CONTENTS

ANNEX A - AIR QUALITY
ANNEX B - NOISE
ANNEX C - WATER QUALITY
ANNEX D - WASTE MANAGEMENT
ANNEX E - LANDSCAPE & VISUAL
ANNEX F – CULTURAL & HERITAGE
ANNEX G - TERRESTRIAL ECOLOGY
ANNEX H - MARINE ECOLOGY
ANNEX I - FISHERIES

1 BASIC INFORMATION

1.1 PROJECT TITLE

Telecommunication Installation at Lot 591SA in DD 328, Tong Fuk, South Lantau Coast and the Associated Cable Landing Work in Tong Fuk, South Lantau for the North Asia Cable (NAC) Fibre Optic Submarine Cable System.

1.2 PURPOSE AND NATURE OF THE PROJECT

Level 3 Communications Limited (Level 3) currently supplies high capacity Internet Protocol (IP) networks connecting over 175 major business centres in Europe and the United States. The company plans to increase broadband facilities for accessing internet service providers, content providers and e-commerce providers in the HKSAR, ultimately enhancing the HKSAR's capability as a communications and service centre in Asia.

Towards this endeavour, Level 3 plans to establish an international telecommunications cable landing station in Hong Kong that will be linked to Japan via an international optical fibre submarine telecommunication cable system - the North Asia Cable (NAC). This cable will connect to trans-Pacific and trans-Atlantic cables, thus providing a world-wide end-to-end IP infrastructure.

An assessment of a number of potential sites around the Hong Kong SAR, yielded a site at Tong Fuk, South Lantau, as the most desirable option. Selection of this site would result in no insurmountable impacts to the local environment and since other submarine cables already land at Tong Fuk, this would tend to indicate that there would be no significant marine installation issues. The actual alignment of this new submarine route in Hong Kong waters will generally follow that of existing cable routes, which supply the Cable & Wireless HKT station. This project will involve the installation and operation of an international telecommunications cable landing station on Lot 591SA in DD 328, Tong Fuk, South Lantau Coast, Hong Kong (similar in size and function to the existing nearby Cable & Wireless HKT station) and an international optical fibre submarine telecommunication cable system (NAC), that will connect the proposed station to Japan.

Demolition of an existing storage shed on the proposed site will be required prior to the construction of the cable landing station and underground drilling operations will be involved for the shore-end installation of the NAC. The types of activities that will occur during the operation of the cable landing station facilities and the NAC, generate no by-products and are therefore considered to be a "clean technology" type of operation.

This Project Profile includes assessments of the potential environmental impacts of the construction and operation of the cable landing station and the

submarine telecommunication cable system (see *Annexes A to I*), based on the conceptual layout plans and the expected construction and operational activities as provided by Level 3.

1.3 NAME OF PROJECT PROPONENT

Level 3 Communications Limited
Suite 2706 - 9, 27th Floor
One International Finance Centre
1 Harbour View Street
Central, Hong Kong

1.4 LOCATION AND SCALE OF PROJECT

1.4.1 *Location*

The location of the cable landing station will be on Lot 591 SA in DD 328, Tong Fuk, South Lantau Island, situated near the coast of Tong Fuk Miu Wan (see *Figure 1.4a*). The proposed cable route starts from Tong Fuk and extends southward beyond the Hong Kong boundary and enters the South China Sea (see *Figure 1.4b*).

1.4.2 *History of Site*

The proposed site for the cable landing station occupies land which has historically experienced little development. A single-storey iron shed built for storage purposes, currently stands on this site but is now derelict. It is speculated that this building dates back to at least the 1970s.

Tong Fuk is the landing site of two other submarine cable systems, FLAG and APCN, which provide connectivity between major countries in Asia and Europe.

1.4.3 *Scale of Project*

The project involves the following works:

- demolition of the existing single-storey iron shed (previously used for storage), which covers an area of not more than 1,060m² and a height of not more than 5.5m;
- construction of the proposed cable landing station, a two-storey, rectangular shaped building, with a gross floor area of about 2,428 m² (see *Figure 1.4a* for the site location and *Figure 1.4c* for the proposed building layout) on a site area of about 2,246m²; and
- installation of the NAC, with an intended burial depth of 3m, starting due south of the landfall and extending to the edge of HKSAR waters.

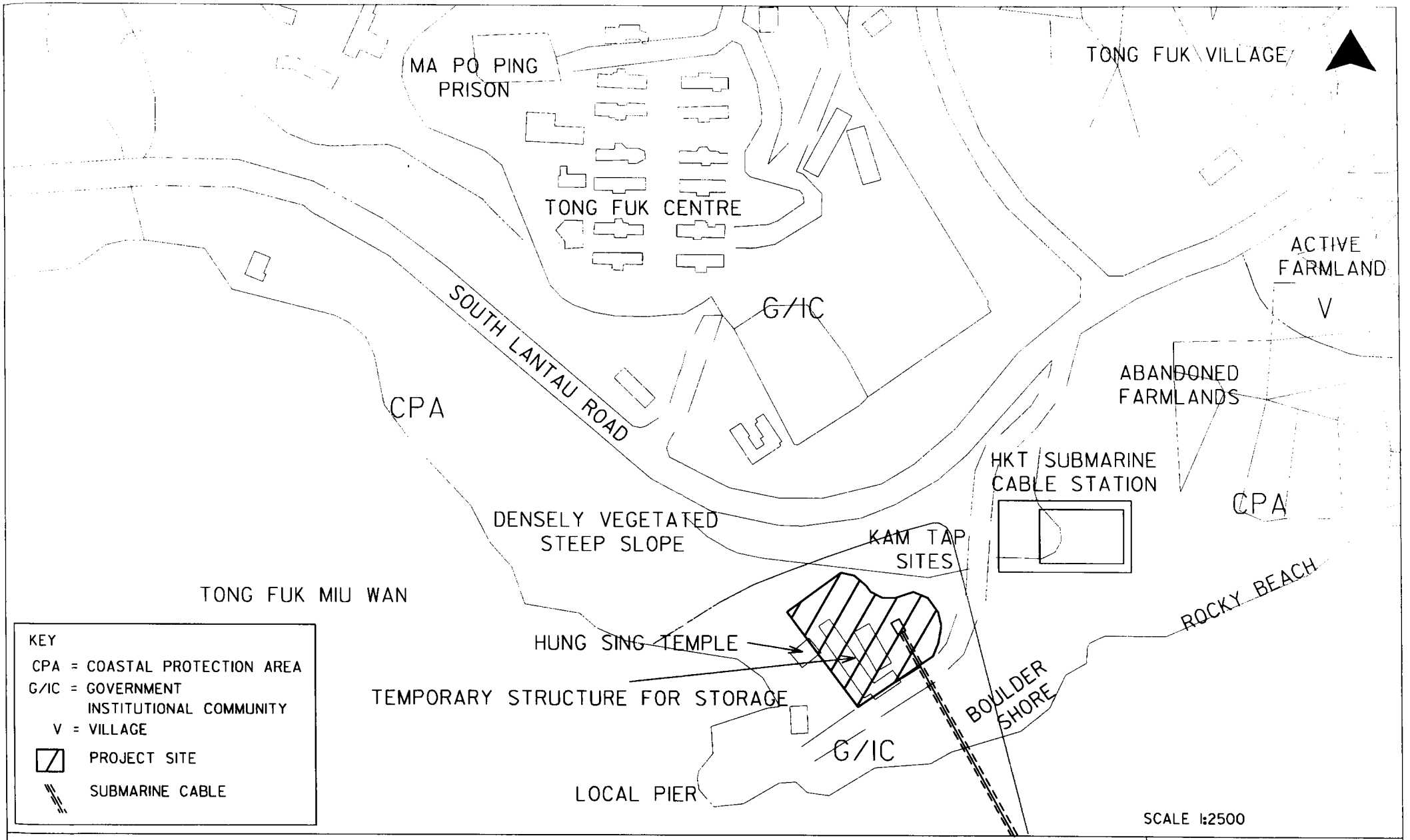


FIGURE 1.4a

PROJECT SITE AND LOCAL PLANNING CONTEXT

USTN FILE: C2022/1.dgn
DATE: 03/2000

Environmental Resources Management

ERM

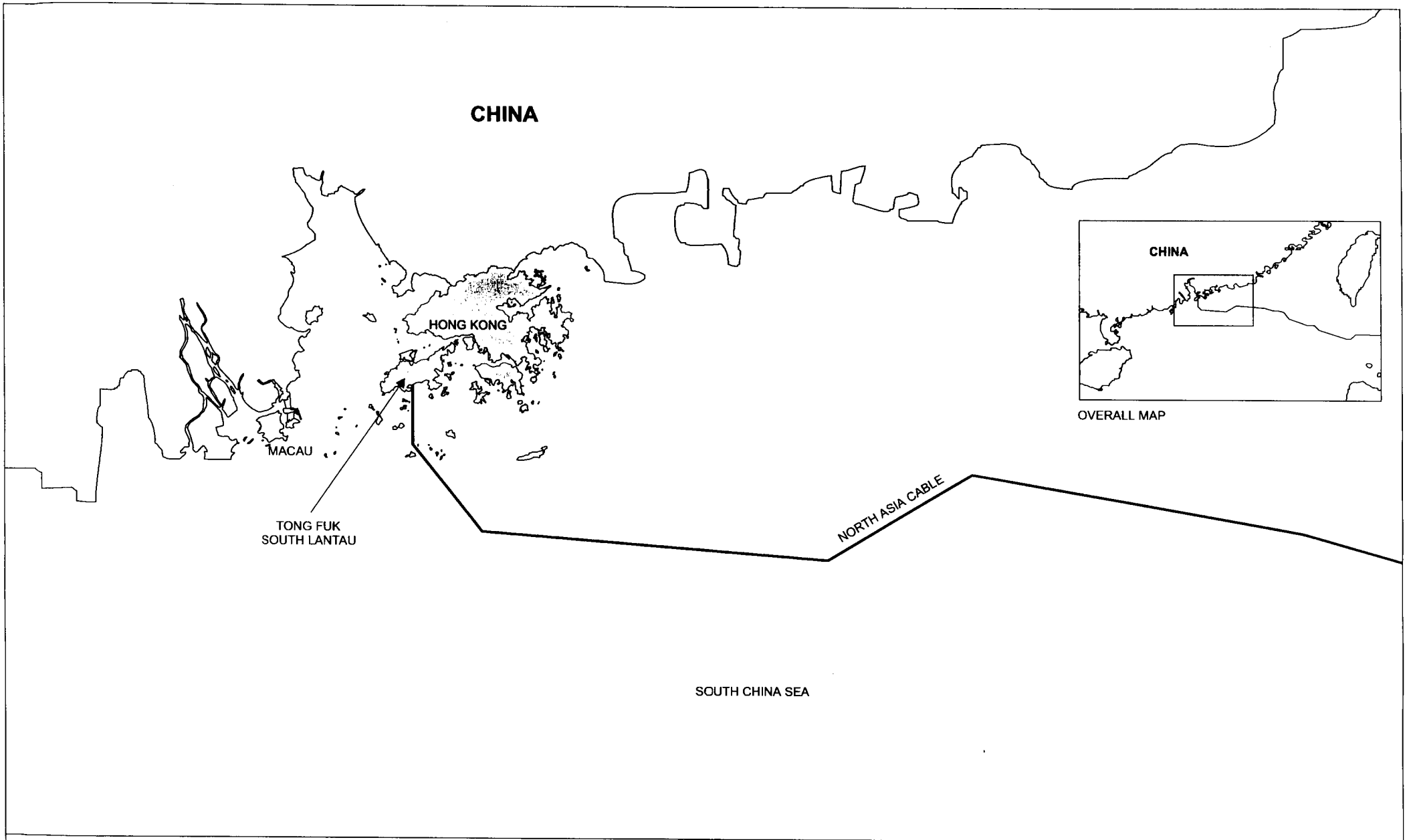


FIGURE 1.4b

NORTH ASIA CABLE (NAC) FIBRE OPTIC SUBMARINE CABLE SYSTEM

FILE: C2022I1
DATE: 27/03/00

Environmental Resources Management

ERM

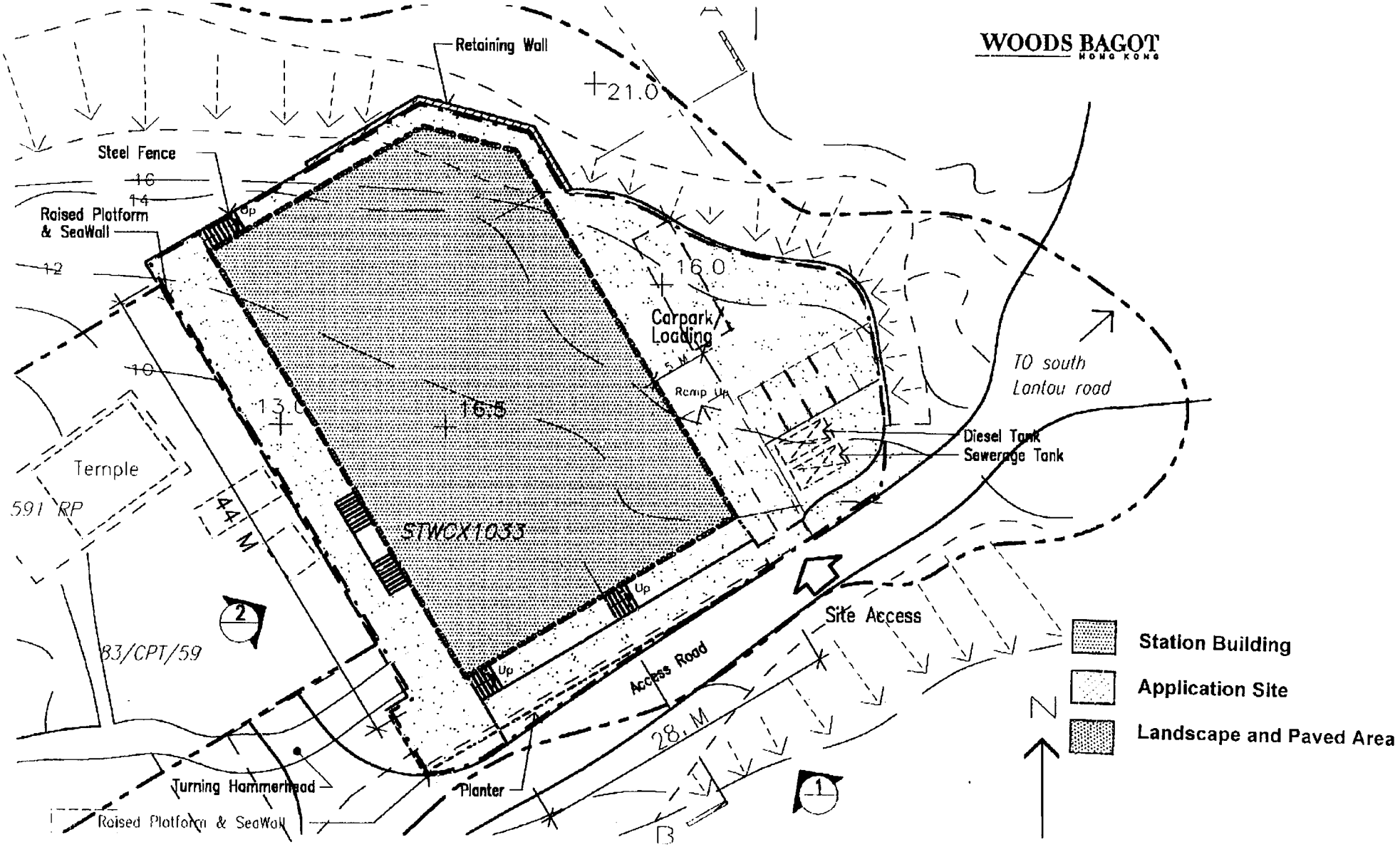


FIGURE 1.4c

PROPOSED BUILDING LAYOUT PLAN

FILE: C2022k
DATE: 24/03/00

Environmental
Resources
Management

ERM

1.5 *DESIGNATED PROJECTS TO BE COVERED BY THE PROJECT PROFILE*

This Project Profile covers two classifications of a Designated Project under the *Technical Memorandum on Environmental Impact Assessment Process (TM-EIAO)*:

- Schedule 2 (Part I), C.12 - A dredging operation which is less than 500 metres from the nearest boundary of a Coastal Protection Area.
- Schedule 2 (Part I), I.1 - A drainage channel or river training and diversion works, which discharges into an area which is less than 300 metres from the nearest boundary of an existing Coastal Protection Area.

1.6 *NAME AND TELEPHONE NUMBER OF CONTACT PERSON*

All queries regarding the project can be addressed to:

Programme Director, Global Submarine Networks
Level 3 Communications Limited

2 *OUTLINE OF PLANNING AND IMPLEMENTATION PROGRAMME*

2.1 *PROJECT PLANNING AND IMPLEMENTATION*

The project will be led by Level 3 Communication Limited. Planning and construction will be undertaken by the following team:

- Project Management - Parsons Brinckerhoff (Asia) Limited
- Architects and Authorised Person - Woods Bagot Hong Kong
- Civil and Structural Engineers - HK Cheng and Partners Limited Consulting Engineers
- E&M Engineers - Far East Consulting Engineers Limited
- Submarine Cable System - Alcatel Submarine Networks and Fujitsu Limited

2.2 *PROJECT PROGRAMME*

Construction of the cable landing station is scheduled to commence in June 2000 and end in December 2000, while the NAC installation will commence in July 2000 and end in November 2000. An implementation programme, showing critical aspects of the project is provided in *Figure 2.2a.*

3 *MAJOR ELEMENTS OF THE SURROUNDING ENVIRONMENT*

The locations of the various major elements of the area surrounding the site are shown in *Figure 3.0a.*

3.1 *COASTAL PROTECTION AREA*

A small portion of the project site (10%) falls within land that is zoned as a Coastal Protection Area (CPA). The CPA zone covers virtually all the area between the sea and the South Lantau Road from Cheung Sha to Tong Fuk. As stipulated in the Explanatory Statements attached to the statutory notes for the CPA, the intention of such zoning is *"to protect the natural character of the shore-line, to safeguard the beaches and their immediate hinterland, and to prevent ribbon development in a haphazard manner along the South Lantau Coast"*. It should be noted that the CPA zone allows uses such as telecommunications cables and stations.

3.2 *GAZETTED BATHING BEACHES*

There are four gazetted bathing beaches along the coast at South Lantau at varying distances from the project site. The closest beach to the project site is the Tong Fuk beach which is 800m to the east. Further away still are the beaches at Cheung Sha Upper, Cheung Sha Lower and Pui O which are all more than 1.3km away from the project site.

3.3 *SHUI HAU INTERTIDAL FLATS*

The sand flats at Shui Hau are well-protected from strong oceanic waves and occupy an area of ~0.2 km^2. The soft, sheltered, nature of the intertidal flats, together with the accumulation of organic detritus, have encouraged a rich diversity of inhabitants. The area is fairly remote, being far from urbanised areas and recreational beaches. The environment is relatively intact and free from pollution as the area is only occasionally visited by study groups and tourists. The sand flats are of high conservation interest as they represent one of the few known nursery areas for the endangered horseshoe crab. The eastern edge of the Shui Hau sand flats is over 700m from the project site.

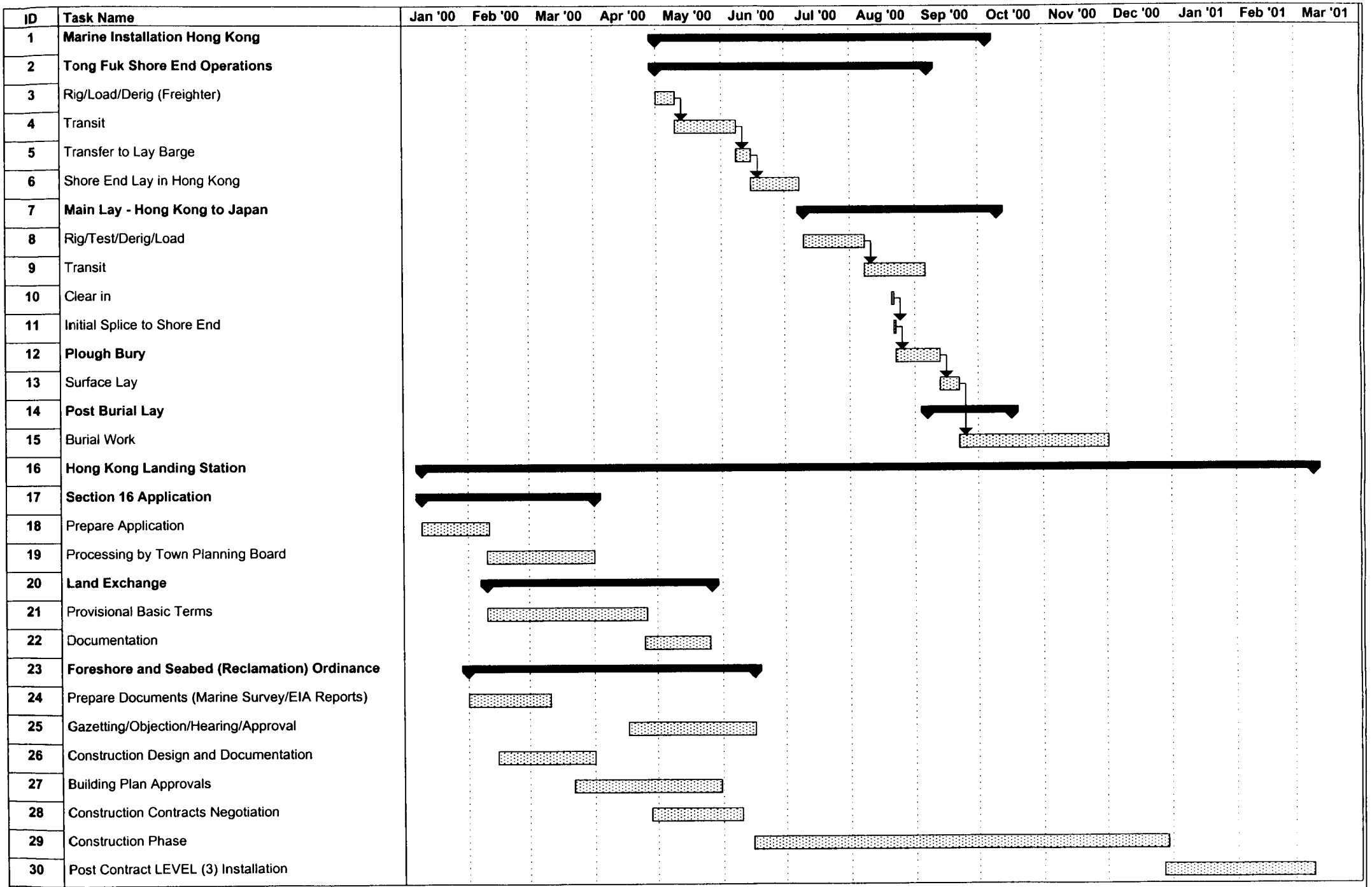


Figure 2.2a Project Implementation Programme

SOUTH LANTAU

SOUTH LANTAU ROAD

CHEUNG SHA UPPER BEACH

CHEUNG SHA LOWER BEACH

PUI O BEACH

TONG FUK BEACH

TONG FUK VILLAGE

TONG FUK MIU WAN

HUNG SING TEMPLE

SHUI HAU VILLAGE

HORSESHOE CRAB HABITAT AT SHUI HAU WAN

LANTAU SOUTH COUNTRY PARK

CPA

R(C)

V

G/IC

KEY

CPA COASTAL PROTECTION AREA

V VILLAGE

G/IC GOVERNMENT INSTITUTIONAL COMMUNITY FACILITIES

R(C) RESIDENTIAL (C TYPE)

GAZETTED BATHING BEACH

HKT STATION

SUBMARINE CABLE ROUTE

-5mPD BATHYMETRIC CONTOUR

FIGURE 3.0a

MAJOR ELEMENTS OF THE SURROUNDING ENVIRONMENT

FILE: C2022j2

DATE: 24/03/00

Environmental Resources Management

ERM

3.4 *FUNG SHUI*

The Fung Shui of the area is regarded as a very important environmental element by local villagers. Level 3 has had direct co-ordination with the local villagers and will obtain their consent before commencing any work to avoid any adverse impacts to the Fung Shui of the area.

3.5 *KAM-TAP (GRAVE JARS) SITES*

To the north of the site, there are two small local Kam-Tap (grave jars) sites. The two sites are surrounded by trees and are at a level of around 15m higher than the project site and therefore are physically and visually separate from the site.

3.6 *HUNG SHING TEMPLE*

The historic Hung Shing Temple, on Lot 591 RP, to the south of the site was established in 1802, later rebuilt in 1965 and refurbished in 1990. The temple is still active and is popular with local people worshipping "Hung Shing Yeh". The building itself is in the 1999 survey record of the Antiquity and Monument Office, awaiting assessment on grading by the Antiquity Advisory Board. Although the Temple is neither Declared nor Graded monument, its long history and significance to the local community is well recognised.

3.7 *CABLE & WIRELESS HKT SUBMARINE CABLE STATION*

Some 30m east of the site is the C&W HKT submarine cable station. This station is similar to the proposed cable landing station in both function and physical attributes. The C&W HKT submarine cable station comprises a 2-storey building with a floor area of around 1,655m^2 and building height of 15m (fluepipes project to 18.3m) on a site of 2,445m^2. It contains telecommunications equipment for submarine cable landing, workshops, cable stores, staff facilities, pump rooms and a sprinkler tank. There is an open area for vehicular circulation, parking and landscaping. As the station is built on the headland, it is visually prominent, especially when viewed from the sea and village area to the east. The section of paved road from this cable station to the intersection with the South Lantau Road has been upgraded to a width of approximately 4.5m for emergency vehicular access.

4.1 SUMMARY OF POTENTIAL ENVIRONMENTAL IMPACTS

The following assessments are based on the conceptual layout plans and the expected construction and operational activities of the proposed cable landing station and submarine transmission cable. The types of environmental impacts that could potentially arise during the construction and operation of the proposed cable landing station and the submarine cable are summarised in *Table 4.1a.*

Table 4.1a Potential Sources of Environmental Impacts

Potential Impact	Construction Phase	Operation Phase
• Dust	✓	×
• Noise	✓	✓
• Liquid Effluents, Discharges, or Contaminated Runoff	✓	✓
• Generation of Waste or By-products	✓	✓
• Disruption of Water Movement or Bottom Sediment	✓	×
• Unsightly Visual Appearance	×	✓
• Cultural & Heritage	✓	×
• Ecological Impacts:		
- Terrestrial	✓	×
- Marine	✓	×
- Fisheries	✓	×
• Gaseous Emissions	×	×
• Odour	×	×
• Night-time Operations	×	×
• Traffic Generation	×	×
• Manufacturing, Storage, Use, Handling, Transport, or Disposal of Dangerous Goods	×	×
• Hazardous Materials or Wastes	×	×
• Risk of Accidents Which Result in Pollution or Hazard	×	×
• Disposal of Spoil Material, Including Potentially Contaminated Materials	×	×

Notes: ✓ = Potential for adverse impacts, × = Adverse impacts are not expected

4.2 DUST

Cable Landing Station: During demolition and construction, excavation and earthmoving activities will be required, and may generate dust impacts at sensitive receivers. Although only a small amount of dust is expected to be generated for a short duration, the potential for impacts at nearby Air Sensitive Receivers has been reviewed. The results of the assessment indicate that the only sensitive receiver of concern is the Hung Shing Temple, but that dust impacts can be minimised provided that standard dust suppression measures are taken. Provided that these measures are adhered to, no adverse dust impacts are anticipated during construction of the cable landing station. During its operation, the cable landing station will not emit any dust.

Submarine Cable: There will not be significant dust impacts during construction because the cable will be connected from the shore-end landing point to the station via underground directional drilling from the station manhole. Hence no dust impact assessment is necessary.

No dust impacts will occur during the operational phase.

4.3 *NOISE*

Cable Landing Station: During the demolition and construction phase, powered mechanical equipment will be required for the demolition of existing structures, excavation, site formation and construction works and may generate noise impacts at sensitive receivers. The potential for construction noise impacts at nearby Noise Sensitive Receivers has been assessed and only the Hung Shing Temple is expected to experience noise exceedances due to its close proximity (less than 10 m) from the work site. However, noise levels can be substantially reduced through careful planning (e.g. avoiding noisy activities when the temple is visited by worshipers/visitors) and use of silencers, mufflers and movable noise barriers. It is expected that with these measures, noise levels are considered to be acceptable.

During operation, it is expected that only a few individuals would be employed at the landing station during the initial start up of the facility and that the facility will be fully automated at a later date. The project would, therefore, generate only minimal vehicle trips during operation and hence would not impact Noise Sensitive Receivers. The cable landing station will house electronic equipment for telecommunications network distribution. Such activities are considered to be a type of "clean technology" which are not noise intensive. Only minimal noise will be generated from the air cooling system as the system will be designed to comply with the acceptable noise standards.

Submarine Cable: It is expected that no excessive noise will be generated during the underground drilling work for the cable installation. Cable laying and burial is at present not expected to take place at night.

4.4 *WATER QUALITY*

Cable Landing Station: Water quality impacts may occur during construction due to the runoff of soil, construction material, or waste into nearby watercourses. These potential impacts were deemed controllable through engineering design and suitable operating procedures and would therefore, not result in any adverse impact to the existing water quality.

Operation phase impacts to water quality could potentially occur due to the discharge of surface run-off from the area of the landing station and due to the discharge of sewage effluents generated by the staff at the station. The potential impacts due to surface run-off could be readily controlled through

design measures for a stormwater system. The sewage effluents are expected to be small in quantity (as the station will be fully automated and largely unmanned) and will be treated by a package plant to a level better than that specified in the *Technical Memorandum for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters* and, as such, would not impact water quality. Therefore, no impacts to water quality would occur during operation of the cable landing station.

Submarine Cable: The marine based construction activities relate to burying the cable 3m below the existing sea bed levels. The cable will be laid using an injection tool, which would only give rise to short term elevations in suspended sediment concentrations in the immediate vicinity of the cable. There were not predicted to be any adverse impacts to sensitive receivers from this activity, which was deemed to be environmentally acceptable.

The operation of the cable will not result in any pollutant emissions into the surrounding waters.

4.5 *WASTE MANAGEMENT*

Cable Landing Station: Construction & Demolition Materials will be generated during construction of the proposed facility and impacts would not occur with the implementation of good waste management practices. During operation, solid waste quantities generated from the Cable Landing Station would be minimal, domestic in nature and will be handled at local waste transfer and collection facilities for transportation to the public landfills. Solid wastes arising from the proposed development will not create significant environmental impacts.

Submarine Cable: During the cable landing work, no waste material or disposal will be generated at the site.

4.6 *DISRUPTION OF WATER MOVEMENT OR BOTTOM SEDIMENT*

Cable Landing Station: There will be no disruption of water movement or bottom sediment during either construction or operation of the cable station.

Submarine Cable: There will be temporary displacement of bottom sediment during the laying of the NAC using the injection tool. However, once the cable is installed, the bottom sediment will naturally resettle.

4.7 *LANDSCAPE AND VISUAL*

Cable Landing Station: The levels of landscape and visual impact which would result from the construction and operation of the cable station are considered to be low and acceptable, assuming that mitigation measures such as new screen woodland planting are incorporated into the scheme.

Submarine Cable: Since the cable conduit is drilled under the sea-shore and the submarine cable is buried in the seabed, it will not cause any visual obstruction or inconvenience to the public. Level 3 will undertake the responsibility to carry out regular inspections along the cable route in order to maintain it in good condition. There will be no adverse long term or cumulative effects or impacts to the environment.

4.8 CULTURAL AND HERITAGE

Cable Landing Station: Provided that the recommended mitigation measures are implemented, such as a watching brief at the cable landing station site during excavation works, and vibration monitoring of the Hung Shing Temple, no adverse impacts on cultural heritage resources from the proposed cable landing station and associated infrastructure are expected.

Submarine Cable: The proposed landing method will only have a minimal impact on the top layer of seabed sediments. As no debris were identified in the geophysical surveys, no impacts to marine archaeological resources are expected.

4.9 TERRESTRIAL ECOLOGY

Cable Landing Station: Low terrestrial ecological impacts are expected due to the generally low ecological value of the habitats affected, the absence of flora or fauna of conservation significance, and the small scale of the proposed development. Tree planting to compensate for the minor loss of woodland edge habitat will be implemented following the established tree felling application procedure.

Submarine Cable: No impacts to terrestrial ecology will arise from the construction and operation of the marine cable.

4.10 MARINE ECOLOGY

Cable Landing Station: No impacts to marine ecology will arise from the construction and operation of the cable station.

Submarine Cable: A review of the existing information on the marine ecological resources surrounding the cable routing has identified the area as supporting benthic fauna which are of low ecological value. Intertidal habitats have been classified as typical of Hong Kong intertidal habitats and are considered to be of low to medium ecological value. The waters are also not considered to be a critical habitat for marine mammals as the number of sightings recorded in these waters is low. Subtidal soft bottom assemblages that will be disturbed during the laying of the cable system are of low ecological value and commonly recorded elsewhere in Hong Kong waters;

therefore, the minor loss of benthic organisms directly along the cable route is not considered to represent an unacceptable ecological impact. The rapid reinstatement of the seabed will result in the area being available for prompt recolonisation, and hence, no permanent impacts are expected to occur.

4.11 *FISHERIES*

Cable Landing Station: No impacts to fisheries will arise from the construction and operation of the cable station.

Submarine Cable: A review of the existing information on the fisheries resources and fishing operations surrounding the cable route has identified the area as supporting a fishery of medium ranking in terms of fisheries production. Information indicates that sediment dispersed by the cable laying will be of low concentration and localised in nature and is therefore not expected to result in any unacceptable impacts to water quality and subsequently fisheries resources or fishing operations.

Full details of the above technical assessments (*Sections 4.2 - 4.11*) are presented in the *Annex to the Project Profile*.

4.12 *OTHERS*

Gaseous Emissions: Only a small amount of gaseous emissions (SO_2 and NO_x) from diesel-powered equipment would be generated during construction of the cable station and the submarine cable and will therefore not impact Air Sensitive Receivers.

No gaseous emissions will be generated during the operation of the station and the NAC.

Odour: No odour impacts are expected during either the construction or operation phases of the proposed project.

Traffic Generation: Very little traffic generation is expected during the construction phase and minimal traffic generation is envisaged during the operation phase of the proposed project.

Dangerous Goods: No dangerous goods will be involved in this project in either the construction or operation phases.

Night-time Operations: It is expected that all cable laying and burial work will be performed during the daytime and that there will be no night-time operations on the beach nor in the nearby area.

Hazardous Materials or Wastes: Apart from asbestos-containing waste generated from the demolition of the existing structure, no other hazardous materials or wastes are expected during both the construction and operation phases of the proposed project. It is likely that the existing storage shed will

contain asbestos within its structure. Therefore, an asbestos assessment must be carried out and an asbestos removal plan be devised to apply for a demolition permit.

Risk of Accidents Resulting in Pollution or Hazard: No pollution or hazard generating accidents are expected during either the construction or operation phases of the cable station. The submarine cables use stable silicon optical fibres protected with multi-layers of corrosion resistant polyethylene and galvanized steel wires and are designed for a normal working life-time of more than 25 years in sea water. Therefore no pollution or hazard generating accidents are expected during either the construction or operation phase of the submarine cable.

Disposal of Spoil or Contaminated Material: There will be no disposal of spoil or contaminated materials, hence no related impacts are expected during either the construction or operation phases of the proposed project.

5 *PROTECTION MEASURES AND ANY FURTHER IMPLICATIONS*

5.1 *MEASURES TO MINIMISE ENVIRONMENTAL IMPACTS*

5.1.1 *Standard Best Practice Measures*

In order to mitigate impacts arising from construction and operation, standard best practice measures are recommended for Dust, Noise, Water Quality and Waste Management (full details are presented in the *Annex to the Project Profile*).

5.1.2 *Specific Mitigation Measures*

Asbestos Management

It is recommended that an asbestos survey be conducted by a Registered Asbestos Consultant and that an *Asbestos Investigation Report* (AIR) be prepared. If asbestos is present, the AIR and an *Asbestos Abatement Plan* (AAP) should be submitted to the EPD for comment, prior to the commencement of the demolition works. The AAP should describe the mitigation and precautionary measures to be employed for the handling and disposal of Asbestos Containing Material.

Landscape & Visual

The concept landscape design allows for the reprovision of two trees for every tree felled and the planting of approximately 500 m^2 of compensatory planting around the periphery of the new development. Under these circumstances, the landscape impact of the proposed cable station is considered to be minimal and acceptable. In an effort to preserve the integrity

of the CPA zoning and the setting of the temple, the design of the building includes space for the planting of large screen trees such as:

- *Acacia auriculaeformis*
- *Albizzia lebbek*
- *Casuarina equisetiformis*
- *Cerbera manghas*
- *Ficus microcarpa*
- *Ficus virens*
- *Hibiscus tiliaceus*
- *Macaranga tanarius*
- *Pandanus tectorius*
- *Pongamia pinnata*
- *Terminalia catappa*
- *Thespesia populnea*

The new planting would be in the form of heavy-standard screen trees. Planting would be along the western and southern elevations of the building. Ground-level amenity planting would also be provided. New woodland planting using a matrix of whips and saplings would be planted along the north and west site boundary to compensate for felled trees, to reinstate the disruptive effects of construction and to reinforce the screening effects of the existing woodland.

Culture & Heritage

Major cultural events should be considered during the duration of construction works, and significant noise and dust generating activities should be reduced or ceased during such events at the Hung Shing Temple. Guidance should be sought from the Tong Fuk Villagers or temple caretakers for the timing of events that are to occur at the temple and construction works should be planned to avoid these periods.

In order to ensure that the construction works at the proposed site do not adversely affect the structure of the temple, it is recommended to provide settlement markers and tilt markers at the temple structure and grounds. Level and precise surveying should be deployed to monitor these markers, and to ensure that the movement tolerance limits are not exceeded. At the commencement of construction, a condition survey is normally commissioned and the survey results should be regularly checked against the temple to detect damage. Vibration caused by construction equipment should be monitored to within 15mm s^{-1}.

An archaeological watching brief by a qualified archaeologist is recommended at the proposed cable landing station during construction. After the existing concrete covering of the site is removed, the archaeologist should closely work with the excavation contractors to monitor the site. Should significant archaeological deposit be identified during excavation, the excavation work will be stopped for a short period for recording and rescuing of the finds to allow preservation by record. The frequency of the "stop, watch and record" work depends on the significance of any deposits at the site. When the excavation reaches bedrock or at a level that the archaeologist considers that no more archaeological deposit would survive, the watching brief is finished.

Terrestrial Ecology

There are no significant terrestrial ecology impacts associated with the proposed cable landing station and associated infrastructure. The following measures are recommended to mitigate against the minor loss of woodland.

- Tree planting is recommended to compensate for minor woodland habitat loss, following the established tree felling application procedure.
- The development layout plans show that the incense trees *Aquilaria sinensis* may be impacted by the proposed cable landing station. Should these trees be affected by the development, they should be relocated or transplanted to a suitable location nearby.
- Fences or boards should be set up during construction to protect the several large trees behind the temple.

As mentioned in the previous section, the few large trees of ecological and cultural value located between the boundary of the proposed site and the temple, including the *Celtis sinensis, Delonix regia, Ficus variegata, Viburnum odoratissimum* and *Bischofia javanica,* should be preserved.

5.2 POSSIBLE SEVERITY, DISTRIBUTION AND DURATION OF ENVIRONMENTAL EFFECTS

5.2.1 *Cable Landing Station Construction and Operation*

The construction of the cable station is expected to take approximately six and a half months. The works that have the highest potential to cause environmental impacts are those associated with site clearance, site formation and initial construction of the station building. These activities will last for less than five months and residual environmental impacts after the mitigation measures presented above have been implemented are predicted to be of low severity and acceptable.

Environmental impacts during the operation of the cable station have been demonstrated as being of low severity and hence acceptable.

5.2.2 *Submarine Cable*

The construction of the portion of submarine cable system in Hong Kong waters is expected to take approximately five months. The residual environmental impacts of the works activities are predicted to be localised to the immediate vicinity of the cable alignment, of low severity and acceptable. No environmental impacts are predicted during the operation of the submarine cable.

5.3 *FURTHER IMPLICATIONS*

The geotechnical environment of the proposed landing point has been confirmed to be suitable for submarine cable landing by electronic surveys. The site has already been used for other submarine cable systems and there has been no record of complaint or incident that indicates adverse effects to the surrounding environment.

The methods used for burying the NAC Submarine Cable System, as described above, have been used around the world for more than one century and are widely accepted to have no impact on the surrounding environment. The working period is normally very short and no waste or contaminant disposal issues or excessive noise will be generated by such an operation.

5.4 *USE OF PREVIOUSLY APPROVED EIA REPORTS*

Tong Fuk is already the landing site of two submarine cable systems, FLAG and APCN, which provide connectivity between major countries in Asia and Europe. EIA Reports were not prepared for these cable systems and it assumed that permissions were given before the *EIAO* process was instigated in 1997. The cable systems were gazetted under the *Foreshore and Seabed (Reclamations) Ordinance (Chapter 127)* on 19 April 1996 (Gazette No 16/1996).

A similar, and more recent, project was conducted for Hong Kong Telecom entitled "*Cable Landing Work in Deep Water Bay for SEA-ME-WE 3 Fibre Optic Submarine Cable System*". The Project Profile for this study was submitted to the EPD in May 1998. The study concluded that there would be no adverse long term or cumulative effects/impacts to the environment.

5.5 *ENVIRONMENTAL MONITORING & AUDIT*

Aside from the requirements to conduct an archaeological watching brief during the site excavation works no further environmental monitoring and audit measures have been recommended for this project.

Annex to the Project Profile

Annex A

Dust

A1 INTRODUCTION

This *Annex* identifies the potential dust impacts that may occur during construction of the proposed fibre optic submarine telecommunication cable landing station and associated land-based infrastructure.

A2 RELEVANT LEGISLATION AND ASSESSMENT CRITERIA

The principal legislation for the protection of air quality during construction includes the following:

- *Environmental Impact Assessment Ordinance (Cap. 499),Technical Memorandum on the EIA Process (EIAO TM);*
- *Air Pollution Control Ordinance (APCO), 1993, (Cap 311);*
- *Air Pollution Control (Construction Dust) Regulation; and*
- *The Hong Kong Planning Standards and Guidelines Chapter 10 (HKPSG).*

Under the *APCO*, the Hong Kong Air Quality Objectives (AQOs) stipulate statutory limits of typical air pollutants and the maximum allowable number of exceedances over specified time periods. The AQOs for total suspended particulates (TSP) and respirable suspended particulates (RSP) are shown in *Table A2a.*

Table A2a ***Hong Kong Air Quality Objectives*** ($\mu g\ m^{-3}$)[a]

Pollutant	Averaging Time [a]	
	24 Hours [b]	1 Years [c]
Total Suspended Particulates (TSP)	260	80
Respirable Suspended Particulates (RSP) [d]	180	55

Notes:
(a) Measured at 298K (25°C) and 101.325 kPa (one atmosphere)
(b) Not to be exceeded more than once per year
(c) Arithmetic mean
(d) RSP are suspended particles with a nominal aerodynamic diameter of 10 micrometres or less

In addition, the *EIAO TM* stipulates an hourly TSP concentration of 500 μgm^{-3} (measured at 25°C and 1 atmosphere at Air Sensitive Receivers (ASRs)) as the criterion for construction dust impact assessments.

A3 DESCRIPTION OF THE ENVIRONMENT

Existing air quality in the vicinity of the proposed cable landing station is expected to be good due to the rural nature of the site and coastal location. The ASRs within close proximity to the site include the Hung Shing Temple (within 10 m of the proposed cable landing station), the Tong Fuk Centre/Outdoor Sports Area (more than 100 m from the proposed cable landing station) and the Cable & Wireless HKT station (more than 70 m from the proposed cable landing station).

A4 IMPACT ASSESSMENT

The activities associated with the demolition of the existing storage shed and construction of the cable landing station that may generate dust include:

- demolition work;
- breaking of foundations;
- earthmoving activities such as site clearance; and
- ground excavation and material handling.

Access to the site is paved, therefore, dust impacts from vehicle movements are not expected to occur. The potential for fugitive dust impacts associated with the demolition and construction work is considered to be transient in nature and any emissions will generally be small in quantity.

Dust impacts will not occur at the Tung Fuk Centre Outdoor Sports Area or the Cable & Wireless HKT station due to their distance from the proposed site and the barrier effect created by the terrain. However, due to the close proximity of the construction works to the Hung Shing Temple, dust suppression measures are recommended to be included during demolition and construction works to reduce the potential for dust nuisances to occur to visitors of the temple.

A5 MITIGATION MEASURES

In accordance with the *Air Pollution Control (Construction Dust) Regulation*, the following measures should be employed at the worksite and incorporated into the Environmental Permit to minimise potential dust nuisance arising from the works. With the incorporation of the following measures, adverse air quality impacts during construction are not anticipated.

- The heights from which materials are dropped should be controlled to a minimum practical height to control fugitive dust emissions from unloading.

- Materials should not be loaded to a level higher than the side and tail boards and should be dampened or covered before transport.

- Water sprays should be applied as required to maintain the work site in a wet condition.

- All dusty materials should be sprayed with water prior to any loading, unloading or transfer operation.

- The load carried by the vehicle should be covered by clean impervious sheeting to ensure that dusty materials are not emitted from the vehicle.

- The excavation working area should be sprayed with water after the operation so as to maintain the entire surface in a wet condition.

A6 CONCLUSION

With the incorporation of dust suppression measures, especially regular wetting of the site area, and the covering of stockpiled materials, adverse air quality impacts during construction of the cable landing station are not anticipated.

Annex B

Noise

B1 INTRODUCTION

This *Annex* describes and evaluates the potential noise impacts arising from the construction of the proposed telecommunication cable landing station and associated infrastructure at Tong Fuk, South Lantau. The cable landing station would house electronic equipment for telecommunications network distribution. It is expected that the only significant noise generating source during operations would be the building air cooling system which can be minimised through the design of the cooling system and installation of a silencer, if necessary. The requirements for such measures have been incorporated in the mitigation measures. Therefore, only the potential for construction noise impacts to occur are addressed in this assessment.

B2 RELEVANT LEGISLATION AND ASSESSMENT CRITERIA

The principal legislation for the control of construction noise include the *Noise Control Ordinance (NCO) (Cap. 400)* and *the Environmental Impact Assessment Ordinance (EIAO) (Cap. 499)*. Three subsidiary Technical Memoranda are relevant to this site:

- *Technical Memorandum on Noise from Percussive Piling (PP TM);*
- *Technical Memorandum on Noise from Construction Work other than Percussive Piling (GW TM);* and
- *Technical Memorandum on Environmental Impact Assessment Process (EIAO TM).*

B2.1 PERCUSSIVE PILING

Percussive piling is prohibited at any time on Sundays and public holidays and during the weekday evening and night-time hours (1900 to 0700 hours, Monday through Saturday). A Construction Noise Permit (CNP) is required for such works during the weekday daytime hours (0700 to 1900 hours, Monday through Saturday).

When assessing a CNP application for the carrying out of percussive piling, the Environmental Protection Department (EPD) is guided by the *PP TM*. The department will look at the difference between the Acceptable Noise Levels (ANLs), as promulgated in the *PP TM*, and the Corrected Noise Levels (CNLs) that are associated with the proposed piling activities. Depending on the level of noise impact on nearby Noise Sensitive Receivers (NSRs), EPD may consider approving 3, 5 or 12 hours of daily piling time (See *Table B2.1a)*.

Table B2.1a ***Permitted Hours of Operation for the Carrying Out of Piling Work***

Amount by which CNL exceeds ANL	Permitted hours of operation on any day not being a general holiday
More than 10 dB(A)	0800 to 0900; 1230 to 1330; 1700 to 1800
Between 0 and 10 dB(A)	0800 to 0930; 1200 to 1400; 1630 to 1800
No exceedance	0700 to 1900

The Government has phased out the use of diesel, pneumatic and steam hammer pile drivers, which are particularly noisy (since 1 October 1999).

B2.2 *GENERAL CONSTRUCTION WORKS*

It is expected that demolition and construction work will occur during normal working hours (i.e. 0700 to 1900 hours on any day not being a Sunday or public holiday). It is not anticipated that night-time work will be undertaken for this project. Therefore the recommended noise standards for construction works during the daytime (normal working hours) during weekdays are considered appropriate.

There are no recommended construction noise standards provided in the *EIAO TM* for places of public worship. Therefore, a comparable type of land use criterion, those specified for education institutions, has been applied as an indication of potential noise impacts. *Table B2.2a* summarises the noise criteria applied to the general construction work.

Table B2.2a ***EIAO TM Daytime Construction Noise Limit***

Uses	Noise Standards ($L_{eq\ 30\ min}$, dB(A))
Domestic Premises	75
Educational institutions (normal periods/exams)	70/65

The *NCO* provides statutory controls on general construction works during the restricted hours (1900 to 0700 hours Monday to Saturday and any time on Sundays and public holidays). Although night time and evening construction work are not expected to be required, if it is found that construction works are required to be undertaken during restricted hours, the use of powered mechanical equipment (PME) during these hours would require a CNP.

The EPD is guided by the *GW TM* when assessing an application for the use of PME. The EPD will compare the Acceptable Noise Levels (ANLs), as promulgated in the *GW TM* and the CNLs (after accounting for factors such as barrier effects and reflections) associated with the proposed PME operations. A CNP will then be issued if the CNL is equal to or less than the ANL. The ANLs are related to the noise sensitivity of the area in question and different Area Sensitivity Ratings (ASRs) have been drawn up to reflect the background characteristics of different areas. The ANLs for ASRs are given in *Table B2.2b*. The acceptable construction noise level during evening hours

(1900 to 2300) and night hours (2300 to 0700) are 60 dB(A) and 45 dB(A) respectively.

Table B2.2b *Acceptable Noise Levels for ASR ($L_{eq, 5mins}$ dB(A))*

Time Period	Area Sensitivity Ratings		
	A	B	C
All days during the evening (1900 - 2300 hours) and general holidays (including Sundays) during the day and evening (0700 - 2300 hours)	60	65	70
All days during the night-time (2300 - 0700 hours)	45	50	55

The proposed cable landing station is situated within a rural area within close proximity to Lantau Road (within 70 m of the site) and, as such, the ASR is considered to be "A".

B3 DESCRIPTION OF THE ENVIRONMENT

The existing noise environment of the study area is quiet, reflecting the rural nature of the site and its coastal location. The closest NSR to the proposed Cable Landing Station site is the Hung Shing Temple (NSR1) (less than 10 m from the development boundary), followed by the Tong Fuk Center/Outdoor Sports Area (NSR2) (around 100 m from the proposed development) and Tong Fuk Village (NSR3) (more than 300 m from the proposed development). The locations of the NSRs are shown in *Figure B3a*.

B4 IMPACT ASSESSMENT

B4.1 POTENTIAL SOURCES OF IMPACT

The major noise sources associated with demolition and construction work are expected to be powered mechanical equipment, such as breakers, dump trucks, excavators, etc. The construction activities that may have noise impacts on the nearby NSRs comprise:

- demolition of an existing illegal structure within the site boundary;
- installation of piles;
- site formation;
- superstructure work;
- external works including widening of the access road;
- directional drilling;
- manhole construction; and
- cable burial.

A construction programme of the above activities is shown in *Table B1a* of *Attachment B1.*

B4.2 ASSESSMENT METHODOLOGY

The assessment of noise impact from the associated construction works for the development was undertaken based on the procedure outlined in the *GW TM.* In general, the procedure to undertake a construction noise assessment is as follows:

- locate representative NSRs that may be affected by the works;
- determine plant teams for corresponding construction activities, based on available information or agreed plant inventories;
- assign sound power level (SWL) to the PME proposed based on the GW-TM or other sources;
- calculate the correction factors based on the distance between the NSRs and the notional noise source position of the work site;
- apply corrections such as potential screening effect and acoustic reflection, if any, in the calculations; and
- predict construction noise level at NSRs.

The total noise levels from different concurrent construction activities have been assessed based on the programme shown in *Table B1a* of *Attachment B1.*

B4.3 EVALUATION OF IMPACT

NSR1 - Due to the close proximity of Hung Shing Temple to the demolition and construction works, substantial construction noise levels are expected to occur in excess of the acceptable noise criterion of 70 dB(A) $_{(Leq\ 30\ min)}$. These noise levels can be substantially reduced through careful planning of construction work and by using silencers or mufflers on construction equipment and movable barriers. During construction, the noise levels at the Hung Shing Temple can be reduced to between 59 dB(A) $_{(Leq\ 30\ min)}$ and 86 dB(A) $_{(Leq\ 30\ min)}$ as shown in *Table B1b* and *B1c* of *Attachment B1.* These noise levels can be reduced by a further 5 to 10 dB(A) through the use of movable barriers on the site.

Although noise levels would still, on occasion, exceed the noise criterion of 70 dB(A) $_{(Leq\ 30\ min.)}$, it is expected that noise levels could be managed during the demolition and construction works at times when the temple is actively used by worshipers/visitors. Through carefully planning of the construction schedule (e.g. rearranging the construction schedule during the period when the temple is in use) the noise levels associated with construction are considered to be acceptable. The specific measures for controlling noise levels during construction works, specific to Hung Shing Temple are provided in *Section B5.*

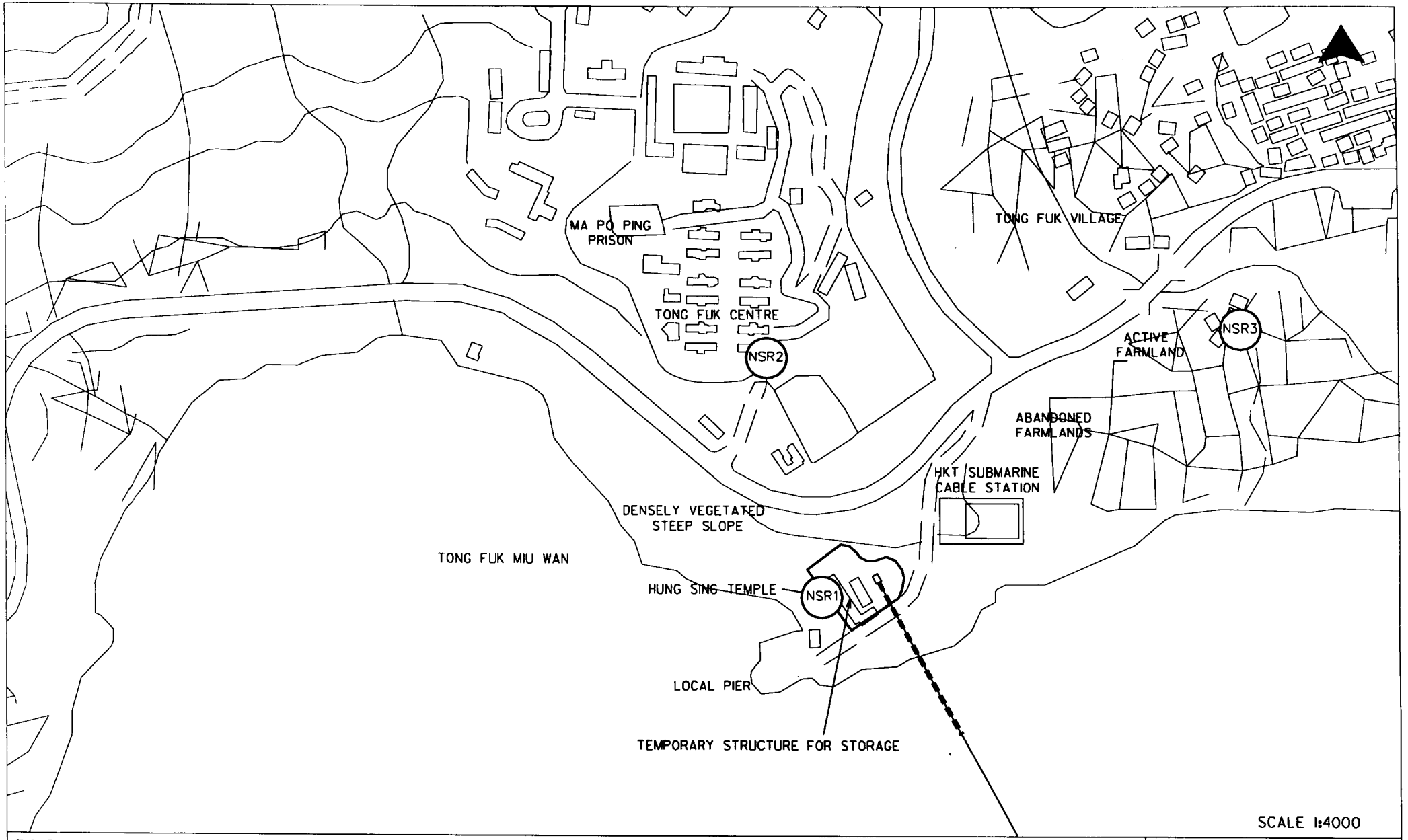


FIGURE B3a

THE LOCATION OF NOISE SENSITIVE RECEIVERS

USTN FILE: C2022/2.dgn
DATE: 03/2000

Environmental
Resources
Management

ERM

NSR2 - Table B1d in *Attachment B1* provides the predicted total noise levels at the Tong Fuk Centre. Based on these results, the Tong Fuk Centre would be exposed to construction noise in the range 70 to 74 dB(A) $_{(Leq\ 30\ min)}$ without the assistance of mitigation measures such as scilenced equipment. The maximum of 74 dB(A) $_{(Leq\ 30\ min)}$ is predicted during November 2000 due to the combined construction of the superstructure work, external work and manhole development. It is expected that noise levels would be further reduced due to the mitigation measures required for the protection of NSR1, Hung Sing Temple, to between 51 dB(A) $_{(Leq\ 30\ min)}$ to 66 dB(A) $_{(Leq\ 30\ min)}$.

NSR3 - Tong Fuk Village is located more than 300 m from the construction site. Based on the significant distance between the construction works and this sensitive receiver location, no noise impacts would occur at this sensitive receiver.

B5 *MITIGATION MEASURES*

The following mitigation measures are recommended to reduce noise levels. It is recommended that the Contractor be responsible for implementing these measures.

During Design Submission

- The cable landing station building air cooling system shall be designed to minimise noise levels to within the acceptable noise criteria. If necessary, installation of a silencer on this equipment shall be required to achieve acceptable noise levels of 50 dB(A) ($L_{eq,\ 30min}$) at NSR1.

During Demolition/Construction Activities

- Only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction programme.
- Machines and plant (such as trucks) that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum.
- Plant known to emit noise strongly in one direction, should, where possible, be oriented so that the noise is directed away from nearby NSRs.
- Silencers or mufflers on construction equipment should be utilised and should be properly maintained during the construction programme.
- Mobile plant should be sited as far away from NSRs as possible.
- Where necessary, moveable noise barriers should be positioned within a few metres of noise plant items.

- The Contractor shall appoint a acousticion to be responsible for the monitoring of the demolition and construction noise levels at Hung Shing Temple and notifying/co-ordinating with the Contractor to reduce noise levels to within the noise criterion of 70 dB(A) $_{(Leq\ 30\ min.)}$ when there are worshipers/visitors present at the temple.

B6 CONCLUSION

A noise assessment was undertaken to describe and evaluate the potential noise impacts arising from the construction phase of the proposed new submarine telecommunications cable installation landing on the South Lantau Coast and potential noise impacts associated with the proposed cable landing station and the associated infrastructure.

According to the predicted construction noise levels, noise exceedances would not occur at the Tong Fuk Centre and Tong Fuk Village Noise Sensitive Receivers. However, construction noise impacts would likely exceed acceptable noise criteria at the Hung Shing Temple, on occasions, due to its close proximity (less than 10 m) to the work site. Mitigation measures have been recommended, these include careful planning of the construction schedule, e.g. to avoid construction during the periods when the temple will be used, and requiring the use of noise reduction measures, such as barriers and noise silencers on noisy equipment. With the implementation of such measures the noise impacts are considered to be acceptable and will not impact Noise Sensitive Receivers.

Table B1a Construction Programme

Construction Activities	Start	End
Demolition	31/03/2000	06/04/2000
Site formation	17/07/2000	16/09/2000
Install piles	17/07/2000	16/09/2000
Superstructure work	17/10/2000	15/12/2000
External work	16/11/2000	15/12/2000
Manhole construction	31/10/2000	29/11/2000
Cable Burial	05/01/2000	08/01/2000

Sub-divided period for the calculation of impacts		
Construction Activities	**Start**	**End**
Demolition	31/03/2000	06/04/2000
Cable Burial	01/05/2000	16/07/2000
Site formation, Install piles and Cable Burial	17/07/2000	01/08/2000
Site formation, Install piles	02/08/2000	16/09/2000
Superstructure work	10/17/2000	10/31/2000
Superstructure work & Manhole Construction	10/31/2000	11/16/2000
Superstructure work, External work & Manhole Construction	11/16/2000	11/29/2000
Superstructure work & External work	11/29/2000	12/15/2000

Table B1b Plant Inventory (With Quiet Plant)

Construction Activities	Plant Required	PME Code	SWL	No. of plant	Corr. SWL
Demolition	Loader	Tab C3/97	105	1	105
	Dump truck	Tab 9/27	105	1	105
	Backhoe	Tab C3/97	105	1	105
	Mobile crane	Tab C7/114	101	1	101
				Sub-total	**116**
Site formation	Breaker (mass> 35 kg)	Tab C2/10	110	1	110
	Air Compressor (air flow equals to or less than $10m^3/min$)	CNP004	109	1	109
	Excavator	Tab C3/97	105	1	105
	Lorry	Tab C8/16	108	1	108
				Sub-total	**114**
Install Piles	Mobile crane	Tab C7/114	101	1	101
	Bore pile, reverse circular drill	CNP166	100	3	105
	Concrete pump	Tab C6/22	106	2	109
	Conrete mixer	Tab C6/35	100	2	103
				Sub-total	**112**
Superstructure Work	Poker vibrator	Tab C6/32	100	1	100
	Mobile crane	Tab C7/114	101	1	101
	Generator	Tab C7/62	100	1	100
	Dump truck	Tab 9/27	105	1	105
	Backhoe	Tab C3/97	105	1	105
	Concrete mixer	Tab C6/35	100	1	100
				Sub-total	**110**
External Work	Grader	Tab C3/97	105	1	105
	Bulldozer	Tab C9/2	104	1	104
	Dump truck	Tab 9/27	105	1	105
	Compactor	CNP050	105	1	105
	Poker vibrator	Tab C6/32	100	1	100
	Asphalt paver	Tab C8/24	101	1	101
	Road roller	Tab C8/27	104	1	104
	Concrete mixer	Tab C6/35	100	1	100
				Sub-total	**112**
Manhole Construction	Backhoe	Tab C3/97	105	1	105
	Mobile crane	Tab C7/114	101	1	101
	Poker vibrator	Tab C6/32	100	1	100
	Lorry	Tab C8/16	108	1	108
				Sub-total	**111**
Cable Burial	Derrick Barge	CNP061	104	1	104
				Sub-total	**104**

Table B1c Predicted Noise Levels at the Temple

NSR 1: Temple (With Quiet Plant)

Construction works	SWL	Distance	SPL
Demolition	110	19	80
Site formation	114	19	90
Install piles	112	19	81
Superstructure work	110	19	80
External work (e.g.road widening)	112	40	76
Manhole construction	110	45	73
Cable Burial	104	98	59

Total noise levels during the construction phase

Construction works	Start	End	Total SPL
Demolition	31/03/2000	06/04/2000	80
Cable Burial	01/05/2000	16/07/2000	59
Site formation, Install piles and Cable Burial	17/07/2000	01/08/2000	86
Site formation, Install piles	02/08/2000	16/09/2000	86
Superstructure work	17/10/2000	31/10/2000	80
Superstructure work & Manhole Construction	31/10/2000	16/11/2000	81
Superstructure work, External work & Manhole Construction	16/11/2000	29/11/2000	82
Superstructure work & External work	29/11/2000	15/12/2000	81

Table B1d Predicted Noise Levels at Tong Fuk Centre

NSR 2: Tong Fuk Centre (Unmitigated)

Construction works	SWL	Distance	SPL
Demolition	120	184	70
Site formation	118	184	68
Install piles	117	184	67
Superstructure work	121	184	70
External work (e.g.road widening)	122	215	70
Manhole construction	118	197	67
Cable Burial	104	257	51

Total noise levels during the construction phase

Construction works	Start	End	Total SPL
Demolition	31/03/2000	06/04/2000	70
Cable Burial	01/05/2000	16/07/2000	51
Site formation, Install piles and Cable Burial	17/07/2000	01/08/2000	70
Site formation, Install piles	02/08/2000	16/09/2000	70
Superstructure work	17/10/2000	31/10/2000	70
Superstructure work & Manhole Construction	31/10/2000	16/11/2000	72
Superstructure work, External work & Manhole Construction	16/11/2000	29/11/2000	74
Superstructure work & External work	29/11/2000	15/12/2000	72

NSR 2: Tong Fuk Centre (With Quiet Plant)

Construction works	SWL	Distance	SPL
Demolition	110	184	60
Site formation	114	184	64
Install piles	112	184	61
Superstructure work	110	184	60
External work (e.g. road widening)	112	215	61
Manhole construction	111	197	60
Cable Burial	104	257	51

Total noise levels during the construction phase

Construction works	Start	End	Total SPL
Demolition	31/03/2000	06/04/2000	60
Cable Burial	01/05/2000	16/07/2000	51
Site formation, Install piles and Cable Burial	17/07/2000	01/08/2000	66
Site formation, Install piles	02/08/2000	16/09/2000	66
Superstructure work	17/10/2000	31/10/2000	60
Superstructure work & Manhole Construction	31/10/2000	16/11/2000	63
Superstructure work, External work & Manhole Construction	16/11/2000	29/11/2000	65
Superstructure work & External work	29/11/2000	15/12/2000	63

Annex C

Water Quality

C1 INTRODUCTION

This *Annex* presents an evaluation of the potential water quality impacts associated with the construction and operation of the Hong Kong section of the proposed fibre optic submarine telecommunication cable system. The cable will pass from Japan into Hong Kong waters and then to a landing at Tong Fuk, South Lantau. Mitigation measures are outlined where potential adverse impacts are identified.

C2 RELEVANT LEGISLATION AND ASSESSMENT CRITERIA

The following pieces of legislation are applicable to the evaluation of water quality impacts associated with the construction and operation of the proposed fibre optic submarine cable system.

- *Environmental Impact Assessment Ordinance (Cap. 499. S.16)* and the *Technical Memorandum on EIA Process (EIAO TM), Annexes 6* and *14;*
- *Water Pollution Control Ordinance (WPCO);* and
- *Technical Memorandum for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM ICW).*

The *WPCO* is the primary legislation for the control of water pollution and water quality in Hong Kong. Under the *WPCO* Hong Kong waters are divided into 10 Water Control Zones (WCZs). Each WCZ has a designated set of statutory Water Quality Objectives (WQO). The route for the proposed fibre optic submarine cable system passes through the Southern WCZ, which was first appointed on 1 August 1988. The WQOs for the Southern WCZ are presented in *Attachment C1*, and are applicable as evaluation criteria for assessing the compliance of any discharges during the construction and operation phases of the proposed fibre optic submarine cable system.

All discharges during both the construction and operation phases of the proposed fibre optic submarine cable system are required to comply with the *TM ICW* issued under Section 21 of the *WPCO*, which defines acceptable discharge limits to different receiving waters. Under the *TM ICW* effluents discharged into the drainage and sewerage systems, inshore and coastal waters of the WCZs are subject to pollutant concentration standards for particular volumes of discharge. These are defined by EPD and specified in licence conditions for any new discharge within a WCZ.

C3.1 HYDRODYNAMICS

The majority of the proposed cable route is sheltered from significant tidal currents by the Sokos Islands and the land features of southern Lantau Island. To the south and west of the Sokos Islands the currents flow in a north west to south east direction around the south western tip of Lantau Island. Further to the south the currents are dominated by the oceanic current of the Lema Channel, which flow in a north easterly direction in the wet season and a south westerly direction in the dry season. Tidal current speeds along the majority of the cable route are low, particularly for the inshore portion. Current direction is likely to be perpendicular to the cable route for the sections to the south of Luk Keng Shan peninsula, while in the vicinity of the Tong Fuk landing point the current directions will be less predictable.

The cable route is outside of the region directly influenced by the strong outflow from the Pearl River in the wet season. This means that large seasonal changes in salinity profiles are not expected to occur, with little stratification present during the wet season. There is the potential for localised changes in salinity close to the coast due to runoff from the surrounding hillsides.

C3.2 WATER QUALITY

The proposed route for the proposed fibre optic submarine cable system passes through the Southern WCZ. There are two EPD routine water quality monitoring stations in the vicinity of the cable route. Water quality data for these stations, which was collected in 1998[1] and are the most up to date published data, are summarised in *Table C3a.* The locations of the stations are shown in *Figure C3a.*

Table C3a EPD Routine Water Quality Monitoring Data for the Southern WCZ for Stations Along the Cable Route

WQ Parameter	SM13	SM17
Temperature (°C)	23.3 (16.7 - 26.8)	23.0 (16.0 - 27.0)
Salinity	31.0 (28.5 - 33.7)	31.4 (29.6 - 33.2)
DO	6.1 (4.3 - 7.6)	6.0 (4.3 - 7.6)
DO Bottom	5.8 (4.3 - 7.5)	5.6 (4.2 - 7.8)
BOD	0.8 (0.1 - 1.7)	1.0 (0.3 - 2.5)
SS	6.9 (4.5 - 11.7)	6.4 (1.5 - 18.0)
TIN	0.19 (0.11 - 0.32)	0.16 (0.08 - 0.24)
Unionised Ammonia	0.002 (<0.001 - 0.006)	0.001 (<0.001 - 0.003)
Chlorophyll-*a* (μg L^{-1})	4.1 (0.9 - 13.7)	4.0 (0.6 - 13.0)
E. coli (cfu $100mL^{-1}$)	2 (1 -10)	1 (1-3)

Notes:
a) Except as specified, data presented are depth-averaged.
b) All units are mg L^{-1}, unless stated.
c) Data presented are annual arithmetic means except for *E. coli* which are geometric means.
d) Data enclosed in brackets indicate the range.
e) Shaded cells indicate non-compliance with the WQOs.

(1) EPD (1999). Marine Water Quality in Hong Kong in 1998.

The data show that compliance with the WQOs for dissolved oxygen and unionised ammonia was achieved at both stations. The WQO for total inorganic nitrogen, however, was breached at both stations. The non-compliance with the WQO for total inorganic nitrogen was found at Station SM13 for the last 10 years, while at Station SM17 compliance was only achieved once in the last 10 years. The data for chlorophyll-*a* show a wide variation between the maximum and minimum values, which indicate that at certain times of the year algal growth may be significant. The *E. coli* concentrations are low and indicate the lack of sewage effluent discharges in the vicinity of the monitoring stations.

C3.3 SEDIMENT QUALITY

There is one EPD routine sediment quality monitoring station in the vicinity of the cable route. Sediment quality data for this station are available for 1997(2) and are summarised in *Table C3b*. The location of the sediment quality monitoring station is shown on *Figure C3a*.

Table C3b EPD Routine Sediment Quality Monitoring Data in the Vicinity of the Cable Route

Parameter	SS6
COD (mg kg^{-1})	9,000 (8,000 - 10,000)
TKN (mg kg^{-1})	320 (190 - 480)
Cadmium (mg kg^{-1})	0.2 (0.1 - 0.5)
Chromium (mg kg^{-1})	21 (17 - 24)
Copper (mg kg^{-1})	12 (10 - 16)
Mercury (mg kg^{-1})	0.1 (<0.1 - 0.1)
Nickel (mg kg^{-1})	13 (11 - 15)
Lead (mg kg^{-1})	25 (22 - 28)
Zinc (mg kg^{-1})	61 (49 - 67)
PAHs (µg kg^{-1})	61 (39 - 218)
PCBs (µg kg^{-1})	5 (<5 - 5)

Notes:

a) Data presented are arithmetic mean; ranges are enclosed in brackets.
b) Results are based on laboratory analysis of bulk samples, which are collected twice per year from each sampling location.
c) All determinedness are reported on a dry weight basis, unless otherwise stated.
d) Shaded cells indicate exceedence of Class C contamination limits.

The above data show that the sediment would not be classed as contaminated, based on the existing and future sediment classification guidelines. The sediments have relatively low chemical oxygen demand and total Kjeldahl nitrogen concentrations.

C3.4 SENSITIVE RECEIVERS

Sensitive receivers in the vicinity of the cable route and landing station have been identified under the broad designations of gazetted bathing beaches and

(2) EPD (1998). Marine Water Quality for Hong Kong in 1997.

areas of ecological interest. The identified sensitive receivers in these two categories, shown on *Figure C3b*, are summarised as follows.

- **Gazetted Bathing Beaches:** Tong Fuk, Cheung Sha Upper, Cheung Sha Lower and Pui O; and

- **Sites of Ecological Interest:** Horseshoe Crab habitat at Shui Hau Wan and an area of medium coral abundance/diversity on Siu A Chau.

The South Lantau Potential Marine Park/Marine Reserve has not been included as a sensitive receiver because it is unlikely to be designated prior to the construction of the fibre optic submarine cable system.

C4 IMPACT ASSESSMENT

The potential impacts associated with the construction and operation of the proposed fibre optic submarine cable system and landing station at Tong Fuk are described below.

C4.1 CONSTRUCTION PHASE

C4.1.1 *Marine Based Construction*

Along the majority of the cable route within Hong Kong territorial waters the cable will be buried 3 m below the surrounding sea bed using a barge mounted special injection tool. In this method the cable and injection tool are lowered to the sea bed. The injection tool fluidises a trench using high pressure water jets and the cable is immediately laid within the trench. The sides of the trench slump around the cable, burying it and leaving a small depression in the seabed, which is infilled by natural sedimentation.

Approximately 100 m from the shoreline at Tong Fuk, cable laying by the barge mounted special injection tool will cease and alternate methods will be used to lay the cable up to the onshore landing point. Two options are being considered, which are directional drill cut and diver operated injection tool. In terms of water quality the method using a diver operated injection tool would have the potential for the greatest impacts, as directional drill cut would be undertaken from an onshore facility and the drilling would occur below the surface of the seabed.

The cable laying process will result in the formation of a cloud of high suspended sediment concentrations around the cable laying area, which will remain very close to the seabed. The sediments will settle rapidly, owing to their proximity to the seabed. Along the pipeline route tidal currents are low, particularly in the inshore areas, and thus the suspended sediments will not be transported away from the immediate proximity of the cable laying

operation. The closest sensitive receivers to the inshore section of the pipeline are the Tong Fuk gazetted bathing beach and the Horseshoe Crab habitat at Shui Hau Wan, which are 500 m and 1,200 m from the cable route respectively. The closest sensitive receiver to the offshore portion of the cable is the area of medium coral abundance/diversity on Siu A Chau, which is 3,500 m from the cable route. The distance of the sensitive receivers from the cable route means that adverse water quality impacts at these locations are not predicted to occur.

The seabed sediments in which the cable will be laid would be classed as uncontaminated, which is not unexpected given that there are no sources of industrial pollution in the proximity to the cable route. The COD values are relatively low, as are the nutrient contents. The low levels of contamination in the sediment, coupled with the short duration for disturbed sediment to remain in suspension, will mean that the effects on water quality (ie dissolved oxygen levels, nutrient concentrations and the release of micro-pollutants) will be very limited. This is because the processes by which these contaminants affect water quality are partially time dependant. It is therefore concluded that unacceptable impacts to water quality are not expected to occur.

C4.1.2 *Land Based Construction*

The primary land based construction activities will be the construction of the cable station building and directional drill cut from the cable station to the shoreline. During these construction activities the primary sources of water quality impacts will be from pollutants in site run-off, which may enter marine waters directly or enter the storm drain system to discharge via outfalls to marine waters. Pollutants, mainly suspended sediments, may also enter receiving waters if pumped groundwater is not adequately controlled on-site.

Wastewater from temporary site facilities should be controlled to prevent direct discharge to the marine waters adjacent to the site. Such wastewater may include sewage effluent from toilets and discharges from on-site kitchen facilities. Water from plant servicing facilities may be contaminated with oil and other petroleum products and would have the potential to discharge to surface waters if not adequately controlled on-site.

The potential sources of impacts to water quality may be readily controlled by appropriate on-site measures to minimise potential impacts as described in *Section C5*. With the implementation of such measures adverse impacts to water quality are not expected to result from land based construction activities.

C4.2 *OPERATIONAL IMPACTS*

Potential impacts to water quality during the operation of the proposed fibre optic submarine cable system relate to the landing station at Tong Fuk.

Potential impacts could arise from surface water run-off and from the sewage effluent generated by the staff based at the landing station during the initial start up of the facility.

Around the landing station building there will be a paved/concreted area providing space for back-up facilities associated with the station, including vehicle parking. There is the potential for contaminants to enter the surface waters during rainfall via the stormdrains. It is expected that potential impacts to water quality from surface run-off from the areas around the landing station will be readily controlled through engineering design and suitable operating procedures, as identified in *Section C5*. With the implementation of such measures water quality impacts are not expected to occur.

It is expected that during the initial start up of the facility, 10 operating staff will be required. This will be a short term measure as the station will be unmanned in the long term. Sewage effluents will therefore be generated at the landing station, and appropriate handling/treatment measures will be required to prevent adverse impacts to water quality. There is currently no sewerage system serving the Tong Fuk area and thus suitable measures to treat the sewage effluent generated by the workforce at the landing station will have to be installed.

The applicant has proposed to install a small package plant at the landing station. The plant will be designed to accommodate the predicted daily flows and treat the effluent to a suitable standard for discharge to the nearby marine waters. The plant will employ an aerobic biological treatment process, which results in accelerated biological treatment of sewage effluents, with ultra-violet disinfection. The treated sewage effluent will be discharged to marine waters to the south of the landing station via a dedicated outfall. The discharge point will be over 500 m from the gazetted bathing beach at Tong Fuk.

The discharge of treated sewage effluent from the package plant will be required to meet the required standards in *TM ICW*, issued under Section 21 of the *WPCO*. The discharge point will be in the inshore waters of the Southern WCZ and will thus have to comply with the standards for effluents specified in *Table 10a* of the *TM ICW*. The flow rate from the package plant is expected to be 1.2 m^3 day^{-1}, based on a conservative flow rate of 120 L $head^{-1}$ day^{-1} and a total occupancy of 10 staff at any one time. This flow rate puts the discharge into the first column, which is represented by the lowest flow rate, in *Table 10a* of the *TM ICW*.

The quality of the treated effluent from the package plant is quoted as 20 mg L^{-1} BOD and 30 mg L^{-1} suspended solids, which are within the standards specified in the *TM ICW*. The *E. coli* concentrations within the treated effluent are likely to be negligible due to the efficiency of the ultra-violet disinfection system and will thus comply with the relevant standard. The discharge of treated effluent with low concentrations of *E. coli* will ensure that there are no adverse impacts to water quality at the gazetted bathing beach at Tong Fuk.

Based on the above, it expected that there will be no adverse impacts to water quality from the discharge of treated sewage effluent from the proposed package plant at the landing station provided that the effluent meets the necessary standards specified in the *TM ICW*.

C5 MITIGATION MEASURES

C5.1 MARINE BASED CONSTRUCTION

No adverse impacts to water quality were predicted for the laying of the cable by an injection tool and as such no mitigation measures will be required.

C5.2 LAND BASED CONSTRUCTION

The Contractor shall implement the following on-site measures to minimise potential water quality impacts associated with land based construction.

C5.2.1 Surface Run-off

- Surface run-off from the construction site should be directed into storm drains via adequately designed sand/silt removal facilities such as sand traps, silt traps and sediment basins. Channels, earth bunds or sand bag barriers should be provided on site to properly direct stormwater to such silt removal facilities. Catchpits and perimeter channels should be constructed in advance of site formation works and earthworks.

- Silt removal facilities, channels and manholes should be maintained and the deposited silt and grit should be removed regularly, at the onset of and after each rainstorm to ensure that these facilities are functioning properly at all times.

- During excavation in the wet season, temporarily exposed soil surfaces should be covered, eg by tarpaulin, and temporary access roads should be protected by crushed stone or gravel, as excavation proceeds. Intercepting channels should be provided (e.g. along the crest/edge of the excavation) to prevent storm runoff from washing across exposed soil surfaces. Arrangements should always be in place to ensure that adequate surface protection measures can be safely carried out well before the arrival of a rainstorm.

- Earthworks final surfaces should be well compacted and the subsequent permanent work or surface protection should be carried out as soon as practical after the final surfaces are formed to prevent erosion caused by rainstorms. Appropriate intercepting channels should be provided where necessary. Rainwater pumped out from trenches or foundation

excavations should be discharged into storm drains via silt removal facilities.

- Open stockpiles of construction materials (e.g. aggregates and sand) on site should be covered with tarpaulin or similar fabric during rainstorms. Measures should be taken to prevent the washing away of construction materials, soil, silt or debris into any drainage system.

- Manholes (including any newly constructed ones) should always be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris from getting into the drainage system, and to prevent storm run-off from getting into foul sewers. Discharges of surface run-off into foul sewers must always be prevented in order not to unduly overload the foul sewerage system.

C5.2.2 *Wheel Washing Water*

- All vehicles and plant should be cleaned before they leave the construction site to ensure that no earth, mud or debris is deposited by them on roads. A wheel washing bay should be provided at every site exit, if practicable, and wash-water should have sand and silt settled out or removed before being discharged into the storm drains. The section of construction road between the wheel washing bay and the public road should be paved with backfall to reduce vehicle tracking of soil and to prevent site run-off from entering public road drains.

C5.2.3 *Wastewater from Building Construction*

- Wastewater generated from concreting, plastering, internal decoration, cleaning work and other similar activities, should undergo large object removal by installing bar traps at the drain inlets. It is not considered necessary to carry out silt removal due to the small quantities of water involved. Similarly, pH adjustment of such water is not considered necessary due to the small quantities and the fact that the water is only likely to be mildly alkaline.

C5.2.4 *Wastewater from Site Facilities*

- The use of chemical toilets will be necessary and these should be provided by a licensed contractor, who will be responsible for appropriate disposal and maintenance of these facilities.

C5.3 OPERATIONAL IMPACTS

The following mitigation measures shall be implemented by the Operator to prevent adverse operational impacts to water quality.

C5.3.1 *Surface Runoff*

- All surface run-off should be collected and discharged via a stormwater drainage system.

- Silt traps or sedimentation tanks should be installed to remove suspended solids, which may contain pollutants, and should be regularly cleaned and maintained in good working condition.

C5.3.2 *Sewage Treatment*

- The package plant should be maintained regularly to be kept in good working order so that the standard of treated effluent discharges does not deteriorate. A back-up power supply should be provided to prevent the discharge of untreated sewage in the event of a power failure.

C6 *SUMMARY AND CONCLUSIONS*

An evaluation has been made of the potential water quality impacts associated with the construction and operation of the Hong Kong section of the proposed fibre optic submarine cable system to a landing at Tong Fuk, South Lantau.

During the construction phase it was determined that potential impacts to water quality could arise from marine and land based construction activities. The marine based construction activities relate to burying the cable 3 m below the existing sea bed levels. The cable will be laid using an injection tool, which would only give rise to short term elevations in suspended sediment concentrations in the immediate vicinity of the cable. There were not predicted to be any adverse impacts to sensitive receivers from this activity, which was deemed to be environmentally acceptable.

The potential impacts to water quality during land based construction activities would be from surface run-off and wastewater discharges from the site. Mitigation measures were described, which would control the potential impacts to within the acceptable levels with no residual impact.

Operation phase impacts to water quality could potentially occur due to the discharge of surface run-off from the landing station site and due to the discharge of sewage effluents generated by the temporary staff at the station. The potential impacts due to surface run-off could be readily controlled through design measures for the stormwater system. The sewage effluents are proposed to be treated by a package plant to a level better than that specified in the *TM ICW* and as such would not pose a risk to water quality.

ATTACHMENT C1 - WATER QUALITY OBJECTIVES FOR SOUTHERN WCZ

	Water Quality Objective	Part or parts of Zone
A.	AESTHETIC APPEARANCE	
	a) There should be no objectionable odours or discolouration of the water	Whole zone
	b) Tarry residues, floating wood, articles made of glass, plastic, rubber or of any other substances should be absent.	Whole zone
	c) Mineral oil should not be visible on the surface. Surfactants should not give rise to a lasting foam.	Whole zone
	d) There should be no recognisable sewage-derived debris.	Whole zone
	e) Floating, submerged and semi-submerged objects of a size likely to interfere with the free movement of vessels, or cause damage to vessels, should be absent.	Whole zone
	f) The water should not contain substances which settle to form objectionable deposits.	Whole zone
B.	BACTERIA	
	a) The level of *Escherichia coli* should be less than 1 per 100 ml, calculated as the geometric mean of the most recent 5 consecutive samples taken at intervals of between 7 and 21 days.	Water Gathering Ground Subzones
	b) The level of *Escherichia coli* should not exceed 1,000 per 100 ml, calculated as the geometric mean of the most recent 5 consecutive samples taken at intervals of between 7 and 21 days.	Other inland waters
	c) The level of *Escherichia coli* should not exceed 610 per 100 ml.	Secondary contact Recreation Subzones Fish culture Subzones
	d) The level of *Escherichia coli* should not exceed 180 per 100 ml.	Bathing Beach Subzones
C.	COLOUR	
	Human activity should not cause the colour of water to exceed 30 Hazen units.	Whole zone
D.	DISSOLVED OXYGEN	
	a) The level of dissolved oxygen should not fall below 4 mg per litre for 90% of the sampling occasions during the whole year; values should be calculated as water column average (arithmetic mean of at least 3 measurements at 1 m below surface, mid-depth and 1 m above seabed). In addition, the concentration of dissolved oxygen should not be less than 2 mg per litre within 2 m of the seabed for 90% of the sampling occasions during the whole year.	Marine waters excepting Fish Culture Subzones

	Water Quality Objective	Part or parts of Zone
	b) The level of dissolved oxygen should not be less than 5 mg per litre for 90% of the sampling occasions during the year; values should be calculated as water column average (arithmetic mean of at least 3 measurements at 1 m below surface, mid-depth and 1 m above seabed). In addition, the concentration of dissolved oxygen should not be less than 2 mg per litre within 2 m of the seabed for 90% of the sampling occasions during the whole year.	Fish Culture Subzones
	c) The level of dissolved oxygen should not be less than 4 mg per litre.	Inland waters
E.	pH	
	a) The pH of the water should be within the range of 6.5 - 8.5 units. In addition, human activity should not cause the natural pH range to be extended by more than 0.2 unit.	Marine waters
	b) Human activity should not cause the pH of the water to exceed the range of 6.5 - 8.5 units.	Water Gathering Ground subzones
	c) Human activity should not cause the pH of the water to exceed the range of 6.0 - 9.0 units.	Other Inland Waters
	d) The pH of the water should be within the range of 6.0 - 9.0 units for 95% of samples collected during the whole year. In addition, waste discharges shall not cause the natural pH to be extended by more than 0.5 unit.	Bathing Beach Subzones
F.	TEMPERATURE	
	Human activity should not cause the natural daily temperature range to change by more than 2.0 °C.	Whole zone
G.	SALINITY	
	Human activity should not cause the natural ambient salinity level to change by more than 10%.	Whole zone
H.	SUSPENDED SOLIDS	
	a) Human activity should neither cause the natural ambient level to be raised by more than 30% nor give rise to accumulation of suspended solids which may adversely affect aquatic communities.	Marine waters
	b) Human activity should not cause the annual median of suspended solids to exceed 20 mg per litre.	Water gathering Ground Subzones
	c) Human activity should not cause the annual median of suspended solids to exceed 25 mg per litre.	Other Inland Waters
I.	AMMONIA	
	The un-ionized ammoniacal nitrogen level should not be more than 0.021 mg per litre, calculated as the annual average (arithmetic mean).	Whole zone
J.	NUTRIENTS	
	a) Nutrients should not be present in quantities sufficient to cause excessive or nuisance growth of algae or other aquatic plants.	Whole zone

	Water Quality Objective	Part or parts of Zone
	b) Without limiting the generality of objective (a) above, the level of inorganic nitrogen should not exceed 0.1 mg per litre, expressed as annual water column average (arithmetic mean of at least 3 measurements at 1 m below surface, mid-depth and 1 m above seabed).	Marine waters
K.	5-DAY BIOCHEMICAL OXYGEN DEMAND	
	a) The 5-day biochemical oxygen demand should not exceed 3 mg per litre.	Water gathering Ground Subzones
	b) The 5-day biochemical oxygen demand should not exceed 5 mg per litre.	Other inland waters
L.	CHEMICAL OXYGEN DEMAND	
	a) The chemical oxygen demand should not exceed 30 mg per litre.	Water gathering Ground Subzones
	b) The chemical oxygen demand should not exceed 30 mg per litre.	Other inland waters
M.	TOXIC SUBSTANCES	
	a) Toxic substances in the water should not attain such levels as to produce significant toxic, carcinogenic, mutagenic or teratogenic effects in humans, fish or any other aquatic organisms, with due regard to biologically cumulative effects in food chains and to interactions of toxic substances with each other.	Whole zone
	b) Human activity should not cause a risk to any beneficial use of the aquatic environment.	Whole zone

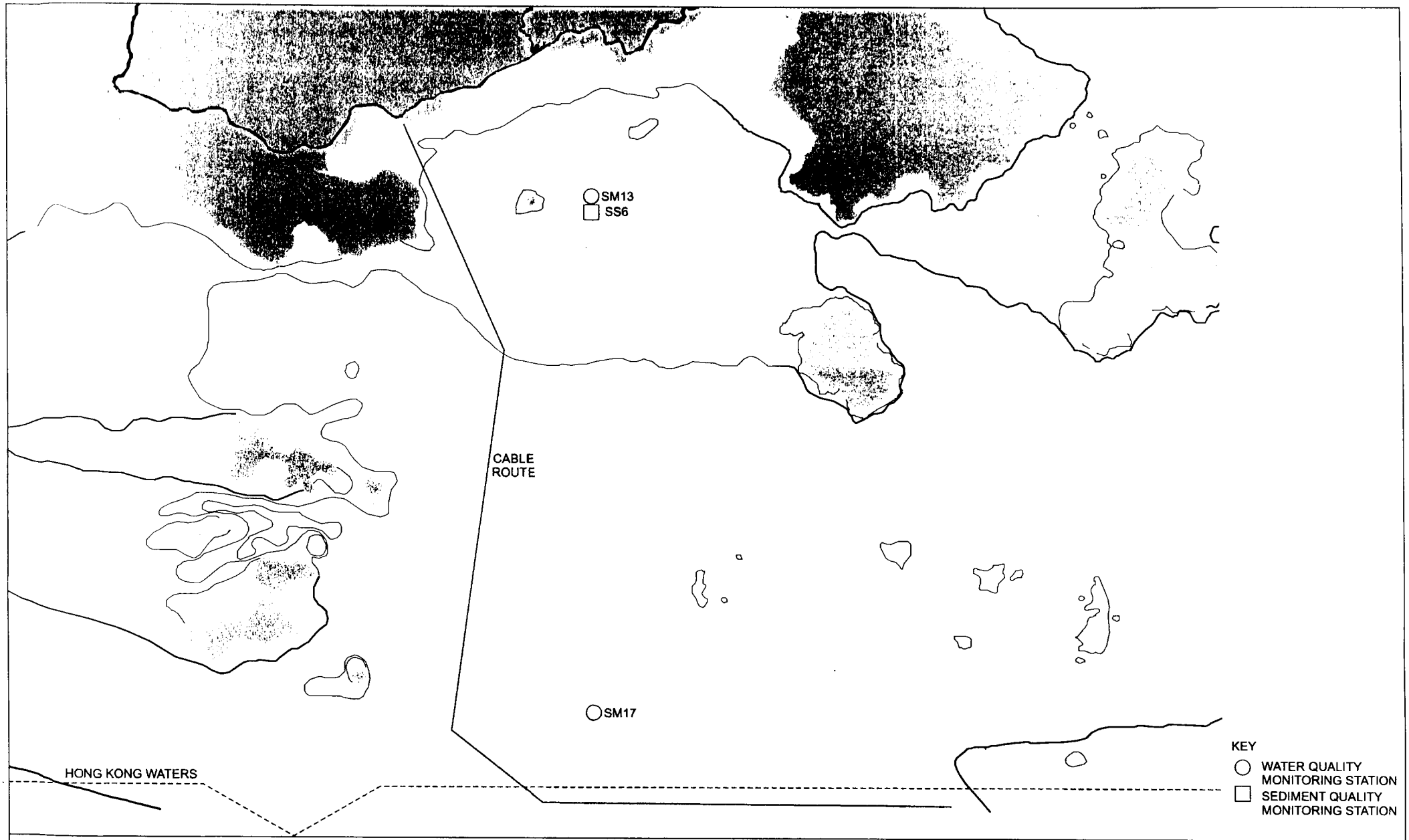


FIGURE C3a

LOCATIONS OF EPD ROUTINE WATER AND SEDIMENT QUALITY MONITORING STATIONS

FILE: C2022j1
DATE: 22/03/00

Environmental
Resources
Management

ERM

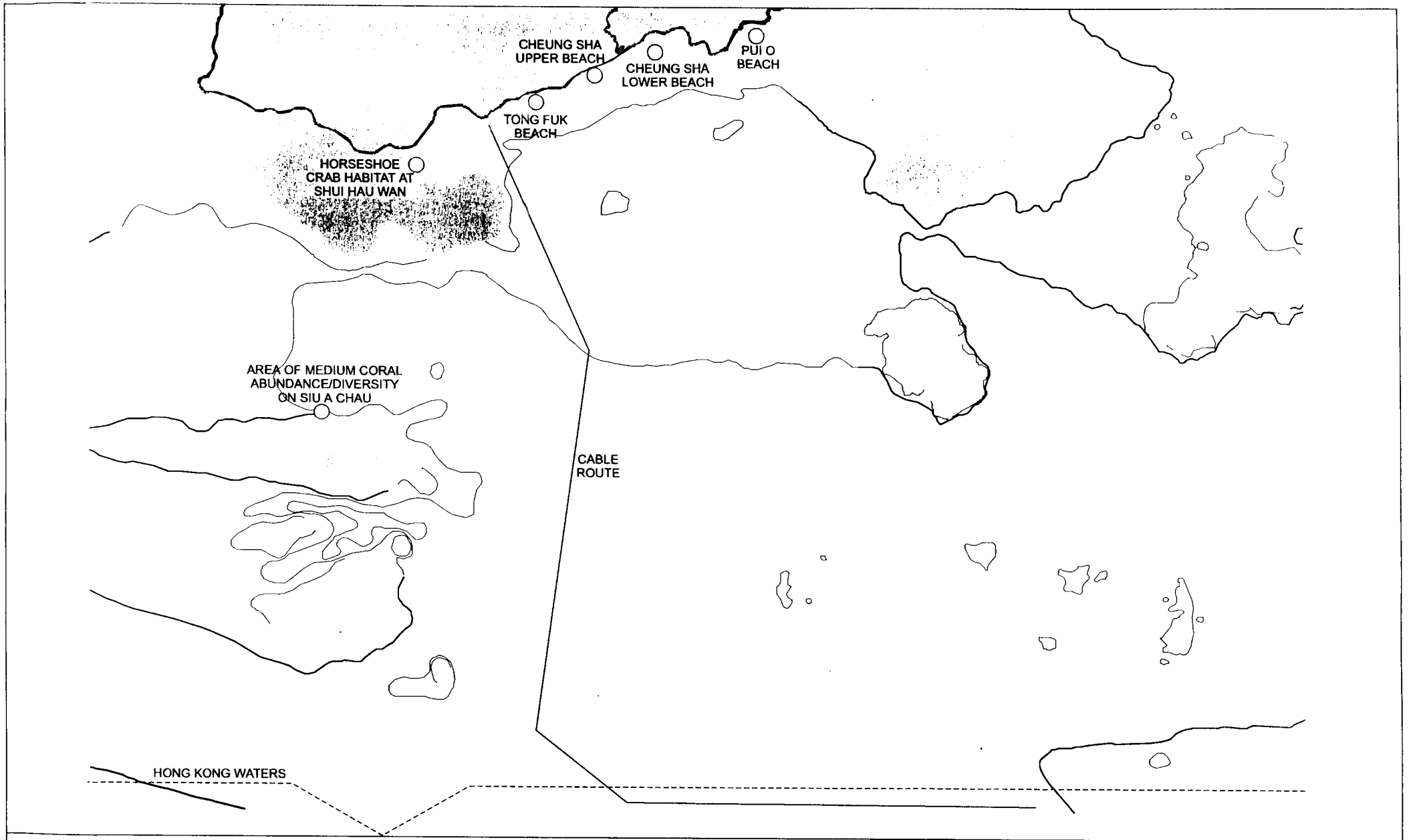


FIGURE C3b

LOCATIONS OF SENSITIVE RECEIVERS

FILE: C2022j
DATE: 22/03/00

Environmental
Resources
Management

ERM

Annex D

Waste Management

D1 INTRODUCTION

This *Annex* addresses the potential waste impacts associated with the construction and operation of the Hong Kong section of the proposed fibre optic submarine cable and cable landing station building.

The expected working life of the submarine cable is over 25 years and no waste is expected to be generated by cable operations.

D2 RELEVANT LEGISLATION AND ASSESSMENT CRITERIA

The following legislation relates to the handling and disposal of wastes in Hong Kong:

- *Waste Disposal Ordinance (Cap 354);*
- *Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354);*
- *Air Pollution Control Ordinance (Cap. 311);*
- *Land (Miscellaneous Provisions) Ordinance (Cap 28);* and
- *Public Health and Municipal Services Ordinance (Cap 132) - Public Cleansing and Prevention of Nuisance (Urban Council) and (Regional Council) By-laws*

Other relevant guidelines and documents which detail how the Contractor should comply with the regulations are as follows:

- *Waste Disposal Plan for Hong Kong (December 1989), Planning, Environment and Lands Branch, Government Secretariat;*
- *Environmental Guidelines for Planning in Hong Kong (1990), Hong Kong Planning and Standards Guidelines (HKPSG), Hong Kong Government;*
- *New Disposal Arrangements for Construction Waste (1992), Environmental Protection Department & Civil Engineering Department;*
- *Code of Practice on the Packaging, Labelling and Storage of Chemical Waste (1992), Environmental Protection Department;*
- *Code of Practice on the Handling, Transportation and Disposal of Asbestos Waste;*
- *Air Pollution Control (Asbestos) (Administration) Regulation;*
- *Code of Practice on Asbestos Control - Preparation of Asbestos Investigation Report, Asbestos Management Plan and Asbestos Abatement Plan;*
- *Code of Practice on Asbestos Control - Asbestos Work Using Full Containment or Mini Containment Method;*
- *Code of Practice on Asbestos Control - Asbestos Work Using Glove Bag Method;*
- *Code of Practice on Asbestos Control - Safe Handling of Low Risk Asbestos Containing Material;*
- *Practice Note for Professional Persons - Handling of Asbestos Containing Materials in Building (ProPECC PN2/97);*

- *Practice Note for Professional Persons, Construction Site Drainage, Professional Person Consultative Committee, 1994 (ProPECC PN 1/94);*
- *Waste Reduction Framework Plan 1998 -2007 (November 1998), Government of HKSAR;*
- *Works Branch Technical Circular No 2/93, Public Dumps;*
- *Works Branch Technical Circular No 16/96, Wet Soil in Public Dumps;*
- *Works Bureau Technical Circular No. 4/98, Use of Public Fill in Reclamation and Earth Filling Projects;*
- *Works Bureau Technical Circular No. 5/98, On-site Sorting of Construction Waste on Demolition Site;*
- *Works Bureau Technical Circular No. 5/99, Trip-ticket System for Disposal of Construction and Demolition Material;* and
- *Works Bureau Technical Circular No. 25/99, Incorporation of Information on Construction and Demolition Material Management in Public Works Sub-Committee Papers.*

D3 DESCRIPTION OF THE ENVIRONMENT

The proposed cable landing station site is presently occupied by an abandoned structure (previously used for storage) which covers an area of no more than 1,060 m^2 and is no more than 5.5 m high. It is considered that this building dates back to the 1970s or earlier.

D4 IMPACT ASSESSMENT

The duration of the construction of the cable landing station building is expected to be six months (from June 2000 to the end of December 2000) and the cable laying and burial works within Hong Kong waters are expected to last about two weeks.

D4.1 SUBMARINE CABLE AND CABLE LANDING POINT CONSTRUCTION

During the laying of the submarine cable, an injection burial machine will be employed which will lay the fibre optic cable to a minimum depth of 3 m below the sea bed. No disposal of marine sediment is anticipated as all the marine sediment will be backfilled immediately after the operation.

During construction of the submarine cable landing point, no excavation or dredging will be required. Rather, directional drilling will be applied from the station manhole to install the conduit. The conduit is about 70 m long and about 300 mm in diameter. The quantity of surplus materials is estimated to be 5 m^3. These surplus materials could be used for backfill on site or disposed of at a public filling area.

D4.2 CABLE LANDING STATION DEMOLITION AND CONSTRUCTION WORK

The demolition of the existing abandoned structure at the site and construction of the proposed cable landing station will generate Construction and Demolition Materials (C&DM)[1].

D4.2.1 *Demolition Work*

The existing structures will be demolished prior to site formation. The structure is constructed of corrugated metal which has a high scrap value. It is expected therefore that this material will be recovered and sold to recyclers or directly to a mill.

It is expected that the building was constructed prior to the 1970's and, as such, it is possible that Asbestos Containing Material (ACM) may be present in the building materials, especially the corrugated sheets of the roof and walls. It is, therefore, recommended that an asbestos survey is conducted by a Registered Asbestos Consultant and an Asbestos Investigation Report (AIR) should be prepared in accordance with the *Code of Practice on Asbestos Control: Preparation of AIR, Asbestos Management Plan and Asbestos Abatement Plan* prior to the demolition works. If asbestos is present, the AIR and an Asbestos Abatement Plan (AAP) should be submitted to the EPD for comment, prior to commencement of the demolition works. The AAP should describe the mitigation and precautionary measures for the handling and disposal of ACM.

The quantity of other C&DM arising from the demolition activities is expected to be small and should be segregated and disposed of accordingly to public fills and landfills.

No adverse impacts are anticipated from the handling and disposal of waste during the demolition works.

D4.2.2 *Construction Work*

The quantity of excavated material to be generated from the foundation works will depend on the construction method employed. It is envisaged that the excavated materials will be small in quantity and surplus materials would be used for back-filling, as far as practicable, to minimise the disposal requirement at public filling areas or at the public filling barging point at Mui Wo. Therefore, no adverse environmental impacts are expected to occur from excavated materials.

Given that the Gross Floor Area (GFA) to be constructed is about 2,428 m^2 and based on a waste generation rate of 0.1 m^3/m^2 of GFA[2] to be constructed, the amount of C&DM to be generated will be about 243 m^3. Based on the composition of C&D waste disposed of at the landfills, about 80% of waste

(1) "C&D material" contains a mixture of inert and non-inert material. The inert portion is the "public fill" and the non-inert portion is the "CD waste".

(2) Reduction of Construction Waste Final Report, March 1993, Hong Kong Polytechnic

materials could be disposed of at public filling areas. If properly segregated, about 195 m^3 of public fill could be recycled and reused for reclamation or land formation projects. The amount of C&D waste requiring landfill disposal would thus be limited to about 50 m^3. The construction period is estimated to be about 6 months and hence the average rate of waste generation would be 1.7m^3day^{-1} of C&DM (1.36 m^3day^{-1} of public fill and 0.34 m^3day^{-1} of C&D waste) which is a small quantity of material. In view of the small amount of public fill and C&D waste expected to be generated, the potential waste impacts from the construction of the proposed facility are minimal and can be controlled through good construction site management practices.

A small amount of chemical waste (in order of a few hundred litres for the whole construction period) will be generated from the maintenance of plant (for example, waste lubricant oil) during construction works as well as other chemical wastes including waste paints and solvents. Provided that the chemical wastes are handled and disposed of in accordance with the *Code of Practice on the Packaging, Handling and Storage of Chemical Waste*, no adverse environmental impacts associated with the handling and disposal of chemical waste are anticipated.

Domestic sewage will arise from sanitary facilities provided for the on-site workforce. As the proposed site is not served by public sewers, portable toilets will need to be provided during the construction period. The maximum number of construction workers is expected to be below 40. Appropriate and adequate portable toilets should be provided by a licenced Contractor who will be responsible for disposal and maintenance activities, such as regular desludging to the Mui Wo Sewage Treatment Plant (STP).

General refuse will be generated by the construction workforce. Based on a waste generation rate of 0.65 kg/person/day for 40 persons, about 26 kg of waste per day will be generated during the construction period. General refuse should be stored and disposed of separately from C&DM and chemical waste. The storage bins for general refuse should be provided with lids which should be kept closed to avoid the generation of odour and wind blown litter. Provided that general refuse is removed from the site regularly (at least once per day) and disposed of at licensed landfills or refuse transfer facilities (ie. the Mui Wo Transfer Facility or the North Lantau Transfer Station), no adverse impacts related to the handling and disposal of general refuse are expected.

Based on the above, with the incorporation of mitigation measures (described in *Section D5*) no adverse waste impacts are anticipated during the construction of the cable landing station.

D4.3 *OPERATION PHASE*

It is expected that there will be approximately 10 staff initially starting up the station, with the station becoming fully automated later on. A Rotating Biological Contactor (RBC) package system with a sludge holding tank has been proposed to treat the domestic sewage generated from the staff (10 per shift for 3 shifts) at the cable landing station. A preliminary calculation estimated that approximately 0.035 m^3day^{-1} of sewage sludge will be generated from the operation of the RBC. Provided that the RBC is properly maintained and the sludge is disposed of by licensed contractor to an appropriate sewage treatment plant (such as the Mui Wo STP), there will be no adverse impacts.

Commercial and industrial (C&I) waste will be generated by the staff during the operation phase of the cable landing station. Based on a generation rate of 1.1 kg/person/day[3], approximately 33 kg/day of C&I waste will be generated. The storage bins for C&I waste should be provided with lids which should be kept closed to avoid the generation of odour and wind blown litter. Provided that C&I waste is removed from site regularly (at least once per day) and disposed of at licensed landfills or refuse transfer facilities (ie the Mui Wo Transfer Facility or the North Lantau Transfer Station), no adverse impact related to the handling and disposal of C&I waste is expected.

No adverse solid waste impacts are expected to arise during the operation of the cable landing station.

D5 *MITIGATION MEASURES*

Although the quantity of C&D waste to be generated during the construction phase is expected to be small, good waste management practices are essential to ensure that there are no unacceptable environment impacts are associated with the handling and disposal of waste. The following waste management practices are recommended to be adopted by the Contractor to avoid or minimise potential environmental impacts associated with the handling and disposal of waste.

- An asbestos survey shall be conducted by a Registered Asbestos Consultant and an AIR should be prepared prior to any demolition works. If asbestos is present, the AIR and an Asbestos Abatement Plan (AAP) shall be submitted to the EPD for comment, prior to commencement of the demolition works. The AAP should describe the mitigation and precautionary measures regarding the handling and disposal of ACM.

- The Contractor shall be responsible for implementing the following site management practices. The Contractor shall:

(3) Monitoring of Solid Waste in Hong Kong 1997, EPD

- avoid and minimise waste through changing or improving practices and design (ie H-piles should be used as far as practical in order to avoid or minimise the generation of excavated materials);

- reuse clean excavated material on site as far as practicable to minimise the amount of surplus excavated material to be disposed of at public filling areas;

- segregate different types of waste to enhance material recovery and recycling and to minimise the amount of waste to be disposed of at landfills;

- handle and store wastes in a manner which ensures that they are held securely without loss or leakage, thereby minimising the potential for pollution;

- ensure that the portable toilets are desludged regularly by licensed contractors during the construction period;

- employ only reputable waste hauliers authorised or licensed to collect the specific categories of waste, in particular chemical waste and asbestos containing materials;

- remove waste in a timely manner and clean the waste storage areas regularly;

- obtain the necessary waste disposal permits or licences from the appropriate authorities, if they are required, in accordance with the *Waste Disposal Ordinance* (Cap 354), *Waste Disposal (Chemical Waste) (General) Regulation* (Cap 354) and the *Land (Miscellaneous Provisions) Ordinance* (Cap 28); and

- dispose of waste at licensed sites and ensure that illegal disposal of wastes does not occur.

D6 CONCLUSION

A waste assessment has been undertaken to addresses the potential waste impacts associated with the construction and operation of the Hong Kong section of the proposed fibre optic submarine cable and cable landing station building. With the implementation of measures identified in *Section D5*, no adverse waste impacts are envisaged arising from the handling and disposal of waste arising from the proposed project.

Annex E

Landscape & Visual

E1 INTRODUCTION

This *Annex* summaries the findings of the landscape and visual impact study (LVIS) conducted for the proposed telecommunications cable landing station near Tong Fuk on South Lantau (OZP No. S/SLC/8).

E2 LVIS STUDY AREA

The Study Area boundary for the assessment of landscape impacts is shown on *Figure E2a*. No boundary was set for the assessment of visual impacts.

E3 OBJECTIVES OF THE LVIS

The objectives of the LVIS were to:

- assess the potential landscape and visual impacts associated with the construction and operation of the cable station;
- evaluate landscape and visual impacts assuming that landscape mitigation measures are incorporated into the design of the cable landing station;
- recommend mitigation measures which should be incorporated into the proposed development to reduce landscape and visual impacts.

E4 LVIS METHODOLOGY, GLOSSARY AND PROJECT DESCRIPTION

E4.1 METHODOLOGY

The main stages of the LVIS are as follows:

- baseline study of landscape and visual resources;
- assessment of landscape impact without and with mitigation measures;
- assessment of visual impact without and with mitigation measures; and
- conclusion.

The baseline study identified and examined the existing landscape and visual resources within the Study Area. Conclusions were drawn on quality, sensitivity and the ability of the baseline conditions to accommodate change. A visual envelope was established which effectively defined the extent of visual influence of the cable landing station and, therefore, of the potential

visual impacts. Definition of the extent of the visual envelope was based on desktop study and site investigation. Sensitive Visual Receivers (SVRs) likely to be affected by the Project were identified within the visual envelope. The following stage was to assess impacts on the landscape and visual resources. These were qualified in terms of the local and wider level of disturbance. The appearance of the proposed cable station is illustrated on the architectural drawings. The impact assessment allows predictions to be made about the likely levels of landscape and visual impacts. The level of visual impact is judged using the following criteria:

- the proximity of the SVRs to the study area;
- the number of people normally present at a SVR location;
- the activity of the SVRs (for example, resident, working, studying, etc);
- the frequency and length of the view of the proposed scheme;
- the quality and sensitivity of the landscape and its ability to absorb change;
- the scale or visual obstruction of the proposed scheme in relation to the overall view, ie, the impact would be low if a scheme occupied a background location in a small sector of a wide panoramic view, and high if it occupied a wide angle of view in the immediate foreground.

Landscape mitigation measures were devised to preserve and conserve the existing landscape where possible, and mitigate the visual impact on views from SVRs. Finally, the residual impacts of the Project, assuming the landscape mitigation measures are incorporated into the design, were assessed.

E4.2 *GLOSSARY OF TECHNICAL TERMS*

Landscape and visual impact assessment is a design and assessment tool used by landscape architects to find the best and most sustainable environmental fit for a proposed development from an urban and landscape planning standpoint. Research has shown that conserving rural landscapes and levels of greenspace in urban areas has beneficial physical and psychological effects on people, as well as fulfilling environmental imperatives. Research has also indicated that groups of people affected by a new development are not solely concerned with protecting 'visual beauty' but rather object to a loss of control over their environment in which they live and work. A LVIS is a useful tool for planning changes to conserve, protect and enhance urban areas and rural landscapes, reducing impact on local communities.

Landscape impact is a direct physical change to existing landscape resources. Landscape resources are elements such as vegetation, topography, open space and recreation facilities as well as buildings and structures. By mapping the extent and location of these features, any loss or change can be objectively assessed and, where possible, re-provisioned or compensated by landscape mitigation measures incorporated into a Project.

Visual impact is a change to the appearance of the study area that affects individuals or groups of people. Visual impact can vary in significance from overall improvement to degradation. Its assessment relies on a professional understanding of aesthetic principles, the design and function of cityscapes and landscapes, and the characteristics of human perception. Permanent and adverse levels of visual impact can lead to the blighting of urban and rural areas, resulting in a long-term decline in the quality of an environment and a subsequent loss in socio-economic vitality.

Severe impact is a negative change to the landscape and to views from sensitive visual receivers that is extensive and potentially adverse. Normally this occurs when a sensitive landscape of regional or district-wide value is permanently lost, or if new development in the foreground completely dominates views from sensitive visual receivers. Where effective mitigation measures are incorporated into a development, a severe impact can be reduced to a high, medium or low impact.

High impact is a negative change to the landscape and to views from sensitive visual receivers that is also extensive and potentially adverse. It would occur when a landscape character of high local value is permanently lost or affected, or if new development in the foreground or middleground occupies a conspicuous part of the available views from sensitive visual receivers. Where effective mitigation measures are incorporated into a development, a high impact can be reduced to a medium or low impact.

Medium impact is a limited negative change to the landscape and to views from sensitive visual receivers. It would occur when a landscape character of local value is permanently lost or temporarily affected, or if new development is a noticeable element in the middleground in views from sensitive visual receivers. Where effective mitigation measures are incorporated into a development, a medium impact can be reduced to a low impact.

Low impact is a negligible change to the landscape and to views from sensitive visual receivers. It would occur when a landscape character of low local value is permanently lost or affected, or if new development is a perceptible but insignificant element in the background in views from sensitive visual receivers.

Sensitive Visual Receivers are individuals or groups of who are sensitive to changes in the visual environment. For example, local residents whose views are extensively and permanently obstructed by views of a new development from a close range would be considered as SVRs. Neighbouring groups of people who would have no views of the new development would not be considered as SVRs.

E4.3 PROJECT DESCRIPTION

The main elements of the cable landing station comprise:

- A two level building with a gross floor area of approximately 2,428m² and dimensions of 28 metres wide, 44 metres long and 18 metres above ground at the highest point. The external design of the building will be simple and uncluttered in appearance.

- Feature planting at ground level along the southern elevation of the proposed building;

- A ground-level hard-paved area for carparking and delivery;

- An up-graded access road.

E5 BASELINE STUDY

E5.1 EXISTING LANDSCAPE AND VISUAL RESOURCES

The LVIS study area is shown on *Figure E5a*. The proposed development would be located at a coastal site currently occupied by derelict buildings approximately next to the South Lantau Road near Tong Fuk on Lantau Island. Existing woodland and trees enclose the site to the north and east. To the south and west, the site is visually exposed to Tong Fuk Miu Wan. There is a temple immediately next to the site to the south. Approximately 30 trees are present (see *Attachments E1* and *E2* and *Figure E5a*). *Figure E5b* illustrates the existing visual resources of the site.

E5.2 LANDSCAPE AND VISUAL ANALYSIS OF BASELINE CONDITION

The site is considered to be a landscape of high local importance owing to the presence of a Coastal Protection Area (CPA) zoning, the temple, and the visually exposed coastal location.

The site is in a secluded position and cannot be seen from the South Lantau Road or Tong Fuk owing the screening effects of the existing woodland. However, it can be easily seen from the temple and the sea to the south and west. Most SVRs are located at Tong Fuk, vehicles travelling along the South Lantau Road or people using the temple (see *Figure E2a*). Visual changes, therefore can be easily absorbed when viewing the site from the north and east, but not from the south and west. The low number of trees on the site also indicates that substantial landscape changes can be absorbed without adverse impact.

E6 ASSESSMENT OF LANDSCAPE IMPACTS

The proposed extent and general arrangements of the architectural and landscape architectural elements are shown on *Figure E6a.*

With regard to landscape impacts, the new cable landing station and associated works would be constructed at the location of the existing derelict buildings, reducing the landscape impact significantly. However, some trees would be affected.

A tree survey was undertaken to ascertain the numbers of trees affected (see *Attachments E1* and *E2*) and to assess the amenity value of the trees to be felled. It was found that 11 trees would need to be felled, while the remaining trees would be retained and protected during construction. The concept landscape design allows for the reprovision of two trees for every tree felled and the planting of approximately 500 m^2 of compensatory planting around the periphery of the new development.

Under these circumstances, the landscape impact of the proposed cable landing station is considered to be minimal and acceptable.

E7 ASSESSMENT OF VISUAL IMPACTS

The approximate mass and scale of the proposed building are shown on *Figure E7a.* In an effort to preserve the integrity of the CPA zoning and the setting of the temple, the design of the building includes space for the planting of large screen trees such as:

- *Acacia auriculaeformis*
- *Albizzia lebbek*
- *Casuarina equisetiformis*
- *Cerbera manghas*
- *Ficus microcarpa*
- *Ficus virens*
- *Hibiscus tiliaceus*
- *Macaranga tanarius*
- *Pandanus tectorius*
- *Pongamia pinnata*
- *Terminalia catappa*
- *Thespesia populnea*

The new planting would be in the form of heavy-standard screen trees planting along the west and south elevation of the building (see *Figure E6a*) and ground-level amenity planting. New woodland planting using a matrix

of whips and saplings would be planted along the north and west site boundary to compensate for felled trees, to reinstate the disruptive effects of construction and to reinforce the screening effects of the existing woodland.

Assuming these mitigation measures are not incorporated into the scheme, a high level of visual impact can be expected from views from the sea and beach to the south and east of the site, and from the temple immediately to the south of the site. If the mitigation measures were incorporated into the scheme, then the high level of visual impact would be reduced to a low and acceptable level. In particular, the setting of the temple would be largely preserved and improved (see *Figure E7a*).

E8 CONCLUSIONS AND RECOMMENDATIONS

The levels of landscape and visual impact which would result from the construction and operation of the cable station are considered to be low level and acceptable, assuming that mitigation measures such as new screen woodland planting are incorporated into the scheme.

ATTACHMENT E1 - TREE SURVEY REPORT

TREE IDENTIFICATION AND SURVEY METHODOLOGY

A tree identification survey of the captioned site was carried out by New Era in February 2000. The trees species are commonly found in Hong Kong. No rare or protected species were identified.

LEGEND

The written report included the following information on each tree surveyed.

Tree number	Identification number for each tree and indicated on *Figure E5a*
Species	Botanical name of tree
Trunk diameter	In metres, taken at 1000 mm height above ground level (multi-trunks tree will be measured with the biggest sized trunk)
Height	In metres, taken from ground level to the top of tree
Crown spread	In metres
Health and condition	Graded as Good, Fair, or Poor
Form and style	Graded as Good, Fair, or Poor
Amenity value	Graded as High, Medium, or Low
Conflict with development	Graded as Yes (affected by development) or No (not affected by development)
Transplantability	Graded as Yes (should be transplanted if affected by the development) or No (should be felled if affected by the development).
Proposed treatment	Recommendation for tree's future status, graded as Retain, Fell or Transplant
Brief comments	Brief description on tree such as "Leaning trunk", rotting trunk" etc. Tree with more than one trunk will be described as double trunks, triple trunks so and so forth.

CRITERIA FOR ASSESSMENT OF HEALTH/CONDITION, FORM/STYLE, AND AMENITY VALUE

Health & Condition

Assessment of the tree health and condition involved inspection for the following:

a) Foliage
- colour and general appearance
- insect and fungal infection

b) Branches
- inspect for dead or die-back or crossing branches
- any heavy horizontal branch which may cause tree instability
- damaged, broken or cut branches
- insect and fungal infection on branches
- special phenomena of the branches

c) Trunk
- tightly forked or multi-ascending trunk is a sign of weakness in trees
- cavities or internal/external rot
- sap seeping through the trunk
- fungi growing on the trunk
- inspect for any cavity or serious bark damage

Assessment of the tree health and condition involves inspection for the above features and classification as follows:

G = Good: trees with a low incidence of the less serious features listed above and a high chance of a fast recovery from such features.

F = Fair: trees with a higher incidence of the less serious features and a medium chance of recovery.

P = Poor: trees with more serious health features and with a low chance of recovery, even with remedial measures.

Tree Form and Style

Assessment for tree form is classified as follows:

G = Good: trees with well balanced form, upright, evenly branching, well-formed head and generally in accordance with the standard form for its species.

F = Fair: trees with generally balanced form with natural compensations for loss of branches or leaning trunks.

P = Poor: trees with very unbalanced form, leaning, contorted, bending trunk, suffering from loss of major branches with general damage and growing close to adjacent trees.

Amenity Value

Amenity value: the significance of tree is expressed as "Amenity Value". It is graded High (H), Medium(M) and Low(L) with (H) as the highest grade and (L) the lowest. Factors that take into consideration in the assessment include:

- Conservation value: rare or protected species, as listed by the Agriculture Fisheries & Conservation Department. Fung shui significance is also taken into account.
- Functional value: provide screening, shade or shelter.
- Visual impact: adverse impact as a result of loss of tree.
- Status & form: a good specimen of its species, maturity, present condition, potentially hazardous and stability.

The grading indicates the following qualities in tree:

H = High: Rare or protected species, fung shui significance or has high visual impact with good health condition and form.

M = Medium: Common species with average health, medium condition and acceptable form. Rare or protected species, fung shui significance or high visual impact with poor health condition and form.

L = Low: Little or non-functional common species with poor health condition and

PROPOSED TREE TREATMENT

Definitions

In general, the following definitions are followed:

Transplant: Trees with high amenity value are recommended to be transplanted. Trees approved to be transplanted will be relocated to a suitable location with the consent of government.

Fell: Trees in direct conflict with the slope safety measure work will be felled, however, decision should be reconfirmed on site by engineer's representative based on expertise horticultural advice.

Retain: Trees in unaffected areas are recommended to be retained and will be protected during construction

Proposed Tree Treatments

The Tree Treatment Schedule in *Attachment E2* recommends a treatment for each tree. The considerations were as follows:

(R) Retain - the feasibility of retaining a tree has been considered with regard to the following:

- Proximity to the area of re-stabilization and potential damaged to the trees as a result of the work.
- Changes to ground levels on a macro-scale that affects the ground water table and may cause severe stress.
- Special construction to maintain the existing ground.
- Conflict between tree roots and slope stabilization method.

(T) Transplant - In situation where it is impossible to retain trees, then trees are considered for transplantation. The criteria upon which the assessment of transplanting trees is base included the following:

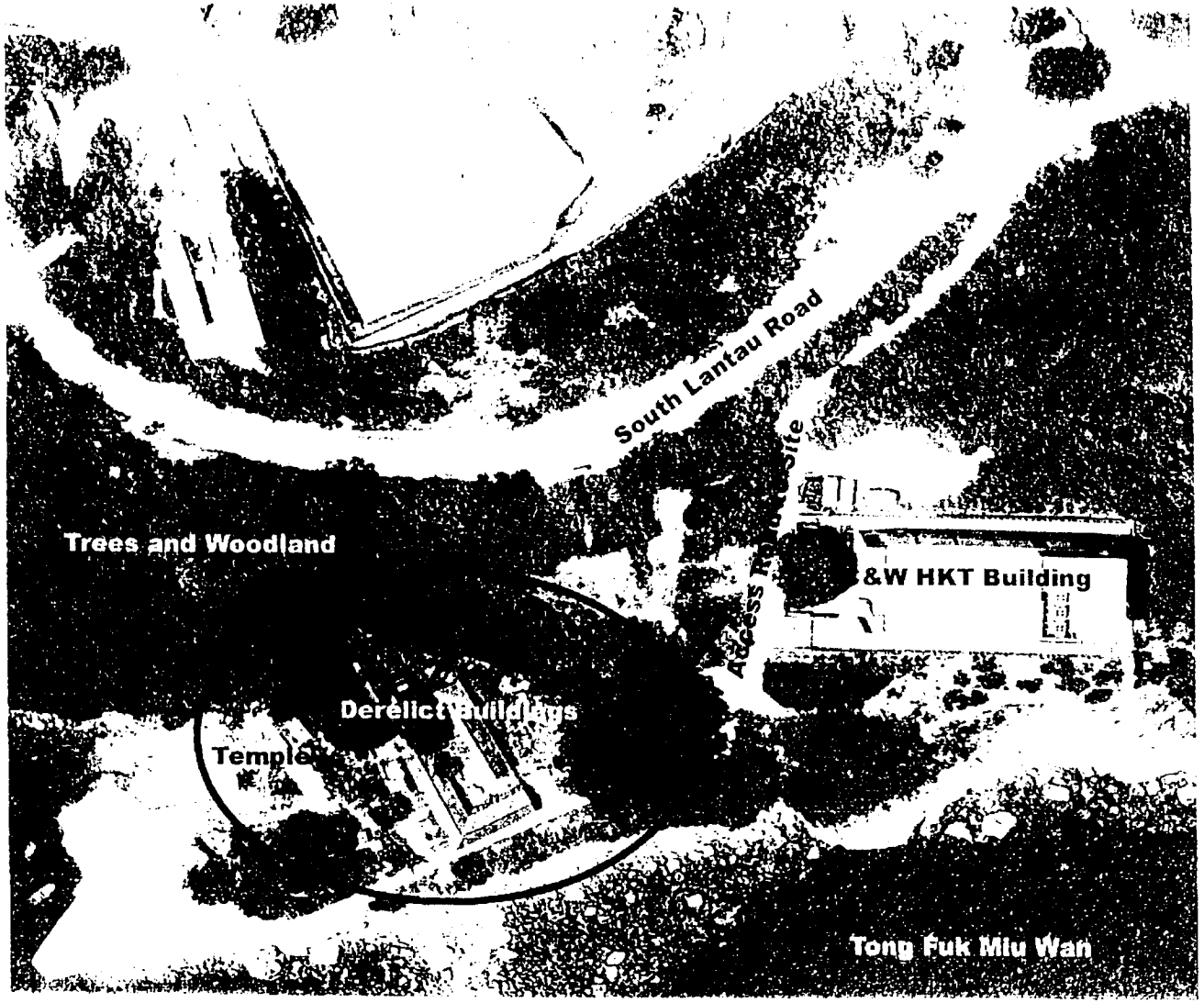
- Distinctiveness - Tree with high amenity value and high local importance eg fung shui.
- Condition of tree - tree with balanced form, good health and high amenity value.
- Maturity: basically, younger trees have higher survival rate while mature trees do not.
- Species character different tree species have different rates of survival.
- Rootball feasibility tree growing on loosen rocky subbase / slope or adjacent to important utility will not be considered
- Access heavy machinery may be required to lift up the tree steep slope, and rocky terrain may make the operation impossible. Rarity of species - rare Hong Kong species are particularly considered.

(F) Fell - Trees in direct conflict with the construction work; change of level etc would be felled. Dead, hazardous or trees with contiguous disease would also be felled. Woodland trees which have had adjacent trees removed and have unbalanced form or which are at risk of being blown over due to loss of supporting trees would also be felled.

Tong Fuk Temple

Bay!*R1C1:R36C12*

TREE NO	SPECIES	TRUNK DIA (M)	OVERALL HEIGHT (M)	AVERAGE SPREAD (M)	HEALTH CONDIT'N (G/F/P)	FORM STYLE (G/F/P)	AMENITY VALUE (H/M/L)	CONFLICT W. DEVELOP'M (Y/N)	TRANS-PLANTABLE (Y/N)	PROPOSED TREATMENT (R/T/F)	BRIEF DESCRIPTION
1	*Acacia confusa*	0.35	8	9	F	P	M	N	N	R	Forked, contorted leaning trunk
2	*Sterculia lanceolata*	0.15	5	3	F	F	M	Y	Y	R	-
3	*Acacia confusa*	0.45	8	10	F	P	M	Y	N	R	Forked, contorted leaning trunk
4	*Delonix regia*	0.3	8	7	F	F	M	N	N	R	Unbalanced crown
5	*Delonix regia*	0.4	9	7	F	F	M	N	N	R	Leaning trunk
6	*Acacia confusa*	0.3	7	7	F	P	M	N	N	R	Forked, rottening trunk
7	*Acacia confusa*	0.25	6	8	P	P	L	N	N	R	Bending trunk
8	*Acacia confusa*	0.4	7	5	F	P	M	N	N	R	Rottening leaning trunk
9	*Delonix regia*	0.45	10	10	F	F	H	Y	N	F	Double contorted trunks
10	*Tristania conferta*	0.3	6	4	F	F	M	N	N	F	Leaning trunk
11	*Ficus hispida*	0.12	4	2	F	F	L	N	N	F	Double ascending trunks
12	*Celtis sinensis*	0.2	5	3	F	F	M	Y	N	F	-
13	*Mallotus paniculata*	0.22	9	6	P	P	L	Y	N	F	Leaning trunk
14	*Mangifera indica*	0.2	8	5	F	F	M	Y	N	F	-
15	*Callicarpa nudiflora*	0.18	6	6	F	F	M	Y	N	F	Leaning trunk
16	*Mallotus paniculata*	0.15	5	6	F	P	M	Y	N	F	Leaning trunk
18	*Ficus varigata*	0.1	4	3	F	F	M	N	N	R	Growing adjacent to wall
19	*Macaranga tanarius*	0.15	5	4	F	P	L	N	N	R	Contorted leaning trunk
20	*Celtis sinensis*	0.8	12	10	F	F	M	N	N	R	Unbalanced crown
23	*Bischofia trifoliata*	0.4	12	8	F	F	M	N	N	R	Contorted trunk
24	*Antidesma bunius*	0.6	10	8	F	F	M	N	N	R	Leaning trunk
25	*Delonix regia*	0.6	13	10	F	F	H	N	N	R	Unbalanced crown
26	*Macaranga tanarius*	0.2	5	5	P	P	L	N	N	R	Leaning trunk, rottening branches
27	*Ficus varigata*	0.45	9	6	P	P	L	N	N	R	Double trunks with cavity between
28	*Sterculia lanceolata*	0.15	5	6	P	P	L	N	N	R	Rottening trunk
29	*Sterculia lanceolata*	0.2	5	6	P	P	L	N	N	R	Leaning trunk
30	*Ficus varigata*	0.3	5	8	P	P	L	Y	N	F	Leaning to fall, root ball exposed
31	*Euphoria longan*	0.5	10	10	P	P	L	Y	N	F	Dying back
32	*Celtis sinensis*	0.3	7	5	F	P	L	N	N	F	Leaning trunk twisted dy climbers
33	*Ficus hispida*	0.2	2.5	0.5	P	P	L	Y	N	F	Crown being chopped off



NOT TO SCALE

KEY ISSUES:

The site is in a secluded location and is currently occupied by derelict buildings.

It is visually enclosed by woodland to the north and east, but visually exposed to the south and west.

There are approximately 30 trees present within the study LVIS study area.

The site is zoned GIC and Coastal Protection Area.

Study area of the LVIS report

FIGURE E2a

LANDSCAPE AND VISUAL IMPACT STUDY STUDY AREA

FILE: C2022k3
DATE: 24/03/00

Environmental Resources Management

ERM

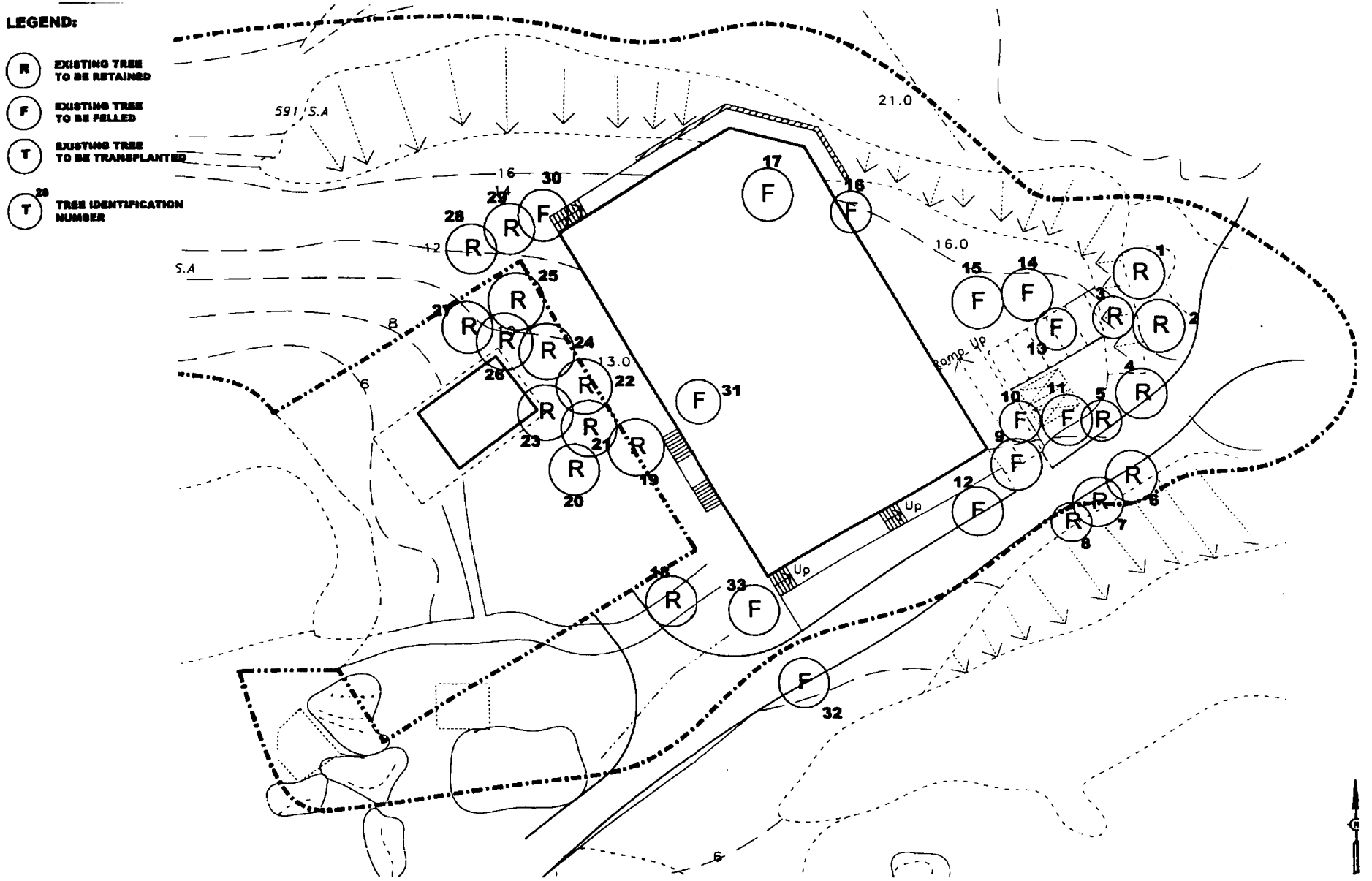


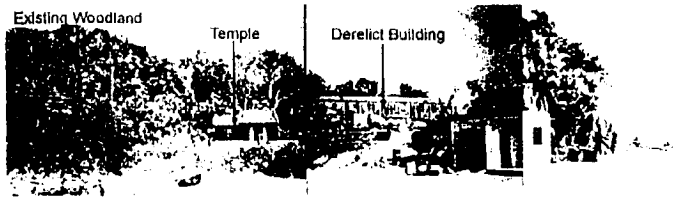
FIGURE E5a

LANDSCAPE AND VISUAL IMPACT STUDY
TREE SURVEY PLAN

FILE: C2022k7
DATE: 24/03/00

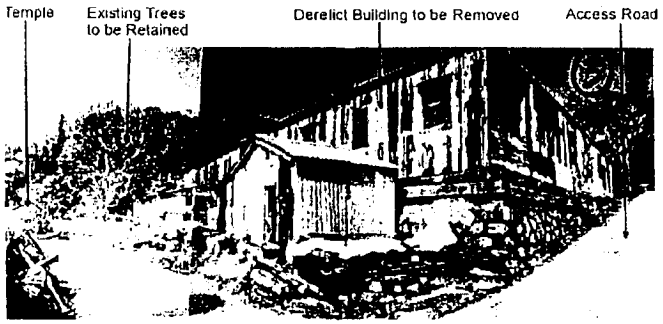
Environmental Resources Management

ERM



Viewpoint 1 - Looking at the site from the south-east


Viewpoint 2 - Looking at the site from the south-east next to the temple



Viewpoint 3 Looking at the site from the existing access road from the south

Viewpoint 4 - Looking at the site from the west from the existing access road


Viewpoint 5 - Looking at the site from the west from the existing access road.
Note the screening effects of the existing woodland.


Viewpoint 6 - Looking at the site from the footpath on south Lantau Road.
The site is completely screened.

This figure illustrates the existing landscape and visual resources of the site.

FIGURE E5b

LANDSCAPE AND VISUAL IMPACT STUDY
SITE PHOTOGRAPHS - EXISTING CONDITIONS

FILE: C2022k5
DATE: 24/03/00

Environmental Resources Management

ERM

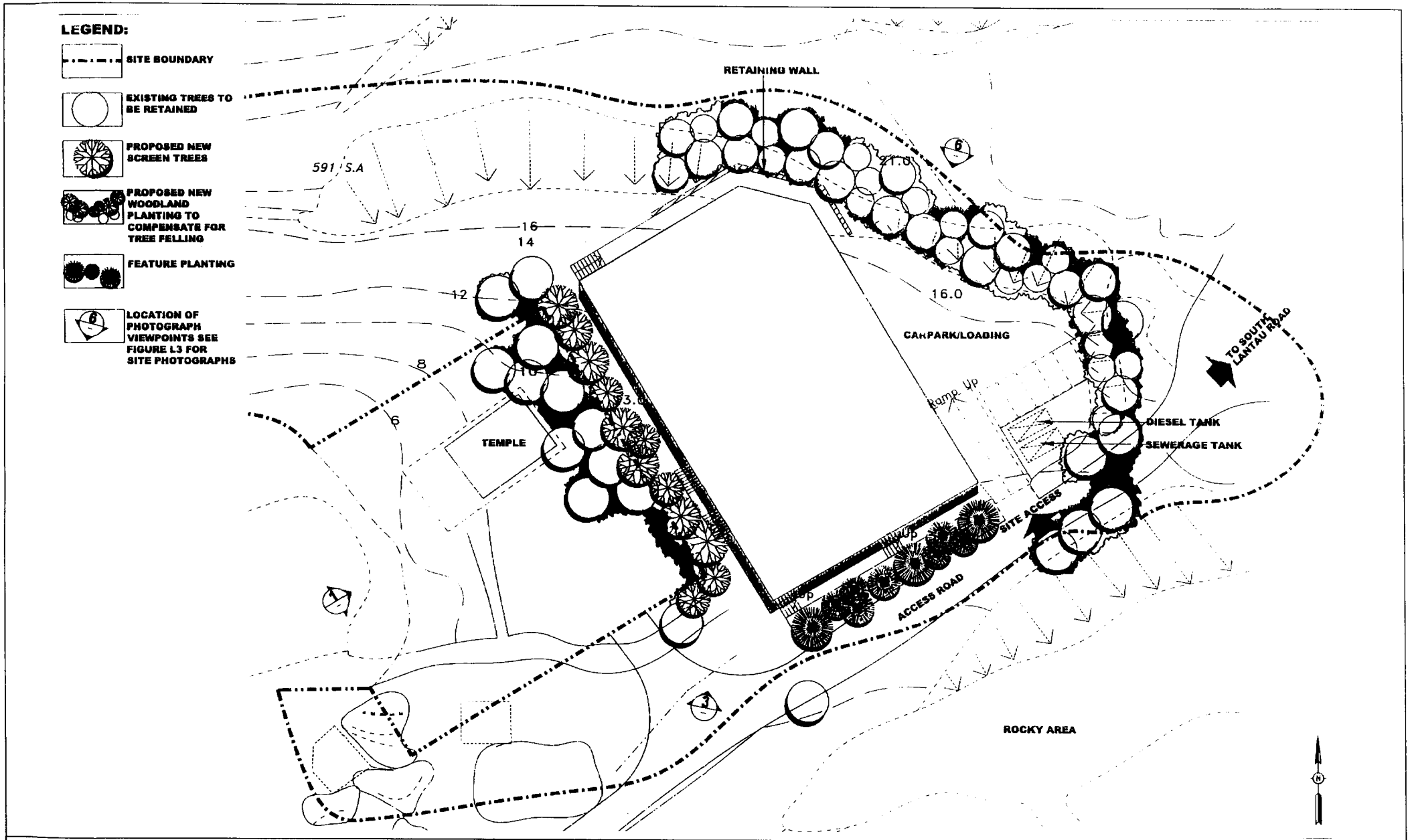


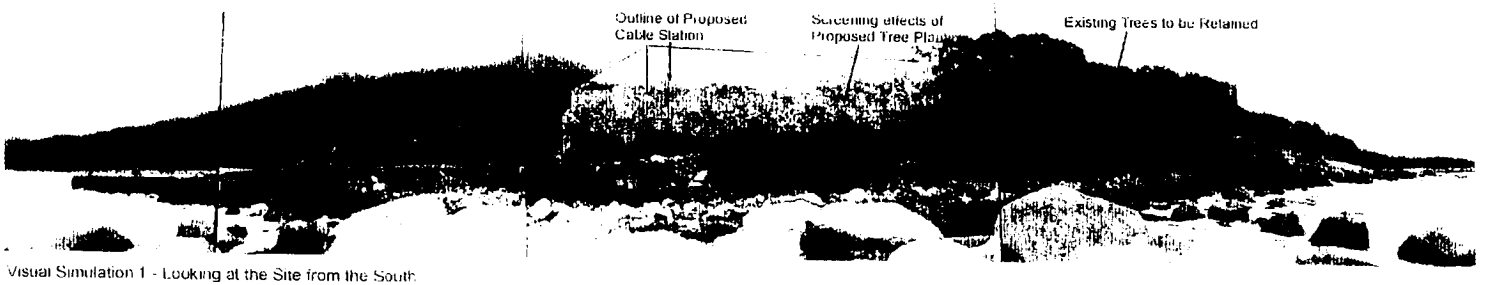
FIGURE E6a

LANDSCAPE AND VISUAL IMPACT STUDY
CONCEPT LANDSCAPE DESIGN

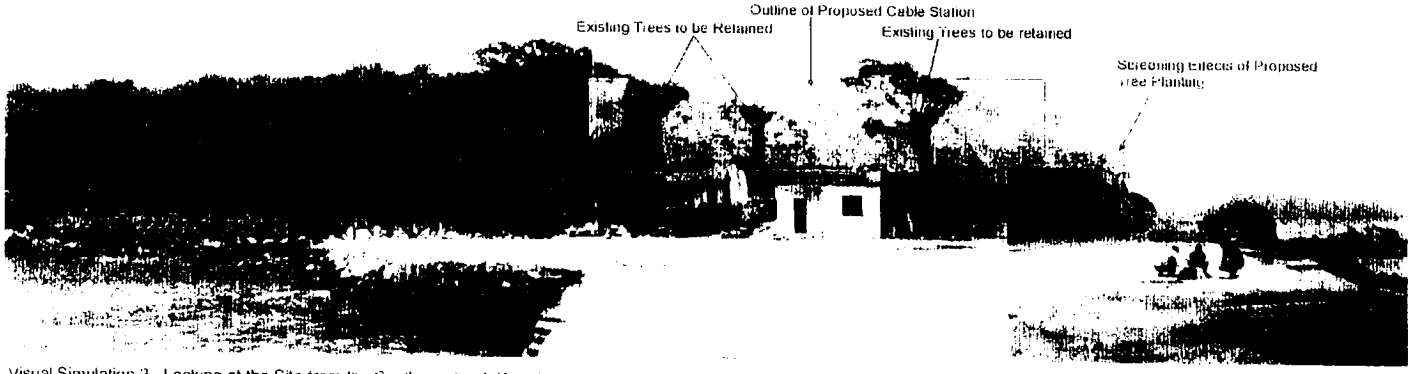
FILE: C2022k4
DATE: 24/03/00

Environmental Resources Management

ERM



Visual Simulation 1 - Looking at the Site from the South



Visual Simulation 2 - Looking at the Site from the South-west with Temple shown in the Middle ground

These visual simulations illustrate the approximate mass and scale of the proposed development and the effect of the proposed landscape mitigation measures.

FIGURE E7a

LANDSCAPE AND VISUAL IMPACT STUDY
VISUAL SIMULATIONS

FILE: C2022k6
DATE: 24/03/00

Environmental
Resources
Management

ERM

Annex F

Cultural & Heritage

F1 INTRODUCTION

This *Annex* identifies the cultural resources within and around the proposed cable landing station and associated infrastructure through literature review and field investigations undertaken in January 2000, and provides an assessment of the potential impacts to cultural resources associated with the proposed development.

F2 RELEVANT LEGISLATION AND ASSESSMENT CRITERIA

The principal legislation pertaining to cultural resources in Hong Kong includes the following:

- *Environmental Impact Assessment Ordinance (Cap 499.S.16) Technical Memorandum on the EIA Process (EIAO TM);*
- *Antiquities and Monuments Ordinance (Cap 53);* and
- *Hong Kong Planning Standards and Guidelines (HKPSG).*

The requirements for cultural impact assessments are defined within *Annex 10* of the *EIAO TM*, which require:

- the protection and conservation of all sites of cultural heritage, as they provide an essential, finite and irreplaceable link between the past and the future and are points of reference and identity for culture and traditions; and
- ensuring that any adverse impacts on sites of cultural heritage are kept to an absolute minimum.

The *Antiquities and Monuments Ordinance (Cap 53)* provides the designation of "Antiquities and Monuments sites" or "Declared Monuments" in Hong Kong. The Ordinance provides statutory protection against the threat of development for declared monuments, historic buildings and archaeological sites which have been recommended by the Antiquities Advisory Board (AAB), approved by the Chief Executive and gazetted in the government gazette to enable their preservation.

"Deemed Monuments" are identified by the Antiquities and Monuments Office (AMO) and agreements are reached with the owner of the Monument to provide for specific measures to ensure Monument preservation. "Deemed Monuments" have the potential to be upgraded to statutory "Declared Monuments".

There are no statutory provisions for the protection of "Sites of Historical Interest", "Deemed Monuments" and "Graded Buildings". However, the Hong Kong SAR Government has administrative procedures which state that

consideration must be given to protect listed and locally designated historic buildings and sites of cultural interest. Further, as many areas are not yet surveyed, the current record of archaeological sites is known to be incomplete; thus, sites should be reviewed on an individual basis for their potential for cultural resources.

Section 11 (and relevant sub-sections) of the *Antiquities and Monuments Ordinance* requires any person who discovers an antiquity, or supposed antiquity, to report the discovery to the Antiquities Authority. There is a need to ensure that the procedures and mechanisms for the preservation or formal notification of previously unknown archaeological resources, either revealed or discovered during a project assessment or during construction, are identified at an early stage in project planning.

The HKPSG, *Chapter 10 (Conservation)*, provides general guidelines and measures for the conservation of historical buildings, archaeological sites and other antiquities.

F3 DESCRIPTION OF THE ENVIRONMENT

F3.1 EXISTING CONDITION

The proposed cable landing station site is presently occupied by an abandoned storage building. The site and surrounding area has been heavily disturbed by hillslope cutting and modifications to the area including the creation of terraces, construction of a concrete platform and access road. The development of the proposed cable landing station would be broadly within the footprint area of the existing abandoned building structure and would require minor cutting of the terraced hillside to the north.

F3.2 CULTURAL RESOURCES

Near to the proposed cable landing station site directly to the west is the Hung Shing Temple (Hung Shing Kung), on Lot 591 RP at the promontory (see *Figure F3a*). The temple is constructed in the traditional Quangtong style which comprises two halls (end hall and entrance hall) and an open courtyard. A new wing at the right of the temple was constructed for storage and village ritual purposes. The temple god "Hung Shing Yeh" (South Sea God) is placed in the middle of the Hall. The temple worshipers believe that Hung Shing Yeh provides protection to sea travellers for safe travel across the South China Sea.

According to the inscription of the metal bell cast inside the temple, the temple was built in 1802 (the seventh year of Emperor Jiaqing, Qing dynasty), and was rebuilt in 1965 and refurbished in 1990. The temple is still active with local people worshipping "Hung Shing Yeh". The building itself is in

the 1999 survey record of the AMO, awaiting assessment on grading by the Antiquity Advisory Board. Though the temple is neither a "Declared" nor a "Graded" monument, its long history and significance to the local community is well recognised.

The temple is overseen by the Tong Fuk Village which is a Hakka settlement, established by the Tang clan in 1686 (24th year of Emperor Kangxi, Qing dynasty). Other clan groups have since moved into the village and is no longer considered to be a "Hakka people" village.

The temple site may have *fung shui* significance as the promontory to the right and a small hill to the left of the temple may be considered to provide protection to the temple or the God, Hung Shing Yeh, by temple worshipers. Additionally, the bay in front of the temple provides water (wealth) which is generally considered to provide a good *fung shui* layout.

Near the temple is a local pier, which provides an open area for religious ceremonies in front of the temple. The local pier together with Hung Shing Temple form an important worship and gathering area for nearby fishermen and local villagers.

Apart from the Hung Shing Yeh Temple, there is a small local Kam-Tap (grave jars) site situated north of the proposed cable landing station (behind the existing storage building) outside the proposed development area. More than ten Kam-Taps of unknown age were identified at the site which has been fenced off. It is expected that these Kam-Tap sites belong to the Tong Fuk Villagers.

F3.3 *ARCHAEOLOGICAL RESOURCES*

The closest registered archaeological site to the proposed cable landing station site is "Tong Fuk Miu Wan Archaeological Site", situated over 1 km to the west of the site. The Tong Fuk Miu Wan Archaeological Site is dated to the late Neolithic Age to Bronze Age (C2500 BC to 221 BC) and stone artifacts and pottery shards have been found through surface collection at this site. Due to the separation between Tong Fuk Miu Wan and the proposed cable landing station, the proposed project will not affect this registered archaeological site.

Within close proximity of the proposed cable landing station(40m), there is a small bay and sandy beach in front of Hung Sing Temple which provides a landing for small in-shore fishing boats. The bay is a natural boat shelter which is protected from strong wind and waves from the east and south-east in the summer and autumn and from the south-west in the spring. In the 19th to early 20th centuries, this small bay was a coastal transport route for the Tong Fuk Villagers to market towns in Tai O and Cheung Chau and may have encouraged ancient settlement or activities in the past.

Due to the proximity of the site to the Tong Fuk Min Wan Archaeological Site and the potential for ancient settlement or activities in the area, archaeological

surface collection surveys were undertaken to identify any artefacts within the proposed site and surroundings in January 2000. During the surveys, no traces of historic artefacts were found, and only modern artefacts were identified. This is most likely due to the highly disturbed nature of terrain.

F3.4 *MARINE ARCHAEOLOGICAL RESOURCES*

A geophysical survey was undertaken within the area of the proposed cable landing site to determine seabed levels and characterise the nature of the seabed sediments and shallow marine geology in the vicinity of the landfall. The main purpose was to optimise cable route selection (1). Offshore seabed sediments consist of a thickness of greater than 5 m of soft silty clay. The character of the material becomes more coarse grained towards the shore. The seabed within 30 m from the cable landing comprises boulder/ rock outcrop and between 30-40 m from shore is fine to coarse sand. The bed of the surveyed coastal area was found to be highly disturbed due to the construction of the pier wall for the existing pier platform and the exposed nature of the area to the sea, with no natural protection. Thus, the potential for the presence of marine archaeological resources is limited.

Only two items of debris located over 250 m from the proposed cable alignment were identified in the geophysical survey. The archaeological potential of the area is, thus, considered to be low.

F4 *IMPACT ASSESSMENT*

F4.1 *CULTURAL RESOURCES*

During development of the proposed cable landing station and associated cable infrastructure works, sites of cultural interest (Hung Shing Temple and Kam-Taps) would not be directly disturbed or impacted by construction works. Indirect impacts from generation of dust, noise and visual impacts may occur during construction if the activities are not well controlled. Appropriate measures to mitigate these impacts are recommended in *Section F5.*

Due to the age of the Hung Shing Temple, there is the potential for structural impacts to occur to the temple during construction of the cable landing station due to vibrations from any significant construction activities such as piling work. Provisions for monitoring potential impacts from vibration to the temple are described in *Section F5.*

(1) [1] EGS(Asia) Ltd. (2000) Hong Kong-Japan Cable Network Hydrographic and Marine Geoplysical Survey at Tong Fuk Proposed Cable landing Site Final Report. For Alcatel Submarine Networks Ltd.

The proposed cable landing station layout has been designed to provide utilities (air cooling system, sewage treatment, etc.) and parking areas on the northeastern side of the structure, thus using the building structure as a barrier between any potential nuisance from the utilities (e.g. visual and noise impacts) and the temple and also allowing for the natural terrain to block any impacts to the Kam-Tap site. Therefore, operational impacts to the temple are not expected to occur.

The preliminary layout of the proposed cable landing station has also avoided alterations to prominent landscape features in the vicinity of the temple area and will not disturb sea views from the temple site. Thus, impacts to cultural landscape features (including the areas considered to potentially hold *fung shui* significance) are not expected to occur. Due to the significance of the temple area to the Tung Fuk Villagers, important landscape features in the temple areas (including prominent rock outcrops on either side of the temple) should be retained as far as possible during construction of the cable landing station and cable installation to avoid impacts to these features.

F4.2 *ARCHAEOLOGICAL RESOURCES*

Due to the highly disturbed nature of the site, there is little potential for remaining *in situ* terrestrial archaeological deposits in the immediate vicinity and within the proposed cable landing station site. Based on the archaeological surveys undertaken of the surface areas, the potential for remaining archaeological resources is considered to be low. Although the exposed areas of the site were inspected during the field survey, the footprint area of the existing structure at the site was inaccessible and may possibly hold artefacts. Although the potential for remaining artefacts is not promising, due to the expected disturbance during construction, investigation of this area during construction activities should be undertaken to confirm that historical artefacts are not present in this area.

F4.3 *MARINE ARCHAEOLOGICAL RESOURCES*

The proposed underwater cable landing site is expected to be situated to the east of the sheltered bay facing the Hung Shing Temple. The area comprises a rocky surface area that has been highly disturbed through the construction of a pier platform and is exposed directly to the sea with no natural protection. Due to the unfavourable conditions for the preservation of marine archaeological resources at the coastal area, no archaeological deposit is expected to be present at the landing site.

Furthermore, given the narrow corridor of disturbance required for cable placement (10 cm) and that construction techniques will create minimal disturbance to the seabed, potential impacts to marine archaeological resources, if any were present, would be minimal.

Although the cable alignment at the offshore area is in silty clay sediment, the landing method will only have minimal impact on the top layer of the seabed and, as no debris was identified to be impacted by the construction of the cable alignment, no impact on marine archaeological deposits is expected.

F5 *MITIGATION MEASURES*

Based on the assessment presented in *Section F4*, there are no adverse impacts associated with the proposed cable landing station and cable laying activities that cannot be mitigated through the implementation of mitigation measures as identified below.

During construction, the following measures shall be undertaken by the Contractor.

- Major cultural events should be considered during the duration of construction works, and significant noise and dust generating activities should be reduced or ceased during such events at the Hung Shing Temple. Guidance should be sought from the Tong Fuk Villagers or temple caretakers for events that are planned to occur at the temple. Construction works should be planned to avoid these events.

- In order to ensure the construction works at the proposed site do not adversely affect the structure of the temple, it is recommended that the Contractor provides settlement markers and tilt markers at the temple structure and grounds. Level and precise surveying should be deployed to monitor these markers, and to ensure that the movement tolerance limits are not exceeded. At the commencement of construction, a condition survey is normally commissioned and the survey results should be regularly checked against the temple to detect any damage. Vibration caused by construction equipment should be monitored within $15mm/s^{-1}$.

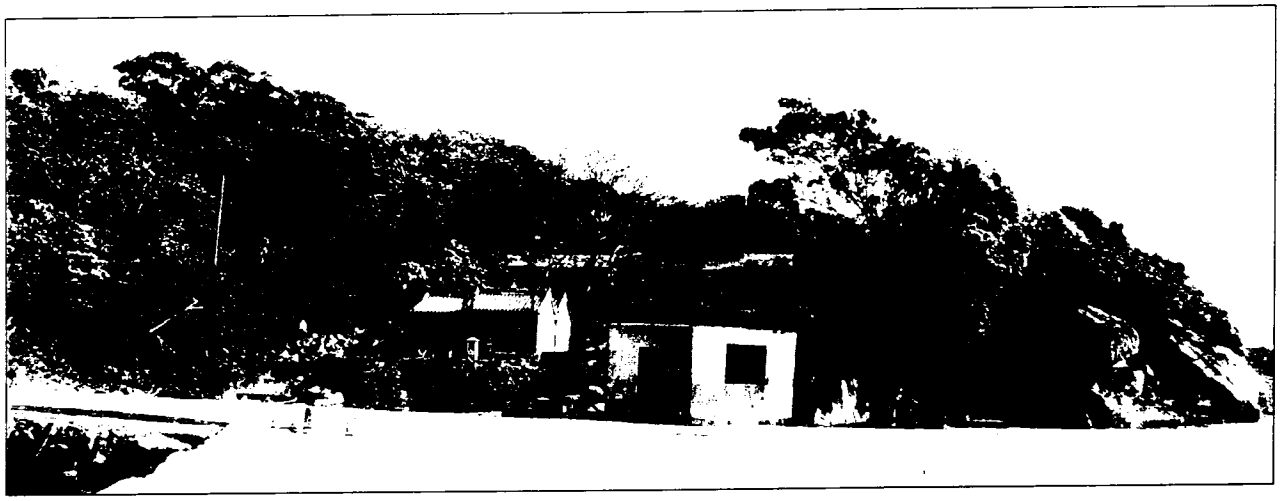
- An archaeological "watching brief" should be undertaken by qualified archaeologist at the proposed cable landing station site during construction. After the existing concrete foundation of the structure is removed, the archaeologist should work closely with excavation contractors to monitor the site. Should a significant archaeological deposit be identified during excavation, the excavation work shall be stopped for recording and rescuing the finds to allow preservation by record. The frequency of the "stop, watch and record" work depends on the significance of the deposit at the site. When the excavation reaches bedrock or a level that the archaeologist considers that there is no further potential for archaeological deposits to be present, the "watching brief" shall conclude.

Other appropriate measures to mitigate potential environmental impacts such as visual, noise and air quality have been addressed in other annexes.

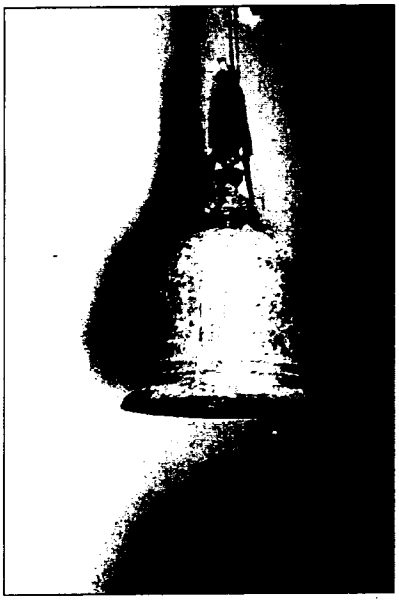
F6 CONCLUSION

Based on the findings of this assessment and the implementation of the recommended mitigation measures, there are predicted to be no adverse impacts on cultural heritage resources from the proposed cable landing station and associated infrastructure.

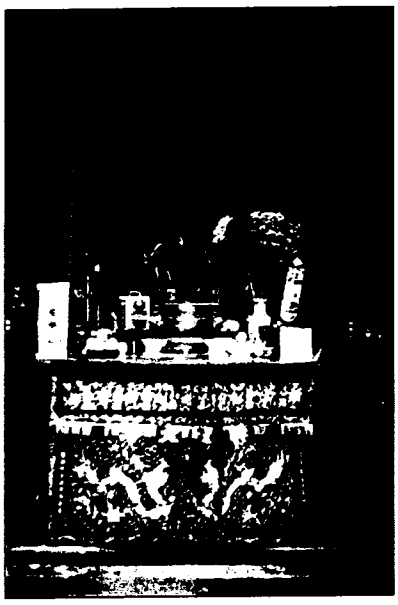
The proposed landing method will only have a minimal impact on the top layer of the seabed and as no debris was identified to be impacted by the construction of the cable alignment, no adverse impacts on marine archaeological deposits are expected.



DIFFERENT VIEW OF THE HUNG SHING TEMPLE



METAL BELL INSIDE THE TEMPLE



HUNG SHING YEH

FIGURE F3a

HUNG SHING TEMPLE

Environmental Resources Management

ERM

FILE: C2022c
DATE:01/02/2000

Annex G

Terrestrial Ecology

G1 INTRODUCTION

This *Annex* presents the existing terrestrial ecological conditions of the proposed development site and its surroundings, based on field surveys undertaken in January 2000. The potential impacts to terrestrial ecology due to land based aspects of the proposed cable landing station and associated infrastructure are addressed in the following Sections. Mitigation measures are recommended where impacts have been identified.

G2 RELEVANT LEGISLATION AND ASSESSMENT CRITERIA

The principal international and local regulations, legislation and guidelines for the protection of species and habitats of ecological importance include the following:

- *Technical Memorandum for the Environmental Impact Assessment Ordinance (Cap 499) (EIAO TM);*
- *Hong Kong Planning Standards and Guidelines Chapter 10 (HKPSG);*
- *Forests and Countryside Ordinance (Cap 96);*
- *Wild Animals Protection Ordinance (Cap 170);*
- *Animals and Plants Ordinance;*
- *Country Parks Ordinance (Cap 208);*
- *Town Planning Ordinance (Cap 131);*
- *Forestry Regulations; and*
- *United Nations Convention on Biodiversity (1992).*

G3 DESCRIPTION OF THE ENVIRONMENT

G3.1 LITERATURE REVIEW

A literature review was undertaken to review published ecological information relevant to the proposed cable landing station site and to identify any habitats and species of potential importance in the area.

The literature review did not identify any previous terrestrial ecology surveys of the development area. The relevant Government published literature, newsletters, reports and vegetation maps that were reviewed. Those which contain information pertaining to South Lantau included the following:

- *Register of Sites of Special Scientific Interest (SSSIs).* Loose-leaf document maintained by Planning Department, Hong Kong SAR Government (Anon,1995);

- *Hong Kong Bird Reports (1996, 1997)* published by Hong Kong Bird Watching Society;
- *Porcupine!* Newsletters published by the Department of Ecology and Biodiversity, Hong Kong University, in collaboration with Kadoorie Farm & Botanic Garden Fauna & Flora Conservation Department; and
- *Country Parks of Hong Kong* published by the Information Services Department, Hong Kong SAR, 1998.

Although the area surrounding the site is zoned as a Coastal Protection Area (CPA), there are no recorded areas of conservation importance within close proximity of the proposed development site. The closest terrestrial sites of conservation importance include the Lantau Country Park, situated about 0.5 km from the proposed cable landing station site boundary, and three registered SSSI sites (containing natural woodland and rare plant species) situated between 3 to 8 km from the proposed cable landing station site.

There have been no terrestrial bird sightings of importance recorded in the proximity of Tong Fuk in the Hong Kong Bird Reports (1996, 1997) (the closest habitat for water birds is Tong Fuk Bay) and no large mammal sightings have been reported in the Tong Fuk area by *Porcupine!*.

G3.2 FIELD SURVEY APPROACH

A terrestrial ecological field survey of the development site and surrounding area was undertaken in January 2000 to collect baseline data on the terrestrial habitats in the area and to determine the dominant flora/fauna and any species of conservation value. During the field surveys, the plant species within each habitat type were recorded, and the presence or signs of presence of birds, mammals, reptiles, and other fauna of potential conservation interest were noted. The primary habitats in the development area and its surroundings were photographed.

G3.3 DESCRIPTION OF HABITATS

G3.3.1 *Flora*

The existing habitats within the cable landing station site comprise woodland on a slope, regenerated shrubs and small trees in a cleared area, a cleared area with grass and shrubs and an abandoned building. Habitats surrounding the proposed cable landing station site comprised:

- secondary woodland below the South Lantau Road to the north and west;
- a temple to the west;
- a landformed area with graves to the east (as described in *Annex F*);
- a coastal area to the south; and
- an existing access road leading from South Lantau Coast Road to the temple and pier.

The surveyed habitats are illustrated in *Figure G3a* and the plant species recorded are listed in the *Table G3.3a*.

Table G3.3a Plant Species Recorded

Species	*Family*	*Abundance*	*Plant Form*
Acacia confusa	Mimosaceae	+++	T
Alangium chinense	Alangiaceace	+	T
Alpinia sp.	Ziniberaceae	+	H
Antirhoea chinensis	Rubiaceae	+	S
Aporusa dioica	Euphorbiaceae	+	S
*Aquilaria sinensis**	Aquilariaceae	+	T/S
Ardisia crenata	Myrsinaceae	+	S
Atalantia buxifolia	Rutaceae	+	S
Bischofia javanica	Euphorbiaceae	+	T
Blechnum orientale	Blechnaceae	+	F
Breynia fruticosa	Euphorbiaceae	+	S
Bridelia tomentosa	Euphorbiaceae	++	T/S
Callicarpa nudiflora	Verbenaceae	++	S/T
Celtis sinensis	Ulmaceae	++	T
Christella acuminata	Thelypteridaceae	++	F
Clerodondrum inerme	Verbenaceae	++	S
Cratoxylun ligustrinum	Hypericaceae	++	T/S
Dalbergia torta	Papilionaceae	++	C
Daphniphyllum calycinum	Daphniphyllaceae	+	T
Delonix regia	Caesalpiniaceae	++	T
Desmos cochinchinensis	Annonaceae	+	C
Dicranopteris linearis	Gleicheniaceae	+	F
Dimocarpus longan	Sapindaceae	+	T
Evodia meliaefolia	Rutaceae	+	T
Ficus hispida	Moraceae	++++	T
Ficus microcarpa	Moraceae	+	T
Ficus superba	Moraceae	++	T/S
Ficus variegata	Moraceae	+	T
Ipomoea cairica	Convolvulaceae	++	C
Lantana camara	Verbenaceae	++	S
Leucaena Leucocephala	Mimosaceae	+	T/S
Litsea glutinosa	Lauraceae	+	T/S
Litsea rotundifolia	Lauraceae	++	S
Macaranga tanarius	Euphorbiaceae	++	T
Maesa perlarius	Myrsinaceae	+	S
Mallotus paniculatus	Euphorbiaceae	++	T
Mangifera indica	Anacardiaceae	+	T
Melastoma sanguineum	Melastomataceae	+	S
Microcos paniculata	Tiliaceae	++	T/S
Mikania micrantha	Compositae	++	C
Miscanthus spp.	Gramineae	++	G
Musa paradisiaca	Musaceae	++	T
Pandanus tectorius	Pandanaceae	++	S
Panicum spp.	Gramineae	++	G
Psidium guajava	Myrtaceae	+	S
Psychotria rubra	Rubiaceae	+++	S
Rhodomyrtus tomentosa	Myrtaceae	+	S
Rhus hypoleuca	Anacardiaceae	+	S
Sageretia theezans	Rhamnaceae	+	S
Sapium discolor	Euphorbiaceae	++	T
Sapium sebiferum	Euphorbiaceae	++	T
Schefflera octophylla	Araliaceae	+	T
Sterculia lanceolata	Sterculiaceae	++	T/S
Strophanthus divaricatus	Apocynaceae	+	C
Tarenna mollissima	Rubiaceae	+	S
Viburnum odoratissimum	Caprifoliaceae	+	T
Xanthium sibiricum	Compositae	+	H
Zanthoxylum avicennae	Rutaceae	+	S
Zanthoxylum nitidum	Rutaceae	+	C

(Abbreviation: On site abundance: + - occasional; ++ - frequent; +++ - common; ++++ - dominant species. Plant form: C - Climber; F - Fern; G - Grass; H - Herb; S - Shrub; T - tree.)
* Protected plant species listed in the China Plant Red Data Book.

Secondary Woodland Habitat

The woodland habitat is distributed on a slope formed at the northeastern and western corners of the site. The woodland is a semi-natural secondary woodland composed of naturally colonised plants mixed with some roadside plantation trees, such as *Acacia confusa* and *Delonix regia*. The woodland is believed to be over 30 years old as several of the trees have reached a height of 10 m and are 30 cm in diameter (*Figure G3b Photo 1*). The woodland is dominated by *Acacia confusa, Mallotus paniculatus, Celtis sinensis* and *Bridelia tomentosa*. As typically seen in other areas of Hong Kong, the shrub *Psychotria rubra* was the dominant plant in the woodland understorey.

One large and some small incense trees *Aquilaria sinensis* were found at the lower woodland slope of the site (*Figure G3b Photo 2 & 3*). This species has been listed in the *China Plant Red Data Book* as a vulnerable species (Fu, 1992). In China, the species has become depleted due to severe damage arising from household collection for use as a balm in medicine. The species is not rare in Hong Kong but retains some botanical interest.

Shrubs and small trees were recorded between the slope woodland and the unused cleared area. The small tree, *Ficus hispida,* was the dominant species in this habitat (*Figure G3b Photo 4*). Common shrubs that were found in the area include *Lantana camara, Maesa perlarius* along with some small fruit trees such as Longan and Guava.

Grass and Shrub Habitat

The unused cleared area around the building supported a mosaic of grasses and shrubs (*Figure G.3c Photo 5*). *Ficus spp., Lantana camara, Musa paradisiaca* and grasses such as *Miscanthus spp* were commonly encountered at the site.

Other Major Features

A large area within the proposed development site is occupied by an abandoned building (*Figure G3c Photo 6*). A small temple is located to the west (*Figure G3c Photo 7*). A few large trees, i.e. *Celtis sinensis. Delonix regia, Ficus variegata, Viburnum odoratissimum* and *Bischofia javanica,* were observed growing between the boundary of the proposed site and the temple site (*Figure G3c Photo 8*). An abandoned nest of a Magpie or raptatory bird was found on one of the large trees.

G3.3.2 *Fauna*

Eight species of birds were recorded at the site during the field survey, as shown in *Table G3.3b.*

Table G3.3b Bird Species Identified

Common name	*Latin name*	*Number of individual recorded*
Japanese White-eye	*Zosterops japonica*	2
Jungle Crow	*Corvus macrorhynchus*	1
Black-faced Laughing Thrush	*Garrulax perspicillatus*	5
Chinese Bulbul	*Pycnonotus sinensis*	3
Crested Bulbul	*Pycnonotus jocosus*	3
Crested Mynah	*Acridotheres cristatellus*	2
Spotted Dove	*Streptopelia chinensis*	1
Magpie Robin	*Copsychus saularis*	1

These bird species are commonly found in similar habitats in Hong Kong and are not classified as rare. Active searching for small mammals and reptiles was undertaken during the field survey, but no sightings were recorded aside from a Changeable Lizard *Calotes versicolor* which is a common species found in open grassland, shrubland and disturbed areas.

G4 *IMPACT ASSESSMENT*

Trees in the woodland area of the cable landing station site are mostly mature and comprise part of the wooded green belt along the South Lantau Road. The majority of trees in the woodland are regarded as mature, ie over 30 years old, and birds have been found to use this habitat as a feeding ground or nesting/breeding site. The incense tree *Aquilaria sinensis,* which is of botanical interest, was recorded in the secondary woodland and has a relatively high ecological value for this area.

The ecological impacts from the secondary woodland habitat loss are considered to be minimal, as only some of the smaller trees on the edge of the woodland slope would need to be cleared for the development. However, it is expected that some mature trees will require removal. It is recommended that compensation planting for these trees is undertaken as part of the tree felling application procedures. Overall, the ecological impacts are considered to be low due to the small area to be disturbed and the number of trees to be cleared (30 to 50 trees) (see *Annex E Landscape and Visual*). The cleared area comprises small trees, shrubs and other vegetation types and no species of fauna and flora of conservation value were recorded at the site. Consequently, the ecological value of the habitat is regarded as low and limited ecological impacts are not expected to result from the development of the proposed cable landing station and associated infrastructure.

However, several large trees, including the *Celtis sinensis. Delonix regia, Ficus variegata, Viburnum odoratissimum* and *Bischofia javanica,* are located between the boundary of the proposed site and the temple and which have both ecological and cultural value. It is recommended that these trees are preserved during demolition and construction work.

G5 MITIGATION MEASURES

The impact assessment indicates that there are no significant terrestrial ecology impacts associated with the development of the proposed cable landing station and associated infrastructure. However, the following mitigation measures are recommended to mitigate against the minor loss of woodland.

- Tree planting is recommended for compensation of minor woodland habitat loss, following the established tree felling application procedure.

- The development layout plans show that the incense trees *Aquilaria sinensis* may be impacted by the proposed cable landing station. Should these trees be affected by the development, they should be relocated or transplanted to a suitable location nearby.

- Fences or boards should be set up during construction to protect the several large trees behind the temple during construction; these include: *Celtis sinensis. Delonix regia, Ficus variegata, Viburnum odoratissimum* and *Bischofia javanica.*

G6 CONCLUSION

The construction of the proposed cable landing station and associated infrastructure is expected to result in the removal and disturbance of low ecological value habitat. During the field investigation, there were no flora or fauna of conservation significance identified at the proposed site and no significant ecological impacts were identified from the proposed development. However, recommendations for tree planting to compensate for the minor loss of woodland edge habitat and for relocation/preservation of the incense trees found in this area have been proposed to be implemented as part of the established tree felling application procedures.

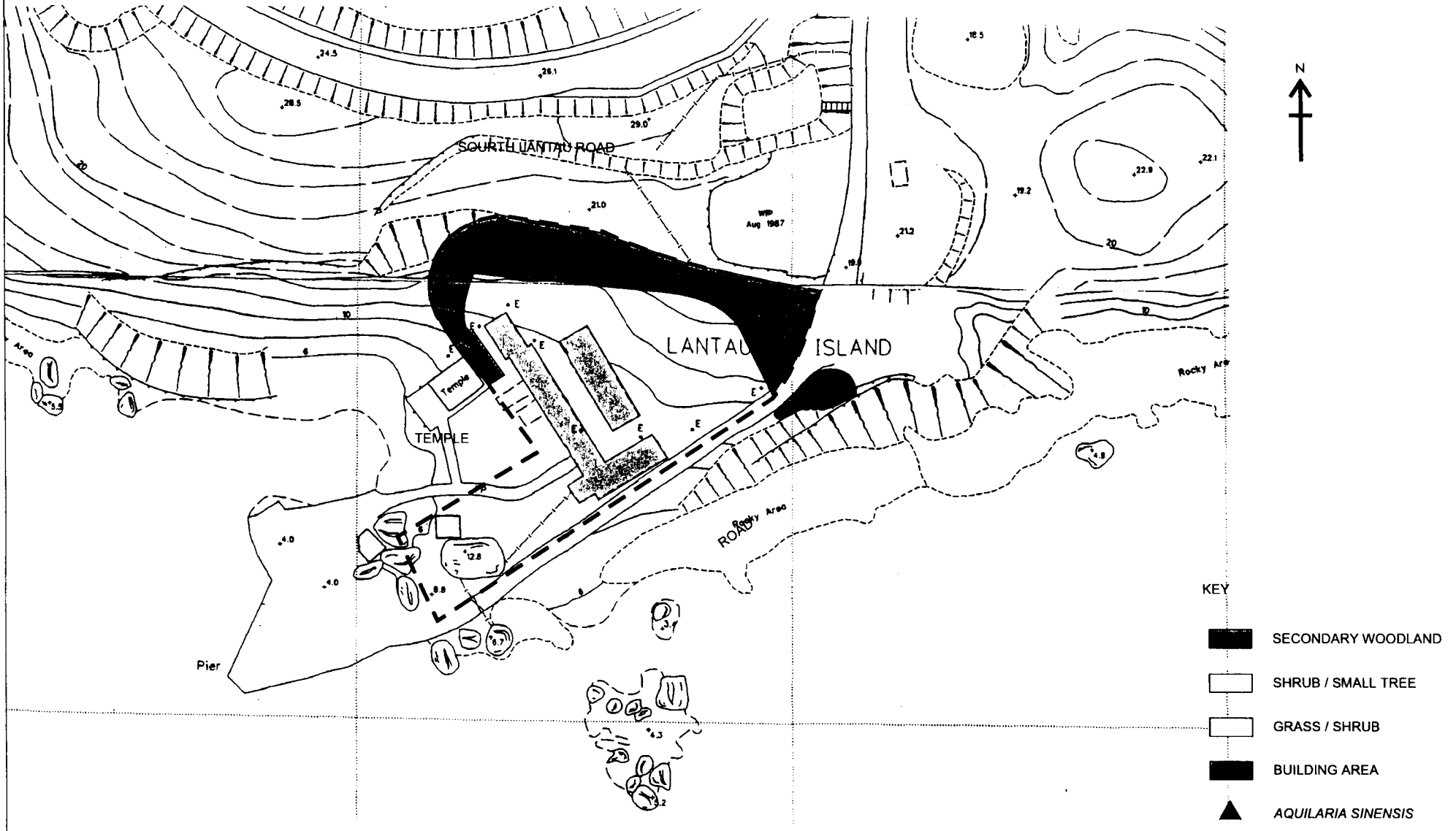


FIGURE G3a

HABITAT MAP OF PROPOSED PROJECT SITE AT TONG FOK, LANTAU

FILE: C2022b
DATE: 01/02/2000

Environmental Resources Management

ERM

Photo 1. A view of the woodland on slope at Tong Fok, Lantau, January 2000

Photo 2. A view of the trunk portion of the Incense tree *Aquilaria* sinensis in the woodland at Tong Fok, Lantau, January 2000. The species is listed in the China Plant Red Data Book.

Photo 3. A view of a small Incense Tree *Aquilaria* sinensis in the woodland at Tong Fok, Lantau, January 2000

Photo 4. A view of abandoned yard growing with naturally colonised shrubs and small trees at Tong Fok, Lantau, January 2000

FIGURE G3b

PHOTOGRAPHS OF TERRESTRIAL HABITATS

FILE: C2022k1
DATE: 24/03/00

Environmental Resources Management

ERM

Photo 5. A view of the grass/shrub habitat at the abandoned yard at Tong Fok, Lantau, January 2000.

Photo 7. A view of the temple close to the proposed site at Tong Fok, Lantau.

Photo 6. A view of the unused building at Tong Fok, Lantau.

Photo 8. Large and mature trees behind temple at Tong Fok, Lantau.

FIGURE G3c

PHOTOGRAPHS OF TERRESTRIAL HABITATS

FILE: C2022k2
DATE: 24/03/00

Environmental Resources Management

ERM

Annex H

Marine Ecology

H1 INTRODUCTION

This *Annex* presents the existing marine ecological resources within and adjacent to the waters neighbouring the Tong Fuk Project Site and an evaluation of the potential impacts to these resources associated with the project.

H2 RELEVANT LEGISLATION AND GUIDELINES

The criteria for evaluating marine ecological are laid out in the *EIAO TM*. *Annex 16* of the *EIAO TM* sets out the general approach and methodology for the assessment of marine ecological impacts arising from a project or proposal, to allow a complete and objective identification, prediction and evaluation. *Annex 8* of the *EIAO TM* recommends the criteria that can be used for evaluating such impacts.

Other legislation which applies to marine ecology includes: *The Wild Animals Protection Ordinance (Cap. 170) 1980,* which protects all cetaceans.

H3 MARINE ECOLOGICAL RESOURCES BASELINE CONDITIONS

H3.1 SUBTIDAL SOFT BOTTOM ASSEMBLAGES

There appears to be little information on the subtidal soft bottom assemblages in the direct vicinity of cable landing point; although a number of surveys have been undertaken at the nearby South Cheung Chau open seafloor disposal site, which is in close proximity to the proposed cable alignment. As these surveys were conducted in waters in close proximity to the proposed area of works, the assemblages recorded at South Cheung Chau can be considered to be representative of the assemblages along the proposed cable alignment.

The most recent of these surveys involved grab sampling as part of the *Seabed Ecology Studies*[1]. As part of this study, sampling was undertaken at numerous stations in and around the South Cheung Chau open seafloor disposal site. These surveys found a total of 11,082 specimens, belonging to 70 families in seven phyla. Polychaetes were the most abundant group present, representing 96% of identified individuals and 33% of the total biomass. By contrast, molluscs constituted less than 1% of the identified individuals but provided 60% of the total biomass recorded.

(1) ERM-Hong Kong, Ltd (1999) Seabed Ecology Studies: Composite Report. For the Civil Engineering Department, Hong Kong Government.

The overall mean abundance recorded from the study site was high (200 individuals grab^{-1} ie 2,100 individuals m^{-2}). In comparison to other sites surveyed under the *Seabed Ecology Studies*, the South Cheung Chau site was generally ranked in the mid-range of the eight sites for all parameters except the total biomass, for which it recorded the highest value at 4.7 g grab^{-1} or 48.9 g m^{-2}.

In summary, in comparison to other areas of Hong Kong, the soft bottom assemblages in the vicinity of the proposed cable route have been found in historical surveys to be characterised by a high abundance of individuals and a high overall biomass. No species that are considered rare were identified in the review, therefore, the benthos can be classified as of low ecological importance.

H3.2 *SUBTIDAL HARD BOTTOM ASSEMBLAGES*

In order to comprehensively characterise the potential subtidal hard bottom assemblages that may be present in the vicinity of the cable landing point, a dive survey was conducted as part of this Study. The methodology and results of this survey are presented in *Attachment H1;* however, a summary of the findings is presented below.

From the results of the dive surveys within the Study Area it is noted that few organisms of ecological interest were present. Two individual colonies of gorgonian sea whips were observed during the survey. Both colonies were recorded in the vicinity of the small headland to the east of the pier. Although the presence of these gorgonian sea whips is of ecological interest, they are common in Hong Kong waters and are not considered to be rare [2]. No other species of conservation interest were recorded.

In terms of seabed substrate there appears to be a clear divide between that found in the shallow regions and the deeper waters surveyed. Between -1m to -3m PD the seabed was mainly rocky, ranging from large boulders to small rocky outcrops. The majority of these hard substrate surfaces were found to be encrusted with barnacles (*Capitulum* sp, *Tetraclita* sp and *Balanus* sp), with the degree of coverage appearing to be a factor of the degree of exposure (the more exposed the site the higher percent cover of barnacles). Below these depths, down to approximately -7m PD the seabed was found to be either fine sand or soft mud. No large epifaunal organisms were observed during the surveys on the surface of the sand and mud deposits.

Based on these findings, no marine ecological constraints to the routing of the cable have been identified. However, where possible, the routing should try

(2) Clark T H (1995) The distribution of ahermatypic corals at Cape d'Aguilar, Hong Kong. The Marine Flora and Fauna of Hong Kong and Southern China IV. Proceedings of the Eighth International Marine Biological Workshop: the Marine Flora and Fauna of Hong Kong and Southern China, Hong Kong, 2 - 20 April 1995. Edited by Brian Morton. Hong Kong University Press.

to avoid the areas where the gorgonian sea whips were located in order to minimise potential impacts to these organisms.

H3.3 *INTERTIDAL HARD SURFACE ASSEMBLAGES*

As with the subtidal hard surface assemblages, little information was available on the potential intertidal hard surface assemblages at the proposed cable landing point; therefore, an intertidal rocky shore survey was conducted as part of this Study. The methodology and results of this survey are presented in *Attachment H2;* however, a summary of the findings is presented below.

The rocky shores at Tong Fuk located at and near the proposed landing point of the cable were surveyed using a quantitative belt transect method. A total of three sites were chosen for field surveys. These three sites varied in their substrate with one appearing to be a disturbed rocky shore, one a natural rocky/boulder shore and one a natural rocky shore.

The disturbed rocky shore site was regarded as of low ecological value due to the comparatively low abundances of intertidal organisms and low number of species recorded. The natural rocky/boulder shore supported assemblages of typical diversity and abundance as elsewhere in Hong Kong and was, therefore, considered to be of low to medium ecological value. No species of conservation interest or that can be considered rare were recorded at either site.

The natural rocky shore recorded no species of conservation interest or species that are regarded as rare. The assemblages recorded were considered to be typical to other exposed rocky shores in Hong Kong. However, due to the high abundances of organisms, particularly snails, and the undisturbed nature of the site, the assemblage was considered to be of medium ecological value.

In summary, the intertidal hard surface assemblages located at the proposed landing point and in close proximity to the proposed landing point for the cable were found to be typical of semi-exposed intertidal assemblages in Hong Kong. No species of conservation interest or that are regarded as rare were recorded. As a result, the intertidal hard surface assemblages were considered to be of low to medium ecological value.

H3.4 *INTERTIDAL SOFT SHORE ASSEMBLAGES*

Surveys were conducted on the intertidal soft shore habitat in the vicinity of the proposed landing point of the cable. The survey work was focused on determining whether the habitats are utilised by the horseshoe crabs which are of conservation value. The methodology and results of this survey are presented in *Attachment H2;* however, a summary of the findings is presented below.

The habitat surveyed appeared to be a natural, semi-exposed sandy/pebble shore located to the east of the proposed landing point. The substratum of the shore was mainly composed of small to medium-sized pebbles with patches of fine sand observed in the low and mid-shore regions. The intertidal assemblages recorded on this natural sandy/pebble shore were mainly composed of snails, bivalves and barnacles. No species of conservation interest were recorded. The abundance of assemblages recorded was generally low in comparison to other sites in Hong Kong, and can generally be considered as typical of a semi-exposed sandy/pebble shore. Based on these findings, the ecological importance of this sandy shore was considered to be low.

As stated above, the main objective of the survey was to determine whether the habitat is utilised by horseshoe crabs which are of conservation interest in Hong Kong. In general horseshoe crabs prefer undisturbed, sheltered sandy beaches or protected sandy-mud/mud flats to breed [3], the hard rocky/boulder shores and concrete seawalls described in *Section H3.3* are unlikely to be a suitable habitat for these organisms. The sandy/pebble shore located to the east of the proposed landing point is mainly covered with hard pebbles; which are also considered unsuitable for horseshoe crabs to breed. The presence of small boats on the sandy shore located west of the proposed landing point indicates that the beach has been disturbed frequently and is thus unlikely to be a preferred breeding habitat for horseshoe crabs. Therefore, the habitats within and adjacent to the proposed landing point are unlikely to be breeding habitats or nursery grounds for the locally endangered horseshoe crabs.

H3.5 MARINE MAMMALS

Although a total of twelve species of cetacean have been recorded in Hong Kong waters, only two are considered to be resident species. These are the Indo-Pacific Humpbacked dolphin, *Sousa chinensis,* and the Finless Porpoise, *Neophocaena phocaenoides*. Between these two species the waters of which the proposed cable routing passes through appear to be most heavily utilised by *Sousa chinensis* [4]. This species was observed in these waters most commonly during the summer and autumn months, with the western part of the south Lantau waters near the Sokos Islands and Fan Lau used more heavily than the eastern area, near Cheung Chau. However during a two and a half year survey, conducted between September 1995 and March 1998, less than twenty sightings of *Sousa chinensis* were recorded in these waters [5]. The findings from this study could not verify the exact use of these waters with respect to the life cycle of these marine mammals, ie breeding, calving or feeding, as it

(3) Chiu HMC and Morton B (1999) The Biology, Distribution, and Status of Horseshoe Crabs, *Tachypleus tridentatus* and *Carcinoscorpius rotundicauda* (Arthropoda: Chelicerata) in Hong Kong: Recommendations for Conservation and Management. Final Report to China Light and Power Company Limited, May 1999.
(4) Jefferson T A (1998) Population Biology of the Indo-Pacific Humpbacked Dolphin (*Sousa chinensis* Osbeck, 1765) in Hong Kong Waters: Final Report. Submitted to the Agriculture, Fisheries and Conservation Department, Hong Kong Government.
(5) Jefferson T A (1998) *Op cit.*

appears that dolphins engage in a full range of activities in each of areas surveyed throughout the waters of Hong Kong.

It is unlikely that the waters which the proposed cable routing passes through are critical habitats for either marine mammal species given the low number of sightings and the fact that the waters are busy shipping lanes that are used frequently by high speed ferries.

H4 IMPACT ASSESSMENT

H4.1 CONSTRUCTION PHASE

H4.1.1 Direct Impacts

No long term direct impacts are expected to occur due to the laying of the cable; however, short term impacts to low ecological value soft bottom benthic assemblages may occur during the injection of the cable into the seabed sediments. Once these operations have ceased the sediments will be rapidly recolonised by similar benthic fauna.

The shore approach of the cable works will be performed by directional drilling and not injection. The drilling will take place within the bedrock and will commence 150m from the shore. Consequently the rocky and sandy shores at Tong Fuk will not be affected by these construction works.

H4.1.2 Indirect Impacts

Indirect impacts are predicted to occur through increases in suspended solids in the water column. Such elevated suspended sediment levels may cause smothering of filter feeders such as corals and bivalves and clogging of gill filaments in other organisms. Another potential indirect impact involves reduction in dissolved oxygen concentrations caused by elevated levels of suspended sediment. An increase in solids in the water column will result in a reduction in sunlight penetration, decreased rate of photosynthesis of phytoplankton (primary productivity) and thus lower rate of oxygen production in the water column.

As discussed in *Annex C*, the injection process will result in the formation of a cloud of high suspended sediment concentrations around the injection machine, which will remain very close to the seabed and, therefore, the sediments will settle rapidly back onto the seabed. As the tidal currents are low along the cable route the suspended sediments will not be transported away from the immediate proximity of the cable laying operation. As a result of the small scale and localised nature of the impacts, no adverse impacts to marine ecological resources are predicted to occur.

H4.2 OPERATION PHASE

No substantial impacts on ecological resources have been predicted during the operation of the cable. The cable is unlikely to be damaged as it will be layed at a depth of 3 m in the sediment. No further assessment is considered necessary.

H4.3 MARINE ECOLOGICAL RESOURCES

An evaluation of the impact in accordance with the *EIAO TM Annex 8 Table 1* is presented below.

- *Habitat Quality*: Impacts are predicted to occur to subtidal soft-bottom habitats of low ecological value.
- *Species*: No species of ecological importance are predicted to be impacted due to the cable laying operations.
- *Size:* The total length of the cable within Hong Kong waters is about 10 km which will be layed by injection. The shore end (150 m from the coast) will be installed using directional drill cut to the cable station.
- *Duration*: The works associated with the cable laying within Hong Kong waters are expected to last for a period of two weeks.
- *Reversibility*: Impacts to the assemblages inhabiting the soft bottom assemblages along the cable alignment are expected to be relatively short term and recolonisation of the sediments is expected to occur.
- *Magnitude*: No impacts to ecologically sensitive habitats are predicted. The magnitude of impact during cable laying is likely to be of low severity and acceptable, given that the disturbances are short term. The cable laying will affect only assemblages of low ecological value and the fauna will recolonise once construction works cease.

H5 MITIGATION MEASURES

During cable laying, all steps should be taken to avoid impacts to water quality so as to prevent impacts to marine ecological resources. It is expected that the measures recommended in *Annex C* to control impacts to water quality to within acceptable levels, are also expected to control impacts to marine ecological resources. Hence, with the implementation of these mitigation measures, no adverse impacts are expected to occur to marine ecology.

A review of existing information on the marine ecological resources surrounding the cable routing has identified the area as supporting benthic fauna which are of low ecological value. Intertidal habitats have been classified as typical of Hong Kong intertidal habitats and are considered to be of low to medium ecological value. The waters are also not considered to be a critical habitat for marine mammals, as the number of sightings recorded in these waters is low.

Subtidal soft bottom assemblages that will be disturbed during the construction of the cable routing are of low ecological value and commonly recorded elsewhere in Hong Kong waters; therefore, the short term loss of benthic organisms directly along the cable route is not considered to represent an unacceptable ecological impact. The rapid reinstatement of the seabed will result in the area being available for prompt recolonisation, and hence, no permanent impacts are likely to occur.

ATTACHMENT H1 - SUBTIDAL HARD SURFACE SURVEY RESULTS

INTRODUCTION

The main objective of this work was to identify any potential marine ecological assemblages of high ecological value or conservation value (specifically corals) in the area where the landing point for the submarine cable is proposed to be located. To fulfil this objective a dive survey was conducted. The methodology and results of the survey are discussed below.

METHODOLOGY

A dive survey was undertaken on 2 February 2000 in the subtidal region (-1m to -7m PD) of the rocky and boulder shore habitat presented on *Figure H1a*. The site is exposed to easterly winds which cause strong waves to form in the surf zone. Visibility was poor during the survey but sufficient to allow organisms of ecological interest to be noted and their relative locations noted.

The Study Area was divided into five individual sites that run sequentially along the coastline (*Figure H1a*). A dive survey was then conducted within each site and seabed type and the presence of corals or other organisms of conservation interest were noted. Where any species or substrate of interest were identified still photographs were taken. Furthermore, a surface marker reference was taken in order for the conservation interest to be identified on a map as an area of constraint.

Information was recorded at each of the sites concerning the nature and slope of the substrate, as well as the presence/absence of species of ecological interest that may constrain the selection of the cable route and landing point. The results of the surveys from each of the five sites are presented in the following section.

RESULTS

The findings of the surveys at each site, as well as a description of the bottom composition is presented below in *Table H1a*. From the results of the dive surveys within the Study Area it is noted that few organisms of ecological interest were present (*Table H1a*). Two individual colonies of gorgonian sea whips were observed during the survey. Both colonies were recorded in the vicinity of the small headland to the east of the pier (*Figure H1b*). Although the presence of these gorgonian sea whips is of ecological interest, they are common in Hong Kong waters and are not considered to be rare [6]. No other species of conservation interest were recorded (*Table H1a*).

(6) Clark T H (1995) The distribution of ahermatypic corals at Cape d'Aguilar, Hong Kong. The Marine Flora and Fauna of Hong Kong and Southern China IV. Proceedings of the Eighth International Marine Biological Workshop: the Marine Flora and Fauna of Hong Kong and Southern China, Hong Kong, 2 - 20 April 1995. Edited by Brian Morton. Hong Kong University Press.

Table H1a *Results of Dive Survey in the South Lantau Study Area*

Site	Nature of Substrate	Species of Substrates of Conservation Interest	Profile of the Site	Constraints
1	The bottom composition was comprised of mainly fine sand or mud. Very little hard substrate was recorded and was only found as isolated rocks or pebbles. No organisms were recorded other than barnacles on the isolated hard surfaces.	None	Gentle slope	None
2	Between -1m and -2m PD the substrate was comprised of large boulders covered with barnacles (*Capitulum* sp, *Tetraclita* sp and *Balanus* sp) and brown algae (Unid spp). One gorgonian sea whip was recorded on a rocky outcrop in this depth. Below -2 m, down to -7m PD, the bottom was mainly comprised of fine sand or mud. No organisms were recorded between this depth.	Individual gorgonian sea whip	Rocky to gentle slope	One individual gorgonian sea whip *
3	Large boulders and rocky substrate between -1m and -3m PD. Hard substrates had sporadic cover of barnacles (*Capitulum* sp, *Tetraclita* sp and *Balanus* sp). As with Site 2, a single gorgonian sea whip was recorded in the shallow region. Between -3m and -7m PD the substrate was either fine sand or mud. No organisms were recorded in this depth range.	Individual gorgonian sea whip	Rocky to gentle slope	One individual gorgonian sea whip *
4	Between -1m and -3m PD there were boulders or rocks, although the majority were smaller than those found at Site 2 and 3. Less barnacle coverage (*Capitulum* sp, *Tetraclita* sp and *Balanus* sp) was noted. Between -3m and -7m PD the substrate was either fine sand or mud. No organisms were recorded in this depth range.	None	Rocky to gentle slope	None
5	Clearly a more exposed site with large to medium boulders between -1m and -2m PD with barnacle coverage (*Capitulum* sp, *Tetraclita* sp and *Balanus* sp). Below -2 m, down to -7m PD, the bottom was mainly comprised of fine sand or mud. No organisms were recorded below -2m PD.	None	Rocky to gentle slope	None

Note: * the seawhips are not considered as a constraint to the routing of the cable but if possible the cable alignment should attempt to avoid them.

In terms of seabed substrate there appears to be a clear divide between that found in the shallow regions and the deeper waters surveyed. Between -1m to -3m PD the seabed was mainly rocky, ranging from large boulders to small rocky outcrops. The majority of these hard substrate surfaces were found to be encrusted with barnacles (*Capitulum* sp, *Tetraclita* sp and *Balanus* sp), with the degree of coverage appearing to be a factor of the degree of exposure (the more exposed the site the higher percent cover of barnacles). Below these depths, down to approximately -7m PD the seabed was found to be either fine sand or soft mud. No large epifaunal organisms were observed during the surveys on the surface of the sand and mud deposits.

Based on the above no marine ecological constraints to the routing of the cable have been identified. However, where possible, the routing should try to avoid the area where the two gorgonian sea whips were located in order to minimise potential impacts to these organisms of ecological interest.

ATTACHMENT H2 - INTERTIDAL SHORE SURVEYS

INTRODUCTION

Intertidal shore surveys were undertaken at and near the proposed cable landing site to collect baseline ecological information on the habitat, identify and quantitatively assess the floral and faunal components of the intertidal community and identify species/habitats which are of conservation importance. The ecological value of the habitats were verified based on the results obtained from field surveys.

METHODOLOGY

Quantitative Rocky Shore Surveys

The rocky shores at Tong Fuk located at and near the proposed cable landing point were surveyed using a quantitative belt transect method. A total of three sites were chosen for field surveys (*Figure H2a*). At each site, horizontal (belt) transects were set up along the shore line and surveyed at three heights up the shore at 50 cm intervals perpendicular to the waterline starting at 1.0 m above Chart Datum. On each transect, 5 quadrats (50 x 50 cm) were placed randomly to assess the abundance and distribution of flora and fauna. All animals found in each quadrat were identified and recorded to species level so that density m^{-2} can be determined. Sessile animals such as barnacles and oysters in each quadrat were not counted but estimated as a percentage of coverage on the rock surface. All species of algae (encrusting, foliose and filamentous) were also identified and recorded by estimating the percentage of cover of the rock surface.

Quantitative Sandy Shore Survey

At the sandy shore site, three line transects were deployed from the low tide mark up to the high tide mark and the number of mobile organisms was recorded. At five locations chosen at random along each of the transects, a core was taken (50 cm x 50 cm x 15 cm) and all organisms within the core were identified and their numbers recorded. The survey work was focused on determining whether the habitats are utilised by the Horseshoe Crabs which are of conservation value and considered to be under threat locally.

RESULTS

The results from field surveys indicated that the coastline within the survey area is composed of artificial seawalls and natural hard boulder/rocky shores. *Figure H2a* illustrates the type of intertidal shores found near and within the survey area. The western coastline within the survey area is lined with an artificial seawall fringed with rocks on its seaward side and a small concrete

pier. The eastern shores are composed of natural rocky/boulder shores and a sandy/pebble shore.

Rocky Shores

Disturbed Rocky Shore (Site R1)

The habitat is an artificial seawall fringed with rocks on its seaward side (*Figure H2a*). It is located next to a concrete pier and appears to have been disturbed by the construction of the pier. The intertidal assemblages recorded on the disturbed rocky shores were mainly composed of snails (67.5 m^{-2}), bivalves (32.6%) and limpets (18.9 m^{-2}) (*Table H2a*). Barnacles were also recorded but occurred in comparatively low abundances (4.3% cover). A percentage cover value of 8.6% was obtained for macroalgae. No species of conservation importance were recorded. The assemblages recorded were typical to other semi-exposed hard bottom shores in Hong Kong.

Table H2a ***Intertidal Assemblages Recorded for the Disturbed Rocky Shore at Site R1***

Species Group	Abundance
Limpets	18.9 m^{-2}
Snails	67.5 m^{-2}
Bivalves	32.6%
Barnacles	4.3%
Macroalgae	8.6%

Natural Rocky/Boulder Shore (Site R2)

The habitat is a natural rocky/boulder shore fringed with numerous scattered rocks in its seaward region (*Figure H2a*). There is a drainage channel built on the backshore of the habitat. The intertidal assemblages recorded on this natural rocky/boulder shore were mainly composed of snails (42.9 m^{-2}), bivalves (22.9% cover) and limpets (14.4 m^{-2}) (*Table H2b*). Barnacles were also recorded but occurred in much lower abundances (2.1% cover). A percentage cover value of 9.3% was obtained for macroalgae. No species of conservation importance were recorded. The assemblages recorded were typical to other semi-exposed rocky shores in Hong Kong.

Table H2b ***Intertidal Assemblages Recorded for the Natural Rocky/Boulder Shore at Site R2***

Species Group	Abundance
Limpets	14.4 m^{-2}
Snails	42.9 m^{-2}
Bivalves	22.9%
Barnacles	2.1%
Macroalgae	9.3%

Natural Rocky Shore (Site R3)

The habitat is a natural, exposed rocky shore located on the eastern side of the shore (*Figure H2a*). The shore appeared relatively free of human disturbance, such as pollution. High densities of snails (71.2 m^{-2}) and moderate abundances of limpets (17.6 m^{-2}) were recorded on the shore (*Table H2c*). Barnacles and bivalves also observed with respective percentage cover values of 4.5% and 4.9%. A percentage cover value of 8.5% was obtained for macroalgae. No species of conservation importance were recorded. The assemblages recorded were typical to other exposed rocky shores in Hong Kong.

Table H2c ***Intertidal Assemblages Recorded for the Natural Rocky Shore at Site R3***

Species Group	Abundance
Limpets	17.6 m^{-2}
Snails	71.2 m^{-2}
Bivalves	1.9%
Barnacles	4.5%
Macroalgae	8.5%

Natural Sandy/Pebble Shore (Site R4)

The habitat is a natural, semi-exposed sandy/pebble shore located at the eastern end of the shore (*Figure H2a*). The substratum of the shore was mainly composed of small to medium-sized pebbles with patches of fine sand observed in the low and mid-shore regions. Road signs indicating presence of submarine telecommunications cables were seen on the backshore. The intertidal assemblages recorded on this natural sandy/pebble shore were mainly composed of snails (9.3 m^{-2}) and limpets (8.0 m^{-2}) (*Table H2d.* A low density of 3.5 m^{-2} was obtained for sand hoppers. No species of conservation importance were recorded. The abundance of assemblages recorded was considered as low and typical of other semi-exposed sandy/pebble shores in Hong Kong.

Table H2d ***Intertidal Assemblages Recorded for the Natural Sandy/Pebble Shore at Site R4***

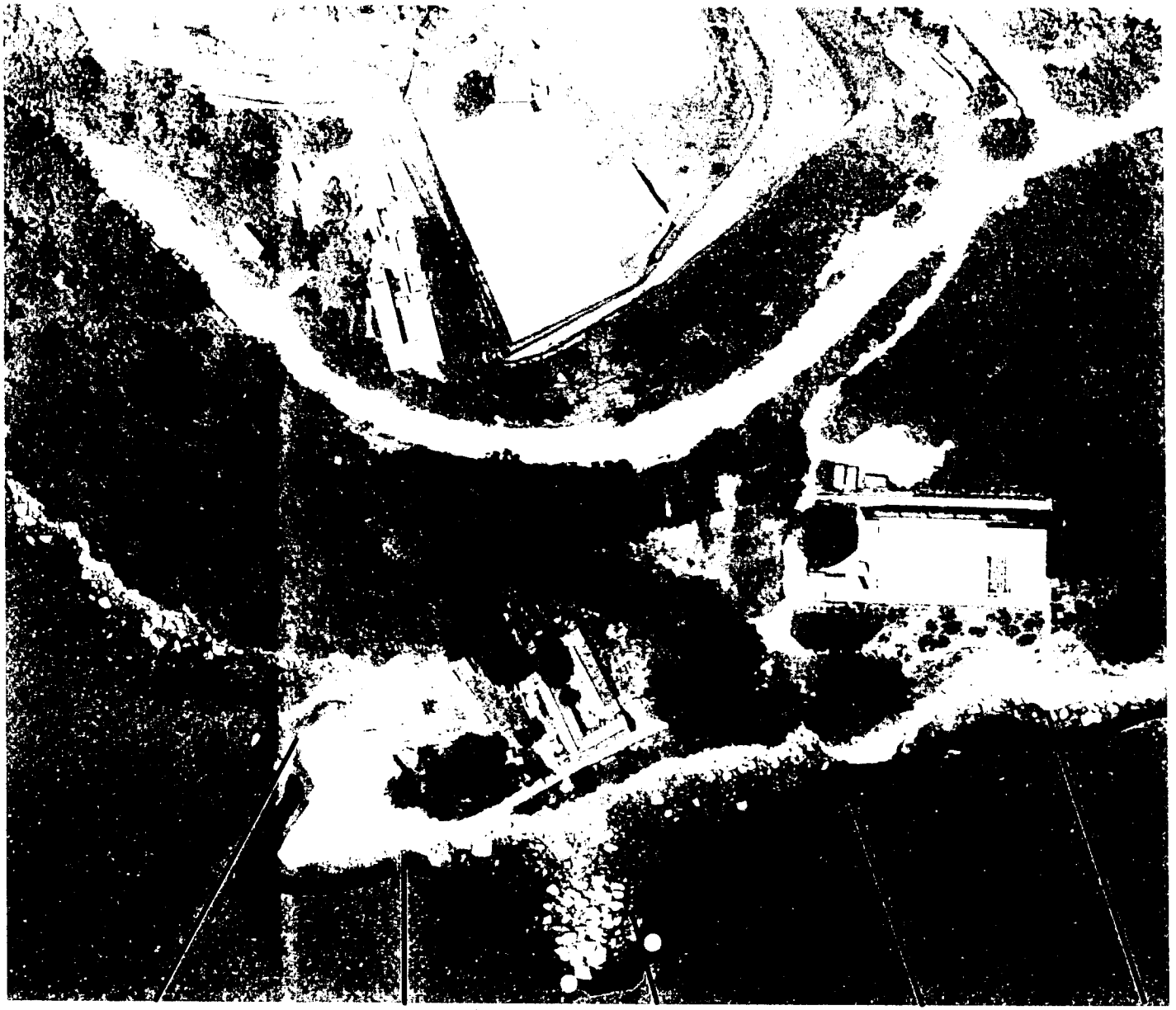
Species Group	Abundance
Sand hoppers	3.5 m^{-2}
Limpets	8.0 m^{-2}
Snails	9.3 m^{-2}
Polychaetes	1.9 m^{-2}

Species of Conservation Importance - Horseshoe Crabs

As horseshoe crabs prefer undisturbed, sheltered sandy beaches or protected sandy-mud/mud flats to breed(7), the hard rocky/boulder shores and concrete seawalls within the Survey Area are unlikely to be a suitable habitat for the animals. The sandy/pebble shore was mainly covered with hard pebbles

(7) Chiu HMC and Morton B (1999) *Op Cit.*

which are also considered unsuitable for horseshoe crabs to breed. The presence of small boats on the sandy shore (see *Figure H2a*) indicates that the beach has been disturbed frequently and is thus unlikely to be a preferred breeding habitat for horseshoe crabs. The habitats within and next to the Project Site are unlikely to be breeding habitats or nursery grounds for the horseshoe crab.



KEY

- SAND/MUD SUBSTRATE
- ROCK/BOULDER SUBSTRATE
- LOCATION OF GORGONIAN SEA WHIPS

FIGURE H1a

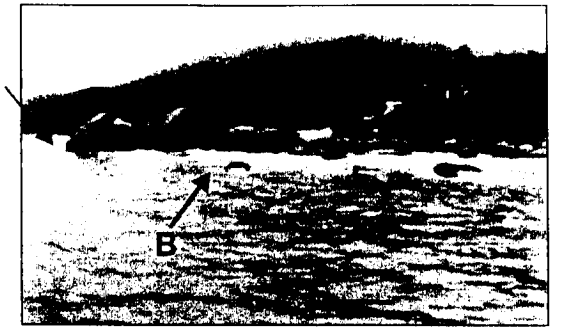
LOCATIONS OF SUBTIDAL HARD SURFACE SURVEY SITES AND GORGONIAN SEA WHIPS

FILE: C2022f
DATE: 09/02/2000

Environmental Resources Management

ERM

SURVEY AREA



AREAS IDENTIFIED AS SUPPORTING
GORGONIAN SEA WHIPS

CORAL A: GORGONIAN SEA WHIPS

CORAL B: GORGONIAN SEA WHIP

FIGURE H1b

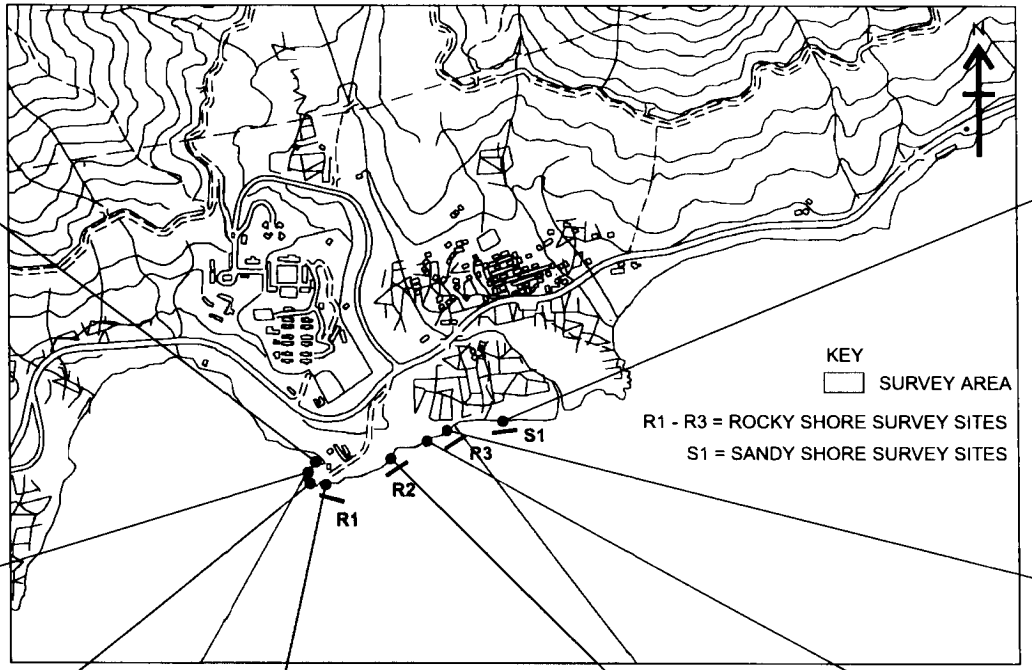
AREAS IDENTIFIED AS SUPPORTING ORGANISMS OF ECOLOGICAL INTEREST

FILE: C2022g
DATE: 09/02/2000

Environmental
Resources
Management

ERM

SMALL SANDY BEACH LOCATED WEST OF THE SURVEY AREA



SANDY PEBBLE BEACH LOCATED EAST OF THE SURVEY AREA

ROCKY SUBSTRATUM NEXT TO THE CONCRETE PIER

NATURAL EXPOSED ROCKY SHORE

CONCRETE PIER

ARTIFICIAL SEAWALL FRINGED WITH ROCKS

NATURAL SHORE WITH SCATTERED ROCKS

NATURAL ROCKY SHORE WITH A DRAINAGE CHANNEL AT THE BACKSHORE

FIGURE H2a

INTERTIDAL HABITATS NEAR AND WITHIN THE SURVEY AREA AT TONG FUK

FILE: C2022e
DATE: 10/03/2000

Environmental Resources Management

ERM

Annex I

Fisheries

I1 INTRODUCTION

This *Annex* presents the existing fisheries resources and fishing operations within and adjacent to the proposed cable alignment and an evaluation of the potential impacts to these resources associated with the construction and operation of the cable system.

I2 RELEVANT LEGISLATION AND ASSESSMENT CRITERIA

The criteria for evaluating marine ecological and fisheries impacts are laid out in the *EIAO TM*. *Annex 17* of the *EIAO TM* outlines the general approach and methodology for the assessment of fisheries impacts resulting from a proposed development, to allow a complete and objective identification, prediction and evaluation of the potential fisheries impact. *Annex 9* of the *EIAO TM* recommends some general criteria that can be used for evaluating fisheries impacts.

Other legislation which apply to fisheries resources include: the *Fisheries Protection Ordinance (Cap 171) 1987* which provides for the conservation of fish and other aquatic life and regulates fishing practices; and the *Marine Fish Culture Ordinance (Cap 353) 1983* which regulates and protects marine fish culture and other related activities.

I3 DESCRIPTION OF THE ENVIRONMENT

In 1989-91 the Agriculture, Fisheries and Conservation Department (AFCD) devised a system whereby the waters of Hong Kong were divided up into Fishing Zones. Data was gathered at that time on the catches of the Hong Kong fleet derived from these Fishing Zones(1). Since this first Hong Kong wide survey, AFCD have updated the information which now indicates that the number of Fishing Zones is 189, of which 179 are actively fished by vessels in the Hong Kong fleet.

The most recent and comprehensive information on the Hong Kong fishery is presented in the Port Survey Data of the Agriculture, Fisheries and Conservation Department (AFCD)(2). This information, which was gathered through interviews with fishermen during the period 1996 to 1997, has revealed that of the 179 actively fished AFCD fishing zones in Hong Kong waters, two of them are proximate to the proposed cable routing. These

(1) Agriculture, Fisheries and Conservation Department (1991) Port Survey 1989 - 1991.
(2) Agriculture, Fisheries and Conservation Department (1998) Port Survey 1996 - 1997.

fishing zones are Tong Fuk (AFCD Code 0012) and Sokos Islands (AFCD Code 0026) as shown on *Figure I3a*. The catches in these fishing zones are mainly derived from fishermen operating P47s and shrimp trawlers[3]. Some pair trawling operations have also been recorded operating close inshore between Tong Fuk and Pui O[4].

The findings of a recent study conducted for AFCD have determined that commercial fish species reproduce throughout the year, though spawning for the majority of species appears to be concentrated during the period from June to September[5]. The southern waters, through which the proposed cable routing will pass, have been identified as both a spawning area and nursery ground for fisheries resources. Commercial species that have been identified as using the waters for spawning are the Moray Eel *(Gymnothorax reevesi)*, the Scorpionfish *(Inegocia japonicus)*, the Scad *(Caranx kalla)*, the Flatfish *(Platycephalus indicus)*, the Bream *(Mylio macrocephalus)*, the Croakers *(Nibea diacanthus* and *Johnius belengeri)*, the Blue Crab *(Portunus pelagicus)* and the Mantis Shrimp *(Oratosquilla spp)*. Commercial species that have been found to use the area as a nursery ground for fry are the Mantis Shrimps *(Oratosquilla anomala)* and *(Dictyosquilla foveolata)* as well as both Sciaenid and Serranid fry.

The closest Fish Culture Zone (FCZ) to the proposed cable routing is located at Cheung Sha Wan, approximately 10 km away, and, as it will not be affected by the proposed project, it is not discussed further.

I4 IMPACT ASSESSMENT

I4.1 CONSTRUCTION PHASE

I4.1.1 Direct Impacts

No long term direct impacts to fisheries resources or fishing operations are expected to occur due to the deployment of the cable. Minor short term disturbances to the seabed in the immediate vicinity of the cable laying operations are predicted to occur. These disturbances are not predicted to affect fisheries resources or fishing operations.

Indirect Impacts

Indirect impacts are predicted to occur through increases in suspended solids concentrations in the water column. Increases in suspended solids can impact fisheries resources through the reduction of dissolved oxygen levels in the water column. This decrease results from a reduction of light penetration as a

(3) ERM - Hong Kong, Ltd (1998) Fisheries Resources and Fishing Operations in Hong Kong Waters. *Final Report*. For the Agriculture, Fisheries and Conservation Department, Hong Kong Government.
(4) ERM - Hong Kong, Ltd (1998) *Op cit.*
(5) ERM - Hong Kong, Ltd (1998) *Op cit.*
(6) Agriculture, Fisheries and Conservation Department (1998) Annual Report 1997/1998.

result of the increased concentration of particles in the water column. Consequently, reduced light penetration limits the amount of primary production (photosynthesis) and thus lowers the rate of oxygen production.

As discussed in *Annex C*, the cable laying process will result in the formation of a cloud of suspended sediment concentrations around the injection machine, which will remain very close to the seabed and the sediments will settle rapidly back onto the seabed. As the tidal currents are low along the cable route, particularly in the inshore areas, the suspended sediments will not be transported away from the immediate proximity of the cable laying operation. As a result of these small scale and localised impacts, no adverse impacts to fisheries resources and subsequently fishing operations, are predicted to occur.

I4.2 OPERATION PHASE

No impacts to fisheries resources and fishing operations are predicted to occur during the operation of the cable. The cable is unlikely to be damaged by fishing activity as it will be jetted to a depth of 3 m in the sediment. No further assessment is considered necessary here, and no additional mitigation measures are required as those for water quality (defined in *Annex C*), will be effective enough to minimise impacts to fisheries. Consequently, no unacceptable impacts to fisheries resources and fishing operations are anticipated to occur.

I4.3 FISHERIES IMPACT EVALUATION

An evaluation of the impact in accordance with the *EIAO TM Annex 9* is presented as follows.

- *Nature of Impact*: As a result of the small scale and localised impacts, no adverse impacts to fisheries resources and subsequently fishing operations, are predicted to occur during either construction or operation of the cable system.

- *Size of Affected Area*: The total length of the cable within Hong Kong waters is about 10 km, of which the majority will be layed through injection. The shore approach (150 m from shore) of the cable will be installed using directional drill cutting and will not affect fisheries resources or fishing operations.

- *Size of Fisheries Resources/Production*: Ranking of the affected areas is medium compared to other areas in Hong Kong in terms of catch weight and value.

- *Destruction and Disturbance of Spawning and Nursery Grounds*: The cable route passes through previously identified spawning grounds and nursery areas for commercially important species. The impacts associated with

construction will be short in duration and will be in the immediate vicinity of the cable laying equipment. Therefore, impacts to these areas are expected to be minimal and short term.

- *Impact on Fishing Activity*: The proposed cable passes through two AFCD fishing zones, of which both are of medium fisheries production in comparison to other fishing zones in Hong Kong. Impacts to fishing activities in either zone are not expected to occur.

- *Impact on Aquaculture Activity*: Impacts to the closest Fish Culture Zones at Cheung Sha Wan (located almost 10 km away) are not predicted.

I5 *MITIGATION MEASURES*

All steps should be taken to avoid impacts to water quality during the cable laying so as to prevent any potential impacts to fisheries resources and fishing operations. It is considered that the measures recommended in *Annex C* to control impacts to water quality to within acceptable levels, are also expected to control impacts to fisheries resources and subsequently fishing operations. Hence, no specific mitigation measures for fisheries resources are required during construction of the cable.

I6 *CONCLUSION*

A review of existing information on the fisheries resources and fishing operations surrounding the cable route has identified the area as supporting a fishery of medium ranking in terms of fisheries production. The waters have been identified as a spawning area and nursery ground for commercial fisheries within Hong Kong waters. Information indicates that sediment dispersed during cable laying will be small scale and localised in nature. Therefore no adverse impacts to fisheries are expected to result from this project.

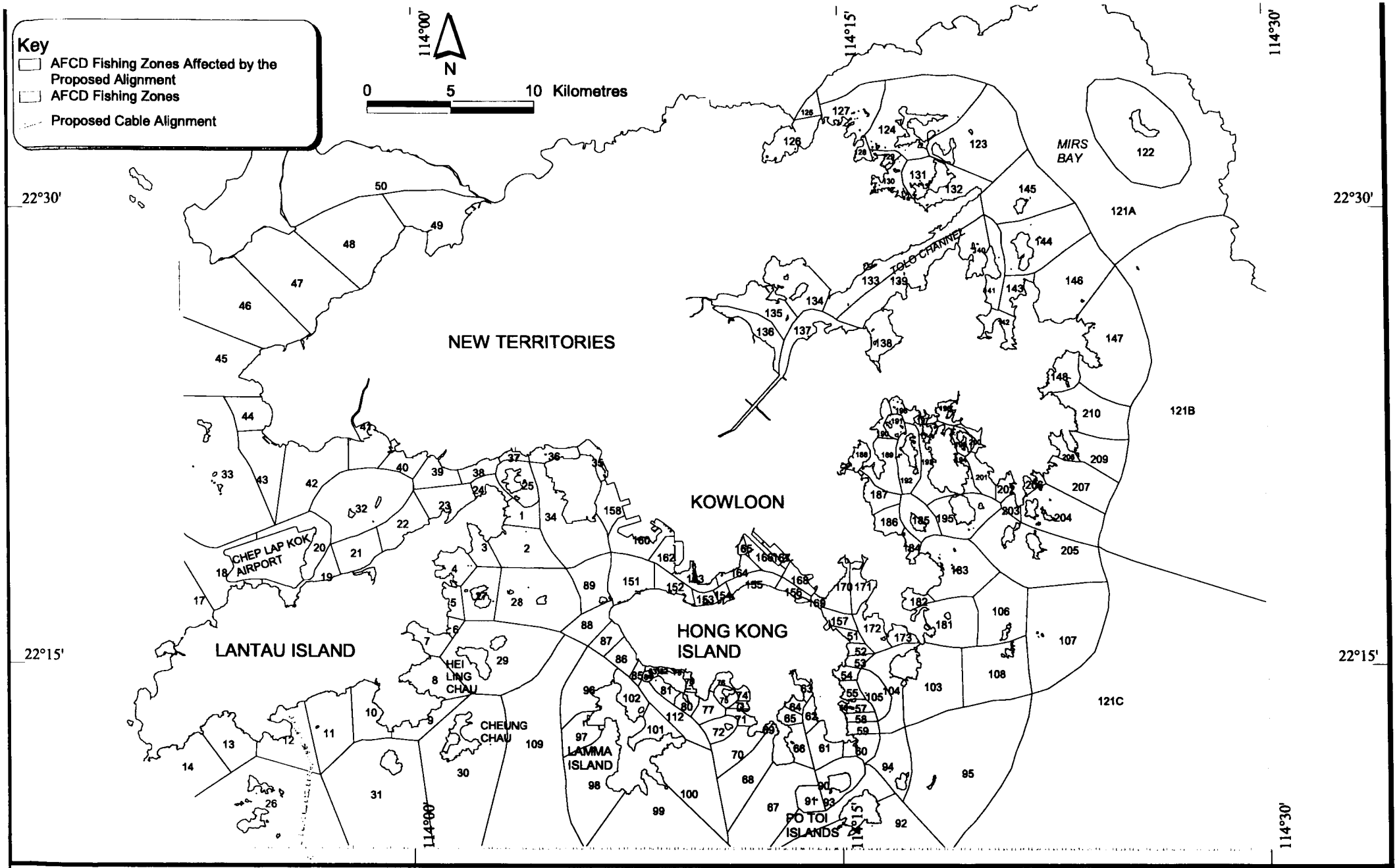


FIGURE I3a

Distribution of AFCD Fishing Zones in Hong Kong Waters and Location of The Proposed Cable Alignment

File: c2022.apr
Date: 2/3/2000

Environmental Resources Management

ERM