong Kong waters. Impacts will be limited to benthic communities directly along the cable route. Species present are expected to be adapted to cope with temporary changes in water quality due to the naturally fluctuating environment, and thus should not be severely affected outside the cable route. No mitigation techniques are required, as only the limited number of individuals along the cable route are expected be affected.

4.2.2 *Oyster Mariculture*

Potential impacts include the loss of oyster beds in the immediate vicinity of the cable route from smothering, direct removal, and from damage caused by machinery employed for trenching. Although no data exists on the effects of increased SS levels on either *Crassostrea gigas* or *C. rivularis* in Hong Kong, it is considered that species found in Deep Bay are likely be able to cope with SS fluctuations, due to the naturally varying levels in the area. Therefore, oysters outside the primary impact zone, should not be adversely impacted. Sediment plume modelling (*Section 2.2*) shows that worst case SS plumes arising from the works are dispersed along the middle of Deep Bay, and do not affect the shore. SS levels will be elevated by less than 1 mg L^{-1}. This finding indicates that most of the oyster beds in the Study Area should not be directly in the path of the plume. Oyster bed trenching at Lau Fau Shan should be undertaken at low tides by manpower using conventional tools to minimise disturbance to the seabed and loss of sediments to the water column.

Where damage to active oyster beds by the works is unavoidable, the project proponent should consult the Director of AFD, to arrange for compensation for financial losses to any active oyster farmers affected.

4.2.3 *Capture Fisheries*

Although Deep Bay contains many commercially important species, it has generally low productivity levels. Therefore, there is predicted to be minimal impact to the fishing industry arising from this project. Most commercially important species will be able to avoid those areas immediately adjacent to the cable route, where suspended sediment levels are temporarily elevated. Ambient sediment levels in Deep Bay fluctuate naturally, and most species should not be impacted adversely by a short term increase in SS.

Nursery areas and juvenile organisms are expected to be similarly affected, except that tolerance ranges for juvenile organisms, however, are more limited and thus, they may be less able to cope with environmental changes. Since only one species has been identified as spawning in the area, and since no other site-specific data exists, no specific time period for construction can be recommended to avoid possible impacts to nursery areas. Modelling for this study (*Section* 2.2) indicates that the worst case sediment plumes will not impact the coasts, and thus will not impact potential nursery areas.

No mitigation is required, as no losses to fisheries are predicted.

4.2.4 *Chinese White Dolphins*

Over 95% of recorded *Sousa* sightings in Hong Kong have been in the northwestern waters and although there are no recorded sightings in Deep Bay, as a conservative assumption, it can be assumed that these animals are found in Deep Bay (pers comm Dr Thomas Jefferson). Therefore, in the absence of any data to the contrary, it should be assumed for this project that dolphins could be present in the Study Area during the proposed cable installation period.

To minimize effects on *Sousa* from the project, the following mitigation measures, similar to those implemented for the Aviation Fuel Receiving Facility and the CLP submarine cable from Sha Chau to Lung Kwu Chau, are recommended:

- An initial "exclusion zone" 100 m in diameter (50 m in every direction from the jet-plough barge) should be established for the project. This zone may need to be modified after acoustic data (detailed below) is gathered;

- This "exclusion zone" should be monitored by trained staff every time before work starts. If dolphins are sighted in the exclusion zone before the works have commenced, cable laying should be delayed until such time as the dolphins have left the area. If, however, dolphins enter the exclusion zone after the works have commenced, no action will need to be taken, as it is assumed that the noise levels are not adversely affecting the dolphins. This method will ensure that dolphins are not exposed to a sudden onset of loud noise;

- Underwater noise measurements should be carried out to assess background noise levels and noise impacts from jet ploughed cable burying for the Phase I 11 kV submarine cable project between Sham Shui Kok and Siu Mo To in August 1996; and

- This information should be used to design a more specific exclusion zone for the Shekou to Lau Fan Shan cable laying project. This exclusion zone, and any further mitigation measures will be designed in association with Dr. Thomas Jefferson, Agriculture and Fisheries Department and CLP.

5 *OVERALL CONCLUSIONS*

The Focused EIA has assessed the environmental implications of concern associated with laying a submarine cable between Lau Fau Shan and Shekou in Deep Bay. Project specific cumulative impacts have been quantified and assessed in terms of water quality, terrestrial and marine ecological implications and both mitigation and monitoring requirements have been detailed, where appropriate.

CLP, the project proponent, has committed to implement all mitigation measures detailed in the Focused EIA and thus it may be concluded that no insurmountable residual impacts are predicted as a result of the construction stage or operation of the proposed cable.

5. 總結

本專題環境影響評估，就於后海灣內敷設一條由流浮山至蛇口的海底電纜，所可能造成環境影響作出了評估。有關該工程的累積影響已被量化，並就其對水質、陸上及海洋生態的可能影響作出了評估。而在適當地方，亦詳述了緩解措施及監察上的要求。

主催此項工程的「中電」已承諾施行本報告內所詳述的所有緩解措施。因此可作結論說，建議中的電纜敷設及運作，預計不會造成無法克服的殘留影響。

的資料，因此無法就適當施工期問題作出建議，以減低對魚苗區可能造成的影響。為此研究而作出的模型模擬（見第2.2節），顯示在最壞的情況下，沉積物的漂移並不會影響海岸區，因而也不會影響可能存在的魚苗區。

由於預計此項工程並不會導致任何漁業上的損失，因此毋須施行任何緩解措施。

4.2.4 中華白海豚

雖然在后海灣區並無發現中華白海豚的記錄，但超過95%的發現，均在香港的西北部水域，因此為審慎起見，可以假設后海灣內有此類動物存在（據訪問Dr. Thomas Jefferson之意見）。在無反證資料的情況下，應假設於電纜敷設期間，在研究區內有此類海豚的存在。

為盡量減少此項工程對中華白海豚的影響，建議實施下列緩解措施，類似措施已在新機場航空燃料接收設施及中電在沙洲和龍鼓洲之間敷設海底電纜的工程中採用：

- 在電纜敷設期間，必須設立一個「施工警戒區」。開始時暫定直徑為100米(以噴射挖掘躉船為中心，向各方伸延50米)，在獲得進一步之聲學資料後(詳見下文)，或需予以修正。

- 在各電纜敷設期開始之前，此一「施工警戒區」必須經常由曾受訓之人員予以監察。若在動工前發現該區有海豚存在，電纜之敷設必須暫緩施工，直至海豚離開該區為止。但若在施工期間發現有海豚闖入該區，則毋須採取任何行動，因為在此情況下，可假定工程之噪音對海豚並無不良影響。此方法可確保海豚不會受到突然而高音量之噪音影響。

- 水底噪音測量必須進行，以評估該區的背景噪音水平，以及評估在一九九六年八月時，於深水角至小磨刀之間，以噴射技術進行的第一期11kV海底電纜掩埋工程所造成的噪音影響；

- 此類資料應可作為依據，從而為由蛇口至流浮山之電纜敷設工程，設計出一個較特殊的「施工警戒區」。此一「施工警

4.2.1 海底群落

所有在電纜敷設期間將受影響的物種，均屬本港水域內的典型軟底群落。有關的影響，將僅局限於沿電纜敷設路線的海底群落。由於該區的天然環境本就經常變動，因此預計該區的現有物種，應可適應水質的短暫變化。電纜沿線以外區域的生物群落，亦當不會受到嚴重影響。由於預計只有電纜沿線的少量生物會受影響，因此毋須實施任何緩解措施。

4.2.2 蠔類養殖業

此方面可能出現的影響，包括緊貼電纜沿線水域內，因混濁窒息、直接清除，以及機器挖坑等原因而令蠔床受損。雖然現有資料並無顯示懸浮固體增多對香港的巨蠣蠔或近江牡蠣會造成何種影響，不過由於該區懸浮固體的數量本就多變，因此相信后海灣內所發現的品種，應可適應這方面的變化。因此，在主要受影響區以外的蠔類，應不會太受影響。據沉積物漂移模型（見2．2節）顯示，在最壞情況下，電纜敷設工程所揚起的懸浮固體煙羽，會沿后海灣中部擴散，而不會影響近岸區域。懸浮固體的增加，亦將少於1mgL^{-1}。此一結果顯示，在研究區內的大部份蠔床，應不會直接處於煙羽漂移的路線上。流浮山的蠔床區坑道挖掘應在低潮期間，以人手使用傳統工具進行，以盡量減少對海床的干擾及沉積物的揚起。

對於現時運作中而難免會受工程影響的蠔床，主催工程的機構應諮詢漁農處處長，以便安排對受影響的蠔民作出賠償。

4.2.3 捕魚業

雖然后海灣內有不少具重要商業價值的品種，但一般而言，該區的魚產量偏低，因此預計此項工程對漁業的影響將屬輕微。大部份具重要商業價值的品種，將能避開那些因貼近電纜沿線致使沉積物懸浮量暫時增加的區域。后海灣的整體沉積物懸浮量本就有自然變動，因此大部份品種，應不會因懸浮固體的短暫增加而受影響。

魚苗區內的幼年生物亦預計會受到同樣影響。不過這類幼苗的承受能力遠低於成年生物，故此可能較難適應環境轉變。由於只發現一個品種在該區繁殖，而除此之外更無其他有關此一區域

（保護此段期間於流浮山地區棲息，具本地及國際重要性的雀鳥），因此該項工程對生態資源的整體威脅非常微小。為進一步減少對該區環境的影響，已建議實施若干緩解措施，包括特定工地的施工方法／指引，以及樹木重植計劃。而其中一項關鍵性建議，為修訂流浮山地區之近岸及陸上挖坑工程的施工期，令十月至三月期間毋須在該區施工，從而避免對在該區過冬的水禽造成干擾。「中電」已同意在該地區的此類工程，不會於這段敏感期間進行。

在電纜敷設妥當後，所有坑道均會加以回填。同時，所有曾受工程影響的土地將進行樹木重植；而近岸區的動植物群落將會自然重集。因此經掩埋後的電纜，預計其運作將不會造成任何影響。

4. 海洋生態

4.1 概述

本節概括闡述了后海灣區海洋環境的現有資料，並意圖找出建議中從中國蛇口至香港流浮山之電纜敷設，對海洋生態資源所可能造成的影響。此外本節亦闡述了為降低殘留影響的規模、範圍及程度至可接受水平所必須的緩解措施。有關此項工程的主要關注點，包括對海底動物區系、蠔類養殖業、捕魚業及中華白海豚所可能造成的影響。

4.2 影響評估

此項工程的規劃相對較小，而且會受影響的區域並無任何稀有或瀕臨絕種的海洋物種。此外，噴射挖掘技術的使用，不單減少了對傳統挖掘方法的需要，亦收窄了坑道的實際闊度。因此對海洋環境的影響，將較傳統的電纜敷設方法為輕。噴射挖掘技術縮短了電纜敷設所需的時間；而更重要的，是大部份原有的沉積物，最終得以留於原處。此點的好處，是令該區的原有生物群集，得以由近似的海底生物重新群集替補。個別對生態感應強的生物所將受之影響，分述如下。

- 盡量減少佔用工地的面積和時間。特別是會影響近岸生態的部份電纜敷設工程，應盡可能縮短施工期；

- 在潮間區內敷設的電纜，應盡速予以掩埋，然後馬上撤離所有器材及人員；

- 拉剷機的使用，應限制在電纜敷設路線的南段，而遠離北邊的紅樹林；

- 使用有減音裝置的拉剷機，以減少對野生動物的滋擾；

- 規定所有器材及人員，只能在電纜敷設區內活動；

- 就該區對野生動物的重要性，以及是項工程的範圍和權限，給予施工人員明確指示；

- 進行定期檢查，以確保工地範圍未被逾越，以及鄰近地區不受破壞；

- 防止污染物被置放於鄰近水域、泥灘及林地；

- 對臨時工地進行施工後修復及維護，使其回復原貌，甚或較原貌為佳；

3.5 生態監察及審核

對於林木及紅樹的幼苗存活情況，會透過每年於固定地點檢查樣本的方法予以監察。此一監察活動，在種植樹苗後的五年內，每年的第四個季度均會進行一次。若發現樹苗的存活密度低於原種植密度的30%，則建議再予補植。

3.6 小結

電纜敷設對海岸線及陸上生境的影響，已透過電纜敷設路線的調整予以避免或盡量減少。鑑於施工期的短暫，兼且其間所造成的影響僅局限於一窄長的施工區，再加上「中電」經已同意流浮山地區之近岸及陸上挖坑工程，不會在十月至三月期間進行

點。對每棵被清理的樹，應在附近重植二十棵新樹，以確保該地點的生態功能得到保持。預計需予清除的樹木數量甚少，因此，一個較高的重植比率有可能令現有的紅樹或林木環境得到改善。此外，據過往經驗，新植的樹木中有不少難以長成，因而有需要採用二十對一的重植比率。被清除的樹木應以同種的樹苗或插枝予以補回，因此應在電纜敷設路線標定後，立即對該地區內將被清理的樹木及紅樹進行清點，以確定其種類及數量。

為緩解林木損失而重植的樹木及紅樹，應在初夏時種植，最好是五、六月期間，以避免泥灘在冬季時受到進一步的干擾，亦可增加幼苗的存活機會。用以重植的紅樹胚軸（生殖芽）可在流浮山海岸區收集。

3.4.2 施工計劃

上述的生態評估顯示，建議中施工季節的安排，很可能較棲息地的損失，對生態環境的影響更大。若在冬季施工，有可能對在流浮山地區過冬的水禽做成嚴重滋擾。

后海灣的鳥類區系，是香港在環境保育上一項重要成就，同時亦是一個重要的環保教育及遊憩資源，因此對本港而言有其重要性。此項成就在國際上的重要性，亦因該區於一九九五年九月被確立為「米埔拉姆沙公約點」，而獲得日益增多的認同。雖然現時對於在后海內灣特定保護區以外的后海灣區進行建築工程，並無特別的指引，不過從保護雀鳥的角度而言，並不建議在冬季期間進行任何工程，因這類工程會影響到遷徙中候鳥的覓食及棲息習慣。

為了盡量減少對過冬雀鳥的滋擾，建議調整施工計劃，以避免在十月至三月期間，於流浮山地區進行近岸及陸上坑道挖掘工程。「中電」已同意此一施工計劃的改變，以圖減少對該區大部份雀鳥的影響，特別是黑臉琵鷺及遠鷗。此兩種雀鳥，在香港、英國及中國均有簽署的國際公約上，均被提及。

3.4.3 施工方法

建議採用下列特定施工方法，以盡量減少電纜敷設工程可能對環境造成的影響：

上述就近岸區挖掘工程對環境影響的意見，亦適用於陸上挖掘工程。

3.3.3 接岸區及壓力缸沙井之挖掘

這方面可能造成的影響包括在挖掘範圍內的植被受損。然而，此區其實已經受到破壞，而在貼近深灣路之範圍，現時的車輛及行人流量已相當高。接岸區工程對該區所引起的額外短期干擾，預計將不會令該區的動物群落出現明顯變化。由於此類工程對地表的干擾非常有限，而且接岸區位置亦有可能作局部調整，此項工程對該區動植物群落的影響將屬輕微。此外，由於此工程在陸上施工，因而對沿岸或泥灘的動植物群落均不會構成影響。

3.3.4 電纜敷設及掩埋

除卻坑道挖掘所造成的棲息地流失外，電纜的敷設及掩埋並不會造成額外損害。雖然敷設及掩埋所需的人員和器材在該區出現，仍會對環境造成一定干擾，不過在流浮山地區的工程僅需十天，且更無其他額外的地面干擾，因此對該區動植物群落的影響應屬輕微。

3.3.5 近岸區坑道回填

除卻坑道挖掘所造成的棲息地流失外，近岸區坑道回填並不會造成額外的損害。在流浮山地區的回填工程僅需一週，因此有關的人員和器材在該區活動，僅會構成短暫影響。該區動植物群落因棲息地受損及工程進行而受到的影響，亦將屬輕微。

上述就近岸區坑道挖掘工程對環境影響的意見，亦適用於此等近岸坑道的回填工程。

3.4 緩解措施

3.4.1 生境受損

建議中的電纜敷設路線，經已作出調整，以避開一些生態上有價值的紅樹林和陸地林木，以及壯年樹木。而對個別因施工而必須清理的幼樹及紅樹類植物，則建議盡量將之移植至附近地

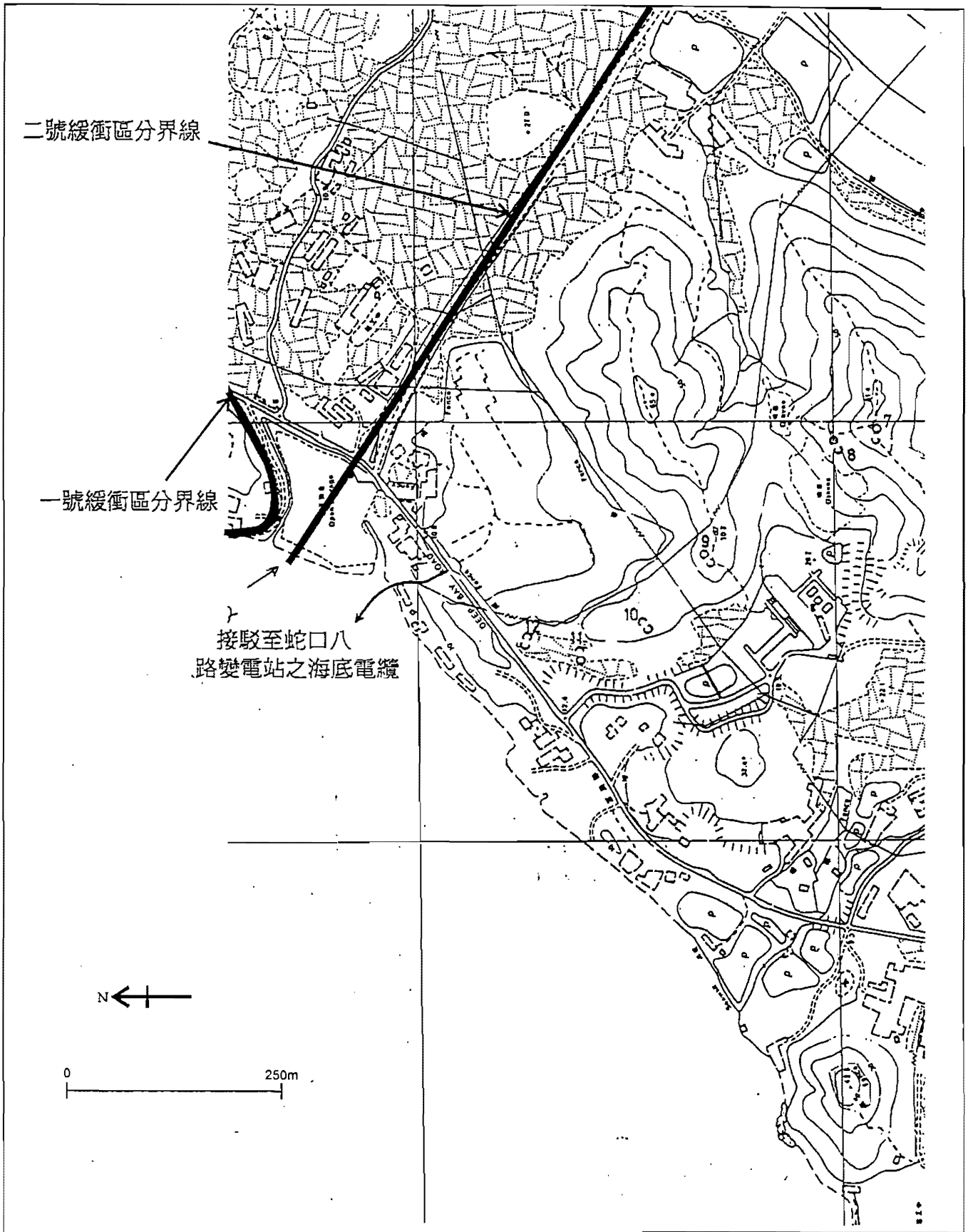

圖3.2b — 建議中之海底電纜接岸路線位置與后海灣環境保護緩衝區分界線示意圖

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Hecny Tower
9 Chatham Road
Tsimshatsui, Kowloon
Hong Kong
ERM

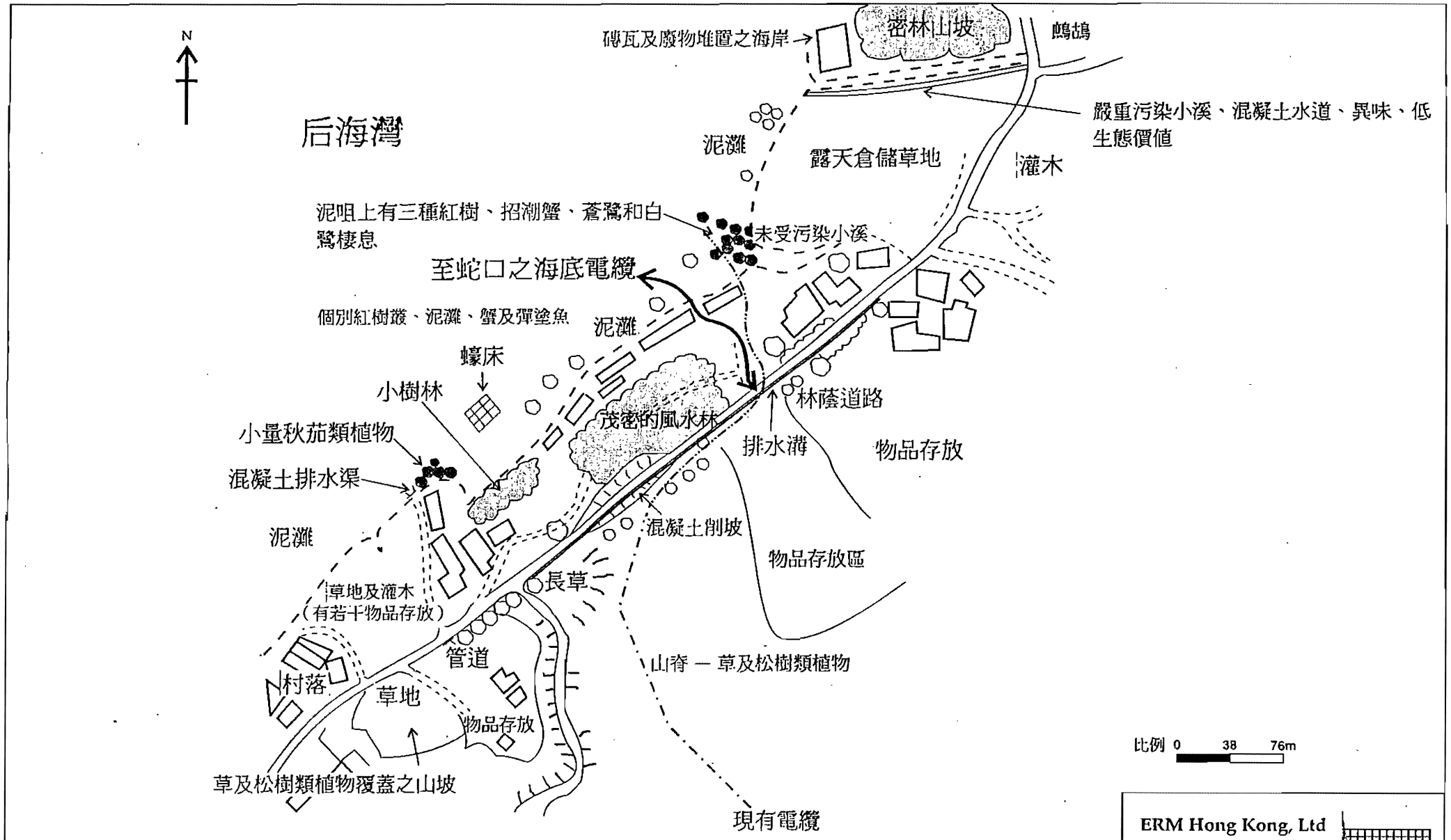

圖3.2a — 建議中海底電纜流浮山接岸處之生物棲息區位置圖

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Hecny Tower
9 Chatham Road
Tsimshatsui, Kowloon
Hong Kong
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近岸坑道挖掘工程將會對泥灘及淡水區棲息地做成短暫影響，因而對沿電纜敷設區的水底動物，可能引致直接死亡或棲息環境受到干擾。對捕食這類動物為生的雀鳥，則可能因短暫地喪失在電纜沿線的覓食基地而受到間接影響。不過這類近岸坑道挖掘工程，僅在有限地域內進行，為時亦屬短暫，因此影響也將屬輕微。有關的棲息環境，亦可在電纜敷設完成後，將曾遭挖掘處加以回填而得到復原。由於回填工作會將敷設電纜時挖走之物料填回，因此預計受影響的海岸區之動植物群，亦可在回填後之數星期至數月間再次群集（請參閱一九九五年之Anderson 報告1）。

近岸坑道挖掘對環境之影響程度，主要視乎其施工計劃。《后海灣挖泥、填海及排水工程指引（ERL1991）》把在后海內灣特定保護區內進行的工程施工期，限制在每年的四月至十月間。此一規定的目的，是要避免影響在冬季於該區棲息或路過的水禽。然而，建議中的整個電纜敷設工程，均在后海內灣及后海灣環境保護緩衝區範圍外（圖3.2b）。該項工程因而毋須受該指引約束。不過，若在一九九六年十月至一九九七年一月期間進行近岸挖掘工程及其接續的地面干擾活動，對在此過冬的雀鳥的影響，會較其他季節進行這類活動所造成的影響為大。雖然施工範圍細小，兼且施工期短，將可令工程對環境的影響減至最低，不過從生態角度考慮，最妥善的方法應是將近岸挖掘及其後的地面干擾活動，避免安排在十月至三月期間進行。

近岸挖掘工程期間，有可能需要將個別紅樹遷移。不過后海灣區有大面積的紅樹林，因此影響尚算輕微。然而要緊的，是盡量減少遷移或砍伐樹木，故應仔細規劃電纜敷設路線，以及嚴格施行於本報告後部所建議的施工方法。

3.3.2 陸上挖掘

陸上挖掘工程會令小塊草地和灌木地暫時受損，但若電纜敷設路線的仔細規劃完成後，當可將此種損害減至最小。在電纜敷設妥當後，坑道將會重新回填，而植被受影響的範圍亦會重新種植，因而電纜之運作預計不會對環境造成影響。

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1 Anderson C., 1995: '泥床操控實驗'，《深圳河整治工程環境影響評估報告》，世界自然基金會。

類淺水且敏感的區域採用噴水式的挖掘方法，較諸傳統人手挖掘法，極可能揚起較大量的懸浮物，因此不建議採用。

3 陸上生態

3.1 概述

是項電纜敷設工程對海洋生態影響的評估，將在第四節加以闡述。本節則主要就這項工程對低潮線至深灣路交匯處之間的陸上及潮間區的生態影響進行評估。至於此一海底電纜的西端，因其接岸處位於蛇口市區的商業區內，故此預計不會構成生態影響。

為了盡可能避開流浮山地區內的生態敏感地點，研究人員曾進行實地生態考察及資料搜集，以圖在「中電」原先所建議的電纜敷設路線的基礎上，找出一條更佳的接岸路線。由此而得出的建議路線，避開了由實地生態考察而發現的兩個主要紅樹林區，以及一些林地和壯年樹木。此建議路線亦有考慮到土地擁有權、工程問題以及對交通的影響等等因素。對這條新建議的路線，亦進行了生態影響評估；更在有需要的地方，建議了若干減少影響環境的緩解措施。

3.2 基準情況

為弄清楚現時流浮山海底電纜接岸區附近的生態環境，研究人員曾作實地生態考察及資料搜集。實地生態考察於一九九六年五月十六日上午十一時至下午六時進行。此時段包括了高潮期及低潮期，因此能考察到整個潮間區的生物棲息環境。基於生態研究人員的實地考察所得，繪製了一幅地圖（圖3.2a），以標示出所有棲息區、主要物種或受關注的生態區。此外，於一九九六年五月廿一日下午亦再作了一次補充性的實地考察。

3.3 影響評估

3.3.1 近岸坑道挖掘

若將所挖起之泥土棄於海中，則須遵照工務科第22/92號技術指引，申請棄置許可證。據環境保護署所提供之資料顯示，該區內之海洋沉積物屬未受污染類（甲類）海洋沉積物。因此，環境保護署應會接受有關之棄置申請，並最後決定棄置方法及附帶要求。此許可證之持有人，有責任確保該許可證之使用情況能完全符合環境保護署署長之要求。在敷設電纜時之泥土棄置量很小（共計約為7,000立方米）。若切實執行所建議之緩解措施，則棄置泥土對環境之影響，應會減至最小。

此外應注意的，是此最壞情況模擬之結果，實際為一個非常保守的最壞情況。它假設以噴射方法所修建之電纜坑道，其中之所有泥土將全部變成水中懸浮物。然而，這種情況應不會出現，因為研究區範圍內的沉積物，並非全屬淤泥。兼且，那些處於2米或7米坑道底部的沉積物，即使鬆脫流動，亦未必會漂離坑道；因而不一定會浮進海床以上之水體，或向外擴散。

在敷設完成後，電纜之運作並不會對水質構成任何影響。

2.3 緩解措施及所需之監察

由於預計電纜的敷設會符合水質指標中，有關各個感應強的地區之懸浮固體及含氧量標準，因此毋須在電纜敷設期間進行任何減少影響水質的緩解措施；而水質監察亦無必要。

雖然在這條從流浮山至蛇口的電纜兩端僅需進行少量挖掘工程，本報告仍然建議盡可能在敷設電纜的各階段，採用適當的挖掘技術，以確保對水質的影響減至最少。

據電腦模擬結果顯示，在春潮期間以噴射/犁刨式挖掘法敷設電纜，會較在小潮期間進行該等工程，令沿電纜C段之局部區域較多地超出水質指標中的懸浮固體標準。故此建議在春潮期間，應避免以噴射/犁刨式挖掘法敷設電纜，作為一種切實可行的減少影響水質的緩解措施。開放式的抓斗挖掘法，包括以鏈斗式挖泥機進行前期挖掘，較諸開斗式或閉斗式挖掘法，均會揚起較多懸浮物。因此應盡量採用閉斗式挖掘法進行挖掘。

在流浮山的蠔床區進行挖掘工程時，應在低潮期間，以人手及傳統工具進行，以盡量減少對海床的干擾及揚起沉積物。在這

為數個階段進行。不過需注意的，是整個工程將只會使用一具小型抓斗式挖泥機、電纜敷設機及一具抓斗式箱形挖泥機。

1.3.2 同期活動

圖1.3a的施工計劃，展示兩個不同時段，可以同時進行兩項工程。其中一個時段在約第15周，屆時電纜敷設機將在分段C操作，而同時分段B或D可進行回填。此外，施工計劃亦顯示第4至6周時，有可能在分段B或D進行坑道挖掘工程，並同時在船隻航道的一段上進行斗式挖掘。

2. 水質

2.1 導言

本節就建議中從流浮山至蛇口敷設電纜，所可能做成的水質影響，作概括闡述。為了檢視潛在的影響，進行過數個最壞情況（詳見第1.3.2節所述）之沉積物漂移狀況電腦模擬。此海底電纜之敷設，會在旱季進行。此期間，后海灣之海水並無分層現象，因而可運用電腦「水質及水力模型」，在最低的限制下，來評估沉積物漂移狀況所受之影響。評估包括懸浮固體濃度的增加，以及海水含氧量減少時所會引起的影響。

2.2 結果摘要

在對研究區內所可能存在之沉積物進行過檢驗後，發現其中有可能在電纜敷設時受影響的海洋沉積物，屬未受污染之類別（甲類）。因此，有關工程對該區水質之主要潛在影響，為懸浮物之揚起及海水含氧量之降低。電纜敷設之最壞情況，均曾以沉積物漂移狀況模型作過評估。所得結論是：單就電纜之敷設而言，除卻在敷設工程之範圍內有懸浮物揚起的問題外，其他地區將不會超出水質指標之規定（例如：在所有情況下，蠔床區內之懸浮物增加及含氧量減少，將僅分別少於每升一毫克(1 mg/l)及每升0.005毫克(0.005mg/l)。）據「水質及水力模型」的預測，在所有最壞情況下，於春潮及小潮期間進行的各項建築工程活動（包括電纜沿線的斗式挖泥機挖掘工程、噴射式挖掘工程和回填，以及前期挖坑工程），均會符合水質指標中，有關各個感應強的地區之懸浮固體及含氧量標準，因此毋須在電纜敷設期間進行任何減少影響水質的緩解措施；而水質監察亦無必要。

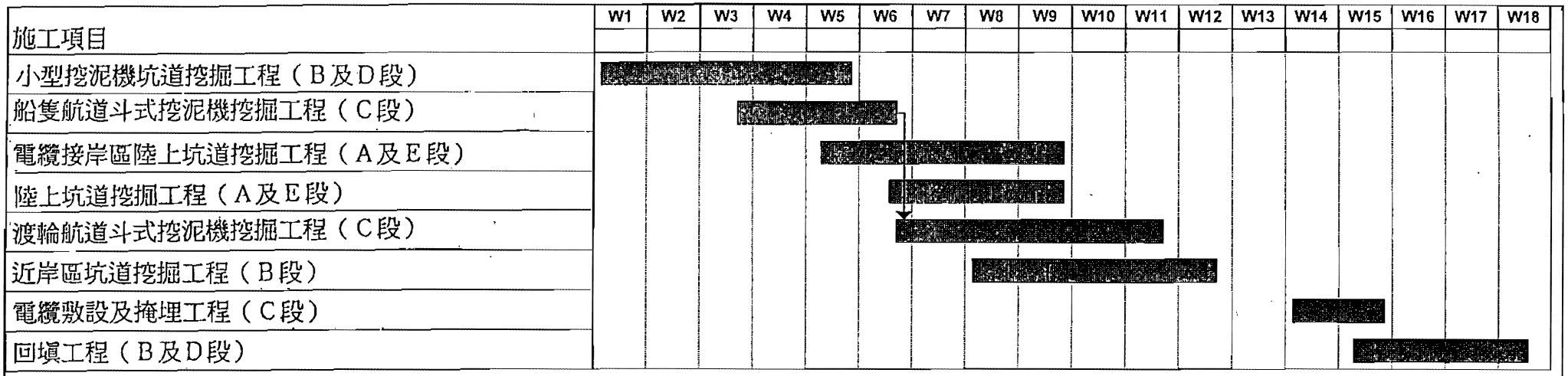

圖1.3a — 施工計劃

施工項目　摘要　累計進度

進度　竣工項目

主要進度標　竣工進度標

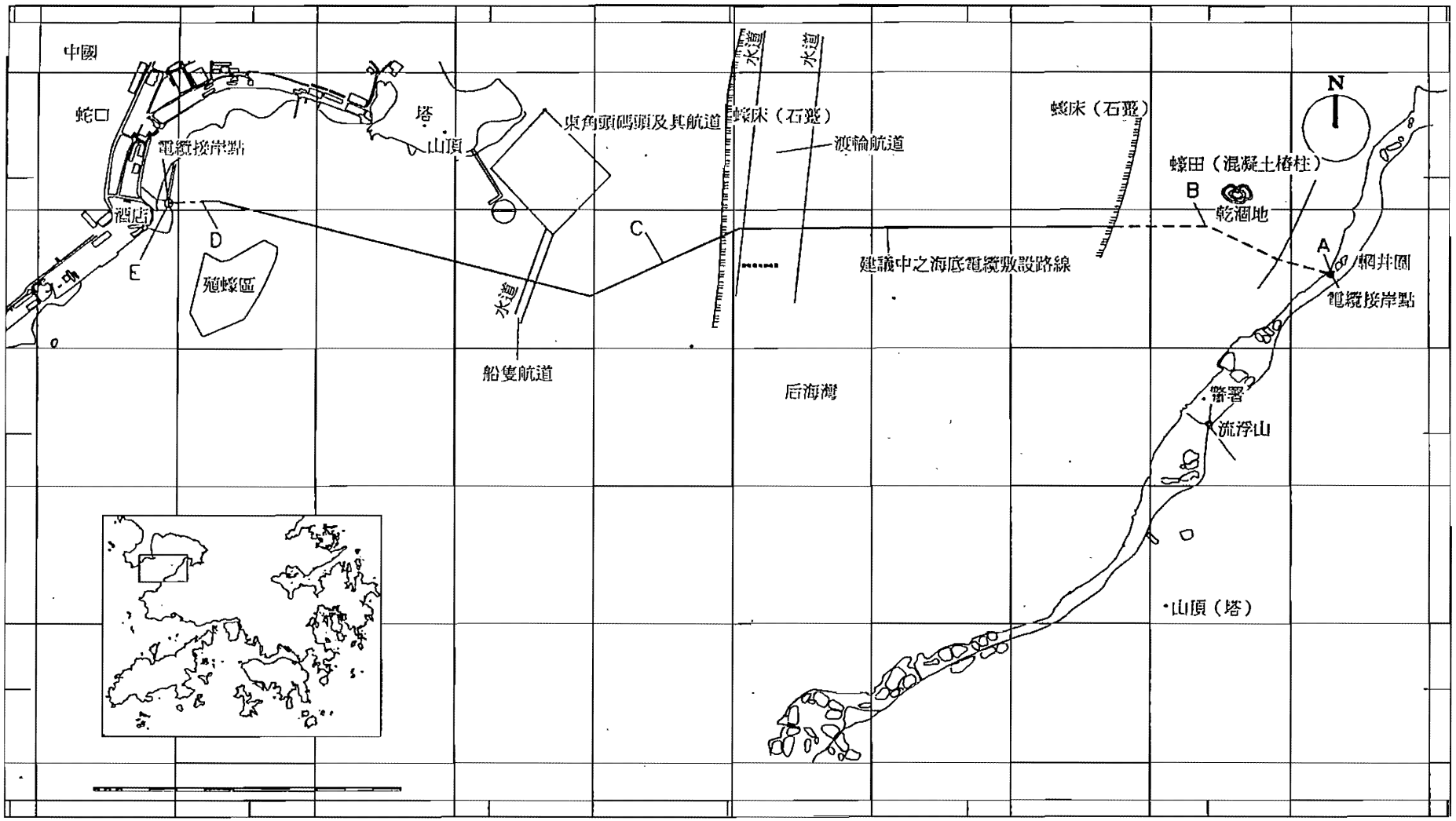

圖1.1a — 第二條從蛇口至流浮山132千伏特海底電纜之建議敷設路線

日期：一九九六年六月七日 | 繪圖編號：/Contract/C1505/C1505_1

資料來源：底圖 — 地政署1:20k地形圖

Prepared by ERM's GIS & MAPPING Group

圖例

建議中之海底電纜敷設路線

- 分段A
- 分段B
- 分段C
- 分段D
- 分段E

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以海上坑道挖掘方法（使用小型抓斗挖泥機）敷設，而另一部份則會運用陸上坑道挖掘方法（使用拉剷機及人手）敷設；

- 分段C：較深水區，長6,620米（大致為東西走向），闊0.5米，深2米，將以電纜敷設機敷設；

- 渡輪航道：較深水區之分段另外包括一段渡輪航道，長480米（大致為南北走向），闊2至3米，深2米，將以鏈斗式挖泥機建造；

- 船隻航道：較深水區之分段另外包括一段船隻航道，長180米（大致為南北走向），闊2至3米，深7米，將以鏈斗式挖泥機建造；

- 分段D：蛇口淺水區，長300米（大致為東西走向），闊0.5米，深2米，將運用小型抓斗挖泥機，以海上坑道挖掘方法建造；

- 分段E：蛇口海岸 — 接岸區（一如前述），長50米（大致為東西走向），闊1.2米，深1.2米。此一乾地分段將運用拉剷機配合人手，以陸上坑道挖掘方法建造。

1.2.2 有關之接岸區及壓力缸安裝工程

除卻上述工程外，更需在海底電纜的東西兩端進行小量挖掘工作，以修建地下接岸區及壓力缸進出口，用作容納一個地下接駁箱，供海底電纜接駁陸上輸電網之用。此一地底結構之大小，約為1.5米 x 1.5米 x 4米 ，將於一九九六年十月左右興建。

1.3 工程計劃及階段安排

1.3.1 一般安排

預計工程將於一九九六年九月左右展開，大約至一九九七年一月完成。因此，在沉積物漂移及水力模型上，亦以旱季為模擬基礎(詳情請參閱第2節)。至於工程進展，將如圖1.3a所示，分

1. 導言

1.1 背景資料

中華電力有限公司（以下簡稱「中電」），建議從流浮山附近之輞井圍至后海灣內之蛇口（位於中華人民共和國境），敷設第二條132千伏特的海底電纜（第二號），以便額外供電至蛇口並加強「中電」與蛇口間的聯網作業。

這條海底電纜的敷設路線，位於后海灣內（參見圖1.1a）。該區是一個環境敏感區，因其內有若干珍貴的生態資源，包括后海內灣之「具特殊科學價值地點」，以及米埔自然保護區這片經「拉姆沙公約」所指定的「國際重要濕地」。此項工程對漁業及貝類養殖業的潛在影響，亦受到關注。環境保護署因此指令「中電」進行一項專題環境影響評估研究，以便就敷設該電纜對環境構成影響的性質及程度提供資料。這些資料將有助於決定下列事項：

（一） 是否需要在該海底電纜的詳細設計及敷設上，製定某些緩解措施；及

（二） 於實施此等緩解措施後所餘下的影響是否可接受，以及這條海底電纜的敷設，對環境的整體影響是否可接受。

1.2 敷設地點

1.2.1 分段A至分段E

如圖1.1a，該海底電纜可分為下列五個分段：

- 分段A：流浮山海岸 － 流浮山接岸區（包括一個地下接駁箱，供海底電纜接駁陸上輸電網之用），長60米（大致為東西走向），闊1.2米，深1.2米。此一乾地分段會以陸上坑道挖掘方法敷設：先以人手從接岸區敷設30米，之後以拉剷機配合人手敷設；

- 分段B：流浮山淺水區，長1,700米（大致為東西走向），闊0.5米，深1.5米。此一位於高低潮線間之分段，部份會

CONSULTING SERVICES BY ENVIRONMENTAL RESOURCES MANAGEMENT

摘 要

中華電力有限公司

專題環境影響評估研究：
流浮山至蛇口第二條
132kV 海底電纜敷設

一九九六年七月三十一日

香港環境資源管理顧問有限公司
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