Hong Kong Government
Civil Engineering Department

Reclamation Works for District Open Space and GIC Facilities in North Tsing Yi Environmental Impact Assessment Study

Final Assessment Report

Mouchel Asia Limited
sub-consultants
HWR · Enpac · WSA

August 1995

Hong Kong Government
Civil Engineering Department

Agreement No. CE 50/93

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1.0 INTRODUCTION

1.1 Background

The Civil Engineering Department (CED) of the Hong Kong Government appointed Mouchel Asia Limited (Mouchel) on 1 July 1994, under agreement number CE 50/93, to undertake an Environmental Impact Assessment (EIA) on the proposed "Reclamation Works for District Open Space and GIC Facilities in North Tsing Yi" (hereinafter referred to as the Project).

The environmental impacts which are evaluated under this EIA include:

- Traffic;
- Noise;
- Air quality;
- Marine water quality; and
- Land contamination.

The EIA for this Project has been carried out in two Phases. Phase I included the preparation of an Initial Assessment Report (IAR) which described the existing environmental conditions in the Project area, provided a preliminary assessment of the Project's environmental impacts, proposed a background monitoring programme to obtain more detailed information about the existing environment and determined the key issues to be considered in the second phase. The Final IAR was completed on 25 October 1994.

Phase II of the EIA has included the preparation of the Final Assessment Report (FAR) which identifies and quantifies the potential impacts associated with the implementation of each stage of the Project and proposes mitigation measures to alleviate identified impacts.

This FAR has taken into consideration recommendations, issues and comments raised by Government agencies on the IAR and information obtained from the background environmental monitoring programme.

1.2 Objectives of Assignment

This EIA is intended to provide information on the nature and extent of potential environmental impacts associated with the Project which will lead to decisions on:

- The overall acceptability of any adverse environmental consequences that are likely to arise as a result of the Project;
- The conditions and requirements for the detailed design and operation of the Project; and
- The acceptability of residual impacts after proposed mitigation measures are implemented.

The objective of the assignment is therefore to carry out an EIA that determines and describes the adverse and beneficial environmental impacts associated with the implementation of the Project and to determine how the Project may be brought into operation in an environmentally acceptable manner.

The scope of the study is described in the Project Brief (Appendix A) and includes the following:

- Carrying out the necessary background studies to identify, collect and analyse existing information relevant to the EIA;
- Carrying out any necessary environmental surveys, site investigations and baseline monitoring work to achieve the objectives;
- Quantifying, by use of models or other predictive methods, the residual and cumulative environmental impacts arising from the construction and operation of the Project;
- Proposing practical, effective and enforceable methods, measures and standards to effectively mitigate any significant environmental impacts in the short and long term; and
- Outlining a programme by which the environmental impacts of the Project can be assessed, monitored and audited.

1.3 Report Structure

Following this Introduction, Section 2 contains a Project description which describes features of the proposed development. The Project description has been prepared from information received from CED on expected works and from review of operations at similar reclamation sites. From this information, a general description of works, equipment requirements and schedule of operations have been compiled.

Section 3 provides an assessment of materials that are presently used on the Project site and describes the estimated type and quantity of materials that will be remaining on the site after relocation of the shipyards.

Sections 4, 5, 6, 7 and 8 provide the assessment of the likely extent and significance of potential adverse impacts resulting from the Project upon traffic, noise, air quality, water quality and land contamination. For each issue area, the applicable environmental standards and guidelines are provided, the existing environment is described, the sensitive receivers are identified and the potential adverse impacts during each stage of the project are determined. Mitigation measures are provided for each identified adverse impact and the likely residual impacts after implementing the mitigation measures have been determined.
Section 9 of the report provides an overview of potential cumulative impacts that may occur from the implementation of this Project together with other projects in the vicinity of the Project site.

Section 10 of the report provides a description of the beneficial impacts associated with the implementation of this Project based on existing conditions at the Project site.

Section 11 summarises the findings and provides a conclusion of the assessment.

An Environmental Monitoring and Audit Manual/Practical Guide and Executive Summary have been prepared for this FAR and are provided as separate documents to be used with this report.

2.0 THE PROPOSED DEVELOPMENT

2.1 General Project Description

The Project to be carried out by CED involves the reclamation of a 7.62 hectare marine front area located in the northern most portion of Tsing Yi Island. The regional area of the Project is depicted on Figure 2.1 and the Project site is depicted on Figure 2.2.

The Project site presently contains 21 shipyards that are occupied by 18 separate shipyard operators; 15 of which are on Government land and 6 of which are on private lots. The site is to be redeveloped to provide public open space and land use for Government Institution Community Facilities. The reclamation is to be formed by the use of public dump materials.

The Project is proposed to commence in mid 1996 and be completed within approximately 21 to 30 months after commencement, depending upon the rate of receipt of fill. A preliminary Project schedule is contained in Appendix B-1.

The Project comprises three main stages of activities:

- Site clearance after relocation of the shipyards;
- Seawall construction; and
- Reclamation construction.

The site will be operated as a public dump; therefore, fill material will consist of surplus contruction waste.

The after-use of the Project site is planned for "O" Open Space with a small portion of the site designed as "GIC" Government Institution Community Facilities. The future land uses at the Project site have not yet been determined and therefore are not assessed in this EIA. The characteristics of the three stages of the Project are described in the following Sections.

2.2 Site Clearance Activities

Residual facilities that are expected to remain on site after the shipyards are relocated include structures and piers which will require demolition, removal and disposal. The type and quantity of material that will require removal and disposal has been estimated from field surveys undertaken at the Project site (see Section 3.0) The calculations used to estimate the residual material remaining on site are contained in Appendix B-2. It is estimated that the equipment listed in Table 2.1 will be required for site clearance activities.

Table 2.1: Typical Equipment Required for Site Clearance

Activity Description	Equipment	Quantity
Preliminary Works and Mobilisation	Truck with Crane	1
Demolition of Buildings	Pneumatic Breaker (Excavator Mounted) JCB Excavator Mobile Crane Blow Torch and Acetylene Cylinders on Trolley	1 2 1 4

Figure 2.3 shows the area of the site that will require clearance. The expected duration for these activities is approximately 3 months and will commence at the start of the Project. The expected traffic generated from removal of materials will be approximately 18 trips a week for a 12 week time period (see Section 4.0).

2.3 Seawall Construction Activities

The construction activities for the Project will include the construction of a 530 m seawall which will involve: dredging of sediments in the area below where the seawall will be located; the placement of sand materials in the dredged area; and the placement of rock material to form the seawall. The seawall is proposed to be located approximately 155 m off shore at a depth of 4 m to 7 m below sea level. Approximately 380 m of the seawall will be of rubble mound type and 150 m would consist of a vertical seawall with landing steps for small boats.

2.3.1 Dredging Activities

Based on the preliminary seawall plan (drawing no. DEV3052A, 6/6/93) and borehole information (CESD Contract no. GC/91/08), the approximate amount of sediment that will require removal and disposal will be 105,000 m^3. The calculations used to estimate the volume of sediment to be dredged are contained in Appendix B-3. About 3 to 4 months will be needed to complete the dredging activities based on the following:

- The dredging will be carried out by one grab dredger using a 3 m^3 grab;
- The working hours of the dredger will be 10 hours a day (0700 - 1900); and
- The dredging rate will be approximately 1,020 m^3 per day.

A typical example of sequence for dredging activities is provided in Appendix B-4.

2.3.2 Seawall Construction

The seawall construction activities will include the placement of a blanket of sand in the dredged area and construction of the rubble seawall and the vertical seawall by placing rock in the dredged trenches.

The seawall will take about 8 months to construct. The expected equipment requirements during each stage of seawall construction is shown in Table 2.2. This estimate has been based on an example of sequence for dredging activities contained in Appendix B-4. A map showing the seawall location is included in Figure 2.4. As the proposed seawall is to be designed as an extension of the coastline area it will not alter access patterns to the neighbouring shipyards to the west of the site.

Table 2.2: Typical Equipment Requirements for Seawall Construction

Stage	Days from Start of Project	Section 1	Section 2	Section 3
1.	40	1 grab dredger 1 barge 1 tugboat	-	-
2.	80	-	1 grab dredger 1 barge 1 tugboat	-
3.	120	1 barge 1 tug boat	-	1 grab dredger 1 barge 1 tugboat
4.	155	1 barge 1 tug boat	-	1 barge 1 tug boat
5.	175	-	1 barge 1 tug boat	1 derrick lighter 1 tugboat
6.	200	1 barge 1 tugboat	-	1 derrick lighter 1 tug
7.	220	1 derrick lighter 1 tugboat	1 barge 1 tugboat	-
8.	240	1 derrick lighter 1 tugboat	-	-

2.4 Reclamation Construction Activities

The reclamation construction activities include the use of the site as a public dump. The activities that will be conducted during the reclamation include the transport of materials to site, unloading of materials, spreading and temporarily stockpiling materials on site, transfer and deposit of stockpiled materials to the active working face and material compaction. Based on observations at similar facilities, these activities will involve bulldozers, loaders, dump trucks and a vibratory roller working on the site to handle and compact the material.

It is understood that there will be no crushing of rock, heavy equipment or mechanical sorting of material used for the reclamation, with the exception of small scale manual and light equipment sorting of unsuitable materials that may be delivered to site. This manual sorting will involve activities such as directing truck loads of materials to specific areas of the site (depending on their size), the manual inspection and extraction of any unsuitable materials and the separation of materials by light equipment. Table 2.3 lists typical equipment that will be used during reclamation construction.

Table 2.3: Typical Equipment Requirements for Reclamation Construction

Equipment	Approximate Number
Backhoe	1
Bulldozer	1
Loader	1 - 2
Dump Truck	2 - 6
Vibratory Roller	1

The duration of reclamation construction is expected to last between 6 to 15 months depending upon the rate of receipt of fill material. Due to the uncertainty of provision of fill material for public dumps, three filling scenarios have been evaluated for this assessment, as follows:

- 6 month period - approximately 3,375 m^3 of material received per day;
- 12 month period - approximately 1,694 m^3 of material received per day; and
- 15 month period - approximately 1,355 m^3 of material received per day.

The hours of operation during reclamation activities will be 08:00 - 18:00, Monday to Saturday with the exception of Public Holidays (approximately 295 days per year).

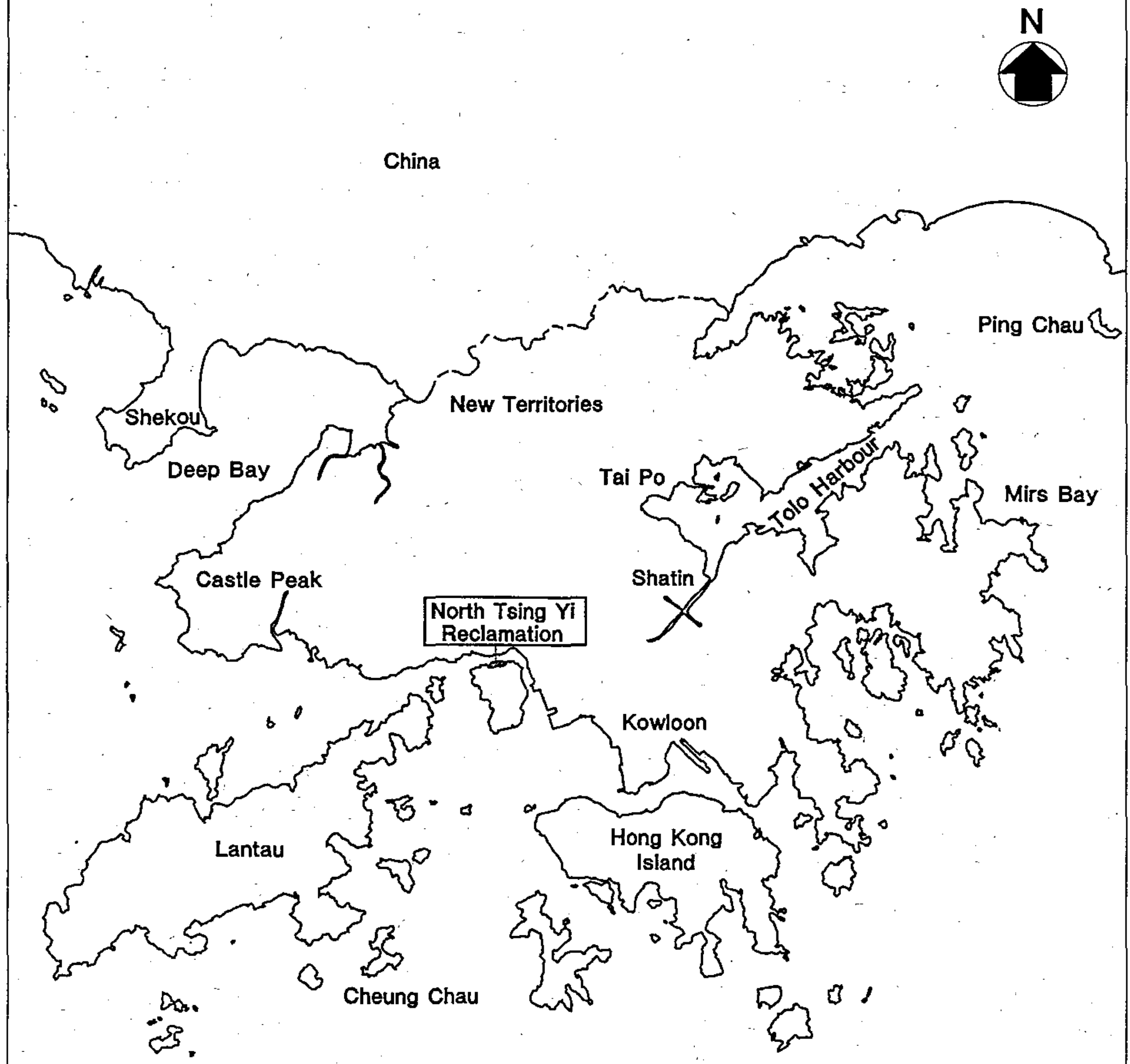
The materials that will be accepted at the site will be public dumping materials which includes construction waste as defined under the Public Dumping Licence Agreement in Appendix I of the Works Branch Technical Circular No. 2/93 (provided in Appendix B-5 of this report). Acceptable material under the Dumping Licence includes earth, inert building debris, broken rock and concrete and the aforementioned materials mixed with small quantities of timber. In order to comply with the present clauses contained in the Public Dumping Licence, material placed in the Public Dump will be free from marine mud, household refuse, plastic, metal, industrial and chemical waste, animal and vegetable matter and any other material considered unsuitable.

The proposed fill requirement for the project is contained in Appendix B-6. The total expected fill materials required for reclamation activities will be 0.5 million m^3 to achieve the desired final fill level of +5 mPD.

The source of fill materials will be construction activities within and around the Tsing Yi area. Information received from the Fill Management Committee (FMC) (see Appendices B-7 and B-8) shows that several projects around the site will be generating surplus fill material that may be suitable for disposal at Public Dumps. A list of projects in the immediate area that will generate fill materials during the reclamation construction of the Project is contained in Appendix B-9.

2.5 Project Construction Works and Neighbouring Shipyards

The Tsing Yi Town Lot No 11, immediately to the west of the reclamation area, is owned by Wang Fat Shipyard Limited; while Leung Wan Kee Shipyard Limited operates the ship building and repair business on the Lot. Attention will be paid to the need to enable the operators to carry on their business un-interrupted during the period of construction of the reclamation and unaffected by its presence following its completion. Dredging or the formation of the foundations for the seawall will be minimal at the extreme western end of the wall alignment because of the shallow nature of the in-situ sediments and the filling of the dredged trench with sand and rock will enhance the local seabed stability. During the construction of the reclamation platform itself the seawall will extend 150 m beyond the tipping face, retaining any disturbed sediment. The strict implementation of the dumping licence should eliminate rubbish from the material being dumped. In the event that wood or other floating rubbish is included, it will be retained by a floating boom placed around the tipping face. The removal of the pier, shown in Figure 2.4, extending northwards and lying parallel to the Lot 11 Jetty will improve access to mooring spaces.



Project Location

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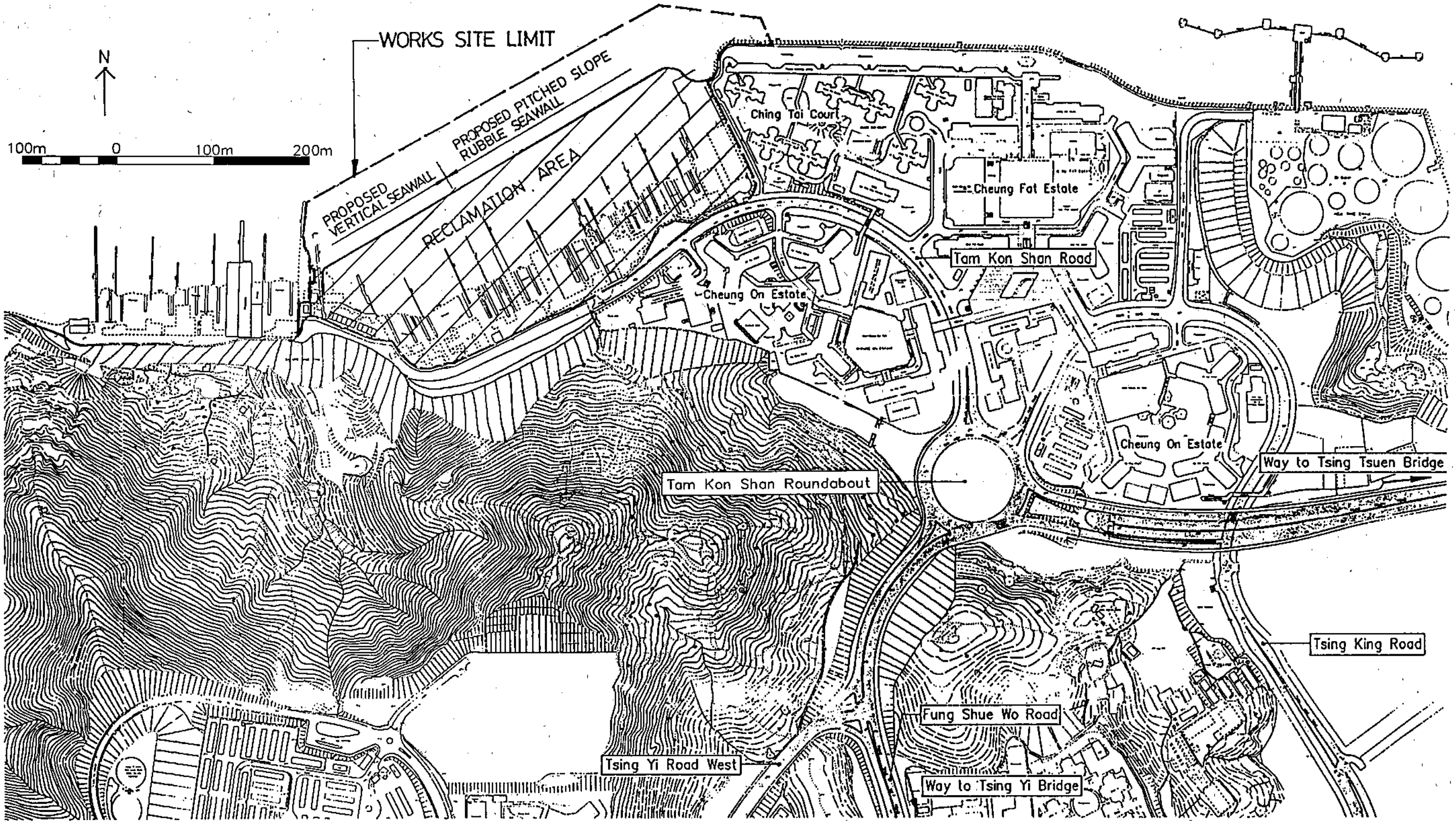
Figure No. 2.1



Project Site Plan

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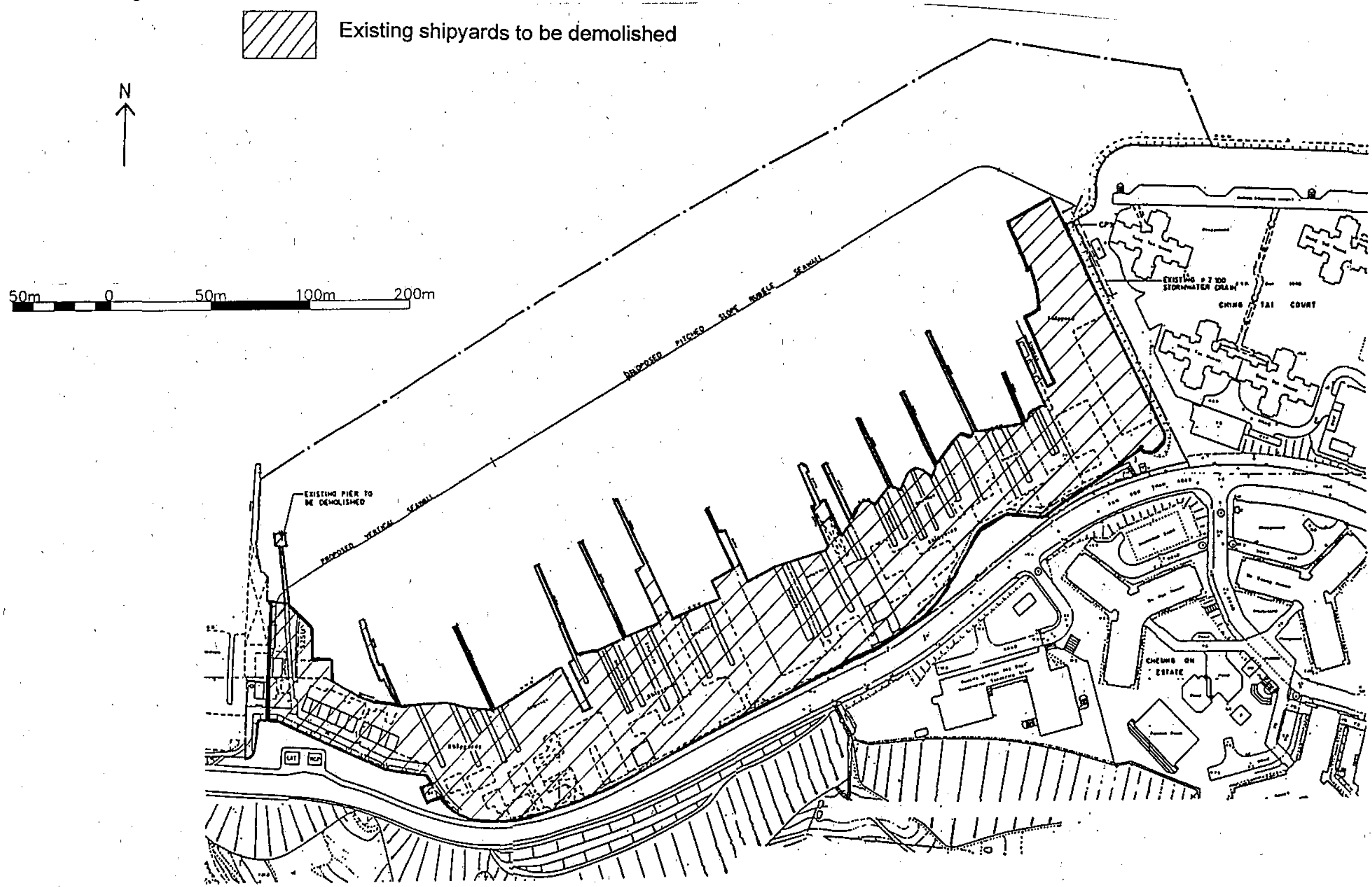
Figure No. 2.2



Site Clearance Area

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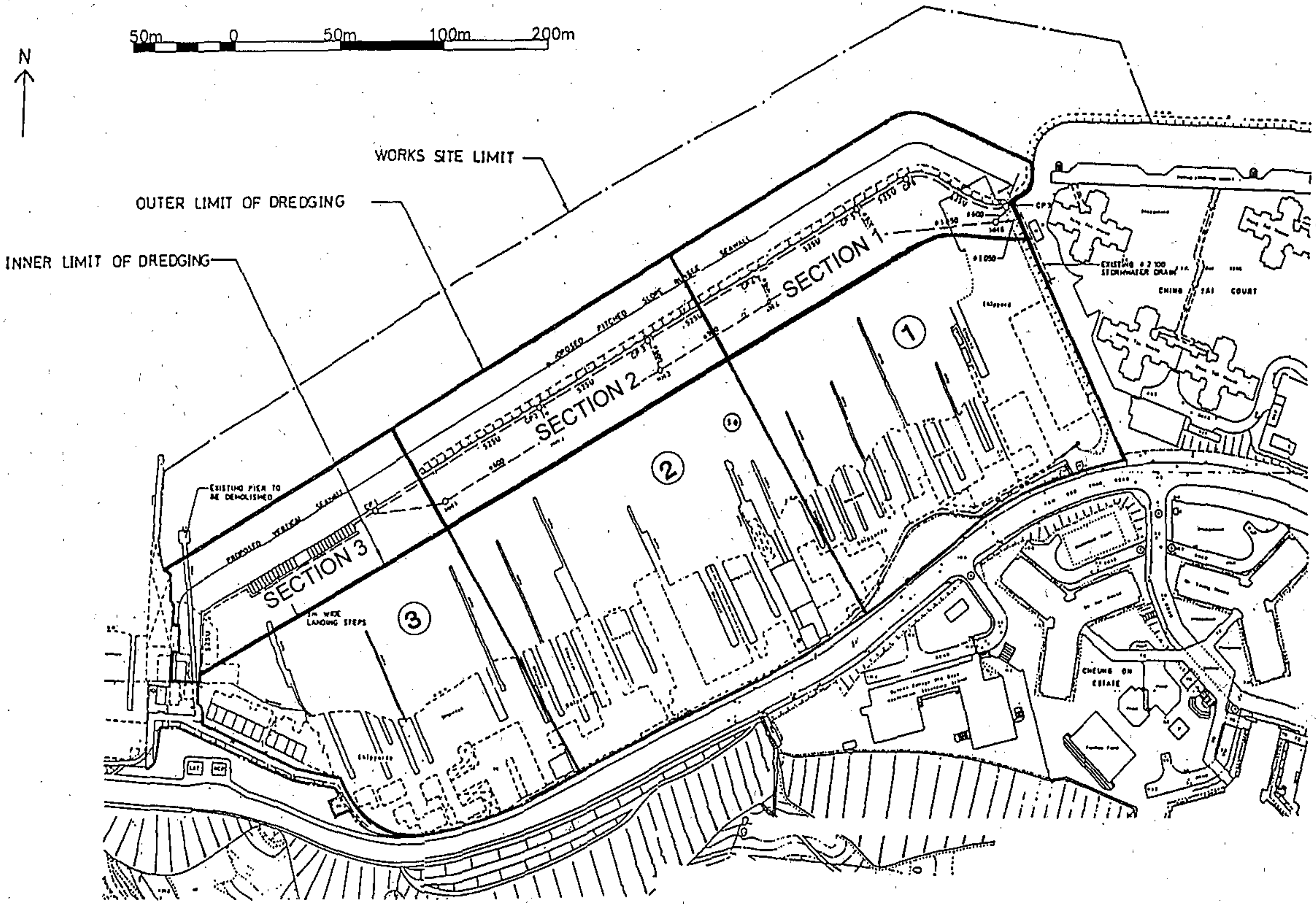
Figure No. 2.3



Seawall and Reclamation Construction Sections

Mouchel

Figure No. 2.4

3.0 SOLID WASTE

3.1 Introduction

This Section describes the type and quantity of materials that will likely remain on site after relocation of the existing shipyards. This assessment was undertaken by conducting field surveys of the Project site and from discussions with shipyard operators. The following Section provides general information and recommendations for handling and disposal of the residual wastes. The Land Contamination Assessment in Section 8.0 considers measures that are necessary to avoid impacts from contaminated land.

3.2 Waste Generation/Characterisation

There are several areas on the Project site that presently contain stockpiled materials. A questionnaire was sent to the shipyard operators requesting information on present site conditions and materials expected to be removed if relocated. The questionnaire is provided in Appendix C-1 of this report, however, no written responses to the questionnaire have been received.

Surveys of the Project site were conducted on 2, 17 and 23 August 1994 to visually identify the types of structure on site and to confirm the accuracy of the structures indicated on the Government survey map (Sheet No. 6-SE-24B, Revision Date 10/92). From these surveys a general map of the individually owned shipyard boundaries has been compiled and is shown in Figure 3.1. More detailed maps (Appendix C-2) of the individual shipyards were also prepared that indicate the shipyards as well as other land uses within the Project site such as restaurants, food stores and hardware shops.

3.3 Existing Waste Disposal Practices

The types of waste materials were established following visits to the shipyards and discussions with shipyard operators. The materials found on site and their existing disposal practices are described in Table 3.1.

3.4 Materials Likely to Remain on Site After Relocation

The shipyard operators have advised that plant and equipment used on the existing site will be relocated to their proposed new location. Some materials will also be removed for recycling. There is an informal agreement between a scrap metal collector and most of the shipyard operators to remove scrap metals from the shipyards. It was noted during the site visits that scrap metals stockpiled on the footpath opposite to the shipyards were being removed by the collector. This suggests that the scrap metals are regularly removed for recycling from the site and it is believed that these recycling activities will continue.

The major source of waste remaining on the Project site after relocation of the shipyards is expected to be from the building demolition. The majority of the buildings (both temporary and permanent) were constructed using steel beams for the structural frames with either steel plates or corrugated iron sheets as the side walls. The roofing material mainly consists of corrugated iron sheets. It appears that asbestos type roofing materials are not presently used, however, this should be confirmed during the detailed contaminated land assessment (see Section 8.0). Other major structures in the shipyards include the wooden platforms of the slipways and the piers.

Table 3.1: Materials Found On Site

Material Type	Existing Disposal Practice
Waste Oil	There is very little waste oil generated from the shipyard operations. Most of the barges that are maintained at the shipyards are without propellers and therefore do not require large diesel engines. For the powered boats or ships, fuel oil is removed off site before servicing. The small quantity (if any) of fuel oil obtained from the incoming ships is used to run mechanical plant on site. Waste lubrication oil from engines is used as lubrication oil for the rails of the slipways and a few of the shipyard operators use the waste oil to melt asphalt.
Fibre Glass Residue	The residue of the fibre glass mat and fibre glass contaminated waste generated from the Kowloon and Supercraft shipyards is disposed of to landfill in accordance with a licence issued by EPD. Records of disposing fibre glass waste to Pillar Point Landfill were provided by the Supercraft shipyard operator. The Kowloon shipyard also advised the same disposal arrangement for their fibre glass waste.
Waste Paint and Containers	It was noted during the site surveys that most of the shipyards did not keep a large quantity of paint stock on site. They normally ordered whatever they required for the maintenance works and very little paint was wasted. The operators stated that they did not dispose of any waste paint on site. It was noted that waste paint containers were recycled together with other scrap metals. The containers were not cleaned to remove any residue paint adhering to the wall of the container.
Scrap Metals	The worn parts of the ship body were cut out and recycled as scrap metals. The scrap metal collector collected the scrap metals from the shipyards and stockpiled the materials on the footpath opposite to the shipyards. The metals were removed regularly.
Gas Cylinders	The empty acetylene and oxygen cylinders were placed outside the shipyards and collected by the gas company for refilling.
Batteries	From the site surveys, it was found that the shipyards used only a few (1 to 2) batteries for normal operations. The stockpile of old batteries found in previous site visits actually belonged to a hardware shop. The shopkeeper confirmed that he would sell or remove the batteries before the relocation.
General Waste Materials	Solid wastes generated from the shipyard workforce are delivered to the Regional Services Department refuse collection point at the western end of the shipyard area and collected regularly by refuse collection vehicles.
Sewage	Sewage generated from the shipyard workforce was discharged to septic tanks prior to the extension of the Tam Kon Shan Road. Wastewater is now being discharged to the public sewer along the Tam Kon Shan Road and, therefore, sludge is no longer generated from the septic tanks. The abandoned septic tanks may require draining and filling or removal as part of the site formation.

The type and quantities of demolition materials which may be left on site after the relocation of the shipyards have been compiled from our site surveys (contained in Appendix B-2) and summarised in Table 3.2. This estimate of materials does not include machines and the raw materials that are currently stored on site which are assumed to be taken away by the shipyard operators.

Table 3.2: Estimated Amount of Waste Generated from Site Clearance

Material		Quantity to be Removed
Metal	Steel	710 tonnes
	Corrugated Iron sheet	7,500 sheets
Concrete		2,500 m^3
Wood/Timber		1,100 m^3
Building Debris		620 m^3

The arrangement and construction of the slipways are very similar for all the shipyards and the estimate of the quantities of wood/timber, concrete and steel to be removed is based on a typical slipway arrangement. The difference in size of the slipways for individual shipyards has been taken into account in the estimate. There are no as-built drawings for the foundations of the structures, especially for the slipways and winches. The amount of foundation materials could not be determined from the site survey and has thus not been included in the estimate.

3.5 Disposal of Residuals After Relocation

The materials which are likely to be left behind by the shipyard operators can be grouped under the categories listed in Table 3.3.

Table 3.3: Material Classification

Classification	Type of Waste
General Waste	• Buildings which are either concrete or steel structures • General debris • Old furniture and racks • Wooden/steel piers • Timbers and railing of slipways (timbers in good condition will likely be removed and reused by the operators at the new site)
Chemical Waste	• Paint containers with or without paint • Waste oils • Waste solvents
Contaminated Material	• Contaminated soil • Contaminated concrete

Some of the general wastes including steel, other metals and timber can be recycled and the uncontaminated concrete material (from building structures) will also be suitable for recycling by public dumping. The remaining demolition waste and debris can be collected as non-hazardous industrial waste and disposed of at landfill sites without special requirements.

Other types of waste that may be present on site include: contaminated soil and the top layer of some of the concrete slabs of the structures from metal dust, rust, stripped paint, lubricating oil or diesel oil; residual chemical containers; oils and solvents; and, although not identified in the visits to the shipyards, materials containing asbestos from buildings. These materials will require special handling and disposal practices.

3.6 Conclusion/Recommendations

It is evident that a large amount of waste materials and plant will be removed from the Project site during relocation of the shipyards. With the possible exception of the potential for asbestos to be present in the roofing materials, residual chemicals left on site and contaminated materials to be present on the concrete slabs, there do not appear to be wastes on site that will require special disposal practices.

It is recommended that the Project proponent carry out a contaminated land assessment, as described in Sections 8.0 as soon as access to the site can be secured for the purpose of determining if soil on the site and/or if the top layer of concrete slabs of the structures are contaminated with metal dust, rust, stripped paint, lubricating oil or diesel oil.

The majority of the materials from demolition will be metal, concrete, wood and other building debris; of which only the uncontaminated concrete could be disposed of at the reclamation site in accordance with the Public Dump Licence.

The following mitigation measures are recommended to be implemented during site clearance activities:

1. Although it appears that materials containing asbestos were not used in the shipyard structures, it is recommended that the Project proponent arrange for an asbestos survey for all the buildings to be carried out prior to demolition works. The survey should be carried out by a registered asbestos consultant and all testing for the identification of asbestos should be carried out by a laboratory accredited for such tests.

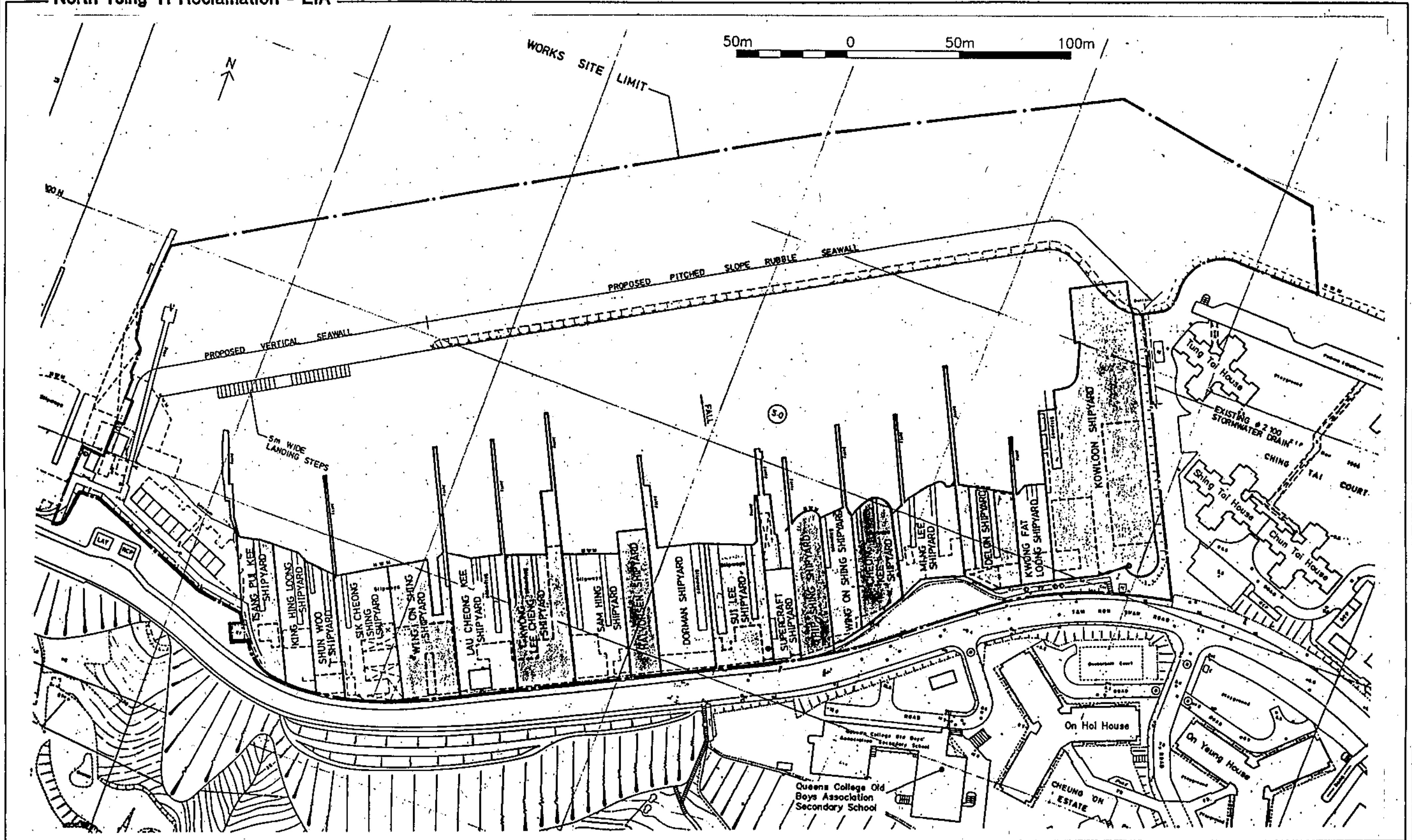
   If materials containing asbestos are found on site then demolition of any structures which contain asbestos should be undertaken by a specialist Asbestos Contractor approved by EPD. All asbestos handling, transportation and disposal should follow the "Code of Practice on Handling, Transportation and Disposal of Asbestos Waste" published under Section 35 of the Waste Disposal Ordinance (Cap. 345) and workers who carried out the demolition works should wear protective clothing, face mask and other safety equipment approved under the "Factories and industrial Undertakings (Asbestos) Special Regulation 1986".

   The only proven method of disposing of asbestos waste in Hong Kong is by secure burial in designated landfill sites. The EPD should be consulted as to which designated landfill site should be used.

2. The Contractor should ensure that all waste paints, oils and solvents found on site are handled, collected, treated and disposed of in accordance with the Waste Disposal Regulation (Chemical Waste and General). These materials should be separated from non-chemical waste, stored in appropriate containers with proper labels and collected by a licensed collector to the Chemical Waste Treatment Centre for treatment or a designated landfill site for disposal as advised by EPD. Workers who are involved in the handling of chemical waste should also be suitably trained and should wear appropriate protective masks and clothing when handling such materials.

3. The Contractor should separate general wastes including steel, other metals and timber from other wastes, as far as practical, and should arrange for a recycling company to collect these materials.

4. The Contractor should stockpile on site all concrete from building structures found to be uncontaminated. This material should be covered and used for infilling during reclamation construction. Other residual uncontaminated demolition waste and debris, not suitable for the reclamation, should be disposed of at landfill sites.



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Existing Shipyard Structures

Figure No. 3.1

4.0 TRAFFIC

4.1 Introduction

Manual traffic counts were conducted at the shipyards on 18 April 1995 to establish the existing volume of traffic generated from shipyard activities. Manual traffic counts were also carried out along all road links leading to and from the roundabout at the Tsing Yi end of the Tsing Tsuen Bridge for both a.m. and p.m. peak hours to define peak flows on the roads leading to and from the Project site.

Traffic condition observations were made on 18 April 1995 during peak hours at the western roundabout (Tsing Yi) and eastern roundabout (Tsuen Wan) located at both ends of the Tsing Tsuen Bridge, at access ramps to and from Tsuen Wan Road and on the Tsing Yi Bridge.

4.2 Critical Junctions

The major road junctions along roads which could be used for access to the Project site include:

- Tam Kon Shan Roundabout;
- Tsing Tsuen Road, Tuen Wan Road, Texaco Road Interchange;
- Kwai Tsing Road, Tsing Yi Road, Tsing Yi Heung Sze Wui Road Roundabout; and
- Kwai Tsing Road, Tsuen Wan Road, Hing Fong Interchange.

4.3 Existing Conditions

4.3.1 Road Layout

The layout of the road approaches to North Tsing Yi and the Project site are shown in Figure 4.1 with the junctions listed above shown as a, b, c and d, respectively. There are two access routes leading to Tsing Yi, which can be considered the northern route and the southern route. The northern route takes traffic from Tsuen Wan Road and Texaco Road onto Tsing Tsuen Road and Tsing Tsuen Bridge. The southern route takes traffic from Tsuen Wan Road together with Hing Fong Road and Kwai King Road onto the Kwai Tsing Road and Tsing Yi Bridge.

Once onto Tsing Yi, the traffic travelling on the northern route to the Project site leaves Tsing Tsuen Bridge via the exit from the Tam Kon Shan Roundabout onto Tam Kon Shan Road. Access from the southern approach is less direct and there are two options:

- Via Tsing Yi Heung Sze Wui Road and from there via Tsing King or Fung Shue Wo Roads to the Tam Kon Shan Roundabout; and
- Via Ching Hong Road and Tsing Yi Road West which then leads to the Tam Kon Shan Roundabout.

The northern and southern routes converge at the Tan Kon Shan Roundabout and both then use Tam Kon Shan Road to gain access to the site.

4.3.2 Existing Traffic Flows at Tam Kon Shan Roundabout

Manual classified traffic count surveys were undertaken at all approaches to Tam Kon Shan Roundabout to provide background traffic conditions for peak a.m. and p.m. flows. The resulting traffic counts are shown in Table 4.1 and Table 4.2 and illustrated in Figures 4.2 and 4.3. The morning peak hour counts show higher traffic volumes than the evening peak hour flows, with flows of 3,297 and 2,985 vehicles, respectively. The roads with the busiest traffic were Tsing Tsuen Bridge and Fung Shui Wo Road. Smaller volumes were observed along Tam

Kon Shan Road and Tsing King Road.

Table 4.1: Traffic Survey Results - Tam Kon Shan Roundabout a.m. Peak Hour 7:30 - 8:30

Location	Dir.	C/T/V	PLB	GV	CV	Bus	Total (Veh)	Total (PCU)
"A" Tam Kon Shan Rd	S	208	29	54	7	132	430	756
"B" Tam Kon Shan Rd	N	82	0	15	3	8	108	138
"C" Fung Shue Wo Rd	N	584	5	180	144	98	1011	1489
"D" Fung Shue Wo Rd	S	500	26	202	152	119	999	1554
"E" Tsing Tsuen Bridge	W	700	37	234	193	112	1276	1887
"F" Tsing Tsuen Bridge	E	1138	14	332	247	107	1838	2555
"G" Tsing King Rd	S	328	6	129	121	8	592	829
"H" Tsing King Rd	N	108	22	34	29	147	340	700
Total Traffic to and from Roundabout								3,297

Note: S - Southbound, N - Northbound, W - Westbound, E - Eastbound
Legend: C/T/V - Car, Taxi, Light Vans; CV - Container Vehicle; PLB - Public Light Bus/Minibus; Bus - Bus/Coach; GV - Goods Vehicle PCU; PCU - Passengers Car Units

Table 4.2: Traffic Survey Results - Tam Kon Shan Roundabout p.m. Peak Hour 17:00 - 18:00

Location	Dir.	C/T/V	PLB	GV	CV	Bus	Total (Veh)	Total (PCU)
"A" Tam Kon Shan Rd	S	359	46	33	0	168	606	990
"B" Tam Kon Shan Rd	N	229	5	52	8	7	301	365
"C" Fung Shue Wo Rd	N	531	13	126	125	102	897	1327
"D" Fung Shue Wo Rd	S	576	30	192	89	117	1004	1486
"E" Tsing Tsuen Bridge	W	565	16	208	165	90	1044	1553
"F" Tsing Tsuen Bridge	E	843	16	142	159	79	1239	1671
"G" Tsing King Rd	S	252	5	62	54	7	380	497
"H" Tsing King Rd	N	163	24	68	98	146	499	952
Total Traffic to and from Roundabout								2,985

Note: S - Southbound, N - Northbound, W - Westbound, E - Eastbound
Legend: C/T/V - Car, Taxi, Light Vans; CV - Container Vehicle; PLB - Public Light Bus/Minibus; Bus - Bus/Coach; GV - Goods Vehicle; PCU PCU- Passengers Car Units

4.3.3 Traffic Conditions at Tsing Tsuen Bridge Approach

Site observations were made of traffic conditions at the Tam Kon Shan Roundabout, at the western end of Tsing Tsuen Bridge, and at the interchange with Tsuen Wan Road and Texaco Road, at the eastern end of the bridge. Site observations were also made at junctions and approaches to Tsing Yi Bridge.

The Tam Kon Shan Roundabout works well during peak traffic hours with no apparent queues or delays to traffic. At the roundabout at the eastern end of the bridge, however, queues were observed on several approaches. Queues were also observed on approaches from Tsuen Wan Road southbound, Texaco Road West, Texaco Road North, and Tsuen Wan Road northbound. No queues or delays were observed for the approach from Tsing Tsuen Bridge. In general, the queuing problems lasted for a few minutes up to a maximum of around 15 minutes. It is therefore considered that these approaches are operating very close to capacity during the peak hours.

4.3.4 Traffic Conditions at Tsing Yi Bridge Approach

Traffic problems were observed at Tsing Yi Bridge in both the morning and evening peak hours. In the morning peak hour, the principal problem is on the approach to the roundabout at the western (Tsing Yi) end of the bridge from Tsing Yi Heung Sze Wui Road. At the time of the survey, queues were observed back to the junction with Chung Mei Road. Previous surveys conducted for other studies have also shown queues extending well beyond this junction to the roundabout with Fung Shui Wo Road and sometimes even further. The problem on this approach to the bridge is a long recognised one which has been extensively documented. In addition to this problem, traffic is very slow moving on the westbound approach to the roundabout from Tsing Yi Bridge. In the evening peak hour, very slow moving traffic was also observed for the approach from Tsing Yi Heung Sze Wui Road and from Tsing Yi Bridge.

At the eastern end of Tsing Yi Bridge at the junction with Tsuen Wan Road and Hing Fong Road, queues were observed during the evening peak hour for traffic to turning right from Kwai Tsing Road to Tsuen Wan Road southbound. No other problems were observed although the junction is operating close to capacity in both peak hours. The junction with Kwai King Road and Kwai Tsing Road was observed to operate freely during both peak hours.

4.3.5 Estimated Trip Generation Due to Shipyard Activities

Traffic counts were also undertaken along Tam Kon Shan Road in the vicinity of the shipyards. The counts were undertaken at the western and eastern ends of the shipyards in order to estimate the approximate amount of traffic currently being generated and attracted by the shipyards. It was assumed that very little traffic associated with the shipyards would travel to and from locations west of the shipyards as the Tam Kon Shan Road is a cul-de-sac.

The North Tsing Yi Reclamation will displace approximately two thirds of the shipyards while the western most shipyards will remain. It was therefore assumed that the amount of traffic generated and attracted by the shipyards to be relocated will be two thirds of the estimated total traffic for the shipyards. The amount of traffic estimated to be associated with the shipyards was calculated by simply subtracting the traffic count taken west of the shipyards from the count taken east of the shipyards. The resulting figures provide an estimate of the total traffic generated and attracted by the shipyards.

The traffic survey results are shown in Tables 4.3 and 4.4 and are depicted on Figure 4.4. Around 61 vehicles are generated and 28 vehicles are attracted in the morning peak hour (89 two-way flow) and around 69 and 41 vehicles are generated and attracted, respectively, in the evening peak hour (110 two-way flow). The figures are broad estimates which give an approximate guide to amount of traffic the reclamation will be replacing.

Table 4.3: Shipyard Traffic Survey Results - a.m. Peak Hour Traffic 7:30 - 8:30

Location	Dir.	C/T/V	PLB	GV	CV	Bus	Total (Veh)	Total (PCU)
Traffic Counts								
Tam Kon Shan Rd, East of Shipyard (T_1)	E	54	4	39	21	5	123	185
Tam Kon Shan Rd, East of Shipyard (T_2)	W	52	4	7	5	9	77	107
Tam Kon Shan Rd, West of Shipyard (T_3)	E	14	4	0	5	8	31	54
Tam Kon Shan Rd, West of Shipyard (T_4)	W	18	4	1	4	8	35	58
Estimated Existing Traffic Flows at Shipyards (1)								
Shipyard	G	40	0	39	16	-3	92	131
Shipyard	A	34	0	6	1	1	42	50
Estimated Trip Generation at Project Site (2)								
Shipyard	G	27	0	26	11	-2	61	88
Shipyard	A	23	0	4	1	1	28	33

Note:
(1) Generations : $T_1 - T_3$ Attractions : $T_2 - T_4$
(2) Estimate is 2/3 of estimated total trip generation and is based on approximate land area.

Legend:
C/T/V - Car, Taxi, Light Vans
PLB - Public Light Bus/Minibus
GV - Goods Vehicle
CV - Cotainer Vehicle
Bus - Bus/Coach
PCU - Passengers Car Units
G - Generations
A - Attractions
E - East Bound
W - West Bound

Table 4.4: Shipyard Traffic Survey Results - p.m. Peak Hour Traffic 17:15 - 18:15

Location	Dir.	C/T/V	PLB	GV	CV	Bus	Total (Veh)	Total (PCU)
Traffic Counts								
Tam Kon Shan Rd, East of Shipyard (T_1)	E	104	9	19	5	3	140	170
Tam Kon Shan Rd, East of Shipyard (T_2)	W	63	6	19	11	3	102	136
Tam Kon Shan Rd, West of Shipyard (T_3)	E	27	5	1	4	0	37	44
Tam Kon Shan Rd, West of Shipyard (T_4)	W	26	5	1	2	6	40	57
Estimated Existing Traffic Flows at Shipyards (1)								
Shipyard	G	77	4	18	1	3	103	126
Shipyard	A	37	1	18	7	1	62	87
Estimated Trip Generation at Project Site (2)								
Shipyard	G	51	3	12	1	2	69	84
Shipyard	A	25	1	12	5	1	41	58

Note: (1) Generations : T_1 - T_3, Attractions : T_2 - T_4

(2) Estimate is 2/3 of estimated total trip generation and is based on approximate land area.

Legend:
- C/T/V - Car, Taxi, Light Vans
- PLB - Public Light Bus/Minibus
- GV - Goods Vehicle
- CV - Cotainer Vehicle
- Bus - Bus/Coach
- PCU - Passengers Car Units
- G - Generations
- A - Attractions
- E - East Bound
- W - West Bound

4.4 Impacts During Site Clearance Activities

The number of truck trips generated from the site clearance activities has been calculated as shown in Table 4.5 (see also Section 3.0).

Table 4.5: Estimated Number of Truck Trips from Site Clearance Activities

Material		Quantity to be Removed	No. of Trucks	Average Trip/Week
Metal	Steel	710 tonnes	36	3
	Corrugated Iron Sheet	7,500 sheets	19	2
Concrete		2,500 m^3	0	0
Wood/Timber		1,100 m^3	54	5
Building Debris		620 m^3	92	8
Total			210	18

Note: The following was used to calculate estimated waste generated from demolition activities:
- All buildings will be demolished within 3 months;
- Steel beams will be stockpiled before being taken away;
- For the transportation of corrugated tin sheets, each truck load (20 tonnes) can carry 400 no.'s of sheets;
- Payload for truck transporting metals is 20 tonnes;
- Payload for truck transporting timber is 20 tonnes and the timber will be cut into 12 m long sections;
- Uncontaminated concrete material suitable for public dumping will be stockpiled on site; and
- Unsuitable mixed building debris (with less than 20% by volume inert materials) will be disposed of to landfill by truck with a capacity of 6.7 m^3.

There will only be eighteen trucks per week removing debris after demolition of the shipyards. The traffic impact of this will not be significant.

4.5 Impacts During Seawall Construction

The seawall will be built using sea based equipment for dredging and delivery of materials. It is therefore not expected that these works will generate any additional road traffic. For seawall construction works, the Project will however involve the movement of marine transport in the immediate area along the proposed seawall area. Due to the small quantity of marine vessels (one or two) that will be active in the area as a result of Project works, it is not likely that they will impact neighbouring shipyard activities to the west.

4.6 Impacts During Reclamation Construction

The reclamation will be formed using surplus construction waste. The rate of delivery will depend on the production of surplus construction waste materials which may vary significantly throughout the year. Therefore, aside from employee generated traffic, the traffic generated from reclamation activities will not follow a consistent pattern of arrivals and departures. It is expected that the majority of the materials received at the site will be delivered in trucks which will have an average capacity of 6.7 m^3.

Based upon observations at similar reclamation sites, the peak periods for vehicles delivering fill material will follow a different pattern than normal daily peak hours on adjacent roads. Road traffic is typically characterised by peak period trips as a result of the daily commuting workforce which occur between 07:30 to 09:00 a.m. and 17:00 to 18:30 p.m. At similar Public

Dumps, the peak periods for delivery of materials generally occur between 10.00 a.m. to 12.00 a.m. and 15.30 to 18.00 p.m. However, it is difficult to precisely determine traffic flows due to the daily and weekly variations in the generation of surplus construction waste materials to be used for infilling.

Given the expected fill material of 500,000 m^3 for Project completion, three scenarios were looked at for traffic generation as follows:

- Filling of the site within a 6 months period;
- Filling of the site within a 12 month period; and
- Filling of the site within a 15 month period.

The one-way and two-way average daily and hourly flows for these three scenarios are shown in Table 4.6.

Table 4.6: Reclamation Generated Traffic Projections

Reclamation Period	Daily Trips		Hourly Trips	
	One-way average flow	Two-way average flow	One-way average flow	Two-way average flow
6 month (148 days)	505	1,010	51	102
12 month (295 days)	253	506	26	52
15 month (369 days)	202	404	21	42

Notes: The above is based on the following:
Total fill 500,000m^3
Average vehicle 6.7m^3/truck
Operational/Hours 8:00 to 18:00 Monday to Saturday, excluding holidays
Operational days/year 295

The environmental impacts from traffic generated by the shipyards at their new site is considered under a separate study and has not been included in this assessment.

The traffic impacts during construction of the reclamation will thus be a combination of the reduction due to relocation of the shipyards and the addition due to vehicles delivering fill material. The existing shipyards presently generate 89 vehicle trips in the a.m. peak hour period (7:30 - 8:30) and 110 vehicle trips in the p.m. peak hour period (17:15 - 18:15). The Project's contribution to peak hour vehicle trips compared to the vehicle trips that will be discontinued at the Project site due to clearance of the shipyards is as follows:

- Filling of the site within a 6 month period will result in an addition of 13 trips during the morning peak flows to the Public Dump (10.00 a.m. to 12.00 a.m.) and a reduction in vehicle trips during the p.m. period of 15.30 p.m. to 18.00 p.m.

- Filling of the site within a 12 month period will result in reductions of vehicle trips from 10.00 a.m. to 12.00 a.m. and from 15.30 p.m. to 18:00 p.m.

- Filling of the site within a 15 month period will result in reductions of vehicle trips from 10.00 a.m. to 12.00 a.m. and from 15.30 p.m. to 18.00 p.m.

Consideration of the impact of the changes in traffic volumes needs to take account the timing of the normal peak hour. This normally occurs between 07:30 - 09:00 while for the Public Dumps the peak morning hour traffic is generally 10:00 to 12:00. Thus the additional vehicle trips for the 6 month scenario will be outside normal peak hour periods and there should be little or no increase in the peak hour.

4.7 Recommended Access Route

Tsing Tsuen bridge is free-flowing and its interchanges at either end experience reasonable traffic conditions. Although busy during peak hours, no major traffic problems were observed although it is considered that the roundabout with Tsuen Wan Road and Texaco Road at the eastern end of the bridge is operating close to capacity. Over the next few years the Texaco Road Improvements will be completed providing a direct flyover connection between the elevated Texaco Road and Tsing Tsuen Bridge. The improvement should remove most of the long distance traffic travelling to and from North Tsing Yi via Texaco Road, thereby allowing additional spare capacity at the roundabout for other movements. Further minor road improvements are planned at the Tam Kon Shan Road Roundabout in order to increase its capacity in time for the opening of Route 3 and the Lantau Fixed Crossing.

In contrast, Tsing Yi Bridge is a single two lane facility which currently experiences traffic congestion. Severe congestion problems occur especially at the western roundabout in both peak hours. The problems are likely to remain until the Duplicate Tsing Yi Bridge is constructed, tentatively by early 1998. There is however no definite programme for implementation of this Project as it is linked to the development of Container Terminal 9 which is pending securing an agreement between the Governments of Hong Kong and China. Access to the strategic road system via Tsing Yi Bridge would involve a longer (in terms of time and distance) journey, via Fung Shui Wo Road, Tsing Yi Heung Sze Wui Road, Tsing Yi Bridge and Kwai Tsing Road. The route would also pass nearby housing estates with resulting traffic noise impacts. Therefore, routing traffic via the northern Tsing Tsuen Bridge is preferred.

It is recommended that Tsing Tsuen Bridge is used as the principal access route to the Project site. Tsing Tsuen Bridge is a dual two lane facility which connects the Tam Kon Shan Interchange directly to the strategic road network in Tsuen Wan. Traffic can gain access to Tsuen Wan Road and to Texaco Road, both of which form part of and are connected with the strategic road network.

4.8 Traffic Impact Summary

The potential traffic impacts during each phase of the Project are summarised in Table 4.7

Table 4.7 : Summary of Traffic Impact

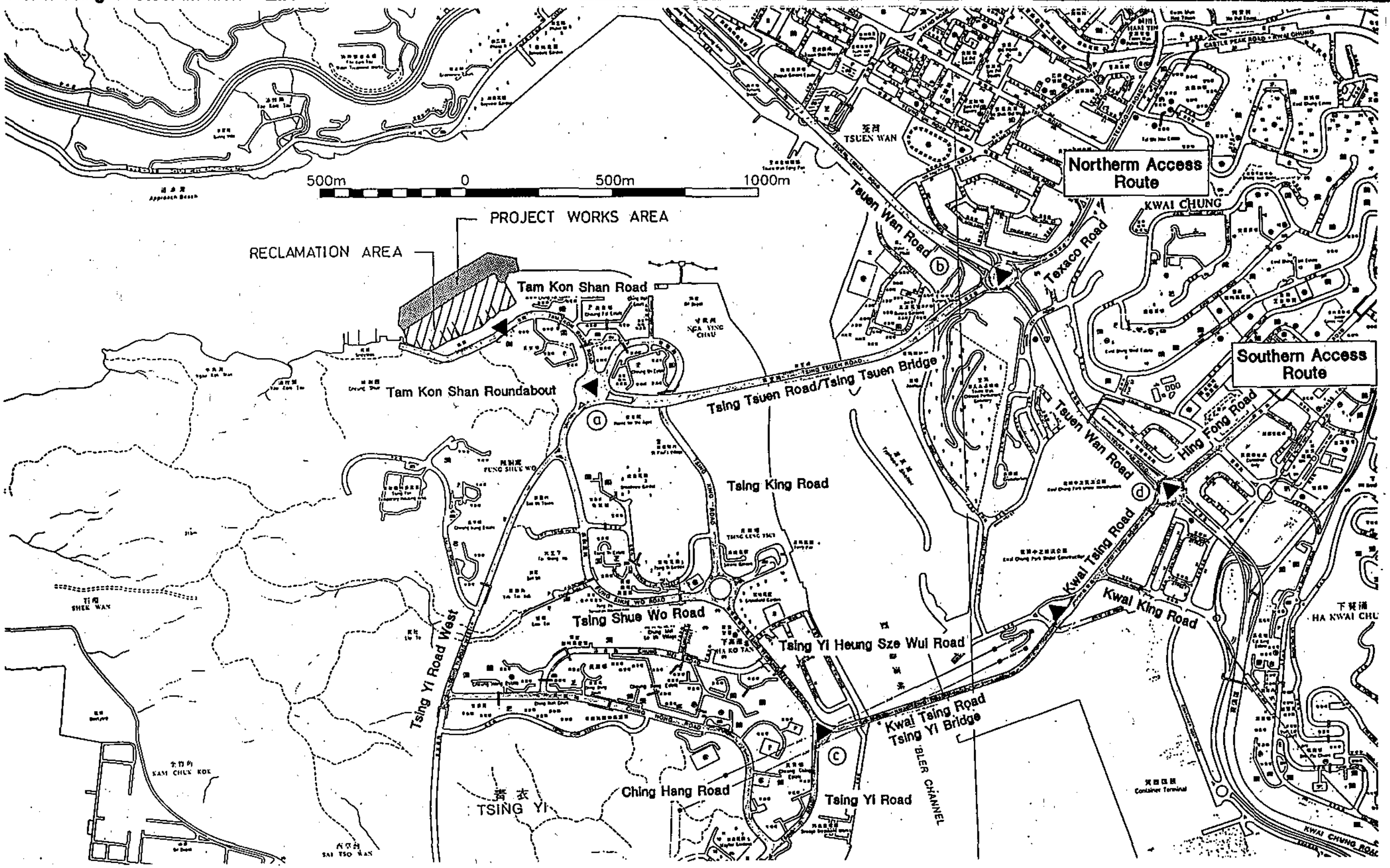
Project Phase		Project Activities	Project Impacts
Site Clearance		Generation of approximately 18 truck trips a week for a 3 months period of time based on a total calculation of 176 truck trips.	Insignificant due to decrease in traffic when compared with existing conditions
Seawall Construction		Generation of no truck trips from primary works occurring from barging, dredging activities and minimal truck trips from seawall construction.	Insignificant due to decrease in traffic when compared with existing conditions
Reclamation Construction	6 month filling period	Generation of approximately 51 one-way average hourly flow and 102 two-way average hourly flow.	Insignificant due to a decrease in p.m. traffic when compared with existing conditions. No increase will occur in traffic during the morning peak hour but there will be a small increase during non-peak hours.
	12 month filling period	Generation of approximately 26 one-way average hourly flow and 52 two-way average hourly flow.	Insignificant due to decrease in traffic when compared with existing conditions
	15 month filling period	Generation of approximately 21 one-way average hourly flow and 42 two-way average hourly flow.	Insignificant due to decrease in traffic when compared with existing conditions

4.9 Mitigation Measures

The proposed Project will not result in an increase in traffic trips over existing conditions at the site, however, the following traffic management measures are recommended to be incorporated into the Project design to improve traffic conditions.

1. A recommendation to use the northern bridge, Tsing Tsuen Bridge, rather than the congested southern Tsing Yi Bridge should be written into the Dumping Licence Agreements.

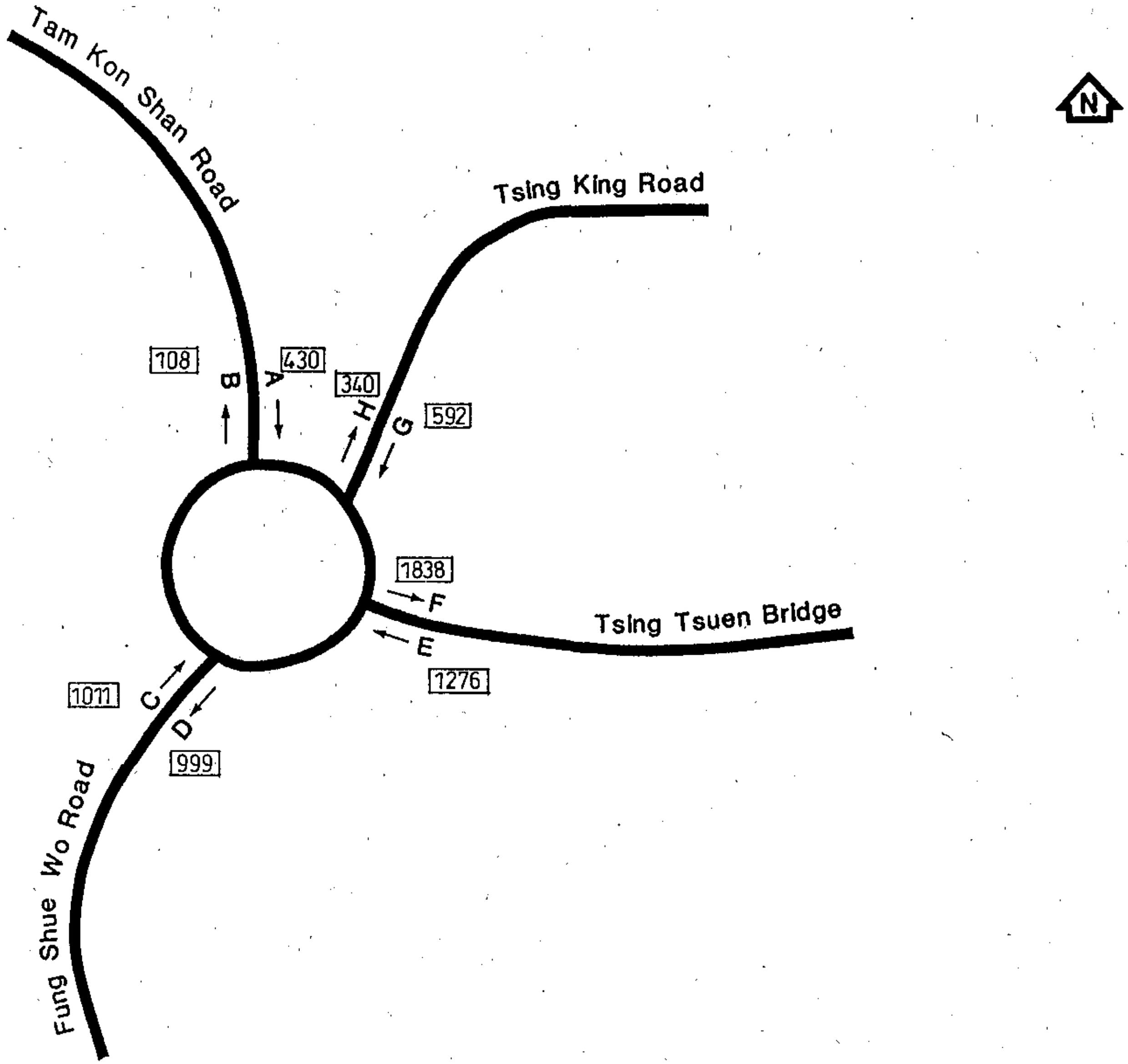
2. The Contractor should be required to locate the site entrance at the western end and the exit at the eastern end of the site. Vehicles should travel along Tam Kon Shan Road to the western end to enter the site, and should leave via the exit at the eastern end. All queuing/ waiting/parking should be within the site boundary with no queuing outside on Tam Kon Shan Road.



Traffic Survey Locations / Area Road Network

Mouchel

Figure No. 4.1



Traffic Counts - Total Vehicle a.m. 7:30 - 8:30 Peak Hour Trips

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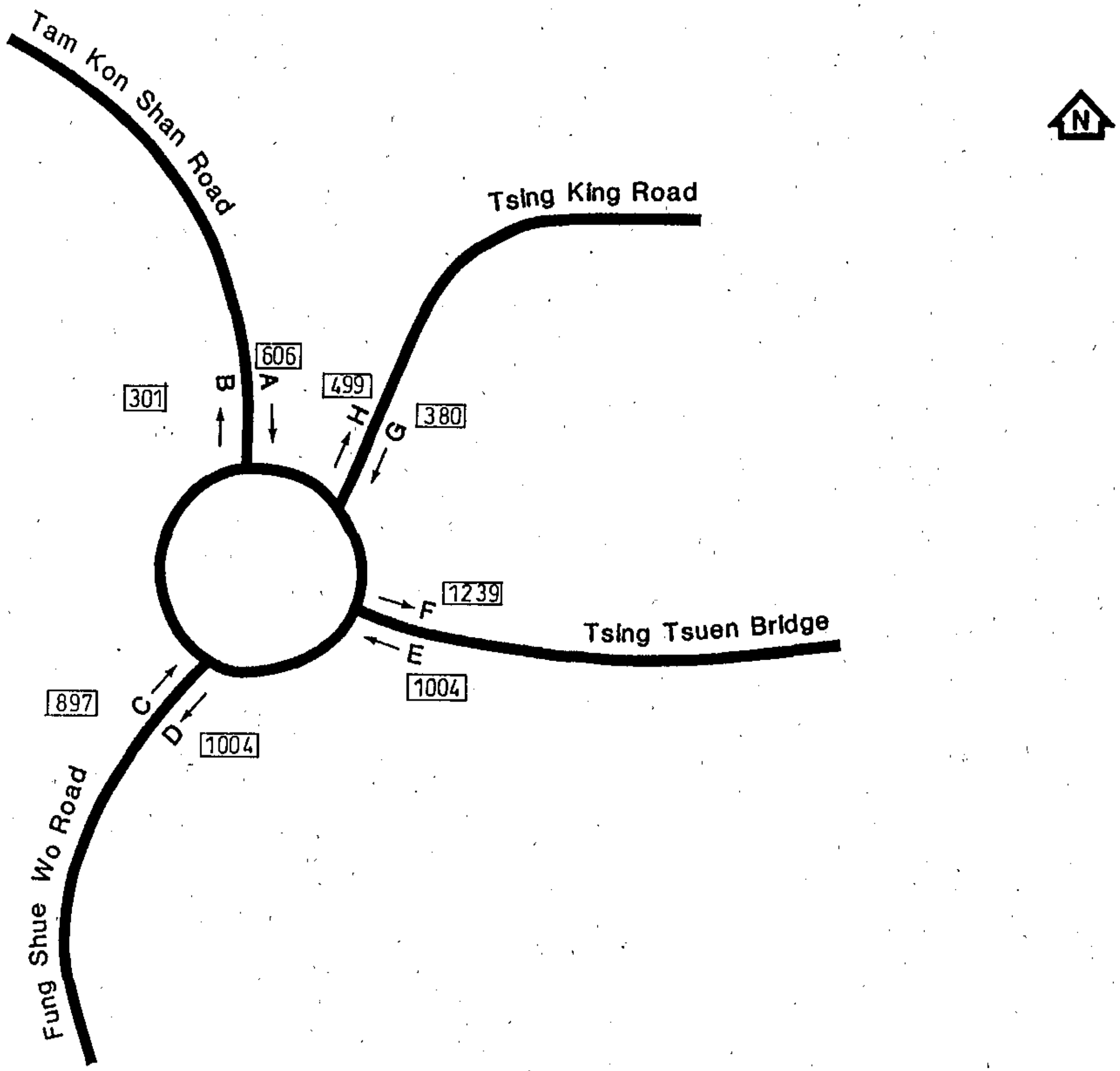
Figure No. 4.2



Traffic Counts - Total Vehicle p.m. 17:00-18:00 Peak Hour Trips

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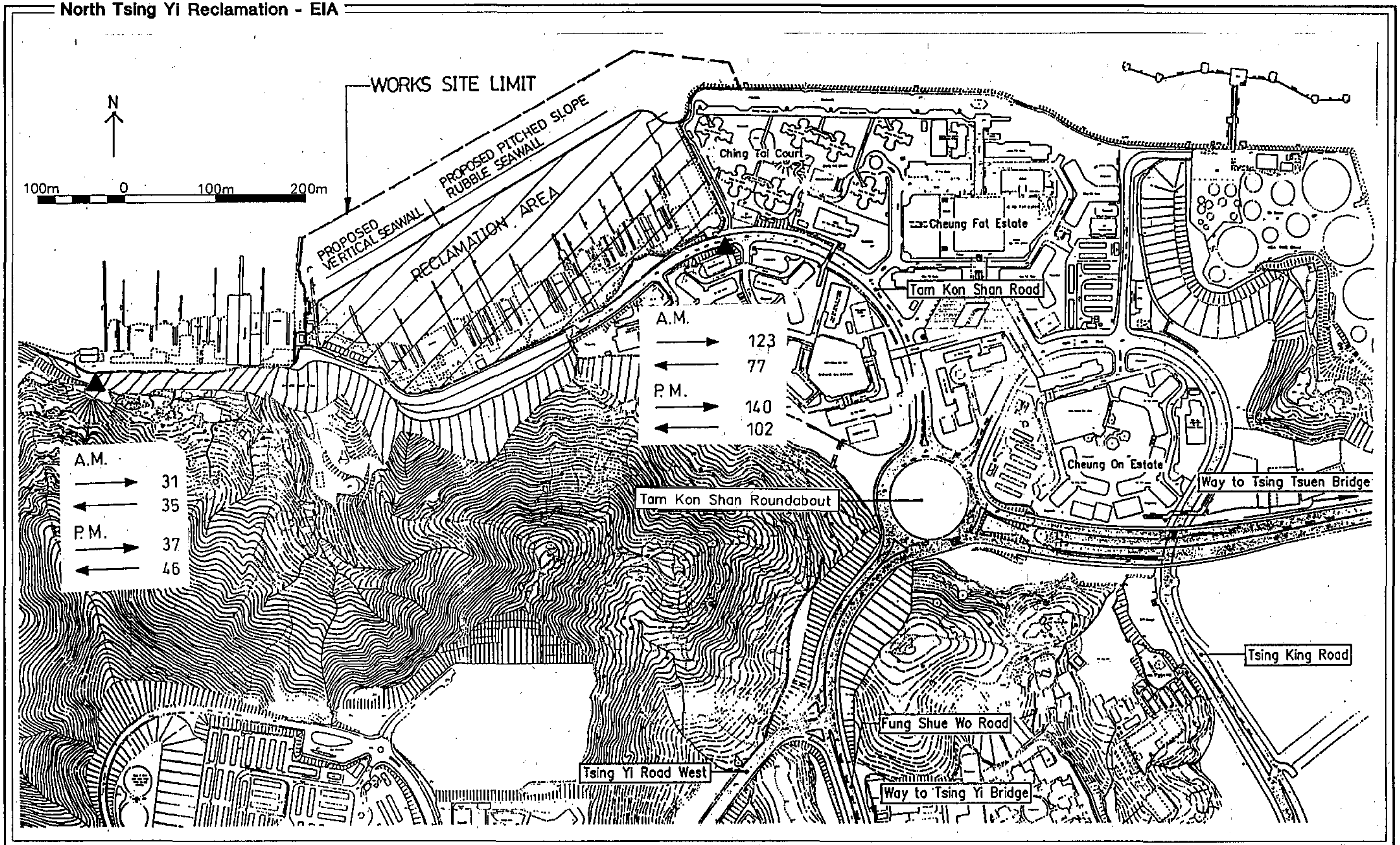
Figure No. 4.3



Existing Traffic From Shipyard Activities, Total Vehicle Counts a.m. and p.m. Peak Hour Trips

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Figure No. 4.4

5.0 NOISE

5.1 Introduction

This Section assesses the potential noise impacts from each stage of the Project activities including site clearance, seawall construction and reclamation construction. Noise impacts have also been addressed from traffic along the access road to the Project site.

5.2 Environmental Standards and Guidelines

According to the Noise Control Ordinance (NCO), works that are in connection with, or for the reclamation of, any foreshore and sea-bed up to a level of +5 mPD are considered to be construction works; whereas, any dumping and compacting activities carried above this level will be treated as industrial activities.

The noise generated from site clearance and construction of the seawall and reclamation (as described in Section 2) during the non-restricted daytime hours (07.00-19.00) has been assessed in accordance with the EPD recommended criteria described in the Practice Note for Professional Persons (No. PNDECC PN 2/93) as shown in Table 5.1.

Table 5.1: Acceptable Construction Noise Level

Receiver	Noise Level L_{eq} (30 min) dB(A)
Dwelling	75
School	70 (65 during examination)

Works at the Project site will cease on or before 19.00 hours, therefore, evening and night-time NCO criteria are not considered relevant for this Project.

The potential impact of Project generated traffic travelling on public roads has been assessed in accordance with the Hong Kong Planning Standards and Guidelines (HKPSG) which stipulate that maximum L_{10}(1 hour) noise levels from road traffic should not exceed 70 dB(A) at sensitive residential facades and 65 dB(A) at sensitive educational facades. EPD further requires that where the existing traffic levels exceed the prescribed noise limits, mitigation measures should be proposed to prevent further deterioration of the noise environment due to increased road transportation associated with the Project.

Although the traffic noise criteria have a clear application for noise sensitive receivers (NSRs) currently exposed to low traffic noise levels (e.g.,Queen's College Old Boys' Association Secondary School), they do not address the deterioration at facades currently exposed to traffic noise levels exceeding the HKPSG criteria (e.g. On Tao House and On Yun House). For these sensitive receivers the need for mitigation may be determined with reference to criteria that address deterioration in the noise environment. In this assessment, mitigation will be considered where for a single prediction year the predicted noise level with Project-related traffic is at least 1.0 dB(A) more than that for existing traffic.

5.3 Noise Sensitive Receivers

Residential and institutional uses in the vicinity of the proposed reclamation area have the potential to be adversely affected by the Project. In relation to the proximity of NSRs to the Project site, Cheung On Estate, Ching Tai Court, Cheung Fat Estate, the squatter area off the western end of the site and Tsing On Temporary Housing Area are considered highly sensitive to the Project activities. The sensitive facades which have a direct line of sight to the Project works area and Tam Kon Shan Road will, in particular, be prone to noise impacts.

In addition to those noise sensitive receivers in North Tsing Yi, an additional sensitive receiver across the Rambler Channel, Greenview Terrace in Yau Kam Tau, has also been included in the noise impact assessment. An interview with the management office of Greenview Terrace (4 August 1994) revealed that hammering noises apparently generated by ship repairing activities are audible at these residences due to the lack of any physical barrier between Yau Kam Tau and the Project site.

The representative NSRs are shown on Figure 5.1. The noise assessment criteria assigned to them are listed in Table 5.2. For the Queens College Old Boys' Association Secondary School (NSR12), existing noise mitigation measures in the form of double glazing with window type air conditioners are presently in place for all classrooms to ameliorate noise that is generated from the shipyards. According to Appendix 4.4 of the HKPSG, acoustic insulation of this type can offer a noise reduction of up to 15 dB(A).

Table 5.2: Representative Noise Sensitive Receivers

Receiver Identification		Noise Assessment Criterion dB(A)
NSR1	Tung Tai House	75
NSR2	Hang Tai House	75
NSR3	Po Tai House	75
NSR4	Hung Tai House	75
NSR5	Shing Tai House	75
NSR6	Chun Tai House	75
NSR7	CNEC Lui Ming Choi Primary School	70(1)
NSR8	Chun Fat House	75
NSR9	On Ching House	75
NSR10	On Yeung House	75
NSR11	On Hoi House	75
NSR12(2)	Queen's College Old Boys' Association Secondary School	70(1)
NSR13	On Kong House	75
NSR14	Greenview Terrace	75
NSR15	Squatter Area	75

Notes: (1) 65 dB(A) during examination.
(2) Existing noise mitigation measures in the form of window type air conditioners and double glazing are already provided to all classrooms to ameliorate noise generated from the shipyards. A noise reduction of 15 dB(A) is applied for such measures in accordance with Appendix 4.4 of the HKPSG.

A separate set of noise sensitive facades have been identified for determining the Project-related traffic noise and are shown in Figure 5.2.

5.4 Existing Noise Environment

The existing noise environment in the area of the Project site is dominated by intermittent hammering noise from the shipyards and noise from school activities (Queen's College Old Boys' Association Secondary School, TWGH Wong See Sum Primary School and CNEC Lui Ming Choi Primary School). Although Tam Kon Shan Road is not a major traffic route, traffic counts have shown that the existing traffic flow is fairly heavy, particularly for the road section close to the Tam Kon Shan Interchange. Roadway noise therefore currently contributes to the overall noise environment in the Project area.

Background noise levels were monitored at four locations in the study area in October and November 1994. The location of monitoring stations are shown on Figure 5.3 and the noise monitoring results are contained in Appendix D-1. The hourly results of the monitoring programme are contained in Appendix D-2. The daytime (07.00 to 19.00) results have been summarised in Table 5.3.

Table 5.3: Results of Background Noise Monitoring

Noise Sensitive Receiver	Location (1)	Location of Noise Meter	Noise Level dB(A) (2)	
			Min.	Max.
Shing Tai House	A	Roof	55	68
Queen's College Old Boys' Association Secondary School	B	Roof	56	68
On Tao House	C	Roof	65	67
Greenview Terrace	D	Roof	60	64

Note: (1) Location shown in Figure 5.2
(2) L_{90}(1 hour) Daytime Facade Noise Level

It is expected that background noise levels will change significantly once the shipyards are demolished. The Contractor should therefore be required to conduct baseline noise monitoring prior to construction activities to provide updated information on the noise environment.

5.5 Impacts During Site Clearance

The specific activities involved during the site clearance stage of the Project are discussed in Section 2.2. The plant and equipment that will be used for demolishing the shipyards, piers and jetties, and subsequent removal of these materials will include cranes, excavators and pneumatic breakers, as itemized below in Table 5.4. Each of these plant and equipment are land-based and will be confined to the Project site. A silenced truck with crane, with a maximum SWL of 109 dB(A) has been assumed to be used during the site clearance.

Table 5.4: Typical Equipment for Site Clearance

Equipment[1]	No. of Equipment	Sound Power Level dB(A)[2]	
		Per Item	Total
Truck	1	109	123
Pneumatic Breaker (Excavator Mounted)	1	122	
JCB Excavator	2	112	
Mobile Crane	1	112	
Blow Torch and Acetylene Cylinders on Trolley	4	90	

Note: (1) The equipment schedule is a preliminary one indicating the types of equipment that will be on site at a given time. It is unlikely that all the equipment will be used for the entire site clearance phase. For the purpose of this assessment, it is assumed that all equipment will be operating simultaneously.
(2) The sound power level for truck is based on equipment used at the Ma On Shan Public Dump (See Appendix D-4).

Table 5.5 indicates the predicted maximum noise level that would be expected at the NSRs during site clearance work.

Table 5.5: Facade Noise Levels at Representative NSRs (Site Clearance)

Receiver Identification	Acceptable Noise Level dB(A)	Source-Receiver Distance (m)[1]	Anticipated Maximum Noise Levels dB(A)[2]
NSR1	75	64	82
NSR2	75	148	75
NSR3	75	180	73
NSR4	75	190	73
NSR5	75	63	82
NSR6	75	95	79
NSR7	70[3]	267	70
NSR8	75	343	68
NSR9	75	431	66
NSR10	75	184	73
NSR11	75	94	79
NSR12	70[3]	83	65[4]
NSR13	75	241	71
NSR14	75	850	60
NSR15	75	201	72

Notes:
(1) Based on the notional source position.
(2) A positive correction of 3 dB(A) facade effect has been included.
(3) 65 dB(A) during examination.
(4) A noise reduction of 15 dB(A) has been included.

As shown in Table 5.5, the noise generated during site clearance is expected to exceed the recommended noise criteria at NSR1, NSR5, NSR6, NSR11 and NSR7 (during examinations).

The noise impact inside the Queen's College Old Boys' Association Secondary School is expected to be acceptable as acoustic insulation has been provided for this receiver.

Although the duration of exceeding the acceptable noise criteria will be short (3 months), measures to minimise construction noise should be adopted by the Contractor. These are discussed in Section 5.9.

The predicted vehicle trips for removal of waste is approximately 18 trips per week, and thus any increase in traffic noise due to demolition trucks would not result in an adverse impact.

5.6 Impacts During Seawall Construction

Activities involved during the seawall construction are described in Section 2.3 of this report. The construction of the seawall is likely to be carried out in sequential phases. A typical schedule of works is contained in Appendix B-4 of this report. The proposed seawall will be divided into sections with different construction activities conducted on each section simultaneously.

The construction of the seawall will involve the use of sea-based powered mechanical equipment (PME). Typical PME required for the construction of the seawall and the associated sound power level of this equipment is shown in Table 5.6.

The results of the noise calculations are presented in Appendix D-3 and are summarized in Table 5.7. According to the predicted noise levels, it is anticipated noise generated during construction will be acceptable during all stages of construction of the seawall. The anticipated maximum noise levels at the most affected dwelling (NSR1) and school (NSR7) are 73 dB(A) and 60 dB(A) respectively.

Table 5.6: Typical Equipment for Seawall Construction

Stage	Time (Day)(1)	Section 1		Section 2		Section 3	
		Equipment	Total SWL dB(A)(2)	Equipment	Total SWL dB(A)(2)	Equipment	Total SWL dB(A)(2)
1	40	1 grab dredger 1 barge 1 tug boat	114	0	0	0	0
2	80	0	0	1 grab dredger 1 barge 1 tug boat	114.1	0	0
3	120	1 bottom dump barge 1 tug boat	110	0	0	1 grab dredger 1 barge 1 tug boat	114
4	155	1 bottom dump barge 1 tug boat	110	0	0	1 bottom dump barge 1 tug boat	110
5	175	0	0	1 bottom dump barge 1 tug boat	110	1 derrick lighter 1 tug boat	111
6	200	1 bottom dump barge 1 tug boat	110	0	0	1 derrick lighter 1 tug boat	111
7	220	1 derrick lighter 1 tug boat	111	1 bottom dump barge 1 tug boat	110	0	0
8	240	1 derrick lighter 1 tug boat	111	0	0	0	0

Notes:
(1) Time in days from Project commencement.
(2) Sound power level (SWL) of equipment:
Grab dredger - 112 dB(A)
Barge - negligible
Tug boat - 110 dB(A)
Bottom dump barge - negligible
Derrick Lighter - 104 dB(A)
(3) Tug boats will not be in operation during the construction hours, only intermittently to move the barge. For the purpose of this assessment, it is assumed that all equipment will be operating simultaneously.

The schedule for each stage of the Project and equipment requirements is described in Section 2.3.2 of this report.

Table 5.7: Summary of Facade Noise Levels at Representative NSRs for Seawall Construction

Sensitive Receiver	Acceptable Noise Level dB(A)	Anticipated Maximum Noise Levels at Various Stages dB(A)(1)							
		1	2	3	4	5	6	7	8
NSR1	75	73	62	69	69	60	69	70	70
NSR2	75	65	59	62	62	57	62	63	62
NSR3	75	62	58	58	58	54	58	60	59
NSR4	75	61	-(2)	57	57	-(2)	57	58	58
NSR5	75	67	62	64	63	59	63	65	64
NSR6	75	64	60	61	61	58	61	62	62
NSR7	70(3)	60	57	58	57	55	57	58	57
NSR8	75	58	56	54	54	52	54	57	55
NSR9	75	56	-(2)	52	52	-(2)	52	53	53
NSR10	75	62	59	61	59	58	59	61	59
NSR11	75	65	62	63	62	60	62	63	62
NSR12	70(3)	48(4)	48(4)	48(4)	46(4)	46(4)	46(4)	48(4)	45(4)
NSR13	75	59	58	59	57	57	57	58	56
NSR14	75	52	52	53	51	51	51	52	49
NSR15	75	55	58	63	59	61	60	56	52

Notes:
(1) A positive correction of 3 dB(A) facade effect has been included.
(2) Noise level will be negligible as sensitive receiver will be completely screened from the work section(s) by other buildings(s).
(3) 65 dB(A) during examination.
(4) A noise reduction of 15 dB(A) has been included.

5.7 Impacts During Reclamation Construction

5.7.1 Impacts from Reclamation Construction

The activities that will be conducted during reclamation construction are described in Section 2.4. In general, these activities will include transporting and unloading materials, spreading and stockpiling material and transferring, depositing and compacting the materials to form the reclamation. There will be no rock crushing conducted on the site during construction of the reclamation.

The noise impacts during reclamation construction have been assessed by looking at three reclamation scenarios. The three scenarios include reclamation completion in 6 months, 12 months and 15 months.

The equipment sound power levels used in the assessment are shown in Table 5.8. The equipment used within the site will remain unchanged for all scenarios, however, the daily truck trips delivering material to the site will vary according to the three different construction periods.

Table 5.8: Typical Equipment for Reclamation Construction

Equipment[1]	No. of Equipment	Sound Power Level dB(A)[2]	
		Per Item	Total
6 Month Period Construction			
Backhoe	1	112	124
Bulldozer	1	109	
Loader	1	112	
Dump Truck	2	111	
Vibratory Roller	1	108	
Dump Truck[3]	13	111	
12 Month Period Construction			
Backhoe	1	112	122
Bulldozer	1	109	
Loader	1	112	
Dump Truck	2	111	
Vibratory Roller	1	108	
Dump Truck[3]	7	111	
15 Month Period Construction			
Backhoe	1	112	122
Bulldozer	1	109	
Loader	1	112	
Dump Truck	2	111	
Vibratory Roller	1	108	
Dump Truck[3]	6	111	

(1) The equipment schedule is a preliminary one indicating the types of equipment that will be on site at a given time. For the purpose of this assessment, it is assumed that all equipment will be operating simultaneously.
(2) The sound power levels for bulldozer and dump truck are based on those used in Ma On Shan Public Dump (see Appendix D-4).
(3) Based on expected number of trucks running on site at any one time based on average hourly trip frequencies for the 3 filling scenarios.

The number of trucks operating at any one time on the reclamation site for each scenario has been derived according to the one-way average hourly trip and the average time that a truck stays within the site (typically 15 minutes).

It has been assumed that the Contractor will be required to use silenced bulldozers and dump trucks, with SWLs of 109 dB(A) and 111 dB(A) respectively, similar to those employed at the Ma On Shan Public Dump, to prevent excessive noise impacts.

Section 4 of this report details the existing traffic flows on roads leading to the Project Site and the anticipated changes in traffic during the Project reclamation period. Tables 5.9 and 5.10 summarise the existing and Project generated traffic flows.

Table 5.9: Existing Traffic Flow

Road	Peak Hour Flow (veh/hr)	% Heavy Vehicle	Speed (kph)
Tam Kon Shan Road (Eastern end of shipyards)	167	31.7	50
Tam Kon Shan Road (West of Tam Kon Shan Roundabout)	907	39.2	50
Fung Shu Wo Road	2010	46.1	50
Tsing Tsuen Bridge	2283	38.3	70
Tsing King Road	932	53.2	50

Table 5.10: Predicted Traffic Flow During Reclamation Construction

Road (Speed 50kph)	Construction Period					
	6 months		12 months		15 months	
	Peak hr. Flow (veh/hr)	% Heavy Vehicle	Peak hr. Flow (veh/hr)	% Heavy Vehicle	Peak hr. Flow (veh/hr)	% Heavy Vehicle
Tam Kon Shan Road (Eastern end of Shipyards)	157	75.8	107	64.5	97	60.8
Tam Kon Shan Road (West of Tam Kon Shan Roundabout)	897	42.9	847	39.6	837	38.8

Traffic noise generated by trucks running on the access road (Tam Kon Shan Road) has been calculated according to the procedure in the U.K. Department of Transport's Calculation of Road Traffic Noise (1988). The results are given in terms of L_{10}(1 hour) dB(A) noise levels.

Construction activities for the reclamation area have also been divided into three sections of the site, as described in Section 2.3 of this report. Tables 5.11, 5.12 and 5.13 show the expected noise level for the three specific locations of the site (areas 1, 2, and 3) per the three filling scenarios (6, 12 and 15 months).

Table 5.11: Facade Noise Levels at Representative NSRs from Reclamation of Section 1

Receiver Identification and Noise Level dB(A)		Source-Receiver Distance (m)(1)	Anticipated Maximum Noise Levels dB(A)(2) Construction Period (months)		
			6	12	15
NSR1	75	66	83	81	81
NSR2	75	147	76	74	74
NSR3	75	178	74	72	72
NSR4	75	224	72	70	70
NSR5	75	62	83	82	81
NSR6	75	102	79	77	77
NSR7	70(3)	153	75	74	73
NSR8	75	240	72	70	67
NSR9	75	363	68	66	66
NSR10	75	125	77	75	75
NSR11	75	75	82	80	79
NSR12	70(3)	102	64(4)	62(4)	62(4)
NSR13	75	198	73	71	71
NSR14	75	755	62	60	59
NSR15	75	496	65	63	63

Notes : No mitigation measures taken into consideration.
(1) Based on the notional source position.
(2) A positive correction of 3 dB(A) facade effect has been included.
(3) 65 dB(A) during examination.
(4) A noise reduction of 15 dB(A) has been included.

Table 5.12: Facade Noise Levels at Representative NSRs from Reclamation of Section 2

Receiver Identification and Noise Level dB(A)		Source-Receiver Distance (m)(1)	Anticipated Maximum Noise Levels dB(A)(2) Construction Period (months)		
			6	12	15
NSR1	75	225	72	70	70
NSR2	75	303	70	68	67
NSR3	75	340	69	67	66
NSR4	75	350	68	66	67
NSR5	75	217	72	71	70
NSR6	75	250	71	69	69
NSR7	70(3)	303	70	68	67
NSR8	75	405	67	65	65
NSR9	75	-	- (5)	- (5)	- (5)
NSR10	75	231	72	70	70
NSR11	75	139	76	74	74
NSR12	70(3)	86	65(4)	64(4)	63(4)
NSR13	75	241	72	70	69
NSR14	75	763	61	60	59
NSR15	75	337	68	66	66

Notes : No mitigation measures have been included.
(1) Based on the notional source position.
(2) A positive correction of 3 dB(A) facade effect has been included.
(3) 65 dB(A) during examination.
(4) A noise reduction of 15 dB(A) has been included.
(5) Noise level will be negligible as sensitive receiver will be completely screened from the reclamation area by other building(s).

Table 5.13: Facade Noise Levels at Representative NSRs from Reclamation of Section 3

Receiver Identification and Noise Level dB(A)		Source-Receiver Distance(1) (m)	Anticipated Maximum Noise Levels(2) dB(A) Construction Period (months)		
			6	12	15
NSR1	75	383	67	66	65
NSR2	75	475	66	64	63
NSR3	75	-	- (5)	- (5)	- (5)
NSR4	75	513	65	63	63
NSR5	75	383	67	66	65
NSR6	75	414	67	66	65
NSR7	70(3)	483	65	64	63
NSR8	75	-	- (5)	- (5)	- (5)
NSR9	75	-	- (5)	- (5)	- (5)
NSR10	75	419	67	65	65
NSR11	75	287	70	68	68
NSR12	70(3)	230	57(4)	55(4)	55(4)
NSR13	75	379	68	66	65
NSR14	75	811	61	59	59
NSR15	75	169	74	72	72

Notes : No mitigation measures included as part of the assessment.
(1) Based on the notional source position.
(2) A positive correction of 3 dB(A) facade effect has been included.
(3) 65 dB(A) during examination.
(4) A noise reduction of 15 dB(A) has been included.
(5) Noise level will be negligible as sensitive receiver will be completely screened from the dump area by other building(s).

As illustrated in Tables 5.11, 5.12, and 5.13, reclamation activities in section 1 will exceed the acceptable noise criteria levels at NSR1, NSR2, NSR5, NSR6, NSR7, NSR10 and NSR11 for the 6 month construction period. For the 12 month and 15 month period, NSR1, NSR5, NSR6, NSR7 (during examination periods) and NSR11will exceed the acceptable noise criteria.

With the exception of NSR7 (during examination period) and NSR11, potential noise impacts arising from reclamation construction in section 2 will be within the acceptable noise criteria level for the 6 month period. For the 12 and 15 month periods, anticipated noise levels at all receivers will comply with the acceptable noise criteria with the exception of NSR7 during examination period.

For construction works carried out in section 3, the noise criteria are not expected to be exceeded at any of the receivers for any of the reclamation time periods.

5.7.2 Assessment of Noise Impact from Traffic During Reclamation Construction

The relocation of the existing shipyards will result in a small decrease in peak hour traffic flow on Tam Kon Shan Road, as demonstrated in Tables 5.8 and 5.9. There will, however, be an increase in the proportion of heavy vehicles during construction of the reclamation. Noise modelling, based on data obtained from traffic counts, indicate that the sensitive receivers along Tam Kon Shan Road are presently subjected to significant noise impacts, particularly the NSR close to the roundabout. Results of the noise monitoring conducted at On Tao House further confirm this situation.

The noise levels from Project generated traffic are shown in Table 5.14. The level of noise will largely depend on the duration of the reclamation construction.

Table 5.14: Predicted Noise Levels at Representative Sensitive Facades From Traffic

NSR	Level (Floor)	Existing Noise dB(A)	Construction Period					
			6 months		12 months		15 months	
			Predicted dB(A)	Increase in dB(A)[1]	Predicted dB(A)	Increase in dB(A)[1]	Predicted dB(A)	Increase in dB(A)[1]
A1	2/F	67.0	68.7	-	67.3	-	66.9	-
A2	2/F	65.3	67.0	-	65.6	-	65.2	-
B1	2/F	65.2	67.5	-	65.6	-	65.1	-
B2	2/F	68.1	69.9	-	68.4	-	67.9	-
B3	2/F	66.2	68.2	-	66.6	-	66.2	-
C1	2/F	69.4	70.6	1.2	69.6	0.2	69.4	0
D1	2/F	75.3	76.0	0.7	75.4	0.1	75.2	-0.1
D2	4/F	66.8	67.4	-	66.9	-	66.8	-
E1	2/F	72.6	73.3	0.7	72.7	0.1	72.6	0
E2	3/F	63.6	64.4	-	63.7	-	63.6	-
F1	2/F	76.7	77.3	0.6	76.8	0.1	76.7	0
F2	2/F	77.8	77.9	0.1	77.8	0	77.8	0
G1[2]	1/F	68.4	68.4	-	68.4	-	68.4	-
H1	3/F	75.1	75.7	0.6	75.2	0.1	75.1	0
H2	3/F	77.3	77.8	0.5	77.4	0.1	77.3	0
H3	3/F	71.5	71.6	0.1	71.5	0	71.5	0
I1[4]	3/F	68.6	69.2	0.6	68.7	0.1	68.6	0
J1	2/F	64.3	67.1	-	64.8	-	64.2	-
J2	2/F	66.8	69.6	-	67.2	-	66.5	-
J3	2/F	69.1	71.7	-	69.4	-	68.7	-
K1	2/F	68.1	70.9	-	68.4	-	67.7	-
K2	2/F	64.0	66.9	-	64.6	-	64.0	-
L1[3]	2/F	51.7	54.6	-	52.2	-	51.5	-
M1	1/F	70.4	63.4	-	63.3	-	63.3	-

Note:

(1) Where existing traffic noise levels at NSRs already exceed the noise criteria, increases in noise level are provided to show the degree of deterioration in the noise environment. For NSRs C1, I1 and L1 (schools), the criterion is 65 dB(A); for all other NSRs, the criterion is 70 dB(A).

(2) NSR G1 (Tsing On Temporary Housing Area) is protected from traffic noise by an existing 4 m high (approximately) noise barrier.

(3) A noise reduction of 15 dB(A) has been included for NSR L1 (Queen's College Old Boys' Association Secondary School).

In summary, for the 6 month reclamation scenario, traffic noise levels are expected to be significant at NSRs J3 (On Yeung House) and K1 (On Hoi House). For those receivers that presently suffer from excessive traffic noise levels, the maximum increase in traffic noise would be 1.2 dB(A). Mitigation measures are therefore required to reduce noise impacts.

For the 12 month period, it is expected that the overall traffic noise will increase by a maximum of 0.2 dB(A) and, therefore, the traffic from the Project will cause a negligible noise impact on the sensitive receivers along Tam Kon Shan Road and no mitigation measures would be required.

For the 15 month period, it is anticipated that there will be a reduction in the noise that is at present occurring at the Project site from shipyard activities. As no noise impacts would occur, no mitigation measures would be required.

5.8 Noise Impact Summary

The noise impacts prior to the implementation of mitigation measures are shown below in Table 5.15.

Table 5.15: Noise Impacts (Without Mitigation)

<table>
<tr><th>Phase</th><th>Duration</th><th>Activities</th><th colspan="2">Level of Impact</th></tr>
<tr><td rowspan="2">Site Clearance</td><td rowspan="2">3 months</td><td>Demolition and clearance</td><td colspan="2">Significant at NSR 1, 5, 6, 7[(1)] and 11</td></tr>
<tr><td>Site clearance related traffic</td><td colspan="2">Insignificant</td></tr>
<tr><td>Seawall Construction</td><td>15 months</td><td>Construction of seawall</td><td colspan="2">Insignificant</td></tr>
<tr><td rowspan="12">Reclamation Construction</td><td rowspan="4">6 month</td><td rowspan="3">Reclamation Construction</td><td>section 1</td><td>Significant at NSR 1, 2, 5, 6, 7, 10 and 11</td></tr>
<tr><td>section 2</td><td>Significant at NSR 7[(1)] and 11 (76 dB(A))</td></tr>
<tr><td>section 3</td><td>Insignificant</td></tr>
<tr><td>Project-related traffic</td><td colspan="2">Significant at NSR J3 and K1</td></tr>
<tr><td rowspan="4">12 month</td><td rowspan="3">Reclamation Construction</td><td>section 1</td><td>Significant at NSR1, 5, 6, 11 and 7[(1)]</td></tr>
<tr><td>section 2</td><td>Significant at NSR7[(1)]</td></tr>
<tr><td>section 3</td><td>Insignificant</td></tr>
<tr><td>Project-related traffic</td><td colspan="2">Insignificant</td></tr>
<tr><td rowspan="4">15 month</td><td rowspan="3">Reclamation Construction</td><td>section 1</td><td>Significant at NSR1, 5, 6, 11 and 7[(1)]</td></tr>
<tr><td>section 2</td><td>Insignificant</td></tr>
<tr><td>section 3</td><td>Insignificant</td></tr>
<tr><td>Project-related traffic</td><td colspan="2">Insignificant</td></tr>
<tr><td colspan="5">Note: (1) Impact only during exam period.</td></tr>
</table>

5.9 Mitigation Measures

The most effective mitigation measure is to control noise at source. In the case of powered mechanical equipment, this involves either selecting silenced equipment, or reducing the transmission of noise using mufflers, silencers, or acoustic enclosures. The following noise mitigation measures are proposed to reduce noise levels at the reclamation site. Section 5.9.1 contains general noise mitigation measures and criteria for the Project. Sections 5.9.2 and 5.9.3 include specific noise mitigation measures to reduce noise impacts for each stage of the Project while Section 5.9.4 includes other noise mitigation measures that should be carried out as part of good working practices.

5.9.1 General Noise Mitigation Measures

1. The Contractor should be required to comply with and observe the Noise Control Ordinance and its subsidiary regulations.

2. In addition to the Acceptable Noise Levels specified in the Noise Control Ordinance, the noise levels at any sensitive receiver resulting from the Contractor's activities should not exceed 75dB(A) at any dwelling or 70dB(A) at any school (65dB(A) during examination periods) during any period not otherwise restricted under the Noise Control Ordinance.

3. No truck, bulldozer and dump truck with sound power levels higher than 109dB(A), 109dB(A) and 111dB(A), respectively, should be used on site unless the Contractor can provide adequate measures such that the overall construction noise levels at the noise sensitive receivers are less than the recommended criteria stipulated in the Practice Note for Professional Persons (No. PNDECC PN 2/93).

5.9.2 Site Clearance Noise Mitigation Measures

There are several types of mitigation that could be used to reduce noise levels from site clearance. The method to be selected will depend on the Contractor's method of working. One method of reducing noise levels is to select equipment which is capable of meeting the required noise level. Table 5.16 lists the equipment that would be necessary to reduce noise levels and demonstrates the noise reduction potential. In doing this, the site has been divided into three work areas, namely section 1 (100 m west of the eastern boundary), section 2 (100-180 m west of the eastern boundary) and section 3 (180 m west of the eastern boundary to the western boundary), as described in Section 2.0 of this report. The site clearance work has been assumed to be conducted at only one work area at any one time.

Table 5.17 demonstrates how demolition noise could be mitigated at the adversely affected receivers (NSR1, NSR5, NSR7 and NSR11) by using the recommended quiet equipment, noise enclosures and proper work scheduling.

Table 5.16: Noise Mitigation Equipment Schedule

Section	Equipment	Total SWL dB(A)
1	1 Truck 1 Hand-held pneumatic breaker, silenced type with SWL=110 dB(A) (to be housed in a semi-enclosure with a noise reduction of 15 dB(A)) 1 Super-silenced air-compressor with SWL=95 dB(A) 1 JCB excavator 1 Mobile Crane 4 Blow torch and acetylene cylinders on trolley Either the JCB excavator or mobile crane will be in use at any one time.	114
2	1 Truck 1 Hand-held pneumatic breaker, silenced type with SWL=110 dB(A) 1 Super-silenced air-compressor with SWL=95 dB(A) 2 JCB excavator 1 Mobile Crane 4 Blow torch and acetylene cylinders on trolley	118
3	As per the original equipment schedule.	123

Note: For sections 2 and 3, use the equipment and noise reduction measures as adopted in section 1 during the examination period.

Table 5.17: Facade Noise Levels at the Adversely Affected NSRs (Site Clearance - Mitigated)

Sensitive Receiver	Work Section 1		Work Section 2		Work Section 3	
	Source-Receiver Distance m (1)	Noise Level dB(A) (2)	Source-Receiver Distance m (1)	Noise Level dB(A) (2)	Source-Receiver Distance m (1)	Noise Level dB(A) (2)
NSR1	72	72	163	69	248	70
NSR5	50	75	147	70	247	70
NSR7	149	65	228	66/ 62(3)	316	68/59(3)
NSR11	70	72	78	75	150	75

Notes : (1) Based on the notional source position.
(2) A positive correction of 3 dB(A) facade effect has been included.
(3) During examination period.

The Contractor should be required to prepare an equipment list and schedule that meet the requirements of the noise level reduction and submit this to EPD for approval prior to the start of site clearance. The Contractor should demonstrate that no noise impacts will occur to any NSRs.

5.9.3 Reclamation Noise Mitigation Measures

Mitigation measures such as use of quiet equipment, proper work scheduling and careful work area planning are available to minimize the noise impacts to the affected NSRs during the reclamation construction. The method of noise mitigation will be selected by the Contractor. One possible method of noise amelioration measures is presented below to demonstrate the reductions that are achievable.

The principle adopted in this approach is to limit the noise generated from work areas close to the sensitive receivers. The reclamation site has been divided into subsections as illustrated in Figure 5.4. Dumping activities have been assumed to be conducted at only one work area at any one time. Depending on the degree of potential noise impacts, a combination of the following measures could be employed:

1. Using silenced plant and equipment;
2. Limiting the time that the equipment is working;
3. Reducing the number of plant and equipment;
4. Proper planning of work schedules; and/or
5. Proper planning of work areas.

Table 5.18 shows the mitigation provisions assumed. Results of the calculations are given in Table 5.19.

Table 5.18: Noise Mitigation Equipment Schedule

Work Section	Equipment	Total SWL dB(A)
1a	1 Silenced backhoe with SWL=105 dB(A) 1 Bulldozer with SWL=109 dB(A) 1 Silenced loader with SWL=105 dB(A) 1 Vibratory roller with SWL=106 dB(A) 2 Dump truck with SWL=111 dB(A) each Percentage on-time for all equipment except dump truck to be reduced to 80% (For all Construction periods)	116.0
1b	1 Silenced backhoe with SWL=105 dB(A) 1 Bulldozer with SWL=109 dB(A) 1 Silenced loader with SWL=105 dB(A) 1 Vibratory roller with SWL=106 dB(A) 7 Dump truck with SWL=111 dB(A) each (For all construction periods)	120.3
2a	1 Silenced backhoe with SWL=105 dB(A) 1 Bulldozer with SWL=109 dB(A) 1 Silenced loader with SWL=105 dB(A) 1 Vibratory roller with SWL=106 dB(A) 8 Dump truck with SWL=111 dB(A) each (For all construction periods)	120.8
2b	As per the original equipment schedule 6 months construction period 12 or 15 months construction period	 124 122

Note : Mitigation measures during examination period:
section 1a Construction activities restricted to the northern half of the work area
section 1b Mitigation arrangement as per those adopted in work section 1a
section 2a Mitigation arrangement same as above except limiting the no. of dump trucks to 4, total SWL=118.3 dB(A)
section 2b Mitigation arrangement same as above except limiting the no. of dump trucks to 6, total SWL=119.7 dB(A)

Table 5.19: Facade Noise Levels at the Adversely Affected NSRs with Mitigation

Receiver Identification	Source-Receiver Distance (1) (m)	Anticipated Maximum Noise Levels (2) dB(A)		
		Construction Period (months)		
		6	12	15
Work section 1a				
NSR1	66	75	75	75
NSR2	147	68	68	68
NSR5	62	75	75	75
NSR6	102	71	71	71
NSR7	160/205(3)	67/65(3)	67/65(3)	67/65(3)
NSR10	117	70	70	70
NSR11	71	74	74	74
Work section 1b				
NSR1	143	72	72	72
NSR2	220	68	68	68
NSR5	138	72	72	72
NSR6	172	70	70	70
NSR7	233	68/64(3)	68/64(3)	68/64(3)
NSR10	178	70	70	70
NSR11	102	75	75	75
Work section 2a				
NSR7	264	65(3)	65(3)	65(3)
NSR11	105	75	75	75
Work section 2b				
NSR7	295	65(3)	65(3)	65(3)
NSR11	175	74	73	73

Notes : (1) Based on the notional source position.
(2) A positive correction of 3 dB(A) facade effect has been included.
(3) During examination period.

Results shown in Table 5.19 indicate that adverse noise impacts could be ameliorated to acceptable levels by using the assumed measures.

The Contractor should be required to prepare a list of equipment and schedule of activities together with a statement of noise impacts for approval by EPD prior to the start of reclamation construction. The Contractor should be required to demonstrate that no noise impacts will occur to any NSRs.

5.9.4 Noise Mitigation Measures for Good Working Practices

Notwithstanding the mitigation measures presented in Sections 5.9.1, 5.9.2 and 5.9.3, the following noise reduction measures should be enforced as part of general working practices to reduce noise levels from Project activities.

1. The following mitigation measures should be implemented by the Contractor :

(a) Noisy equipment and noise generating activities should be sited as far from sensitive receivers as is practical.

(b) Noisy plant or processes should be replaced by quieter alternatives wherever possible. For example, pneumatic concrete breakers can be silenced with mufflers and bit dampers. Silenced diesel and gasoline generators and power units, as well as silenced and super- silenced air compressors, shall be used.

(c) Noisy activities should be scheduled to minimise exposure of nearby NSRs to high levels of construction noise. For example, noisy activities can be scheduled for midday, or at times coinciding with high background noise (such as during peak traffic hours). Prolonged operation of noisy equipment close to dwellings or during school examination periods shall be avoided.

(d) Idle equipment should be turned off or throttled down. Noisy equipment shall be properly maintained and used no more often than necessary

(e) The power units of non-electric stationary plant and earth-moving plant should be quietened by vibration isolation and partial or full acoustic enclosures for individual noise-generating components.

(f) Construction activities should be planned so that parallel operation of several sets of equipment close to a given receiver is avoided.

(g) If possible, the number of operating powered mechanical equipment should be kept to a minimum.

(h) Construction plant should be properly maintained and operated.

(i) Temporary noise barriers or earth embankment should be used to screen specific receivers. Enclosures for noisy activities such as concrete breaking shall be applied where the noise impact is potentially severe.

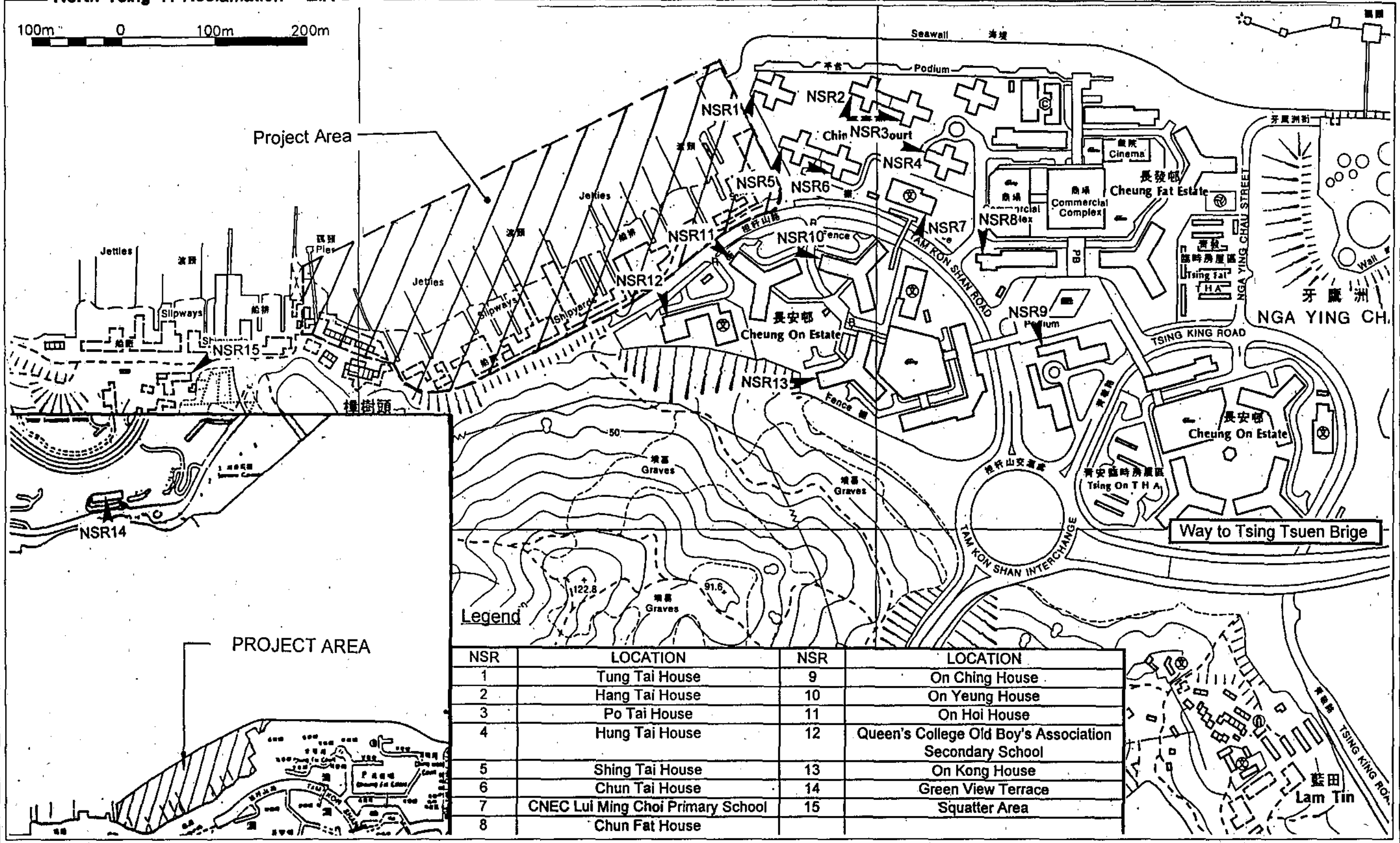
(j) Though not effective in reducing noise levels, the Contractor should establish good community relations. This should include notifying residents and school administrations in advance of planned noisy operations and kept informed of progress. If necessary, a liaison body should be established to bring together representatives of the affected communities, the Government, and the Contractors. At minimum, residents and the school administrations should be provided with a telephone number for the Resident Engineer's office, where they may register complaints concerning excessive noise. If justified, the Resident Engineer may authorise noisy operations to cease or to be conducted at more restricted hours.

5.9.5 Traffic Noise Mitigation Measure

The high-rise, high density nature of developments, close proximity of NSRs to Tam Kon Shan Road, compounded by the temporary nature of the reclamation, render the provision of noise mitigation such as road side barriers, semi-enclosures or full enclosures to be impracticable and/or cost-ineffective. Limiting the flow rate of dump trucks would be effective in minimising the adverse traffic noise impact. However this will not be practicable for this Project as it is not possible to control the rate at which fill is delivered to the Site.

5.10 Residual Impacts

Compliance with the construction noise criteria for site clearance and reclamation construction can be achieved by employing mitigation measures as listed in Sections 5.9.1 - 5.9.4. Therefore, no residual impacts, after mitigation measures are implemented, would occur. Traffic generated from reclamation construction will impact NSR J3 (On Yeung House) and NSR K1 (On Hoi House) if filling is conducted in less than a 12 month period. As there is no feasible mitigation measure to reduce the required noise level in excess of the noise criteria (71.7 and 70.9 dB(A), respectively), residual impacts may occur at these locations if the filling duration is less than 12 months.



Legend

NSR	LOCATION	NSR	LOCATION
1	Tung Tai House	9	On Ching House
2	Hang Tai House	10	On Yeung House
3	Po Tai House	11	On Hoi House
4	Hung Tai House	12	Queen's College Old Boy's Association Secondary School
5	Shing Tai House	13	On Kong House
6	Chun Tai House	14	Green View Terrace
7	CNEC Lui Ming Choi Primary School	15	Squatter Area
8	Chun Fat House		

Noise Sensitive Receivers

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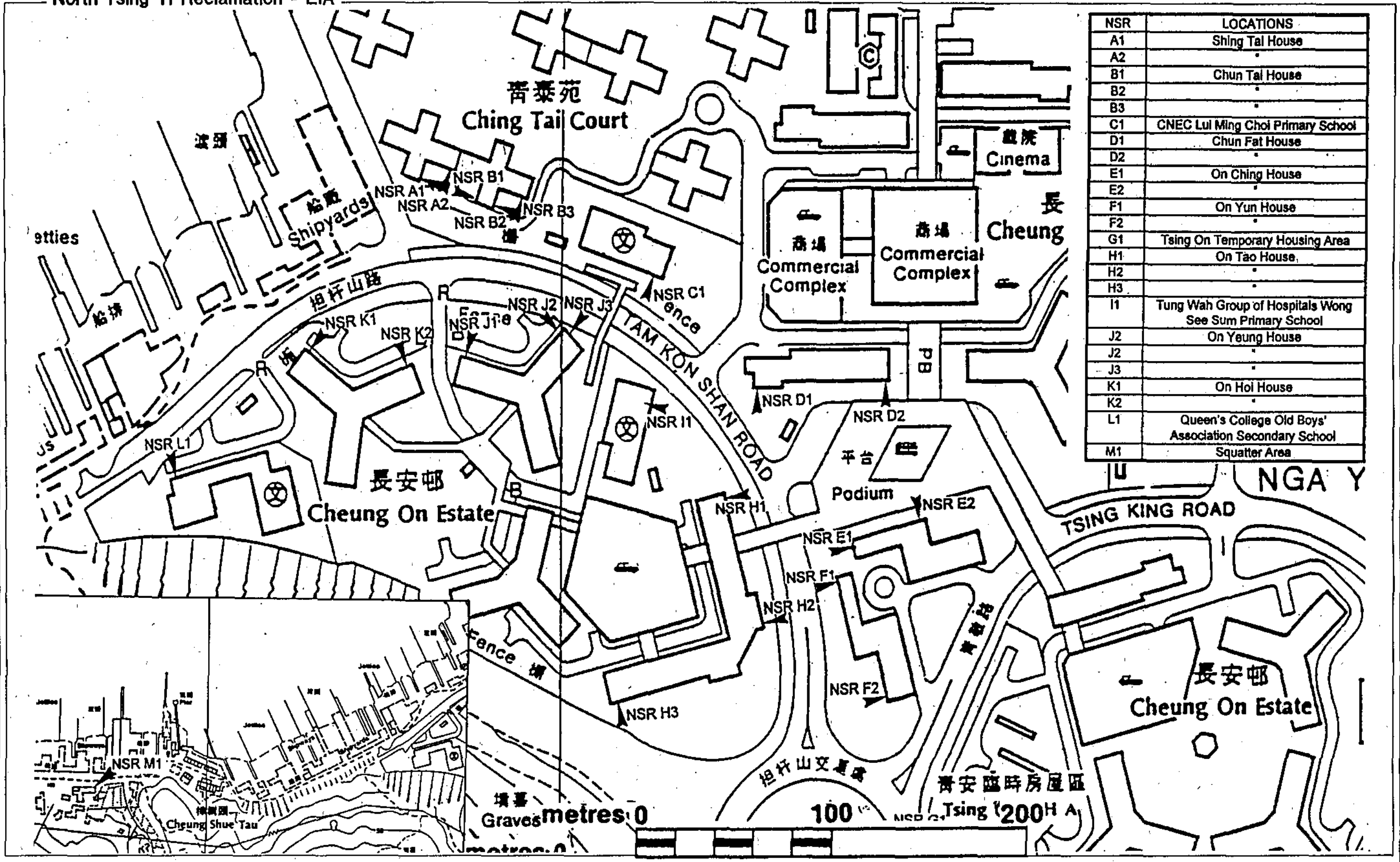
Figure No. 5.1



NSR	LOCATIONS
A1	Shing Tai House
A2	"
B1	Chun Tai House
B2	"
B3	"
C1	CNEC Lui Ming Choi Primary School
D1	Chun Fat House
D2	"
E1	On Ching House
E2	"
F1	On Yun House
F2	"
G1	Tsing On Temporary Housing Area
H1	On Tao House
H2	"
H3	"
I1	Tung Wah Group of Hospitals Wong See Sum Primary School
J2	On Yeung House
J2	"
J3	"
K1	On Hoi House
K2	"
L1	Queen's College Old Boys' Association Secondary School
M1	Squatter Area

Selected Noise Sensitive Facades for Traffic-Related Noise Assessment

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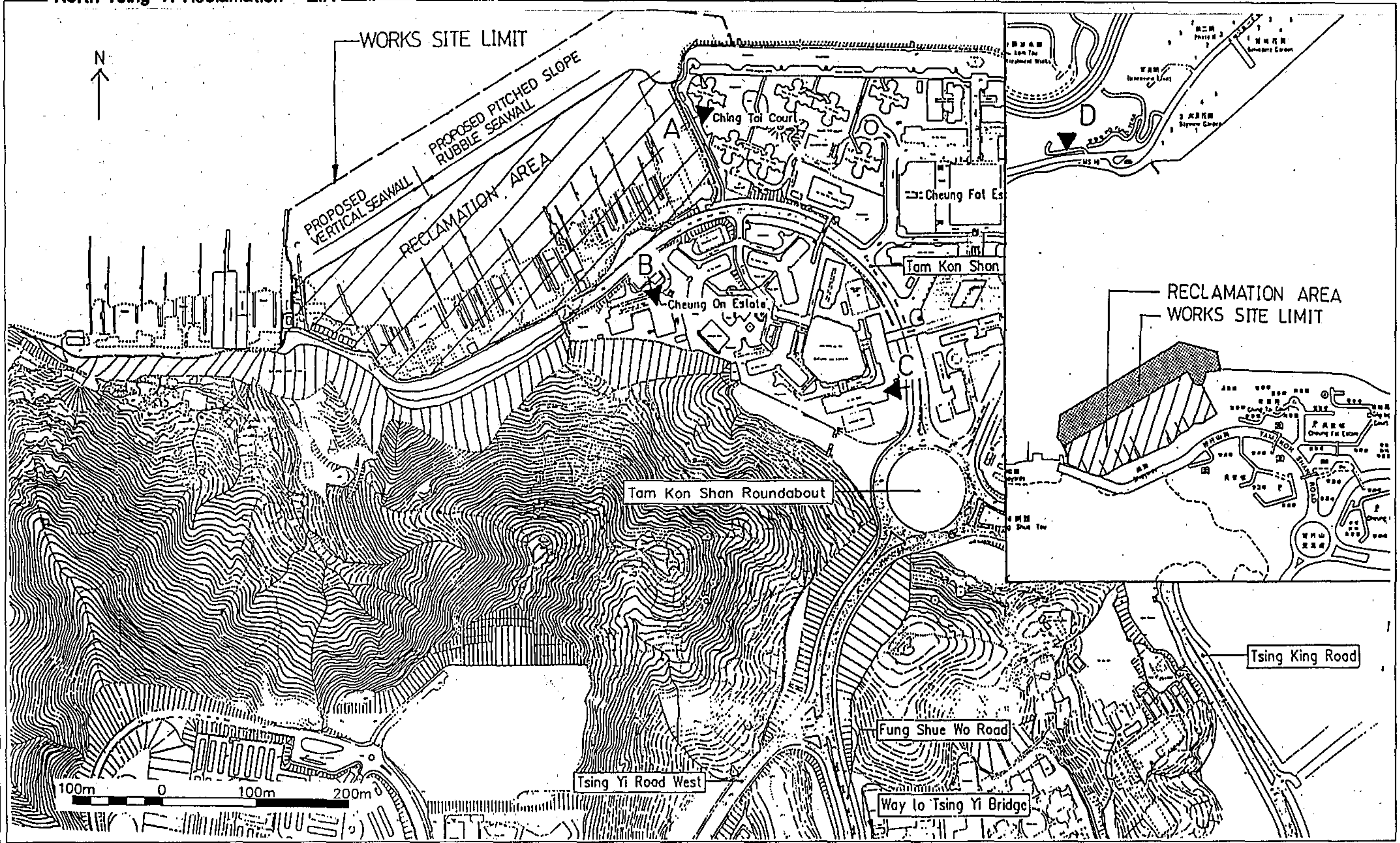
Figure No. 5.2



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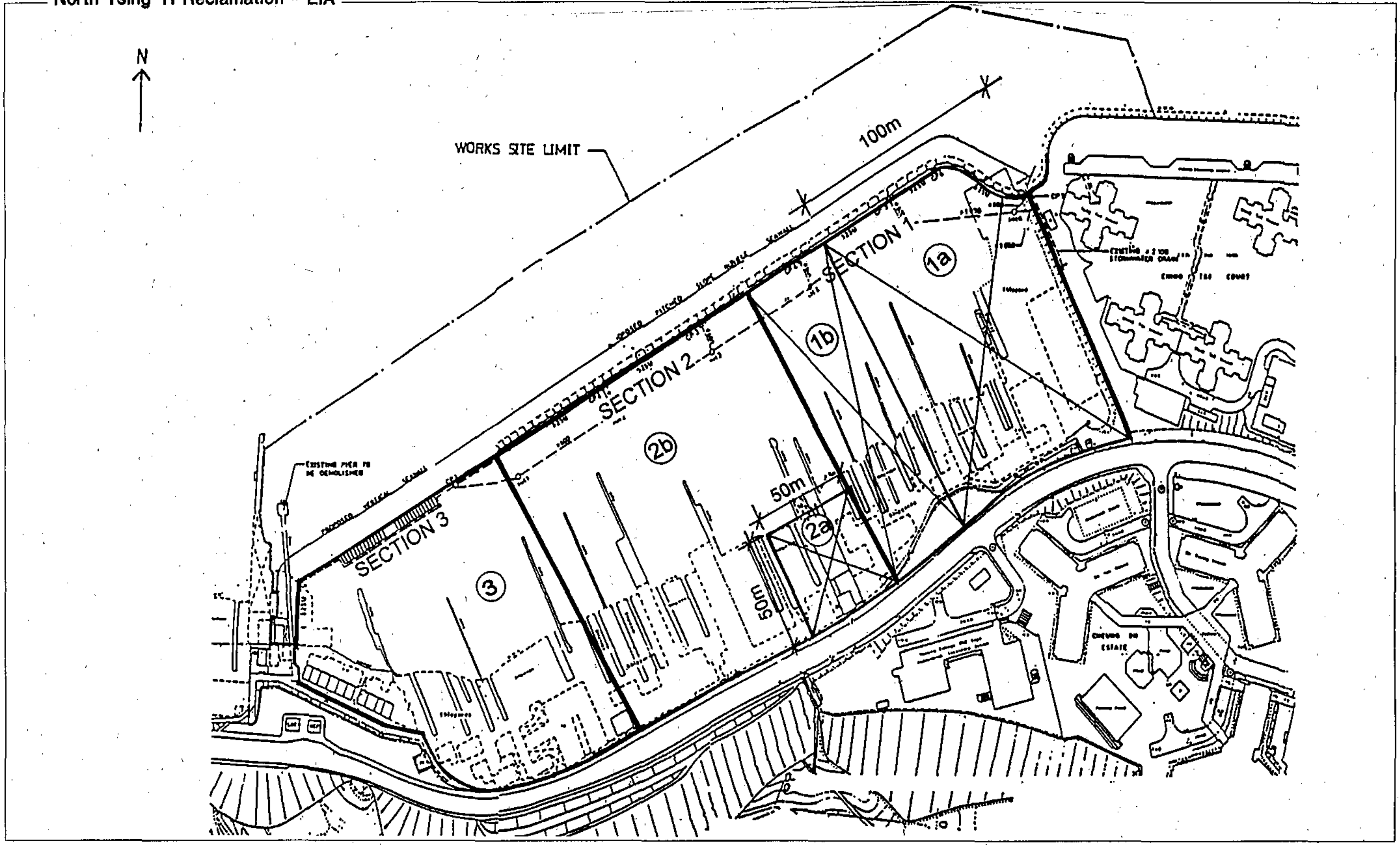
Noise Background Monitoring Locations

Figure No. 5.3



Work Areas for Noise Mitigation

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Figure No. 5.4

6.0 AIR QUALITY

6.1 Introduction

This Section assesses the potential for air quality impacts from site clearance of the existing shipyards, seawall construction, construction of the reclamation and traffic generated along the access road to the Project site.

6.2 Environmental Standards and Guidelines

Dust emissions from construction sites are regulated under the Air Pollution Control Ordinance, which calls for compliance with a set of health-related air quality objectives (AQO) for seven pollutants. Of the parameters listed in the AQO, Total Suspended Particulates (TSP) and Respirable Suspended Particulates (RSP) are relevant for this assessment.

The AQO do not contain hourly criteria for concentrations of TSP and RSP. However, Dust Suppression Guidelines have been established by EPD to indicate the maximum acceptable concentration of TSP during construction works which is a 500 $\mu g/m^3$ hourly average.

The Project is required to comply with the concentration levels shown below in Table 6.1.

Table 6.1: Air Quality Objectives

Parameter	Average Concentration ($\mu g/m^3$)		
	1 hour$^{(1)}$	24 hours$^{(2)}$	1 Year$^{(3)}$
TSP	500$^{(4)}$	260	80
RSP	-	180	55

Notes:
(1) Not to be exceeded more than three times per year.
(2) Not to be exceeded more than once per year.
(3) Arithmetic mean.
(4) EPD Dust Suppression Guideline.

6.3 Air Quality Sensitive Receivers

Air pollution sensitive receivers include residential buildings, schools and recreational areas that may be impacted from the Project activities. A number of such air quality sensitive receivers have been identified close to the proposed Project site and are shown in Figure 6.1. The sensitive receivers include portions of Cheung On Estate, Ching Tai Court, Cheung Fat Estate, Tsing On Temporary Housing Area and Tsing Fat Temporary Housing Area. Other sensitive receivers include the neighbouring educational establishments, basketball courts and football fields which are considered to be prone to dust impacts from the Project activities.

The residential developments along Castle Peak Road in Yau Kam Tau across the Rambler Channel from the Project site are also considered to be potential sensitive receivers.

6.4 Existing Air Quality Environment

6.4.1 General Regional Air Quality

The proposed reclamation is situated at northern Tsing Yi, about 1.3 km away from Tsuen Wan industrial areas and as close as 600 m west of the nearest industrial development (Nga Ying Chau Oil Depot) on Tsing Yi Island. The industrial areas in Tsuen Wan and Tsing Yi Island both house potentially polluting industries.

Ambient pollution concentrations have been monitored by EPD at the Tsuen Wan air quality monitoring station, the station closest to North Tsing Yi. The monitoring results for TSP and RSP for 1993 are shown below in Table 6.2.

Table 6.2: Average 1993 TSP and RSP Levels at EPD's Tsuen Wan Monitoring Station

TSP ($\mu g/m^3$)		RSP ($\mu g/m^3$)	
Maximum Monthly	Annual	Maximum Monthly	Annual
161	101	94	57

Notes: Data for February and March were not available.
Number of valid hourly means is below minimum data requirement.

For TSP, the highest monthly concentration measured at Tsuen Wan Monitoring Station in 1993 was 161 $\mu g/m^3$, while the lowest concentration was 78 $\mu g/m^3$. There was no dust monitoring data collected for the month of February and March, however, for the remaining months of the year the TSP daily objective was met. The RSP concentration recorded at the monitoring station in 1993 varied between 39 to 94 $\mu g/m^3$. NO_2 concentrations were also monitored and showed no exceedances in 1993.

The 1993 sequential meterological data recorded at Ching Pak House has been obtained from the Royal Observatory, and has been used in the air quality assessment for this Report. In general, winds in Hong Kong prevail from the east with an average wind speed of 6.3 m/s (over the years 1961 - 1990).

6.4.2 Background Dust Monitoring Results

Dust levels in the Project area, dust levels were measured from 24 October to 22 November 1994 at four locations surrounding the Project site. The following areas were monitored:

- The podium in front of Tung Tai House;
- The rooftop and ground level at Queen's College Old Boys' Association Secondary School;
- The canopy of On Tao House; and
- The rooftop of Greenview Terrace.

The following parameters were measured:

- 24-hour TSP concentration;
- 24-hour RSP concentration;
- 1-hour TSP concentration;
- 1-hour RSP concentration;
- wind speed; and
- wind direction.

The dust monitoring locations are shown in Figure 6.2. The monitoring report is contained in Appendix E-1 and the results of dust monitoring are summarised in Tables 6.3 to 6.6.

Table 6.3: Background Dust Levels: 24-hour TSP

Monitoring Station	Number of Samples	Mean ($\mu g/m^3$)	Maximum ($\mu g/m^3$)	Numbers of AQO Exceedances
Tung Tai House(1)	14	91	173	0
Queen's College Old Boys' Association Secondary School(1)	14	132	217	0
On Tao House(1)	14	98	159	0
Greenview Terrace(2)	13	133	203	0

Note: (1) Samples taken over a two week time period (14 samples)
(2) Sample time period of 13 days due to power failure on 2/11/94

Table 6.4: Background Dust Levels: 24-hour RSP

Monitoring Station	Number of Samples	Mean ($\mu g/m^3$)	Maximum ($\mu g/m^3$)	Numbers of AQO Exceedances
Tung Tai House(1)	14	56	97	0
Queen's College Old Boys' Association Secondary School(1)	14	81	122	0
On Tao House(1)	14	62	97	0
Greenview Terrace(2)	13	79	115	0

Note: (1) Samples taken over a two week time period (14 samples).
(2) Sample time period of 13 days due to power failure on 2/11/94.

Table 6.5: Background Dust Levels: 1-hour TSP

Monitoring Station	Number of Samples	Mean ($\mu g/m^3$)	Maximum ($\mu g/m^3$)
Tung Tai House	42	104	215
Queen's College Old Boys' Association Secondary School	42	195	523
On Tao House	42	121	293
Greenview Terrace	42	193	422
Note: Based on a 14 day sampling period (three one-hour samples per day).			

Table 6.6: Background Dust Levels: 1-hour RSP

Monitoring Station	Number of Samples	Mean ($\mu g/m^3$)	Maximum ($\mu g/m^3$)
Tung Tai House(1)	42	56	165
Queen's College Old Boys' Association Secondary School(1)	42	137	299
On Tao House(1)	42	75	198
Greenview Terrace(2)	41	125	217
Note: (1) Based on a 14 day sample period (three one-hour samples per day). (2) The one-hour sample conducted on 2/11/94 was not included due to damage to filter medium.			

6.5 Impacts During Site Clearance

The site presently contains shipyards which consist of single and two-storey high workshops, slipways, jetties and piers, most of them being simple steel or wooden structures. As there are only a few concrete structures, it is unlikely that substantial quantities of dust will be generated as a result of shipyard demolition and removal of materials. Vehicle trips to and from the site during site clearance and removal activities are expected to result in minimal dust levels due to the low volume of traffic (18 trucks per week) that would be generated.

The existing shipyards may contain old sewers which could generate odour during dismantling, however, the potential odour occurrences from the dismantling activities are expected to be short term and localised in nature and therefore the potential odours are not considered to be highly noticable to surrounding receivers.

6.6 Impacts During Seawall Construction

The seawall construction activites will include dredging and underwater placement of material. These activities are not considered to be dust generating and would not result in impacts to air quality in the area.

6.7 Impacts During Reclamation Construction

The reclamation construction activities consist of transport of fill material to the site and transfer, placement and compaction of fill material on site to form the reclamation. Dust will be generated by the transport and handling of fill material. The traffic assessment has shown that the total number of vehicles on these roads during reclamation construction will be similar to the number of vehicle that use the roads at present. It is therefore unlikely that there will be any increase in NO_2 pollution levels as a result of vehicles on public roads. The assessment has therefore focused on dust from construction vehicles on Tam Kon Shan Road and vehicles on site.

6.7.1 Assessment Methodology

One-hour, 24-hour and annual average TSP concentrations have been examined, using the Fugitive Dust Model (FDM), to predict worst case dust concentrations. The following input parameters were used in the model:

- Mixing height data as supplied by the Royal Observatory
- Surface roughness 1 m
- Emissions at ground level

Based on activities of similar facilities, it has been estimated that 25% or less of the total reclamation area will be under construction at any one time. Furthermore, it has been assumed that the following measures will be undertaken by the Contractor during the dumping period as normal operating procedures:

- Watering will be carried out twice-daily to suppress dust emissions.
- Areas reaching the final fill level will be progressively covered with hydroseed and a surface water drainage system will be installed to control dust generation and surface water runoff.

Operations on the reclamation itself have been modelled as an area source using the AP-42 emission factor (E_R) for heavy construction operations (1.10×10^{-7} kg/m^2.sec). This is considered the most appropriate emission factor available, since it deals with such operations as land clearance, ground excavation and cut and fill operations which are typical of reclamation and dumping activities.

Stockpiled materials have been modelled as an area source for wind erosion of the stockpile. In accordance with the US Environmental Protection Agency (EPA) publication AP-42, Section 11.2.3, an emission factor of 2.566×10^{-3} kg/day/m^2 was used which was based on the following factors:

- Silt content of material is 15%
- Percentage of time that the unobstructed wind speed exceeds 5.4 m/s at mean pile height would be 19.6 %
- Number of days with 2.5 mm or more precipitation per year is 122 days
- There will be one stockpile on the site with an area of 500 m^2 and a mean height of 3 m

The access road (Tam Kon Shan Road) is a paved 2-lane urban road. This road has been modelled as a line source in accordance with the AP-42 publication using a TSP emission factor of 15 gram per vehicle-kilometer travelled.

A haul road will be necessary to transport materials to the tipping area. It is assumed that a 7 m wide haul road, running along the western and northern boundaries of the reclamation site, will be provided. The road has been modelled as a line source using the AP-42 emission factor for unpaved road of 0.762 kilogram per vehicle-kilometer travelled. The emission factor was obtained based on a vehicular speed of 12 kph, and twice-daily watering as a normal operation. According to AP-42 publication, twice-daily watering can reduce dust emissions by up to 50 percent.

The FDM does not permit emission factors (which are input in units of quantity per second) to change over time. As a result, it is not possible to combine appropriate reductions in the 24-hour emission factors for traffic on the access road and for activities on the reclamation, which are dust emitters for only 8 to 9 hours per day and one year's sequential meteorological data. For this reason, an alternative methodology to estimate 24-hour TSP concentrations has been utilised.

The FDM permits 1, 3, 8 and 24 hour averages to be calculated. Working within this limit, the 8-hour average (A_8) based on emission factors E_{AR}, E_{HR} and E_R and on an 8 hours subset of meteorological data per day, has been obtained, along with a 24-hour average (A_{24}) based on emission factor E_8. The combined 24-hour average has been calculated using the following formula:

$$(A_8\,(8/24)) + A_{24}$$

A similar methodology has been used to obtain the annual averages.

A background TSP concentration of 101 $\mu g/m^3$ has been added to the predicted annual model results to obtain the cumulative concentrations. This figure is based on the annual average obtained during 1993 at EPD's Tsuen Wan Monitoring Station.

With regard to the annual average TSP concentration, the monitoring results for the year 1993 obtained from EPD's Tsuen Wan Monitoring Station, the closest station to North Tsing Yi, have been used as the baseline data. North Tsing Yi and Tsuen Wan are neighbouring coastal urban areas situated close to hill sides but they do have different development environments. Tsuen Wan is an industrial town with industrial sites heavily developed across the area. North Tsing Yi, on the other hand, is mainly a residential area with only a few industrial activities nearby (ie. a number of shipyards to the west and an oil depot to the east). The major industrial sites are located largely along the coasts at the southern half of Tsing Yi Island and are at least 2 km away from the area. As such, it is anticipated that the annual average TSP concentration level at North Tsing Yi would be lower than that obtained from Tsuen Wan (101 $\mu g/m^3$). This can further be substantiated by the baseline TSP concentration levels measured in the area. According to the background monitoring results, the mean daily averaged TSP concentration is 132 $\mu g/m^3$ (also see Section 6.4.2), which is approximately 50% of the AQO.

Background TSP concentrations of 132 $\mu g/m^3$ and 195 $\mu g/m^3$ have been added to the predicted 24-hour and 1-hour model results respectively to obtain the cumulative concentrations. These figures are derived from the mean monitored values obtained at Station "B" (Queen's College Old Boys' Association Secondary School). As the dust impacts are expected to be higher at ground level, background data recorded from this monitoring station is more appropriate than the results obtained from other stations. The air samplers were located at low levels at Station "B" while the samplers were positioned at high levels at all other stations.

6.7.2 Impacts from Reclamation Construction

Dust concentrations have been calculated and modelling results at ground level are presented in Table 6.7 and as concentration contours in Figures 6.3 and 6.4. The 1-hour and 24-hour values include background dust levels.

Table 6.7: Predicted TSP Concentrations at Exposed Sensitive Receivers

Sensitive Receivers	TSP Concentration at Ground Level (μg/m³)			
	1-hour		24-hour	
	Net	Cumu.	Net	Cumu.
Queen's College Old Boys' Association Secondary School	315	510	99	231
Cheung On Estate (On Hoi House)	333	528	91	223
T.W.G.H. Wong See Sum Primary School	171	366	40	172
Ching Tai Court (Tung Tai House)	1,090	1,285	168	300
C.N.E.C. Lui Ming Choi Primary School	181	376	47	179
Cheung Fat Estate (Chun Fat House)	136	331	33	165
Ting Fat Temporary Housing Area	59	254	14	146
Tsing On Temporary Housing Area	99	294	20	152

According to the modelling results, the hourly averaged TSP concentrations are expected to exceed the maximum acceptable level of 500 μg/m³ at Queen's College Old Boys' Association Secondary School, On Hoi House at Cheung On Estate, and Tung Tai House, Shing Tai House, Chun Tai House, Hong Tai House and Po Tai House at Ching Tai Court. Exceedance of the daily average is expected to occur at Tung Tai House. Dust impacts at the worst-affected receivers are mainly due to the movement of the dump trucks on the haul road and handling of material. Stockpiling on the site and the movement of trucks on the paved Tam Kon Shan Road are not expected to contribute significantly to the dust levels.

Daily average TSP concentrations were also calculated at 0, 5, 10, 15 and 20 m above ground at the above representative receivers. The results have been plotted as vertical concentration profiles and are contained in Appendix E-2. For purpose of illustrating the height variation, the background dust concentration has been included. According to these profiles, maximum TSP concentrations will occur at ground level.

The results indicate that dust suppression measures, in addition to the normal provisions, are required to reduce dust concentrations to acceptable levels. The mitigation measures that are required and their anticipated effectiveness are addressed in Section 6.9.

The predicted annual averaged TSP concentrations at the sensitive receivers due to the reclamation activities are only 1 to 11 $\mu g/m^3$. It is thus expected that the air quality impact would be minimal and the annual cumulative dust impact would be well within the AQO.

6.8 Summary of Dust Impacts

The dust impacts from the Project activities are shown below in Table 6.8.

Table 6.8: Summary of Dust Impacts

Phase	Activities	Level of Impact
Site Clearance	Demolition of Structures and removal of materials	Insignificant
Seawall Construction	Dredging, sand and rock placement	Insignificant
Reclamation Construction	Material filling (including movement of dump trucks on haul road) and stockpile of materials	Significant at Queen's College Old Boy's Association Secondary School, On Hoi House at Cheung On Estate and Tung Tai House, Shing Tai House, Chun Tai House, Hong Tai House and Po Tai House at Ching Tai Court.
	Project related traffic along Tam Kon Shan Road	Insignificant

6.9 Mitigation Measures

As dust emissions from reclamation construction are expected to produce a significant impact at nearby sensitive receivers, effort should be made by the Contractor to reduce dust emissions. In general, dust emissions from the Project may be suppressed by means including wetting, covering of exposed surfaces to prevent wind erosion, and minimization of mechanical disturbance. The following specific measures are proposed to be implemented during reclamation construction to reduce Project generated dust emissions.

6.9.1 General Compliance Criteria

The Contractor shall undertake at all times to prevent dust nuisance from the Works. The Contractor shall ensure that levels of Total Suspended Particulates (TSP) do not exceed 500$\mu g/m^3$ at the site boundary or 260$\mu g/m^3$ at the nearest sensitive receivers.

6.9.2 Haul Road Mitigation Measures

1. The Contractor should water the road at least four times a day.

2. Dust emission should further be controlled by limiting the vehicular speed to 8 kph and confining haulage and delivery vehicles to designated roadways. The 8 kph speed limit should be posted on site in areas visable to incoming drivers. If found not effective by the Site Engineer, other measures such as chicanes (double bends) or speed bumps should be implemented.

3. If it is found through the dust monitoring that watering and limiting vehicular speed are not effective, then paving of the haul road should be required to reduce dust to an acceptable level.

6.9.3 Access Road Mitigation Measures

In order to protect those receivers near the access road, the following measures are recommended for the access road during reclamation construction.

1. The Contractor should provide a comprehensive washing facility for vehicles exiting the site to remove dust and grit from the tires, undercarriage and body of the vehicle.

2. Proper cleaning of the access road (e.g. flushing or vacuuming) should be conducted twice a week.

6.9.4 Reclamation Construction Mitigation Measures

1. The Contractor should water any stockpile of materials twice daily and provide windbreaks on three sides to prevent wind erosion at stockpiles. During excessive dust generating activities, continuous water or chemical treatment should be used to more effectively wet fines and retain moisture. During adverse weather conditions (e.g. windy and dry conditions) additional watering over and above the normal twice-daily watering should be conducted.

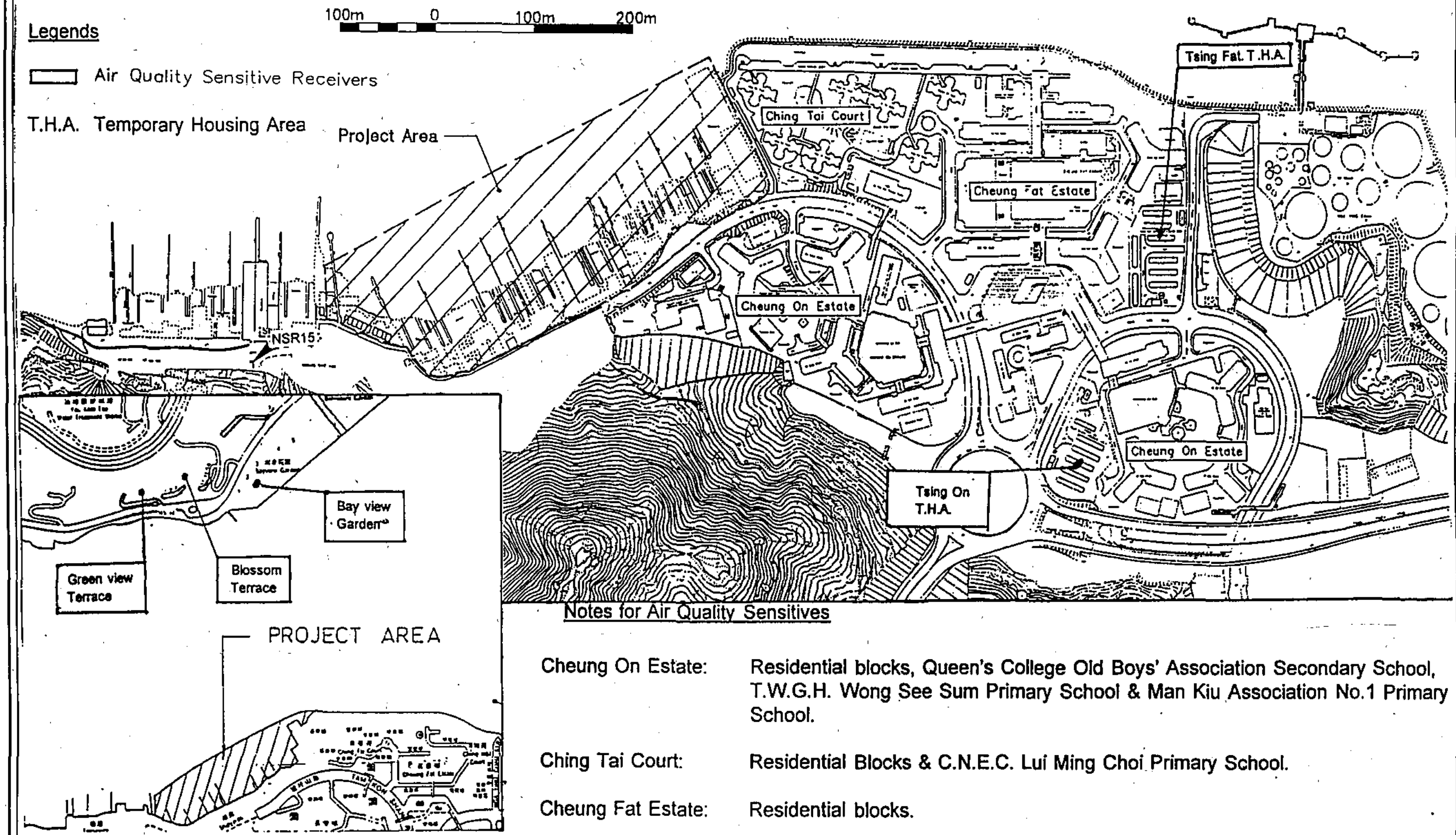
2. The Contractor should be required to hydroseed reclaimed areas progressively as reclaimed areas reach the final fill level.

6.10 Residual Impacts

Predictions of dust impacts with the recommended mitigation are presented in Table 6.9, and dust concentration contours are shown on Figures 6.4 and 6.5. The results indicate that TSP emissions from the reclamation site will be reduced to acceptable levels over the entire study area without residual impacts.

Table 6.9: Predicted TSP Concentrations at the Most Exposed Sensitive Receivers with Proposed Mitigation Measures

Sensitive Receivers	TSP Concentration at Ground Level ($\mu g/m^3$)			
	1-hour		24-hour	
	Net	Cumu.	Net	Cumu.
Queen's College Old Boys' Association Secondary School	94	289	36	168
Cheung On Estate (On Hoi House)	135	330	42	174
T.W.G.H. Wong See Sum Primary School	73	268	23	155
Ching Tai Court (Tung Tai House)	292	487	65	197
C.N.E.C. Lui Ming Choi Primary School	119	314	32	164
Cheung Fat Estate (Chun Fat House)	83	278	20	152
Ting Fat Temporary Housing Area	28	223	7	139
Tsing On Temporary Housing Area	36	231	11	143



Notes for Air Quality Sensitives

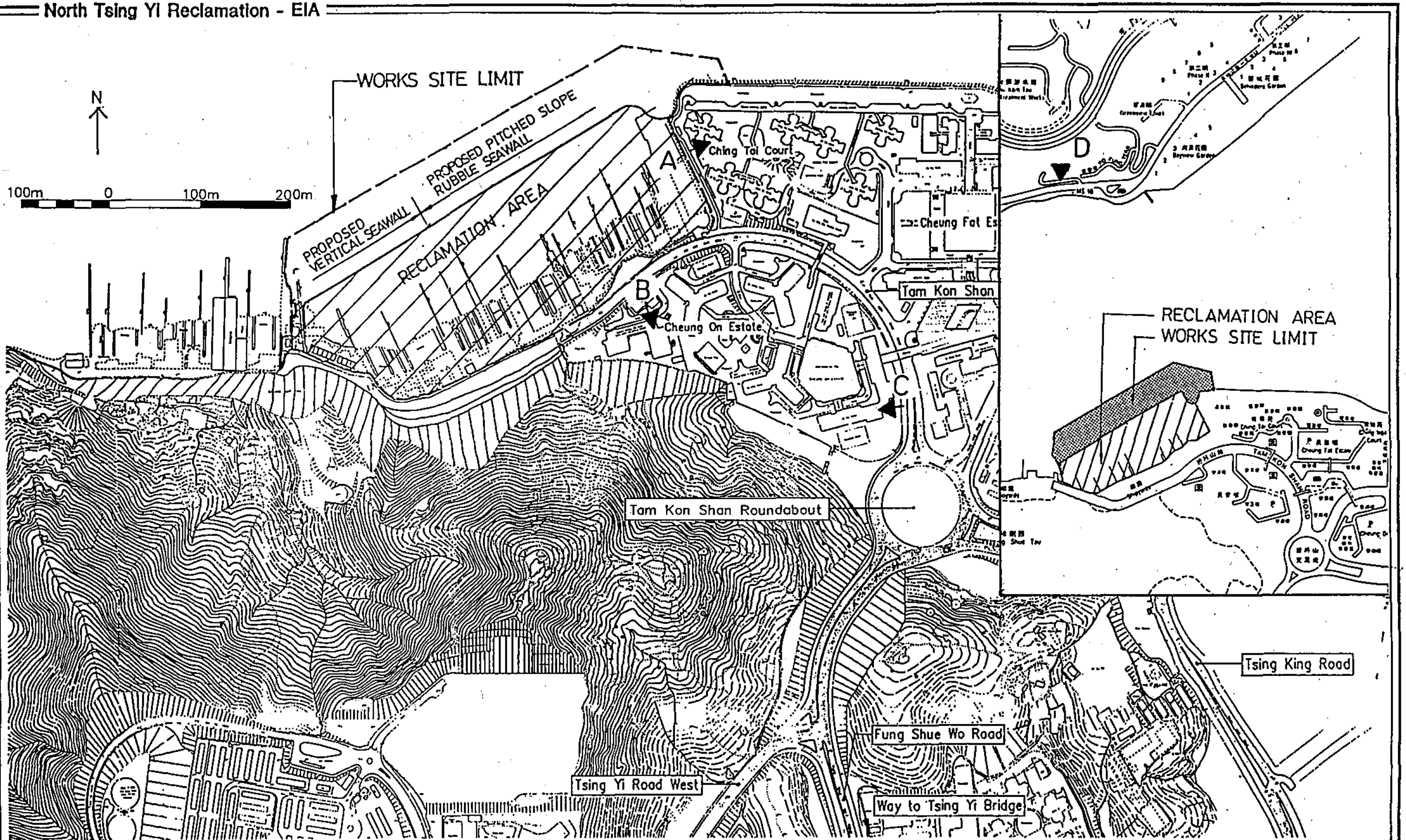
Cheung On Estate:	Residential blocks, Queen's College Old Boys' Association Secondary School, T.W.G.H. Wong See Sum Primary School & Man Kiu Association No.1 Primary School.
Ching Tai Court:	Residential Blocks & C.N.E.C. Lui Ming Choi Primary School.
Cheung Fat Estate:	Residential blocks.

Air Quality Sensitive Receivers

Mouchel

Figure No. 6.1

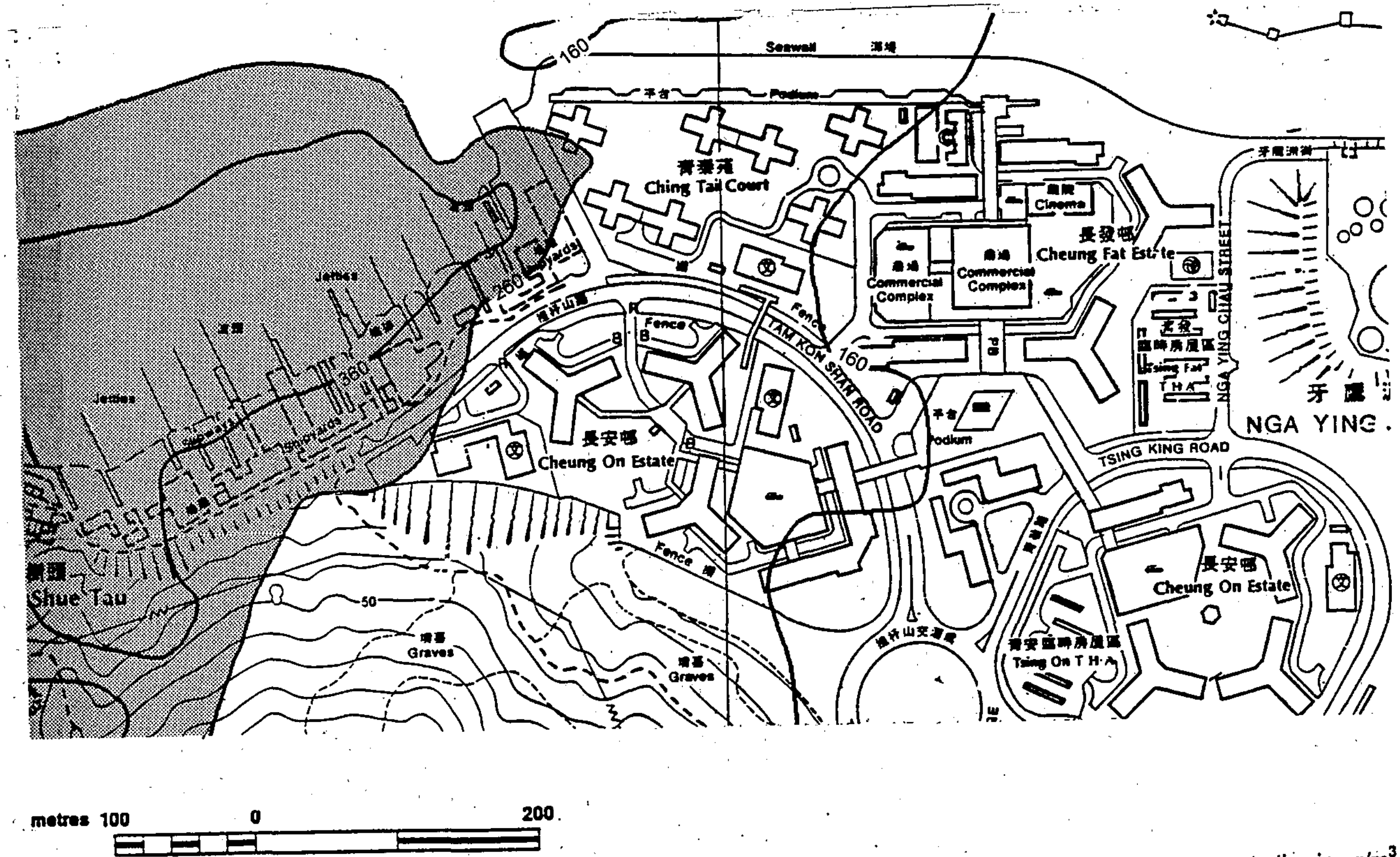
North Tsing Yi Reclamation - EIA



Air Quality Background Monitoring Locations

Mouchel

Figure No. 6.2



Concentration in $\mu g/m^3$

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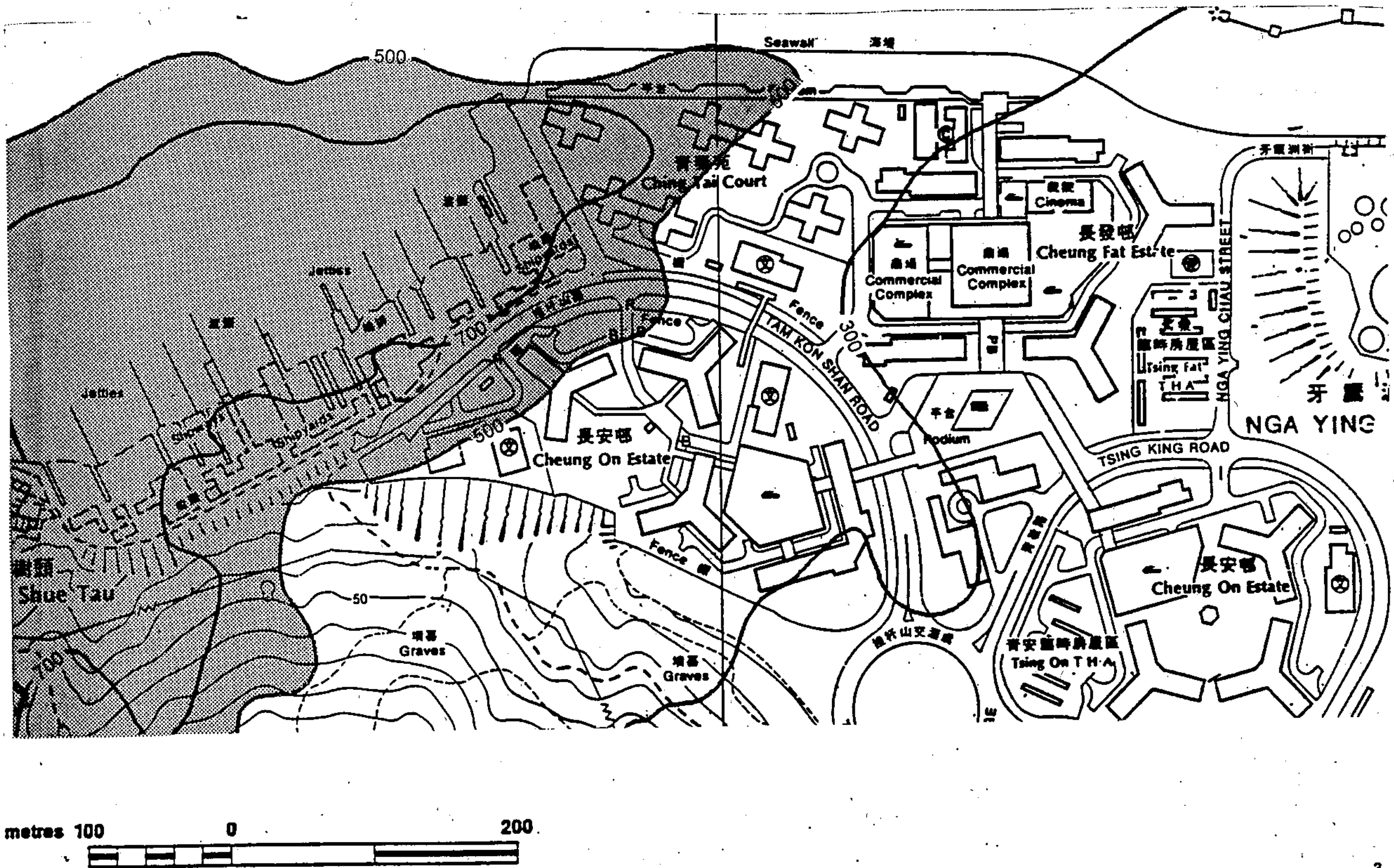
Daily Average TSP Concentrations (Unmitigated)

Figure No. 6.3

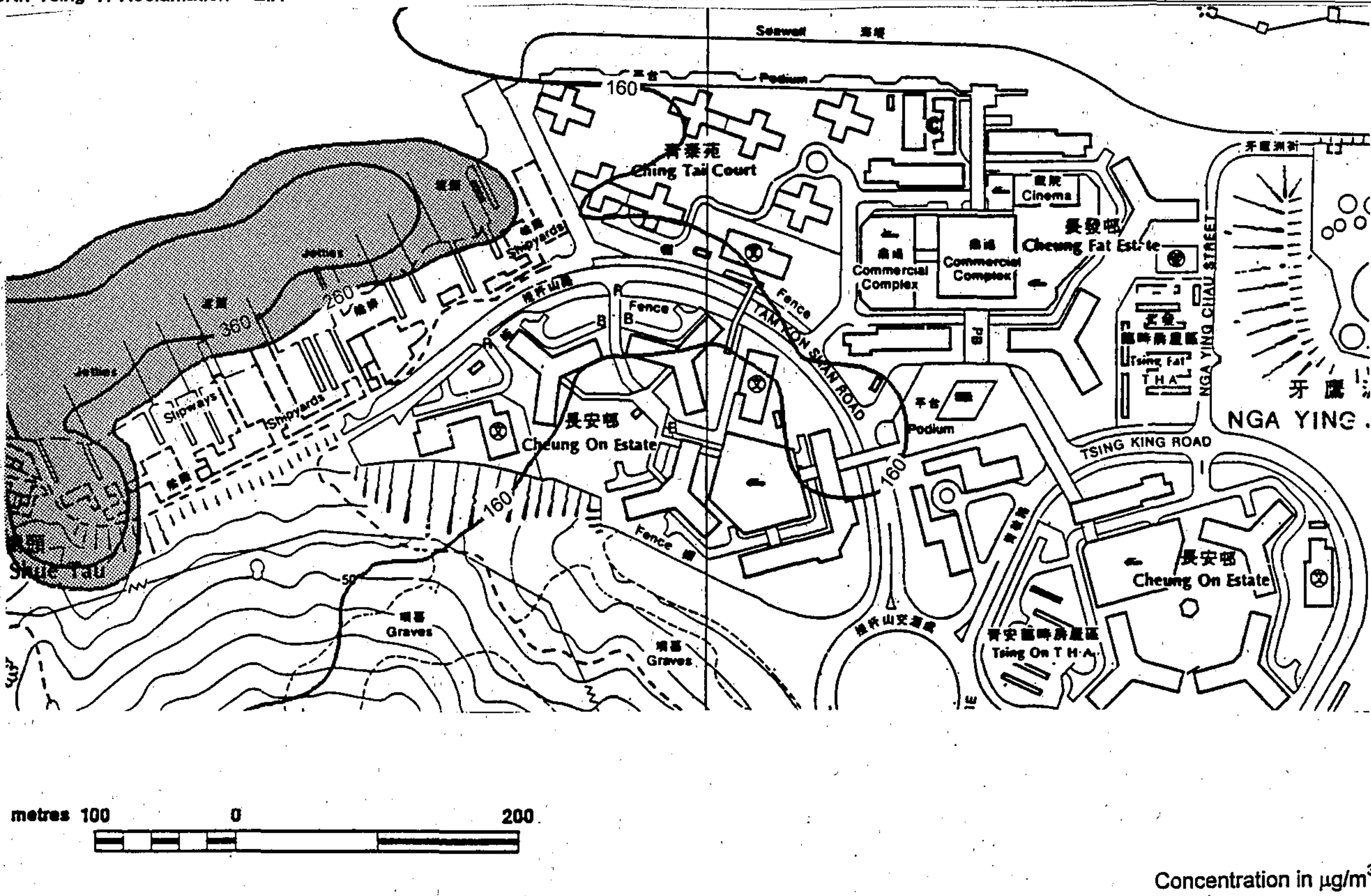


Concentration in $\mu g/m^3$

Hourly Average TSP Concentrations (Unmitigated)

Mouchel

Figure No. 6.4



Daily Average TSP Concentrations (Mitigated)

Mouchel

Figure No. 6.5

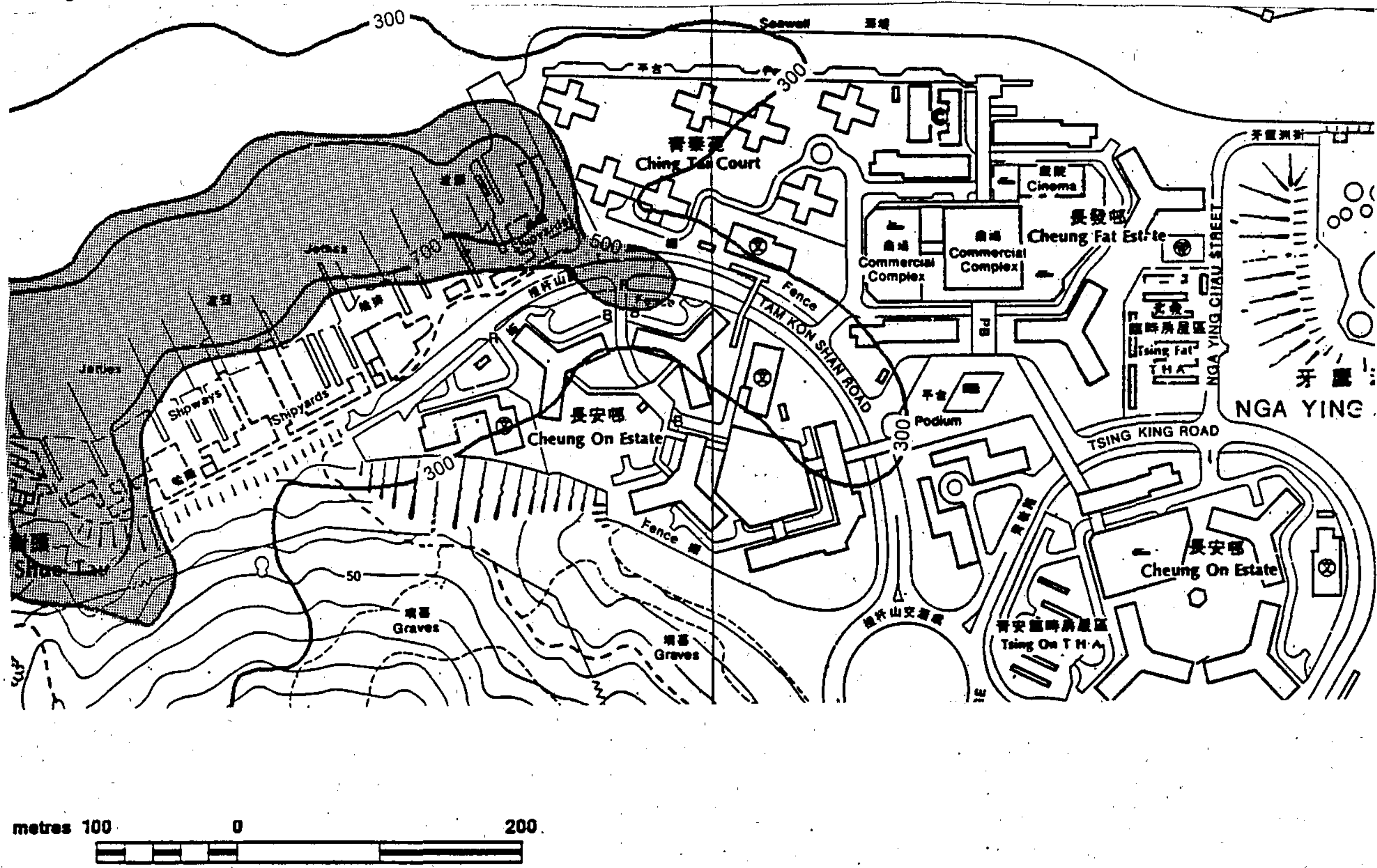


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Figure No. 6.6

Hourly Average TSP Concentrations (Mitigated)

7.0 MARINE WATER QUALITY AND SEDIMENTS

7.1 Introduction

This Section assesses the impacts of Project activities on marine water in the Project area. The study was undertaken by review of existing marine water and sediment data, assessment of information from background marine water and sediment sampling and analyses, and modelling and analyses of potential marine water quality impacts.

7.2 Environmental Standards and Guidelines

7.2.1 Marine Water Quality Standards

Marine water quality in Hong Kong is managed through the process of assigning Beneficial Uses (BU) to the Water Control Zone (WCZ). Associated with the BU are the Water Quality Objectives (WQO) which are a series of water quality parameters that are assigned numerical values or permissable changes in magnitude. The Project is located within the Western Buffer Water Control Zone (WBZ) which was gazetted as a WCZ in 1993. The Project is also located close to the Victoria Harbour Water Control Zone (VHZ), Phase I of which was gazetted at the end of 1994. Although the Project site lies within the WBZ, its proximity to the boundary of the VHZ is such that the proposed WQO of the VHZ should be considered as part of the impact assessment. The boundaries between the two zones are shown in Figure 7.1.

7.2.2 Beneficial Uses for Marine Waters

The range of BU and sensitive receivers for the two zones are given in Table 7.1. BU1 is maintained by the application of the WQO directly to the food substance and not the water from which the food was taken. Consequently, there are no defined parameters in the marine environment which are controlled. WQOs expressed in terms of numerical values have been derived for particular quality parameters to ensure that water quality is suitable for the assigned BUs. The water quality parameters which are required to be controlled to maintain the prescribed BUs are given in Table 7.2.

7.2.3 Marine Water Quality Objectives

The WQO for the WBZ and those in the VHZ Phase I are defined in Tables 7.3 and 7.4 respectively.

7.2.4 Quality Targets for Flushing and Cooling Water

Water taken from the sea for flushing undergoes screening and chlorination prior to supply to the seawater network. The Water Supplies Department (WSD) have target values for water quality designed to minimise sediment accumulation in the system, safeguard public health and provide water which is aesthetically acceptable for its purpose. The target values applied by WSD are given in Table 7.5.

Table 7.1: Beneficial Uses Applicable to Marine Waters of WBZ and Proposed for VHZ

BU	Beneficial Use	Victoria Harbour	Western Buffer
BU1	Source of food for human consumption	-	+
BU2	Resource for commercial fisheries and shell fisheries	-	+
BU3	Habitat for marine life and a resource for human exploitation	+	+
BU4	Bathing	-	+
BU5	Secondary contact recreation such as diving, sailboard and dinghy sailing	*	+
BU6	Domestic and industrial purposes	+	+
BU7	Navigation and shipping and use of officially approved and endorsed sheltered harbours and typhoon shelters as temporary havens	+	+
BU8	Aesthetic enjoyment	+	+

Note: * BU5 for Victoria Harbour covers the dinghy sailing off the Royal Hong Kong Yacht Club.
+ Applicable, - not Applicable

Table 7.2: Water Quality Parameters to be Controlled for Specific Marine Related Beneficial Uses

Parameter	BU1	BU2	BU3	BU4	BU5	BU6	BU7	BU8
Aesthetic	-	+	+	+	+	+	+	+
Bacterial	-	-	-	+	+	+	-	-
Dissolved Oxygen	-	+	+	-	-	+	-	-
pH	-	+	+	+	+	+	-	-
Ammonia	-	+	+	-	-	+	-	-
Temperature	-	+	+	-	-	-	-	-
Colour	-	+	+	+	+	+	-	-
Suspended Solids	-	+	+	-	-	+	-	-
Salinity	-	+	+	-	-	-	-	-
Dangerous Substances	-	+	+	+	+	+	-	-

Note: + Applicable, - not Applicable

Table 7.3: Marine Water Quality Objectives for the WBZ

Parameter	Objective	Part of Zone
Offensive odour, tints and colours	not to be present	whole marine zone
Visible foam, oil, grease, scum, litter	not to be present	whole marine zone
E.coli	annual mean not to exceed 610/100 ml bathing season mean not to exceed 180/100 ml	secondary contact recreation sub-zone fish culture subzone bathing beach subzones
Dissolved Oxygen within 2 m of the bottom	not less than 2 mg/l for 90% of samples	whole marine zone
Dissolved Oxygen depth averaged	not less than 4 mg/l for 90% of samples not less than 5 mg/l for 90% of samples	marine waters except fish culture sub zone fish culture sub zone
pH value	values to be 6.5-8.5 change due to human activity less than 0.2	whole marine zone
Salinity	change due to human activity less than 10% of natural ambient level	whole marine zone
Temperature Change	change due to human activity not to exceed 2 Centigrade degrees	whole marine zone
Suspended Solids	human activity not to raise the natural ambient level by 30% nor cause accumulation of suspended solids which may adversely affect aquatic communities	whole marine zone
Toxic Substances	not to be present at levels producing significant toxic effects	whole marine zone
Unionised Ammonia	annual mean not to exceed 21 µgN/l	whole marine zone
Nutrients	not be present in quantities that cause excessive algal growth annual mean depth average inorganic nitrogen not to exceed 0.4 mg/l	whole marine zone

Table 7.4: Marine Water Quality Objectives for Phase I of the VHZ

Water Quality Parameter	Objective	Part of Zone
Offensive odour, tints and colours	not to be present	whole marine zone
Visible foam, oil, grease, scum, litter	not to be present	whole marine zone
Dissolved Oxygen depth averaged	not less than 4 mg/l for 90% of sampling occasion annually	whole marine zone
Dissolved Oxygen within 2 m of the bottom	not less than 2 mg/l for 90% of sampling occasion annually	whole marine zone
pH value	values to be 6.5-8.5 change due to human activity less than 0.2	whole marine zone
Salinity	change due to human activity less than 10% of natural ambient level	whole marine zone
Temperature Change	change due to human activity not to exceed 2 Centigrade degrees	whole marine zone
Suspended Solids	waste discharge not to raise the natural ambient level by 30% nor cause accumulation of suspended solids which may adversely affect marine communities	whole marine zone
Toxic Substances	not to be present at levels producing significant toxic effects	whole marine zone
Unionised Ammonia	annual arithmetic mean not to exceed 21 μgN/l	whole marine zone
Nutrients	not to be present in quantities to cause excessive algal growth. annual mean depth averaged Inorganic Nitrogen not to exceed 0.4 mg/l	whole marine zone

Table 7.5: Target Limits for Water Quality for Flushing Water

Water Quality Parameter	Target Limit
Colour	< 20 Hazen Units
Threshold Odour Number	<100
Turbidity	<10 NTU
E coli	<20,000/100 ml
Dissolved Oxygen	>2 mg/l
BOD	<10 mg/l
Suspended Solids	<10 mg/l
Synthetic Detergents	<5 mg/l
Ammoniacal Nitrogen	<1 mg/l

For the West Kowloon Project area the Mass Transit Railway Corporation (MTRC) suggested a critical threshold values of a suspended solids level of 180 mg/l based on operational requirements. This figure represents a level at which the concentration of suspended solids may have an effect on the pump bearings and should be regarded as an upper limit. The actual limit for any one particular user will be system dependent. However, since there are no registered cooling water abstraction in the vicinity of the project site there is no potential impact which can be determined.

7.2.5 Marine Sediment Criteria

The Environmental Protection Department (EPD) Technical Circular (TC No 1-1-92) contains the criteria for classification of sediments based on their level of contamination by toxic metals. The criterion for inclusion in a particular class requires that if the concentration of one or more metal lies within a class boundary the sediment is defined as that class. The boundaries for each class are defined in Table 7.6.

Table 7.6: Criteria for Marine Sediment Quality Classification

Class	Determinant (mg/kg)						
	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
Class A	0-1.0	0-50	0-55	0-65	0-0.8	0-35	0-150
Class B	1.0 - 1.4	50 - 79	55 -64	65-74	0.8-0.9	35-39	150-190
Class C	≥ 1.5	≥ 80	≥ 65	≥ 75	≥ 1.0	≥ 40	≥ 200

The constraints on dredging and disposal of each class of sediment are as follows:

Class A - Uncontaminated sediments for which no special dredging, transport or disposal methods are required other than those necessary for compliance with the WQO or for the protection of sensitive receivers in the vicinity of dredging works.

Class B - Moderately contaminated material which requires special care during dredging and transport and which must be disposed of in such a way as to minimise the loss of pollutants into solution or suspension.

Class C - Seriously contaminated sediments which must be dredged and transported with great care and which cannot be dumped in the gazetted marine grounds and which must be effectively isolated from the environment upon final disposal.

The EPD Technical Circular (TC No. 1-1-92) does not provide guidelines for levels of contamination by organic contaminants. Values given in the Final Report of the Contaminated Spoil Management Study have been used as an approximate guide. The Lowest Observed Effect Concentrations (LOEC) are given as 0.0029 mg/kg for total PCB and 0.87 for total PAH in marine sediments. The same report cites a Maximum Allowable Risk Level (MARL) for PCB of 0.04 mg/kg.

The authority for the licensing and statutory control of marine disposal of dredged mud lies with the Director of Environmental Protection (DEP). The Fill Management Committee (FMC) is responsible for the management and allocation of the mud disposal capacity at the different disposal sites, FMC is guided by WBTC 22/92 in performing this task.

Under the terms of WBTC 22/92, the disposal of 500,000 m^3 or more of uncontaminated mud or any volume of contaminated mud will not be considered until the need for removal of the mud has first been demonstrated. The volume of sediment which would need to be dredged for this Project, if conventional seawall construction techniques were to be used, has been estimated to be approximately 105,000 m^3. The sediment is in the Class "C" category; therefore, the rationale for mud removal must be provided by the seawall design team and directed to the Principal Government Geotechnical Engineer who acts as adviser to the FMC on this matter.

The legislative control on marine dumping under the Dumping at Sea Act 1974 (Overseas Territories) Order 1975 (DASO) is enforced by the EPD through the issue of licences which are valid for specific periods of time, specific quantities and types of waste and are subject to certain conditions. Failure to comply with the licence conditions renders the contractor liable to legal action and, for repeated offences, refusal of future licences. Since January 1993 the issue of a licence has required that the vessel transporting the waste has a self monitoring system which records the location and draft of the vessel, date and time. The data are retrievable by EPD who can monitor the vessels and detect short dumping.

7.3 Sensitive Receivers

Sensitive receivers are defined as those users of the marine environment whose use could be impaired as a result of a reduction in quality. The sensitive receivers that have been identified are shown in Figure 7.2. The sensitive receivers which were considered are as follows:

- Mariculture Zone at Ma Wan of approximately 46,300 m^2;
- Gazetted Bathing Beaches including:- Tung Wan (Ma Wan), Angler's, Gemini, Hoi Mei Wan, Casam, Lido, Ting Kau, and Approach where both swimming and secondary contact recreation activities occur;
- The WSD sea water intakes for flushing water, Drainage Services Department (DSD) sea water intakes for band screen washing and two oil depot pumphouses in the Rambler Channel; and
- In addition to the point use sensitive receivers, the marine water quality in the WBZ and VHZ are considered as sensitive receivers.

The study area for marine water quality has been based on the results of initial float track modelling carried out using the WAHMO hydrodynamic model. These studies have shown that the sediment plume generated from the Project would not affect the mariculture zone at Ma Wan or the Gazetted Bathing Beaches.

7.4 Existing Conditions

7.4.1 General Marine Water Quality

The marine waters of Hong Kong are subject to a wide range of pollution sources, including domestic sewage effluent, contaminated storm water, industrial effluent, reclamation works and dredging activities. In the western part of the Territory, the Pearl River has a strong freshwater influence which affects the salinity profile, temperature, nutrient loads and suspended solids concentrations in the local marine waters. The extent of influence of the Pearl River varies significantly between the two main seasons, being greater during the wet season than during the dry season.

7.4.2 Available Background Data of Marine Water

As part of its role in monitoring and protecting the marine environment in Hong Kong, the EPD carry out routine water quality surveys throughout the Territory's waters. Data have been provided by the EPD from their routine monitoring data for two stations in the WBZ (WM3 and WM4) and three stations in the VHZ (VH12, VH13 and VH14). The locations of these monitoring stations are shown in Figure 7.1 and a summary of the water quality at the five locations for the years 1991, 1992 and 1993 is provided in Appendix F-1. Data relating to specific water quality parameters are discussed in the following Sections.

7.4.3 Influences on Water Quality Adjacent to the Project Area

The influences on water quality in the Project area include:

- Water from the Pearl River containing, in particular, high suspended solids;
- Discharges from foul sewers and storm drains into the Rambler Channel; and
- Restricted flushing of the Rambler Channel due to low tidal currents.

7.4.4 Water Movements in the Rambler Channel

The extent of the water movement and hence flushing of the Rambler Channel is demonstrated by simulated float track plots from the WAHMO hydrodynamic model given in Appendix F -2. The four different tides the were simulated were wet and dry season spring and neap tides. The simulation comprised 'floats' being released on the surface and bottom water layers of the reclamation site at the start of the flood and ebb tide cycles. The tidal plots indicate the position of the float at hourly intervals during the succeeding tidal cycle which enables the westward and eastward movement of water originating at the project site to be followed. The excursions for the different releases are summarised in Table 7.7 and show that the greatest excursion occurs during a wet season spring tide and the least occurs during a dry season neap tide. These represent the greatest and least dispersive situations which could occur. Consequently, these season/tide combinations have been chosen for the more detailed sediment plume modelling.

Table 7.7: Simulated Float Track Excursions for Wet and Dry Season/Spring and Neap Tides

Season/Tide	Water Layer	Release Time	Excursion (m)		
			Westward	Eastward	Total Range
Wet Season					
neap	S	flood	1,100	3,200	5,400
	S	ebb	0	4,300	
	B	flood	700	900	1,900
	B	ebb	0	1,200	
spring	S	flood	700	beyond channel after 21 hr	>6,200
	S	ebb	0	beyond channel after 6 hr	
	B	flood	800	0	4,400
	B	ebb	0	3,600	
Dry Season					
neap	S	flood	800	3,400	4,400
	S	ebb	0	3,600	
	B	flood	450	0	3,450
	B	ebb	0	3,000	
spring	S	flood	1,600	0	5,700
	S	ebb	0	4,100	
	B	flood	700	0	4,000
	B	ebb	0	3,300	

Note : S - Surface layer, B - Bottom layer

7.4.5 Existing Compliance with WQO and other Water Quality Criteria

The existing marine water quality has been considered by comparing the marine water quality data with the WQO and other criteria required by users, where these have been defined. The details of the WQO and the requirements of sensitive receivers have been provided in detail in Section 7.2. The existing condition of the water, the compliance of the water quality with the WQO and the sensitivity of the water quality to changes in the receiving environment are as follows:

7.4.6 Dissolved Oxygen Levels

Tables 7.8 and 7.9 depict dissolved oxygen levels at the five monitoring stations for the depth averaged and bottom layer giving the 10% ile (value exceeded for 90% of the time) during the years 1991, 1992 and 1993.

Table 7.8: Depth Averaged 10% ile Values for Dissolved Oxygen mg/l (% Saturation)

Year	WM3	WM4	VM12	VM13	VM14
1991	3.7 (52)	4.5 (63)	3.9 (54)	3.3 (46)	4.1 (55)
1992	4.4 (65)	4.4 (66)	3.4 (50)	3.4 (49)	3.7 (54)
1993	4.7 (71)	5.4 (74)	3.3 (46)	3.6 (51)	4.1 (60)

Table 7.9: Bottom Waters 10% ile Values for Dissolved Oxygen mg/l (% Saturation)

Year	WM3	WM4	VM12	VM13	VM14
1991	3.0 (40)	3.0 (40)	3.5 (44)	3.4 (48)	3.8 (53)
1992	4.5 (66)	4.3 (64)	3.4 (49)	3.5 (51)	3.4 (50)
1993	4.9 (65)	4.7 (64)	2.6 (35)	2.1 (29)	3.7 (51)

Dissolved oxygen levels at monitoring stations WM3, WM4 and at VM14 achieve the WQO for both the depth average value (4 mg/l) and the bottom layer value (2 mg/l). However, at VM12 and VM13 neither criteria are achieved which is indicative of the effect of the high organic loads into Victoria Harbour.

The dissolved oxygen levels in the WBZ in the vicinity of the Ma Wan Mariculture Zone (as shown from marine water quality data from station WM4) achieved the requirements for mariculture of 5 mg/l as depth average valued and 2 mg/l in the bottom water.

7.4.7 *E. coli* Levels

There are no WQO for *E. coli* levels for the marine waters of the VHZ. For the WBZ, the annual *E. coli* mean should not exceed 610/100 ml. The values for the annual *E. coli* geometric mean and maximum counts are shown in Table 7.10.

Table 7.10: Annual Geometric Mean and Maximum *E. coli* Counts (No/100 ml)

Year	WM3	WM4	VM12	VM13	VM14
1991	202 (3,346)	79 (497)	673 (5,466)	1,651 (5,806)	638 (32,200)
1992	309 (3,667)	122 (1,200)	2,220 (23,033)	2,411 (41,666)	833 (6,533)
1993	451 (3,244)	134 (970)	3,172 (14,466)	10,900 (73,333)	1,275 (5,103)

As shown in Table 7.10, *E. coli* levels at WM3 and WM4 are currently in compliance with the WQO, however, the quality at the gazetted beaches in the WBZ, which are also monitored by EPD, fail to satisfy the more stringent standards of 180/100 ml for inclusion in the "Good" and "Fair" class ratings for bathing beaches. This has resulted in the beaches being classified as in "Poor" or "Very Poor" condition and levels at Angler's Beach are such that it has been closed for swimming.
The particularly poor water quality at this beach is due to the impact from adjacent squatter and unsewered developments in the hinterland and is not symptomatic of a general deterioration in water quality. The programme for the interception of the sewage outfalls along that section of the coast and its subsequent treatment at Sham Tseng is expected to bring about significant improvements in the water quality at the beaches.

The geometric mean values meet the target value of WSD but the maximum levels of VM13 exceed the value in 1992 and 1993.

7.4.8 pH Value

The WQO value for pH is set between 6.5 and 8.5 pH units. Marine waters are generally well buffered systems and pH values usually remain stable. The marine water at all monitoring locations complies with the lower range limit of 6.5 however the maximum at VM13 exceeded the upper limit by up to 0.1 unit in 1991 and 1992. Elevated pH conditions at other marine water locations in Hong Kong often coincide with times of high phytoplankton activity. This suggests that the exceedance may be due to temporary disturbances of the carbonate-bicarbonate equilibrium due to rapid consumption of carbon dioxide during high primary productivity rates rather than from any direct alkaline pollution source.

7.4.9 Suspended Solids

The western part of Hong Kong's waters is strongly influenced by the quality of water in the Pearl River which carries very high suspended solid loads, particularly during the wet season. Table 7.11 depicts the annual mean and maximum suspended solid concentrations for the five EPD monitoring stations.

Table 7.11: Annual Mean and Maximum Suspended Solids Concentrations (mg/l)

Year	WM3	WM4	VM12	VM13	VM14
1991	9 (21)	11 (32)	12 (50)	10 (21)	7 (16)
1992	12 (24)	13 (29)	19 (39)	11 (20)	7 (16)
1993	12 (42)	11 (23)	9 (26)	10 (20)	9 (23)

There are no absolute values for suspended solids in the WQO for the WBZ, rather the WQO is expressed in terms of an increase above background levels and a level which does not significantly affect the marine ecosystem. Users of marine water for activities such as flushing or cooling activities and other users have target values for the water which they abstract. This is explained in further detail in the following Section.

The mean values for suspended solids at the monitoring stations generally lie close to or above the WSD target level of 10 mg/l while the maximum value in years 1991, 1992 and 1993 exceed the WSD target level. Any activity which increases the suspended solids concentration in the water column is likely to have an impact on the quality of the water being taken for flushing. The data that have been reviewed indicate that at no time did the suspended solids concentrations approach the critical threshold established by the MTRC for cooling water at 180 mg/l.

7.4.10 Toxicant Level

No data for toxicants are presented in the EPD annual reports nor held on the standard marine water quality data bases. The presence of active mariculture at Ma Wan and of attached barnacle growths on piles and rocks along the shoreline indicate that the water quality in this region is sufficient to support a marine ecosystem. Similarly, the presence of fish, attached barnacles, mussels, and benthic bivalves within the VHZ indicate that the water quality is sufficient to support limited biological communities.

7.4.11 Ammoniacal Nitrogen Level

The WSD abstracts water from the Rambler Channel and Victoria Harbour for flushing purposes. This water is first screened and chlorinated before being pumped to service reservoirs for distribution. A target limit of 1 mg/l for ammoniacal nitrogen levels in this incoming water has been set for the purpose of minimising the chemical chlorine demand through the formation of chloramines. A summary of the ammoniacal nitrogen annual depth averaged levels at the five EPD monitoring stations is shown below in Table 7.12.

Table 7.12: Annual Depth Averaged Concentrations of Ammoniacal Nitrogen in mgN/l (values in brackets are the maxima)

Year	WM3	WM4	VM12	VM13	VM14
1991	0.15 (0.37)	0.10 (0.30)	0.27 (0.75)	0.26 (0.61)	0.26 (0.61)
1992	0.16 (0.47)	0.14 (0.23)	0.25 (0.39)	0.22 (0.39)	0.22 (0.39)
1993	0.15 (0.29)	0.11 (0.19)	0.19 (0.34)	0.18 (0.42)	0.18 (0.42)

The data in Table 7.12 show that the WSD target value is presently being met at the five monitoring locations.

7.4.12 Unionised Ammonia

Unionised or free ammonia is toxic to marine fish and invertebrates. The concentration of the unionised form for any given total ammonia concentration is a function of both temperature and pH and to a lesser degree salinity. The EPD monitoring station data for years 1991, 1992 and 1993 have been extracted from the EPD data base for the five locations and the concentration of unionised ammonia have been calculated using the graphical relationship shown in the "Sewage Strategy Study Working Paper 2". These are depicted in Table 7.13.

Table 7.13: Annual Depth Averaged Concentrations of Unionised Ammonia in µgN/l (values in brackets are the maxima)

Year	WM3	WM4	VM12	VM13	VM14
1991	10 (18)	5 (10)	10 (17)	11 (33)	11 (22)
1992	5 (13)	5 (8)	8 (14)	8 (12)	10 (42)
1993	8 (16)	6 (12)	9 (24)	10 (25)	6 (15)

All five stations show the calculated annual mean concentration below the WQO value of 21 µgN/l which is prescribed for the WBZ and for VHZ.

7.4.13 Nutrients

Table 7.14 shows the inorganic nitrogen concentrations.

Table 7.14: Annual Average Total Inorganic Nitrogen Concentration (mgN/l)

Year	WM3	WM4	VM12	VM13	VM14
1991	0.32	0.30	0.42	0.45	0.44
1992	0.31	0.32	0.46	0.46	0.51
1993	0.37	0.34	0.52	0.65	0.49

At the locations in the WBZ, the annual average inorganic nitrogen concentrations are within the WQO of 0.4 mgN/l. However within the VHZ, the value of 0.4 mgN/l is exceeded where the nitrogenous loading from sewage discharge has a greater influence.

7.4.14 Short Term Water Quality Variation in the Vicinity of the Project Site

To determine the smaller scale, within tide, variations in water quality that exist in the vicinity of the project site, a detailed monitoring exercise was conducted at the five locations in the Rambler Channel shown in Figure 7.3. The monitoring was carried out during a spring tide cycle on 20-21 October 1994. The variation in predicted tidal height at Quarry Bay Gauging Station on either side of and during the survey period is given in Appendix F-3; the time base is in hours relative to the start of the water quality monitoring cycle.

Dissolved oxygen, turbidity, temperature and salinity were measured at three depths in the water column at approximately 2 hour intervals at the five locations. Water samples for suspended solids measurements were taken at the same times and depths for the subsequent laboratory measurement of suspended solids. The depths at which data were collected include surface -1 m, sea-bed +1 m and mid depth. The results of the sampling programme are given in Appendix F-4 and the summary statistics are shown in Table 7.15.

Table 7.15: Summary of Marine Water Quality Measured During the Intensive Survey

Parameter			Sampling Location				
			P	Q	R	S	T
Temperature °C		mean	26.8	26.8	26.8	26.9	26.9
		max	27.3	27.3	27.3	27.2	27.3
		min	26.4	26.4	26.0	26.4	26.0
Salinity - ppt		mean	32.8	32.7	32.6	32.6	32.7
		max	33.6	33.6	33.6	33.5	33.5
		min	32.0	32.0	31.9	31.8	31.7
Suspended Solids	NTU	mean	8	9	9	7	6
		max	27	28	27	14	13
		min	4	4	4	4	4
	mg/l	mean	14	16	17	14	13
		max	28	42	66	23	29
		min	8	8	9	7	5
Dissolved Oxygen	mg/l	mean	4.7	4.5	4.4	4.0	4.0
		max	5.7	6.0	5.6	5.2	5.0
		min	3.5	3.4	3.3	3.4	3.5
	% sat	mean	71	68	66	60	60
		max	86	91	85	79	75
		min	52	51	50	50	52

The water quality in the longitudinal profile through the Rambler Channel during the monitoring period is shown in Figure 7.4. The key features of the water quality are as follows:

- The water column shows a weak salinity stratification with a general downward trend in average salinity from west to east;
- The tidal averaged dissolved oxygen values decrease from west to east with the water in the bottom layer having a higher concentration than the middle and upper layers; and,
- Suspended solid concentrations are higher in the bottom layer which show an increase towards the middle of the monitoring line opposite station R.

Salinity, dissolved oxygen and suspended solids exhibit trends and cyclic variations within the tide period. These are shown in Figure 7.5 for the two stations P and T at the extreme west and east end of the transect, respectively. Key features of these two stations are as follows:

- There is an upward trend in salinity at both stations through the tidal period;
- Dissolved oxygen concentration variations have a greater amplitude around a higher average value at station P than station T. The distinct cycle at Station P correlates with the flood and ebb periods of the tide; and
- Suspended solid concentrations show distinct peaks, particularly in the bottom layer at station T, which are in phase with the mid flood and mid ebb stages of the tide.

Short term variations in water quality within the vicinity of the proposed reclamation are influenced by the local tidal conditions. These effects will need to be taken into account when defining the baseline water quality conditions and interpreting the results of the compliance monitoring.

7.4.15 Background Sediment Quality at VS10 (EPD Data)

The monitoring information taken at VS10 indicates that the sediments in the Project area consist of fine materials with a high silt content, over 80% by weight passing a 63 μm sieve. The organic carbon content of the sediments are high, 2.1% of the dry weight, with redox potentials indicative of anaerobic conditions within the sediment.

The mean values for the years 1991, 1992 and 1993 for VS10 that have been taken from the EPD database for five reported heavy metals of the six used by EPD to classify sediment quality and are shown below in Table 7.16, together with Polychlorinated Biphenyls (PCB) and Polycyclic Aromatic Hydrocarbons (PAH).

Table 7.16: Surface Concentrations of Heavy Metal and Trace Organic Contaminants at VS10

Date	Determinant mg/kg							
	Chromium	Copper	Mercury	Nickel	Lead	Zinc	PCB	PAH
Aug 1991	**230**	**1200**	0.86	**130**	**99**	**290**	-	-
Aug 1992	**250**	**1400**	0.06	**150**	79	**290**	0.014	0.463
Sep 1992	**170**	**420**	0.1	**67**	57	**370**	0.049	0.122
Nov 1992	**270**	**1100**	<0.05	**150**	71	**300**	0.024	1.04
May 1993	220	700	0.13	120	68	250	-	-
Average	**228**	**964**	0.29	**123**	75	**300**	0.029	0.541
Note: Bold indicates class C sediment								

These values indicate that the sediments lie in Class C, seriously contaminated sediment. Class C sediments must be dredged and transported with great care, may not be dumped in gazetted marine disposal grounds and must be effectively isolated from the environment on final disposal.

The PCB, PAH concentrations at VS10 are particularly high compared with these found in other marine waters in Hong Kong. For example in Tolo Harbour PCB and PAH levels are 0.007 and 0.05 mg/kg, respectively. In particular, PCB concentrations are approaching the Maximum Acceptable Risk Level (MARL) of 0.04 mg/kg and the PAH concentrations are approaching the Lowest Observed Effect Concentration (LOEC) of 0.87 mg/kg.

7.4.16 Background Sediment Sampling at Project Site

The area offshore of the shipyards along the line of the proposed seawall is at present in constant use by the shipyard operators for temporary anchoring of vessels and for access to the yards and slipways. As a result, it was not possible to deploy a vibro or rotary drilling core barge for sediment sampling since this would, albeit temporarily, block access to the shipyard slipways. Samples were therefore taken by using either a gravity core tube or a surface grab. The sampling locations and the results of the chemical analysis of the sediments sampled are given in Figure 7.6 and Table 7.17. At location E it was possible to collect a core but at the other stations there were such quantities of debris on the sea bed or immediately below the surface as to make core sampling not possible.

Table 7.17: Analysis of Sediments Sampled Along the Line of the Seawall (concentrations as mg/kg unless otherwise stated)

Determinant	Location						
	E	E	E	F	G	H	I
	Sampling Method/Depth (m)						
	Grab/ Surface	Core/ 0-0.1 m	Core/ 0.9-1 m	Grab/ Surface	Grab/ Surface	Grab/ Surface	Grab/ Surface
Cadmium	-	0.2	0.2	0.29	0.4	0.96	0.46
Chromium	-	38	23	**230**	**210**	**130**	**170**
Copper	-	**81**	14	**580**	**620**	**550**	**580**
Lead	-	**120**	27	**1,500**	**1,800**	**540**	**1,000**
Mercury	-	0.21	0.06	0.27	0.44	**1.4**	0.46
Nickel	-	15	11	**45**	**43**	33	30
Zinc	-	110	62	**870**	**1,100**	**560**	**740**
PAH	-	0.8	0.1	5	8	6	5.00
TBT	-	2	1	0.4	0.3	0.7	0.1
COD (g/kg)	-	34	26	57	95	140	74
Sulphide	-	30	2	1,100	1,000	110	990
TKN	-	500	910	910	400	1,500	1,100
pH (units)	7.60	-	-	9.1	7.5	7.4	7.4
Eh (mv)	-130	-	-	-260	-130	-110	-130

Note: Bold indicates class C sediment

Based on the Sediment Classification Scheme, the sediments along the line of the seawall are within Class C contamination levels with respect to their heavy metal content. The Polycyclic Aromatic Hydrocarbon (PAH) concentrations along the line of the seawall are approximately ten times the concentration found in the more open waters at VS10. This is indicative of the impact of petroleum hydrocarbons from the shipyard operations.

7.5 Impacts During Site Clearance

The Project site presently contains land and marine structures which consist of buildings, plant, piled piers and slipways. Demolition and removal of the existing facilities during site clearance will therefore involve both onshore and water based activities.

7.5.1 Onshore Activities

It is expected that there will be an increase in suspended solids during the clearance of the buildings from site in the run-off, some of which may be contaminated by materials used in the shipyards. The area of influence for potential run off will be limited to the shoreline area. The extent of contamination from run off during site clearance activities will be relatively short term in duration and will likely be similar to existing works at the site.

There is also the potential for spillage of fuels, oils, paints, thinners and other chemicals onto the ground which may drain into marine waters and cause contamination. Spills of solid waste into the sea or onto the intertidal region will increase the quantities of floating rubbish in the channel and give rise to aesthetic degradation and increase the risk of fouling of marine vessels which may also result in impacts to marine water quality.

7.5.2 Water Based Activities

The removal of existing pier and jetty piles and slipway rails will disturb the nearshore sediments. These are at least as contaminated as those sampled along the line of the seawall and will give rise to a localised increase in suspended solids. There is also the potential for a small increase in suspended solids during removal of the slipway rails although it is not expected that this would significantly increase the suspended solids to levels greater than that which is currently being produced by vessels being moved in and out of the relatively shallow water of the shipyards and on and off the slipways at present.

7.6 Impact During Seawall Construction

7.6.1 Dredging Requirements and Disposal Options

The possibility of constructing the seawall by use of stabilisation techniques, counterfill and drainage is being investigated by the Geotechnical Engineering Office (GEO). These techniques will minimise the quantity of contaminated sediment to be removed and disposed of. The combined effects will be to reduce water quality impacts from dredging and minimise the impact at the disposal grounds. However, these techniques have not yet been fully evaluated and tested for use in the Hong Kong environment and are thus not proposed for this Project. It is therefore expected that some of the existing sediments will need to be removed for the seawall foundation.

Two, non marine dumping, disposal options were proposed by EPD for consideration in respect to this Project. These were the retention of the sediment within the confines of the Project site contained in specific areas of the reclamation and the disposal of the sediment following pre-treatment to landfill.

The Contaminated Spoil Management Study considered in detail the disposal of contaminated sediment at marine disposal sites, as land formation, land based disposal options and other disposal methods. The study concluded that where possible *in situ* disposal should be considered and if this was considered not practicable containment in redundant borrow pits with capping by inert material should be employed.

The retention of contaminated sediments within the site would utilise a significant proportion of the capacity of the proposed public dump. The volume of dredged material to be generated during the dredging for the seawall has been calculated to be 105,000 m^3 while the total capacity of the site is planned as 500,000 m^3.

The Contaminated Spoil Management Study recommended that anoxic conditions are maintained within the sediments to minimise contaminant mobilisation. This is best achieved by not allowing the level of the sediment to rise above sea level. In the case of the Project site, the capacity available below 0 mPD is 65,000 m^3 which would require significant quantities of the sediment to be placed above sea level. These sediments would drain and generate contaminated leachate which, if released to the marine environment, would result in the mobilisation of the heavy metals as the insoluble sulphides are oxidised to soluble sulphates. These would then require collection, containment and treatment.

The dredged material, if disposed of on the Project site, would also require mechanical treatment to increase the rate of consolidation prior to loading with the incoming construction waste. The construction waste would require less time for consolidation compared to the marine sediments due to its coarser nature and therefore would allow the site to be operational for infilling immediately once the appropriate length of seawall had been constructed.

The disposal of dredged contaminated sediments to landfill would, in principle, be contradictory to the purpose of the creation of public dumps, which is to reduce the pressure on landfills from relatively inert materials and increase their capacity for biologically degradable materials and other wastes. Because of the high water content of the sediments, pre-treatment would be required to increase the suspended solids content of the material and to fix the contaminants to prevent their leaching once placed in the landfill.

Because the anticipated rate of production of sediment due to dredging for the seawall is 1,020 m^3/day, the dewatering of such volumes of sediment are beyond the capacity of available plate or filter presses and would require dewatering in lagoons. Dewatering by lagoons would result in the formation of oxidising conditions and the consequent mobilisation of the heavy metals into a decantrate which would require additional treatment before disposal.

Because of the above conditions, the retention of the dredged materials within the site is not appropriate due to capacity limitations and consolidation requirement. Further, the disposal of such materials to a landfill site would reduce landfill capacity. The most practicable option is the disposal of this material at a designated spoil ground. Because the sediments are Class C, it is expected that the site will be the East Sha Chau contaminated mud pits. The location of these pits and their operation have been identified by Government as the most appropriate means of disposal of contaminated spoil. For this Project, the Fill Management Committee will allocate the precise location for the disposal of the spoil.

7.6.2 Impacts from Dredging

The quality of the sediments was investigated in detail through a programme of gravity core and surface grab sampling along the line of the seawall as described in Section 7.4.16.

The assessment showed that the sediments are contaminated by heavy metals to such an extent as to place them in a Class "C" contamination status. Class "C" sediments are defined by EPD as seriously contaminated sediments that must be dredged with great care, cannot be dumped in the gazetted marine disposal grounds and must be effectively isolated from the environment upon final disposal.

Dredging works along the proposed seawall area will add quantities of sediment into suspension which may subsequently impact the general water quality and, in particular, the seawater intakes which are considered as sensitive receivers. In addition, the mixing of sediment into the water column during dredging will release oxidisable organic material and reduced iron and manganese which will contribute to the localised increase in demand for oxygen. The oxidation of these metals produces a particulate phase which will scavenge heavy metals from the aquatic phase thus reducing their impact. Organic nitrogen resulting from the decomposition of organic material will contribute to the nitrogen pool available for algal growth.

The extent to which the sediment will be carried by the tidal currents was examined by use of the WAHMO sediment plume transport model. The 50 m grid Ting Kau Bridge 2-layer hydrodynamic model was considered appropriate for use in the relatively narrow channel. Based on the analysis of the float track simulations, dry season neap tide and wet season spring tide were chosen for the simulations. It was estimated that the Project would involve the following:

- Volume of mud to be dredged = 105,000 m^3
- Type of dredgers = 3 m^3 grab dredger
- Number of dredgers = one due to site access constraints
- Sequencing of dredging = east to west
- Rate of dredging = 102 m^3/hr equivalent to 1,020 m^3/day
- Duration of dredging = approximately 3-4 months

It was assumed that the loss of suspended solid to the water column during the dredging works would be 5% of that dredged. Simulations were carried out during both the flood and ebb tide states and the maximum concentration of suspended solids above the existing background conditions were calculated. The concentration contour plots which show the increase above background level and time series plots throughout the tide are given in Appendix F-5.

The bed deposition of sediment given as kg/m^2 by the model may be converted to sediment depth using an *in situ* dry density of 500 kg/m^3. The 0.1 kg/m^2 contour thus equates to an accumulated sediment depth of 0.2 mm.

7.6.3 Results of Sediment Plume Modelling - Wet Season Spring Tide

The surface layer shows a 1-3 mg/l increase contour extending westwards during the flood tide which does not impact any of the sensitive receivers. The closest sensitive receiver to the east of the site is the oil depot pump house. At this site there is an insignificant increase of less than 0.5 mg/l, and concentration levels in the range 3 - 9 mg/l are confined to within the project area itself. Redeposition is predominantly within the project area itself and beyond this area it is less than 0.2 mm/tide.

The surface and bed layer plumes during the ebb tide are confined to the Tsing Yi shore which give rise to an increase of suspended solids at the seawater intake at Tsing Yi Bridge of 1 mg/l and at the oil depot pump house between 2 and 5 mg/l for a short duration, less than 2-hours. The predominant redeposition takes place within the project area with a 0.2 mm deposition contour extending to the southern entrance of the Rambler Channel.

7.6.4 Results of Sediment Plume Modelling - Dry Season Neap Tide

The behaviour of the surface layer plume during the flood tide is similar to that of the wet season spring tide, extending westwards. The only sensitive receiver at which an increase in suspended solids is predicted is the oil depot pump house to the east of the site where an increase of up to 2 mg/l can be expected. The predominant redeposition occurs within the project area while the 0.2 mm contour has a greater area.

The surface and bed layer components of the plumes during the ebb tide are confined to the Tsing Yi shore but extend less far than in the case of the spring tide. Similarly, the extent of the redeposition is less and occurs mainly within the project area.

7.6.5 Contaminant Increases Associated with the Sediment Plume

Increases in total heavy metal concentrations have been calculated for the 3, 6 and 9 mg/l suspended solids concentration levels generated by the sediment plume model. These have been calculated using the average of the concentrations measured in the sediments collected along the line of the sea wall. The values are given below in Table 7.18 together with values applied by the European Union (EU) for the protection of marine life.

Table 7.18: Predicted Contaminant Increases Associated with the Sediment Plume

Contaminant	EU average dissolved concentration for protection of marine life (μg/l)(1)	Average total contaminant concentration (ug/l) associated with different suspended solids concentrations		
		3 mg/l	6 mg/l	9 mg/l
Cadmium	2.5	0.001	0.003	0.004
Chromium	15	0.4	0.8	1.2
Copper	5	1.2	2.4	3.6
Lead	25	2.5	5.0	7.5
Mercury	0.3	0.001	0.003	0.004
Nickel	30	0.09	0.18	0.27
Zinc	40	1.7	3.4	5.2
Poly Aromatic Hydrocarbons	no value given	0.012	0.025	0.037
Tributyltin (TBT)	0.002	0.002	0.005	0.007

Notes: (1) Reference: United Kingdom Water Quality Standards arising from European Community Directives - An Update. FR 0041. Foundation for Water Research, Marlow, Bucks. UK.

The total dissolved and particulate concentration of contaminants are below the levels recommended by the EU for the protection of saltwater life, with the exception of TBT. The tendency for TBT to adsorb onto the solid organic phase will result in lower dissolved concentrations in the water column. However, it is only in the immediate vicinity of the project area that the concentration of suspended solids will increase by more than 3 mg/l.

7.6.6 Oxygen Demand of the Sediment Plume

The marine sediments in the vicinity of the shipyards have a potential high oxygen demand which will reduce the concentration of dissolved oxygen in the water column. The results of the sediment plume model have been used to determine the extent of the reduction using the following sub-model:

$$DO_{res} = DO_{back} - (k.BOD.conc)/(1+1.5/d)$$

where:

DO_{res}	= resulting Dissolved Oxygen Concentration
DO_{back}	= background Dissolved Oxygen Concentration
k	= rate of oxidation of BOD
BOD	= BOD of sediment, equal to 0.5 x COD
conc	= tidal average suspended sediment concentration
d	= layer depth in the two layer model

The following input values were used for the model:

- The background dissolved oxygen level were taken as 5.4 mg/l, the average of the years 1991, 1992 and 1993 concentration levels at VM14 which is the closest EPD long term monitoring station to the Project area;
- The rate of oxidation of BOD used in the WAHMO two layer water quality model was 0.23/d;
- A COD value of 140,000 mg/kg was used, the maximum value measured in the sediment survey; and
- The suspended solids concentration for each run was provided by the output from the previous runs of the sediment plume using the input parameters defined in Section 7.6.2.

The results of the modelling are shown in Appendix F-6. The spatial extent of the oxygen 'sag' is shown by the shaded area, unshaded areas do not fall below the background level. Decreases of more than 0.02 mg/l below a depth averaged background of 5.4 mg/l are only found in the immediate vicinity of the dredging. Even in that region the levels do not fall below 5.3 mg/l at any time. A similar magnitude decrease of 0.1 mg/l applied to the mean dissolved oxygen concentration in the bottom 2 m layer (5.1 mg/l) would result in the concentration falling to 5 mg/l. Consequently, there will be no significant impact on the dissolved oxygen in the water column.

7.6.7 Nitrogen Loading of Sediment Plume

The development of algal blooms in Hong Kong marine waters is controlled to a large extent by the availability of inorganic nitrogen which is increased by the discharge of sewage and other effluent into inshore waters. The sediments to be dredged will make a contribution to the overall nitrogen loading to the Rambler Channel. The additional loading is based on the following assumptions:

• Daily dredged volume	1,020 m^3
• Sediment dry density	500 kg/m^3
• Loss during dredging	5%
• Sediment Kjeldahl nitrogen	887 mgN/kg

This results in a predicted loading of 22.6 kg/d which is equivalent to a sewage discharge from a population of 2,660 head.

Mineralisation of the sediment bound nitrogen will occur while the sediment is suspended in the water column. The maximum suspended solids concentrations occur in the region of the dredging and reach 9 mg/l above the existing background. Assuming that all of the nitrogen bound to those solids are mineralised and the inorganic nitrogen released to the water the increase in nitrogen available to stimulate algal growth is 7 μg/l. This represents a 1.4% increase in the annual average at VM14 which is 0.49 mg/l. This is unlikely to have any measurable effect on the trophic state of the local waters.

7.6.8 Impacts During Sediment Transport and Disposal

The normal procedure for disposal of contaminated sediments which are required to be dredged is transport to prepared seabed pits to the south of East Sha Chau. The procedure involves dumping the sediments from a stationary split bottom hopper barge into the pits then 'sprinkling' a layer of clean sand over the sediments from a moving barge. This prevents the sediments from being resuspended, brings the fill level up to the original sea bed depth and prevents any further migration.

Sediment could be lost from barges during transport of the sediment to the disposal site due to:

- Slopping overboard in the case of overloading;
- Material being washed off the deck;
- Leakage through bottom doors; and
- Short dumping where the sediment is dumped prior to the designated dumping ground in order to save time and costs.

The first two of these will give rise to localised increases in suspended solids and will cease when the load has settled to below the well coaming or when the deck has been washed clear. The third will give rise to a continuous loss until the vessel reaches the disposal ground. The final process is likely to result in a significant deposition of sediment on the sea bed.

7.6.9 Impacts During Seawall Construction

The formation of the seawall will require the placement of marine sands in the dredged trench by use of bottom dump barges. It is expected that these materials will be taken from existing gazetted marine borrow areas. Due to the coarse nature of the sands, the relatively shallow depth of the works area and low current speeds, the placement of marine sands will result in negligible losses of fines in the form of a sediment plume and therefore will not result in an impact to the marine environment.

The second stage of core fill and placement of secondary and primary rock will be carried out by grab from a derrick lighter. The coarse material used will settle rapidly to the prepared sand foundation layer and, therefore, will not give rise directly to any impacts on water quality. However, to minimise the scope for resuspension of the existing sediments, the placing of the foundation and fill material must be closely controlled spatially.

7.7 Impacts During Reclamation Construction

The reclamation activities will consist of the reception of public dump material at the site and the progressive infilling of the area between the seawall and site boundary to a level of +5 mPD. This will initially entail tipping of material into the marine area and progressively building up to the full reclamation height. Water depths in the area landward of the seawall are relatively shallow (mean depth being -1.73 mPD). Consequently, it is unlikely that bottom dumping from barges of fill material will be a practicable option considering the water depth and the available space for manoeuvring.

7.7.1 Impacts from Enclosure of Reclamation Area

The reclamation time frame cannot be defined precisely since the availability of fill material is dependent upon the need by contractors to dispose of surplus and unwanted construction materials. This is unlike a conventional reclamation which is created using marine fill in as short a time period as possible. It has been assumed that reclamation of the site will be completed within a minimum period of 6 months and a maximum period of 15 months.

To prevent the formation of a static body of water in which significant deterioration could take place, the option exists to begin placing of public dump material in the site before completion of the full length of the seawall. Placement of the fill will be predominantly by end face tipping from trucks. For the Green Island Public Dump Reclamation EIA, it was assumed that the plume resulting from the placement of fill material contained fines which made up 22.5% by volume of the construction waste. The concentration of suspended sediments was predicted using a simple box model assuming the same fines content as the Green Island Public Dump EIA, a loss rate of 5% and a range of the dumping rate of 135 m^3/hr and 338 m^3/hr. The predicted concentration of suspended solids is shown in Table 7.19.

Table 7.19: Suspended Solids Concentration Increases Adjacent to the Tipping Area

Width and Depth Average Concentration (mg/l)						
Filling Rate (m^3/hr)	Current (m/s)	Face	50 m	75 m	100 m	150 m
338	0.02	220	29	0	0	0
135	0.05	35	19	14	9	0
338	0.05	88	47	35	23	0

In the absence of wind induced currents and at maximum dumping rate the sediment plume has settled within 75m. With maximum current velocities in the region of the face at most 0.05 m/s concentration increases at the end of a 150 m seawall would not be expected to be detectable from the background levels.

The seawall should be constructed progressively to ensure that it extends a minimum of 150 m from the tipping face. When the seawall is within 150 m from total enclosure, the vertical seawall should be completed to facilitate final closure. At a maximum rate of delivery, under typical site conditions, the sediment plume will have settled within 75 m of the tipping face. The final closure of the seawall would be by placement of the vertical seawall blocks prior to the final phase of filling.

7.7.2 Impacts from Increased Suspended Solids

The material which will be placed in the area behind the seawall creating the reclamation will be construction waste comprising earth, building debris and broken rock. These materials, while relatively chemically inert, may contribute to a localised area of increased suspended solids while they are being tipped into place. Increases in suspended solids for short duration have been observed in the immediate vicinity of the active face at the Aldrich Bay Public Dump while end tipping was taking place.

7.7.3 Impacts from Floating Materials

The material that will be deposited at the site will settle rapidly, however there may be small amounts of timber and other floatable material such as expanded polystyrene, plastics, glass fibre and rock wool matting and empty containers which are often found in the construction waste. This will give rise to floating debris which will result in visual annoyance and, if allowed to float into the main channel, cause damage to marine craft.

7.7.4 Impacts from Vehicles Wheel Washing and Maintenances Areas

To minimise the amount of material carried off the site on the wheels and underbody of trucks, and so reduce dust generation, the installation of wheel and under body washing facilities at the exit from the site is recommended. However such a facility will produce an effluent with high concentration of suspended solids which may also contain fuel and lubricant hydrocarbons. If allowed to run into the surface water drains this could result in excessive siltation in the catchpits and produce a visible sediment plume and possible surface oil film.

Plant will be required for handling imported material and for site levelling. This will necessitate on site maintenance and re-fuelling areas giving rise to risk of oil and fuel spillage.

7.7.5 Impacts from Staff Facilities

Site facilities will also be required for staff managing the site, inspecting loads and directing operations. Toilet and washing facilities will be required which if uncontrolled may discharge or be discharged into the marine waters.

7.7.6 Impacts to Hydrodynamics of the Rambler Channel

It is not expected that the presence of the reclamation will have any adverse effect on the hydrodynamics of the Rambler Channel. There will be no change in the flushing characteristics of the storm water discharge along the eastern boundary of the site.

7.8 Marine Water Quality Impact Summary

The significance of the water quality impacts during each Phase of the Project is shown in Table 7.20.

Table 7.20: Marine Water Quality Impacts

Phase	Duration	Activities	Anticipated Level of Impact
Site Clearance	3 months	Onshore activities including removal of concrete, disturbance of soil and potential runoff of contaminated materials	Insignificant in comparison to existing conditions.
		Water based activities including removal of piles, slipway runners.	Slight impacts due to increase in suspended solids and possible contaminant loads from removal of slipways.
Seawall Construction	8 to15 months	Dredging activities	Significant due to Class "C" sediments along the proposed seawall site requiring containment and disposal at a contaminated spoil ground. Insignificant effects of suspended solids plume as a result of solids, metal contamination and dissolved oxygen sag.
		Seawall construction	Moderate during the placement of sand and potential losses to fines in the form of a sediment plume. Insignificant for second stage core filling and placement of primary and secondary rock materials.
Reclamation Construction	6 - 15 months	Filling activities	Potentially significant due to generation of suspended sediments during placement of fill, enclosure of the reclamation area and loss of floatable materials to the channel.

7.9 Mitigation Measures

7.9.1 Mitigation Measures for Site Clearance

To reduce the potential for impacts to the marine environment from the uncontrolled disposal or spillage of fuels, oils and chemicals during site clearance, the following mitigation measure is proposed:

1. The Contractor should provide solid waste containers for waste paints and chemicals during site clearance activities. These containers should be stored in a secure area at least 5 metres from the mean high tide level. Chemical storage containers shall be properly labelled to avoid mixing of chemicals.

To reduce potential impacts associated with an increase in suspended solids during removal of slipway runners:

2. The Contractor should be required to remove slipway runners only at low tide during slack water.

7.9.2 Mitigation Measures for Seawall Construction

The following mitigation measures are proposed for the dredging, transport and disposal of the sediments:

1. During dredging activities, the Contractor should use the following:

   (a) Dredging of designated contaminated marine mud should only be undertaken by a suitable grab dredger using a close grab within a silt curtain at all times to retain fine sediments released to the water column (as shown in Figure 7.7).

   (b) Silt curtains should be formed from tough, abrasion resistant, permeable membranes, suitable for the purpose, supported on floating booms in such a way as to ensure that the leakage of turbid waters is restricted.

   (c) The bottom of the curtain should be formed and installed in such a way that tidal rise and fall are accommodated, and that the leakage of turbid waters is limited. The removal and reinstallation of such curtains during typhoon conditions should be as agreed with the Director of Marine.

   (d) The Contractor should regularly inspect the silt curtains to ensure that they are adequately moored and marked to avoid danger to marine traffic.

   In the case that the Contractor fails to implement the necessary mitigation measures or the water quality deterioration persists despite the mitigation measures, then the Engineer can instruct the Contractor to temporarily suspend the causative works until the Engineer is assured that proper mitigation measures have been implemented and the water quality has returned to acceptable levels.

2. EPD's Contaminated Sediment License Agreement contain requirements that shall be followed for the transport and disposal of contaminated sediments. The Contractor should ensure that the following precautionary measures are also undertaken when transporting the contaminated sediment:

   (a) Adequate load management should be undertaken to ensure barges are not overloaded and to avoid spilled material being washed-off the decks and slopping.

   (b) Purpose built bottom dumping barges should be used which shall be fitted with water tight doors to prevent leakage.

   (c) Transport of designated contaminated marine mud should be by split barge well maintained and capable of rapid opening and discharge at the disposal site.

   (d) Discharge from split barges shall take place within a radius of 100 metres of centre of the area allocated for the disposal of designated contaminated marine mud.

   (e) Discharge should be undertaken rapidly and the hoppers should then immediately be closed; any material adhering to the sides of the well should not be washed out of the hopper and the hopper should remain closed until the barge next returns to the disposal site.

3. In addition to the above mitigation measures, the Contractor should also include the following general procedures for the avoidance of water pollution during dredging, transporting and dumping of marine mud.

   (a) Mechanical grabs should be designed and maintained to avoid spillage and should seal tightly while being lifted.

   (b) All vessels shall be sized such that adequate clearance is maintained between vessels and the sea bed and under water pipelines at all states of the tide to ensure that undue turbidity is not generated by turbulence from vessel movement or propeller wash or pipelines damaged.

   (c) The Works should cause no visible foam, oil, grease, scum, litter or other objectionable matter to be present on the water within the Site or dumping grounds.

   (d) All barges should be fitted with tight fitting seals to their bottom openings to prevent leakage of material.

   (e) Excess material should be cleaned from the decks and exposed fittings of barges before the vessels are moved.

   (f) Loading of barges should be controlled to prevent splashing of dredged material to the surrounding water and barges shall not be filled to a level which will cause overflowing of material or polluted water during loading or transportation.

   (g) The Engineer may monitor any or all vessels transporting material to ensure that no dumping outside the approved location takes place. The Contractor should provide all reasonable assistance to the Engineer for this purpose.

   (h) The Contractor should ensure that all contaminated marine mud is disposed of at the approved locations. He will be required to ensure accurate positioning of vessels before discharge and will be required to submit and agree proposals with the Engineer for accurate position control at disposal sites before commencing dumping.

   (i) The Engineer should monitor any or all vessels transporting material to ensure that loss of material does not take place during transportation. The Contractor is to provide all reasonable assistance to the Engineer for this purpose.

   (j) The Contractor should ensure that all unsuitable material that is found during dredging is disposed of at the approved landfill or other designated location.

7.9.3 Mitigation Measures for Reclamation Construction

The terms of the present Construction Waste Dumping Licence allow a limited quantity of wood to be present in the material to be dumped which may result in floating debris. To reduce the potential for impacts associated with the loss of floating debris, the following is recommended:

1. The Contractor should provide a containment curtain with a suitably protected surface boom to be used for containing any floating material. The area contained by the boom should be cleared at least daily by scavenging sampans during periods when the site is being operated. The timber and other materials recovered should be disposed of appropriately at a landfill.

2. The Contractor should enforce strict application of the dumping licences and monitor the material placed in the reclamation to control disposal of unauthorised materials. Unauthorised materials should not be used in the reclamation.

To reduce suspended solids and oil discharges from the vehicle washing facility, the following mitigation measure is recommended:

3. The Contractor should provide a recirculation system to be used to reduce the amount of discharge from the vehicle wash. The settled solids should be disposed of to dry areas of the reclamation and arrangements made for treatment or off site disposal of oil contaminated wash water.

To mitigate impacts to the marine water quality from possible oil and fuel spillage during plant maintenance, the following is recommended:

4. The Contractor should ensure that fuel tanks on the site are housed within bunded containment areas which should be regularly drained of rain water. Vehicle maintenance should be carried out on paved areas and spillage, if it occurs, should be controlled by adsorbents. Waste oils should also be collected in designated tanks prior to disposal off site.

To reduce the potential for impacts to water quality from discharge of effluent from site offices, the following mitigation measure is recommended:

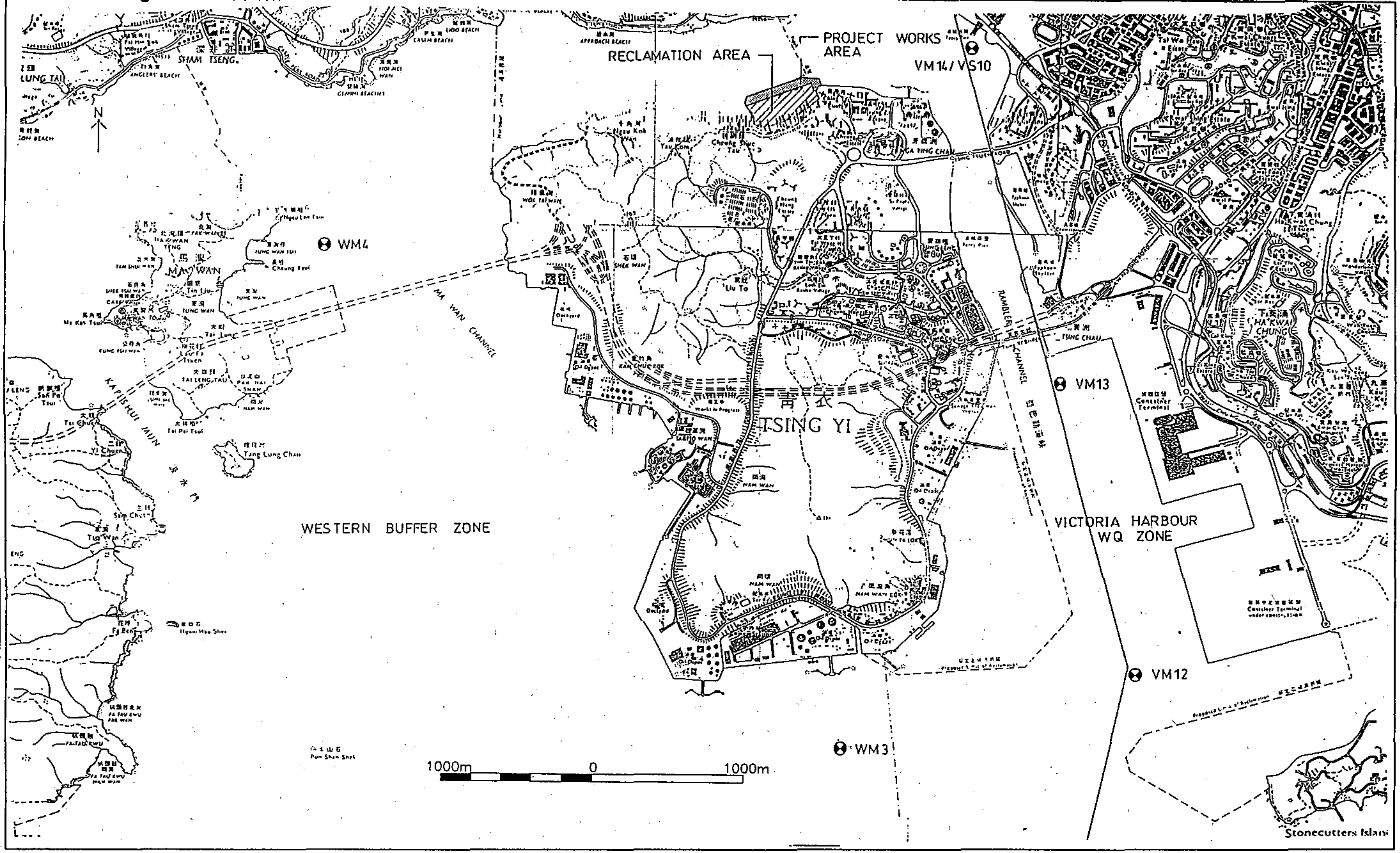
5. The Contractor should, if feasible, connect permanent site offices and facilities to the sewer in Tam Kon Shan Road. If this is not found feasible, chemical toilet facilities should be provided and serviced daily.

To reduce the potential for water quality impacts from embayment of water inside the seawall, the following mitigation measure is recommended:

6. The seawall should be constructed progressively to ensure that it extends beyond a 150 m distance from the tipping face. When the seawall is within 150 m from total enclosure, the vertical seawall should be completed to facilitate final closure.

7.10 Residual Impacts

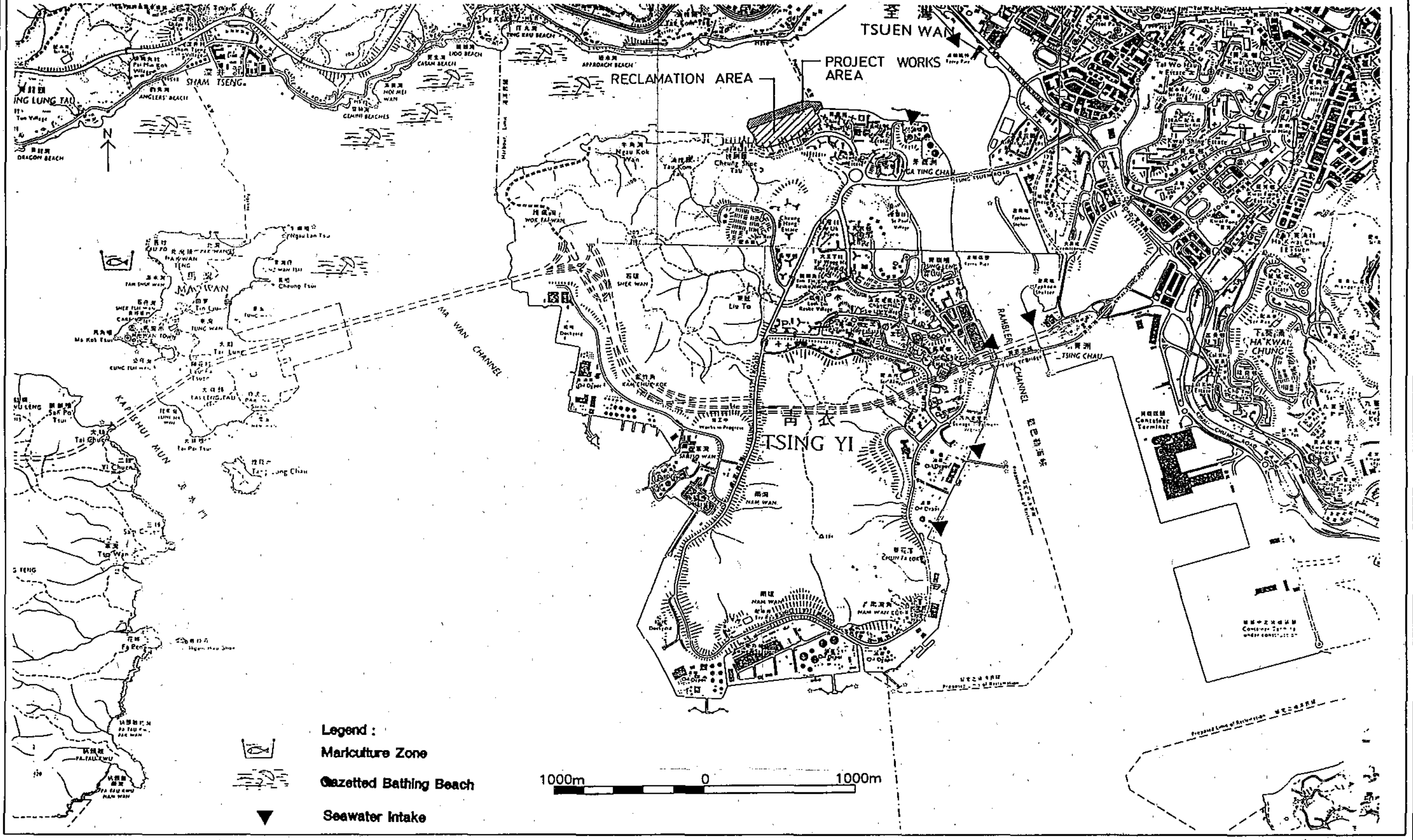
Implementation of the above mitigation measures will reduce identified impacts to a less than significant level with no impacts to sensitive receivers.



Marine Water Quality Zones and Monitoring Stations

Mouchel

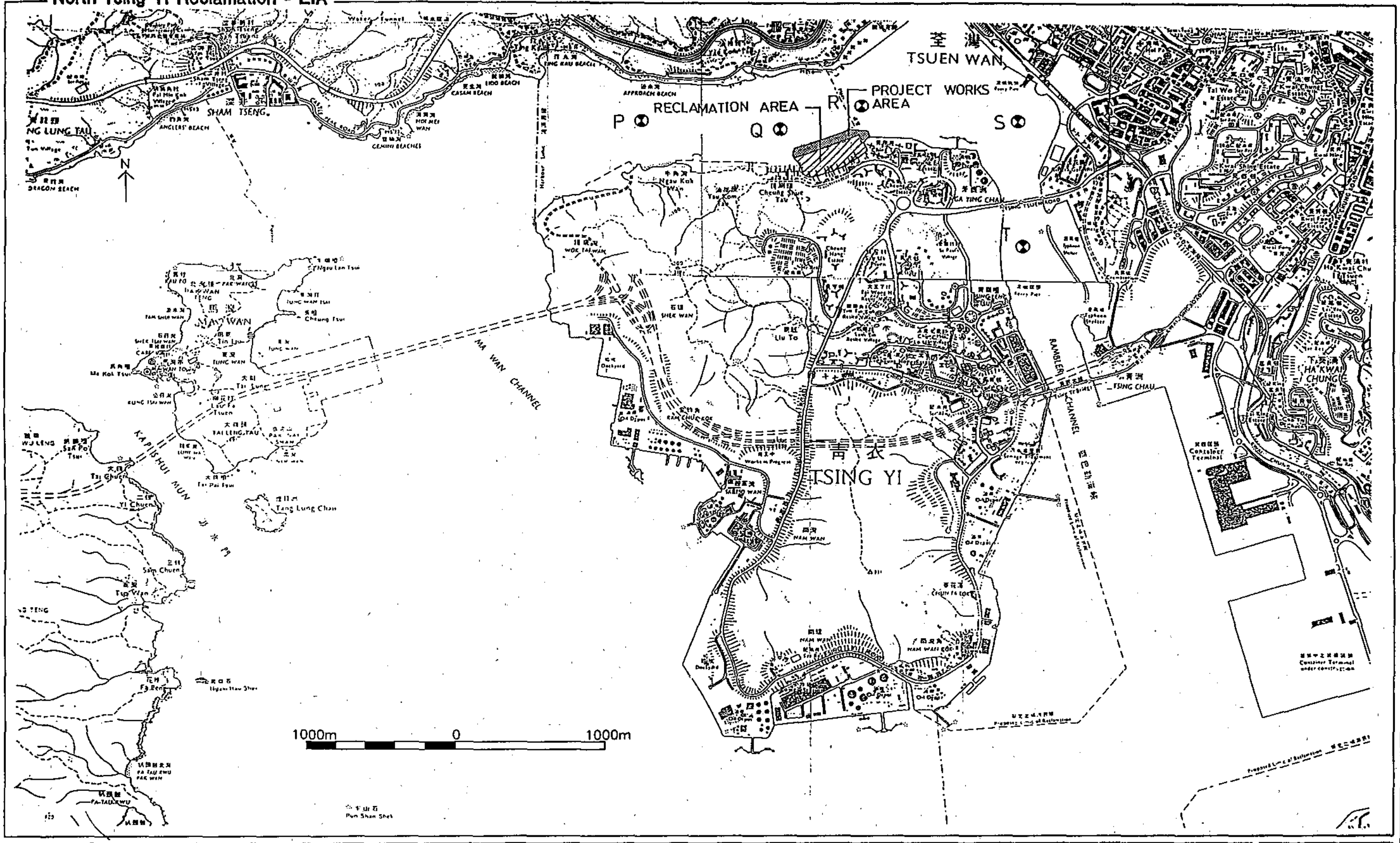
Figure No. 7.1



Marine Water Sensitive Receiver Locations

Mouchel

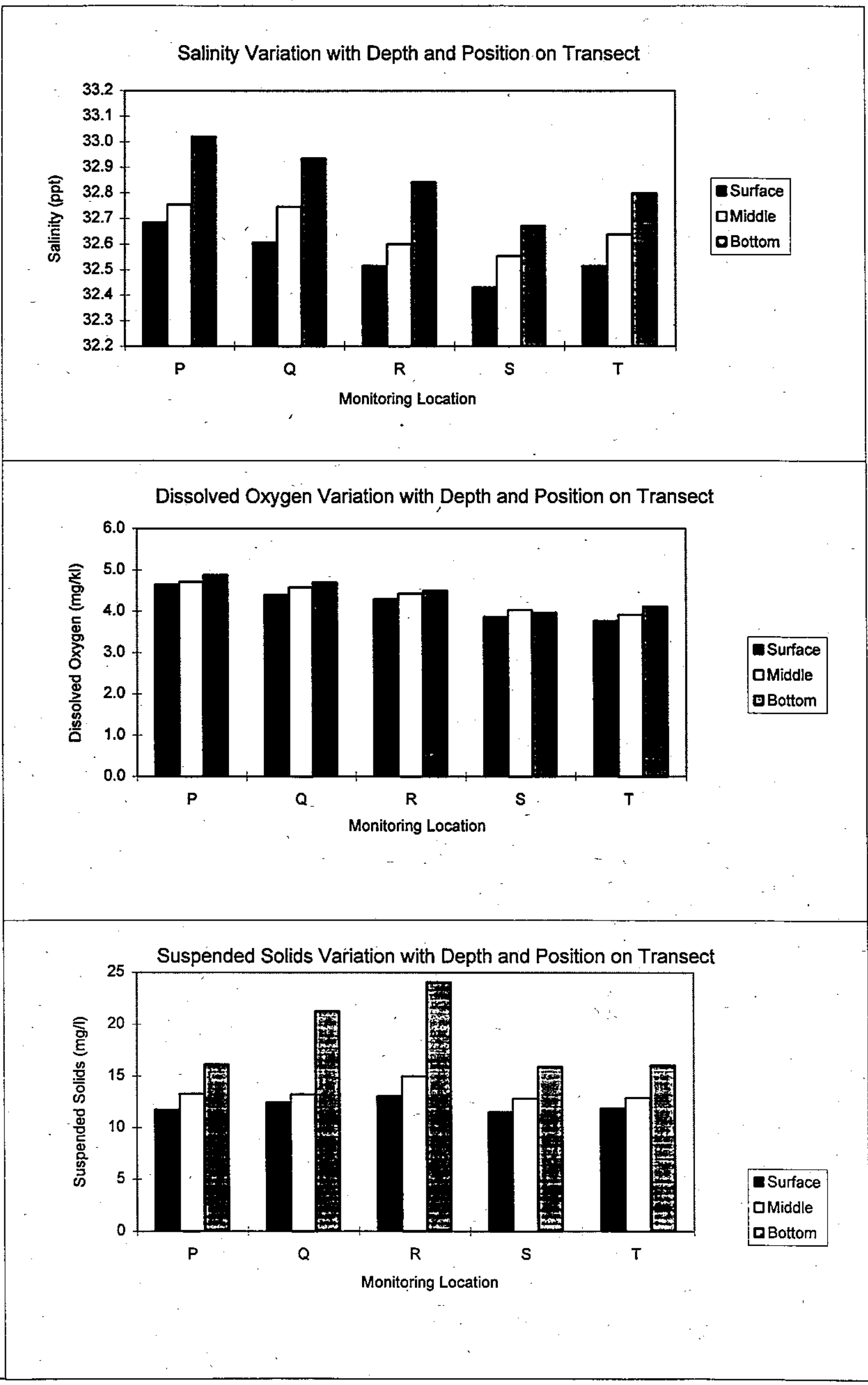
Figure No. 7.2



Marine Water Quality Background Sampling Locations

Mouchel

Figure No. 7.3



Longitudinal Profile Through the Rambler Channel During the Monitoring Period

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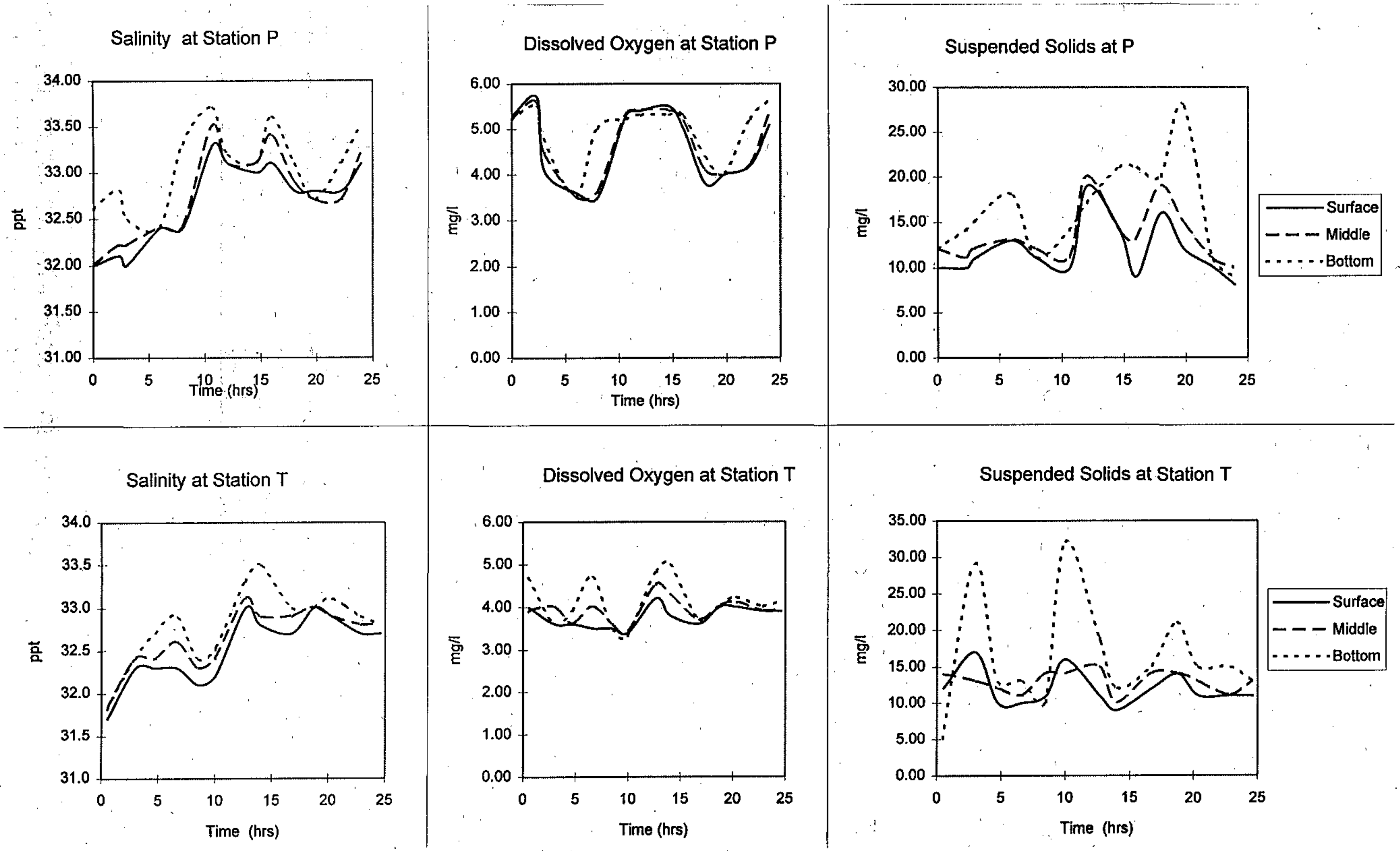
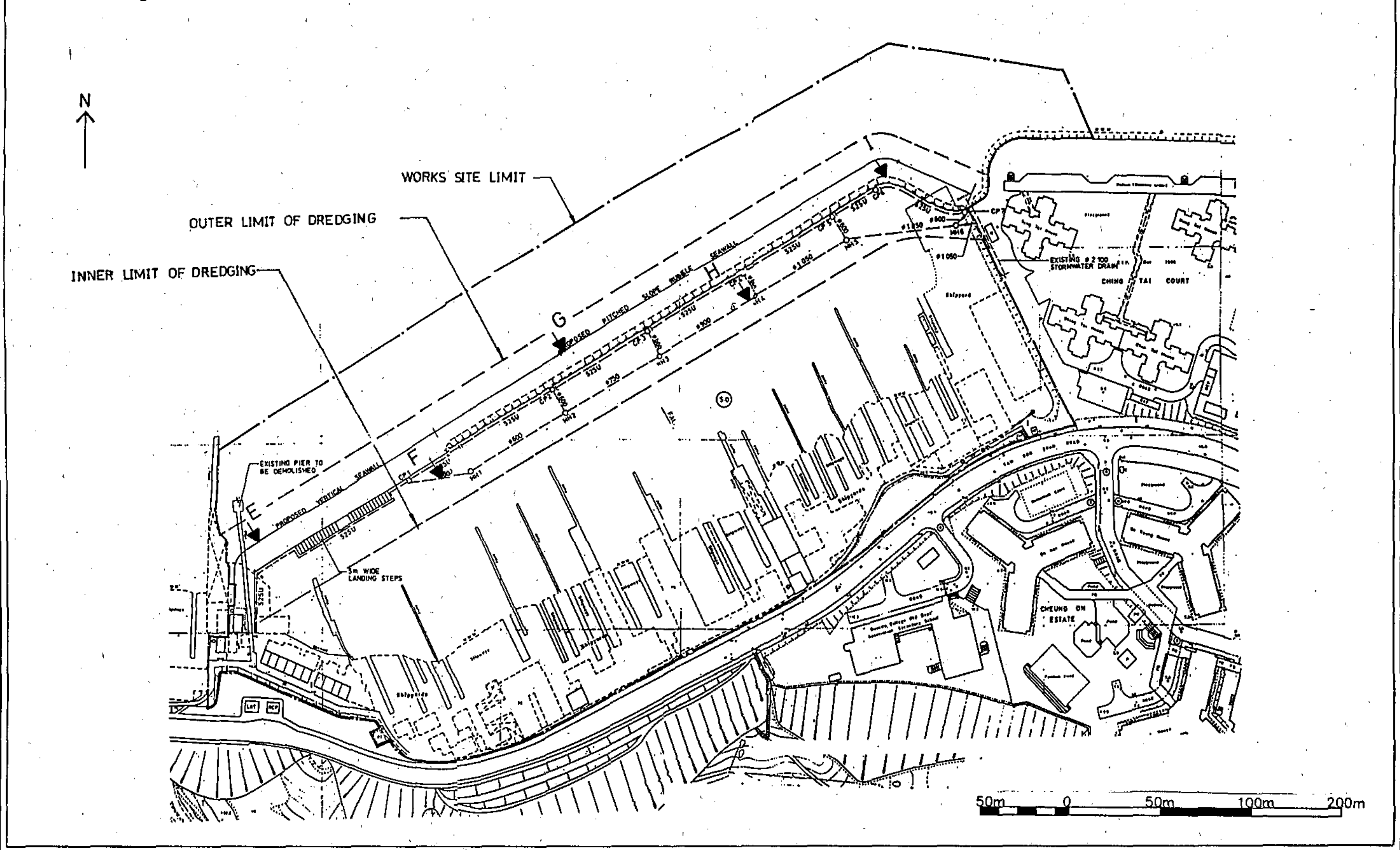
Figure No. 7.4



Trends and Cyclic Variations for Stations P and T

Mouchel

Figure No. 7.5



Marine Sediments Background Sampling Locations

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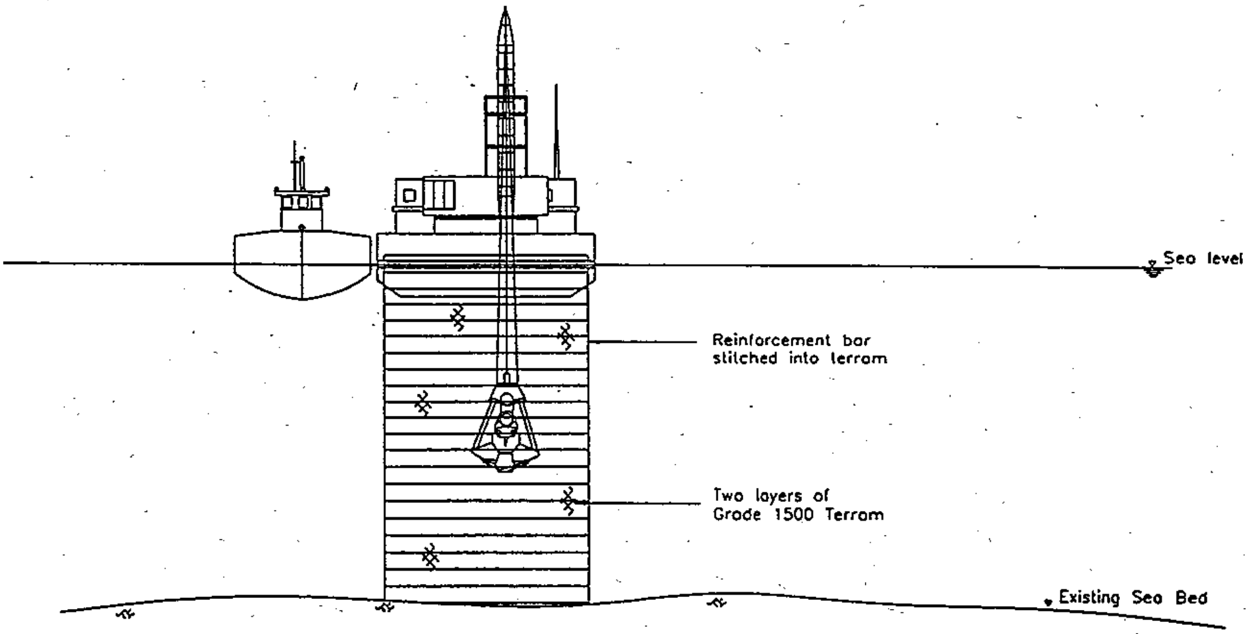
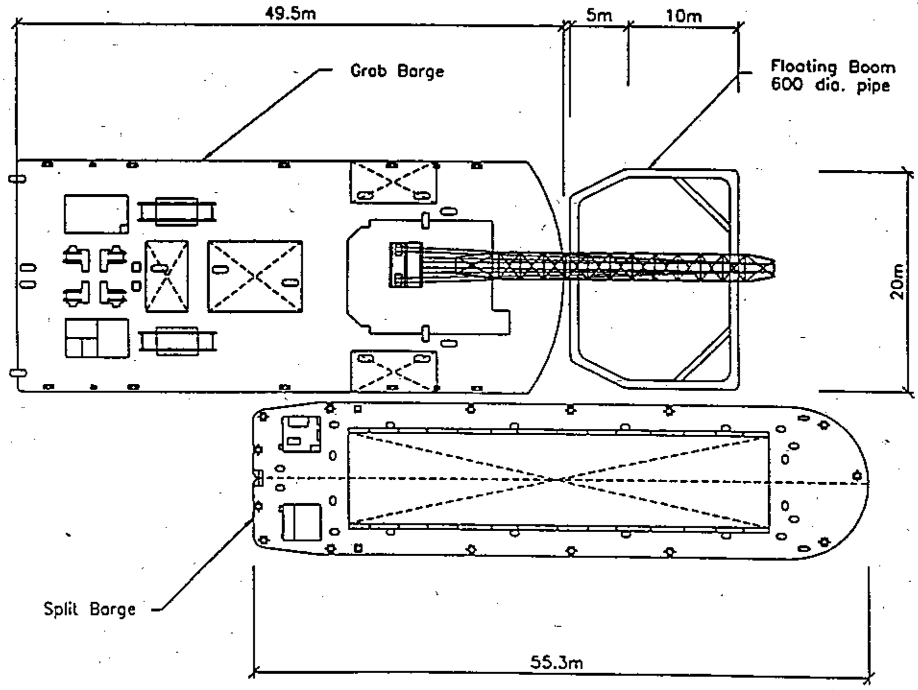
Figure No. 7.6



Front Elevation



Plan

Grab Dredging with Silt Curtain

Mouchel

Figure No. 7.7

8.0 LAND CONTAMINATION

8.1 Introduction

This Section assesses the impacts of the project activities on ground contamination and predicts the implications of the contamination for the proposed land uses at the site. The study was undertaken by desk study, an inspection of the shipyards (as described in Section 3.0) and discussions with shipyard staff.

The Initial Assessment Report recommended that soil samples should be analysed for a suite of contaminants prior to site clearance in order to provide an indication of potential levels of contamination across the site. This would enable a thorough assessment of soil contamination and the development of appropriate mitigation measures. Unfortunately, the shipyard operators have refused to grant permission to the Consultants for access to the shipyards for soil sampling, therefore, the impact of contamination on the site could not be fully assessed during this Study. It is recommended that the findings of this assessment be reviewed following a detailed contamination survey which should be undertaken as soon as access to the site can be secured.

8.2 Environmental Standards and Guidelines

Guidelines for the assessment of contaminated land are specified in the Draft EPD Land Contamination Assessment Standard Brief and the Guidelines on Sampling and Analysis, a copy of which is contained in Appendix G-1. This brief describes the procedure to be used for the assessment of potential contamination, the taking of samples, and the analysis and interpretation of results.

The EPD requires that the interpretation of the results of the soil analysis is undertaken according to international guidance levels such as the Dutch Indicative Index, the UK guidelines published by the Interdepartmental Committee on the Redevelopment of Contaminated Land (ICRCL) or those of the US Environmental Protection Agency.

The Dutch Indicative Index provides guidelines for use in assessing the significance of ground contamination. If the levels of contaminants lie in Level "A", then the soil is classified as unpolluted, and if at level "B", it implies that pollution is present and further investigation is required. Level "C" implies that significant pollution is present and clean-up is required. A copy of The Dutch Indicative Index is contained in Appendix G-2.

The UK ICRCL system provides guidelines for fewer components than the Dutch Index but has the added value of providing different guideline values depending on the proposed land use of the site. The rationale is that the importance of any hazard on a site depends primarily on the proposed site use, since this use determines who and what may be at risk and the routes by which they may become exposed. For example, on land which is to be used for gardens or which would remain as bare soil, there would be greater risk that someone may ingest toxic contaminants in soil than there would be on an area of land which is to be covered with concrete. These guidelines are therefore useful in the assessment of contamination in relation to land use proposals. A copy of the UK ICRCL guidelines is contained in Appendix G-3.

8.3 Sensitive Receivers

Sensitive receivers can be defined as any land or marine environment which could be affected by an increase in contamination brought about as a result of activities on site. The Project will not in itself directly cause an increase in contamination at the site, although certain proposed activities could lead, indirectly, to soil disturbance and contaminant movement and potentially cause adverse effects on sensitive receivers. If contaminated soils are present on site, the expected sensitive receivers would include those identified below:

8.3.1 Marine Environment

The marine sediments and water quality could become adversely affected by contaminated surface water runoff derived from sediment and soil on site, which has been loosened following demolition activities. The runoff may be increased as a result of the greater rain impact following the removal of structures on site.

8.3.2 Contractors on Site

Site construction workers, working on the site during the site clearance and during the construction phase, could become exposed to contaminants on site. The principal exposure routes would be inhalation of dust during demolition and clearance activities, and direct ingestion of contaminated soil through eating or smoking on site without controlled hygiene procedures. There is also the risk that the construction workers may encounter toxic gases in contaminated ground conditions.

8.3.3 Future Land Uses on Site

The final sensitive receivers are the future users of the site. According to the Draft Outline Zoning Plan No. S/TY/8, it is proposed that the land use for the site would be primarily "O" - Open Space Land use, with a small portion of the western corner being designated as "GIC" - Government/Institution Community. Table 8.1 provides examples of the land uses which are *always permitted* in the two classes. A full lists of uses which are *always permitted* and uses which *may be permitted*, are contained in Appendix G-4.

8.3.4 Surrounding Land Uses

The surface water on the Project site drains directly to the sea and it is unlikely that there will be any groundwater movement to the surrounding land. Land uses surrounding the site will therefore not likely be affected from potential runoff of contaminated water. Surrounding land users are considered as sensitive receivers with respect to air borne pollutants, for example if they became exposed to toxic fumes or contaminated dust.

Table 8.1: Examples of Land Uses always permitted on Open Space and GIC Land

Open Space	Government Institution Community
Ancillary Beach Use	Ambulance Depot
Ancillary Car Park	Broadcasting Studio
Aviary	Canteen
Changing Room	Hawker Centre
Park and Garden	Hospital
Plant Nursery	Place of Recreation, Sports or Culture
Playground/Playing Area	Plant Nursery
Public Convenience	Public Car Park
Refreshment Kiosk	School
Zoo	Wholesale Food Market

If the Project site were to be used for buildings, it would be sensitive to exposure to flammable substances or to high levels of materials which could corrode building materials. Similarly, a plant nursery, an area to be used for recreational activity, or an area of public beach would be sensitive to any toxic substances in the soil.

8.4 Existing Conditions

8.4.1 General Condition

The current level of contamination at the site depends on a number of factors including the current and past uses of the site and adjacent areas, current and past activities and product usage and waste disposal practices. These aspects are discussed below. The potential for contamination at the site is discussed in Section 8.4.7.

8.4.2 Site History

No historical site plans or maps of the Project area were available for inspection and therefore the site history was determined from a review of aerial photographs. The oldest photographs of the activities at the Project site are December 1964 and May 1967. The 1964 photograph shows that the Project site was being formed at that time. This was being undertaken by excavating the sloping hillside adjacent to the site, and pushing excavated fill into the adjacent coastline. This latter point is confirmed by borehole logs DH7, DH9, DH11, DH12 and DH14 of the Site Investigation Report (CESD Contract No. GC/91/08) "Site Investigation of Marine Works". The May 1967 photograph shows a wooden slipway and associated temporary structures. Discussions with shipyard staff and review of later aerial photographs have indicated that the site has been continuously used as a shipyard since this time.

From this study of the site history, it is considered unlikely that the uses of the site before the establishment of the shipyards would have made any significant contribution to contamination

8.4.3 Current and Past Site Activities

The site comprises a series of single and two or three-storey buildings and slipways. For the purpose of this study, the individual shipyards, and facilities within these areas are described according to the numbering system provided in Appendix C-2. The floors of most of the shipyard buildings are surfaced with concrete or are covered with steel sheets of the type used in ship repair. However, there are a number of buildings where the floors are bare soil which could allow contaminants to leak into the ground.

The surfaces of the yard areas are either bare soil or concrete, although in some yards wooden jetties extend directly from the buildings. At a number of places it was not possible to determine by visual inspection whether there was a concrete surface beneath the thick superficial deposit which lies on the ground.

The main activities carried out in the shipyards are the construction, maintenance and renovation of steel hulled ships and barges. During the field surveys the majority of the shipyards were carrying out maintenance works for metal ships and barges. The Kowloon Shipyard previously manufactured fibre glass ships, however the production ceased about seven years ago and the buildings are used for storage of moulds and equipment. The Supercraft Shipyard also used to produce fibreglass ships, however most activities have now been moved to a new shipyard at the western end of Tam Kon Shan Road.

Typical activities include:

- Winching the ship or barge up the slipway using electrical driven winches and cables. The cables are lubricated with oil along the cable length;
- Removal of the engine oil, waste oil and oily-water from the few ships with in-board engines;
- Removal of marine growth attached to the bottom of ships;
- Removal of surface rust on the hull by hammering and grinding, or, in the case of one shipyard, by sand blasting;
- Cutting out the worn or rusted sections of the hull by blow torch and welding new steel plates to ship bodies;
- Paint stripping;
- Mechanical repair;
- Welding zinc sacrificial anodes (sacrificial metal for to reduce rusting) on ship bodies;
- Polishing welding joints; and
- Painting the hull and top sides of ships.

All these activities could potentially lead to contamination in specific areas of the site due to the products which are, or have been, used.

8.4.4 Product Usage

Table 8.2 lists the main products which were present on site during the field visits. The shipyard operators who were interviewed were not able to show stock records and therefore this is unlikely to be a complete product list.

Table 8.2: Main Products Presently used on Site

Product	Components of Products
Paints	• Various metal-containing paints and primers, which use constituents such as copper, zinc, aluminium, magnesium, nickel, chromium, cadmium, lead, tin and cyanide. • Anti-fouling paints containing copper and lead
Solvents	• Acetone • Various thinners
Oils and Greases	• Lubricating oil • Hydraulic oil • Grease
Fibre Glassing Products	• Resins • Fibre glass • Various lacquers • Epoxy primers • Glass fibre primers
Gases for Welding and Cutting	• Acetylene gas • Oxygen

The shipyard operations are basically simple but labour intensive. The materials and chemicals used consist mainly of paint, solvents, acetylene gas and oxygen for cutting, welding tubes, zinc sacrificial anodes, diesel oil and lubricating oil/grease for the machinery, cables and rails of the slipways. Figures C-2.2 to C-2.20 contained in Appendix C-2 show the general locations where chemicals and wastes are stored.

Many of the product labels do not include details of the constituents. Appendix G-5 lists the names of the products that were noted.

Although the Kowloon and Supercraft Shipyards are no longer involved in manufacturing, a small quantity of fibre glass mats, acetone and resin are stored on site. Acetone and resin are considered as dangerous goods and are stored in a separate storage area (concrete structure) which is regularly inspected by the Fire Services Department.

The majority of the shipyard operators use paint and thinners which are mainly used in the yard area and on the slipways. Oil and grease are applied at various places inside the buildings and within the yards. The cable hauls are lubricated along their length which extends from the winches inside the buildings to the shoreline. Other uses of oil and grease include the maintenance of cables, which is generally undertaken inside the yard buildings.

Paints are stored on racks in the main buildings or in separate buildings outside, where storage tends to be either on a concrete floor or bare soil. It should be noted that the chemicals are by no means confined to these areas and are also located in proximity to the working areas.

Shipyard operators and staff were able to supply only limited information on the changes which have taken place since the shipyard operations commenced, particularly with respect to changes in site activities, working practices or product usage. Therefore, whilst Table 8.2 provides information on the current usage of products at the site, it can only be considered as a guide to the likely products which may have been used on the site in its earlier years. For example, there is no record as to whether tributyltin, an anti-fouling product which has been commonly used worldwide until recently, and which is highly marine-toxic, has ever been used on the site.

From experience of other shipyards, it would be expected that the following additional materials may be held on site:

- Other metal working wastes especially the swarf from the drilling or cutting of brass and bronze;
- Lead ballast;
- Copper from the repair or disposal of electrical components;
- Asbestos from lagging of boilers and steam pipes, insulation of hulls;
- Bitumen paints; and
- Various acids and alkalis.

8.4.5 Solid and Liquid Waste Handling

The shipyards generate a considerable quantity of wastes. There seems to be little or no control over the disposal of solid waste other than the scrap metal which is collected for recycling. Anything from waste paint and solvent containers, which may or may not have been washed out, to oil drums, batteries, discarded zinc sacrificial anodes and contaminated rags are being deposited at the numerous tips in the corners of the individual shipyards. Whilst some of these tips are sited on concrete, others are on bare soil, thus increasing the potential for soil contamination.

Liquid wastes at the sites include waste oil, paints and solvents. It is likely that soil contamination could have occurred as a result of leaks from the waste oil containers or from any liquid waste which has been disposed of at the above tips. According to the shipyard operators, there has been no large scale accidental spillage of paint, thinners or oil at the shipyard sites, however, small scale spills are evidently a routine occurrence.

8.4.6 Superficial Deposits

A surface deposit of varying thickness has accumulated on the bare soil and the concrete surfaces across the site, from the buildings to the high water mark. Whilst the composition of the deposit can only be determined following analysis, it appears to be composed of a variety of solid materials such as marine growth residue, stripped paint, rust, and liquid wastes which are discarded on the floors of the buildings and the open shipyard areas and slipways during normal shipyard activities.
It is considered that the predominant constituents of the deposit within the buildings would be lubricating oil (from the winches and cable hauls), metal swarf (from cutting the metal sheets) and paint (from accidental spillage or leaks during storage). The material deposited in the yard and slipway areas is likely to be wide ranging in composition, consisting of the following main constituents:

- Discarded paint and paint containers;
- Pieces of rusty steel from the surface of ships, fine metal dust from sanding, metal fragments and swarf from cutting, and discarded and rusting rivets;
- Corroding zinc sacrificial anodes;
- Oil (from lubricating the cable hauls and other equipment) and grease;
- Marine growth scraped off the ships;
- Discarded rags;
- Waste timber;
- Rubber tyres; and

- Discarded lead and acid-containing batteries.

It is evident that little attention has been given over the years, to the development of working practices which would minimise the deposit of such materials. As the shipyards are rarely swept, waste which is routinely discarded in the yards builds up, increasing the contact of the contaminants with the soil and increasing the risk of contaminant penetration.

In addition to the general presence of surface deposits, there are localised areas of oils on the concrete soil floors of the buildings and yards in the majority of the shipyards, particularly around the waste oil drums (none of which are bunded), around the winches, cable hauls and pulley systems, and in the vicinity of the metal slipway runs.

There are localised patches of paint, especially in the paint stores and in areas of the yard where ship maintenance is concentrated. Where the surface material is bare soil, it is likely that the paint has penetrated into the ground.

8.4.7 Potential for Contamination on Site

As a result of this site inspection, it is considered that there is likely to be contamination of the bare soil and concrete surfaces of the buildings and shipyard areas. The main contaminants are expected to be oils, greases and solvents, and metals from the paints and swarf. In addition, localised areas of high oil contamination may exist where activities such as winching in the ships or storage of waste oil have been carried out. The hazardous substances which are likely to be on site, together with a description of their hazardous properties, are listed in Table 8.3.

Table 8.3: Hazardous Substances Potentially on Site

Substance	Hazardous Property
Cadmium	• Toxic by contact and ingestion • Toxic to marine organisms • Uptake in plants
Chromium	• Toxic by ingestion • Toxic to fish and plankton, accumulates in fish and shellfish
Lead	• Toxic by contact and ingestion • Toxic to mammals and fish • Uptake in plants • Specific precautions required in relation to monitoring and control in dust during site activities
Nickel	• Toxic to plants • Toxic to fish
Copper	• Toxic to plants, highly toxic to fish, algae, marine plants and invertebrates
Zinc	• Toxic to plants
Phenols	• Toxic by contact • Causes deleterious effect on building materials especially plastic • Flammable • Highly mobile in water
Tributyltin (TBT)	• Toxic to marine organisms, especially to the larval stage of oysters and other shellfish
Cyanide	• Toxic by ingestion
Sulphate	• Attacks concrete and plastics • Causes metal corrosion • Increased effect in acid conditions
Chloride	• Deleterious affects on concrete, especially in acid conditions
Polycyclic Aromatic Hydrocarbons	• Toxic by ingestion and contact
Oils, oily wastes, bitumen	• Toxic by contact • Flammable • Affects building materials especially plastics
Solvents such as benzene, toluene, pertroleum hydrocarbons	• Toxic by inhalation, ingestion and contact • Flammable
Paints in general	• Flammable • Anti-Fouling paint is toxic
Rubber	• Flammable, combustible
Thinners other solvents	• Flammable • Toxic by inhalation, injestion and contact
Acids	• Attacks concrete • Corrodes metals and attacks plastics • Toxic by contact
Asbestos	• Harmful by contact and inhalation

It should be noted that the substances noted in Table 8.3 are only hazardous if present at high enough concentrations, and that those concentrations depend on the route and duration of exposure, the medium of exposure and the sensitive receivers or organisms concerned (see Section 8.3). In order to determine the actual levels of contamination on the site, it is recommended that a soil contamination study as described in Section 8.10 is undertaken following demolition of the superstructures of the shipyards, with particular focus on those components identified in Table 8.3 (see Section 8.4).

8.5 General Impact Assessment

Guidance on "acceptable" levels of hazardous substances for different combinations of media and sensitive receivers is contained in the following:

- For contaminants in soil, the environmental standards and guidelines described in Section 8.2.
- For hazardous substances in the atmosphere, guidance and regulations including the Occupational Exposure Limits (EH 40/94) and the Control of Substances Hazardous to Health Regulations (1988).
- The marine toxicity effects of contaminants are outlined in Sections 6 and 7 of this report.

The impacts of the site activities on the sensitive receivers described in Section 8.3 cannot be evaluated against the environmental standards and guidelines until the soil contamination survey has been undertaken. However, from the study undertaken to date, the following impacts can be tentatively predicted. Following the soil contamination survey, it is recommended that these predicted impacts and the tentative mitigation measures described in Section 8.8 are reviewed.

8.6 Impacts During Site Clearance and Seawall Construction

8.6.1 Impacts on the Marine Environment

It is expected that there would be an increase in the concentration of contaminants in surface water runoff to the marine environment during the clearance of the buildings from site. This would result from the loosening of the existing surface deposit and contaminated soil following demolition and clearance and the exposure of the surface material to rainfall.

8.6.2 Impacts to Workers on Site

There would be potentially adverse effects on the health and safety of workers undertaking site clearance activities on site, and during the construction phase due to their exposure to hazardous materials in the soil and dust. Appropriate precautions will need be included in the Contract Specification in order to prevent unacceptable exposure to any hazardous substances in the dust as specified, in accordance with the relevant Code of Practice published by the Labour Department in relation to the Factories and Industrial Undertakings Regulation, the Health and Safety at Work Act 1974, the Control of Substances Hazardous to Health Regulations 1988 and other relevant guidelines.

8.6.3 Impacts on Surrounding Land Uses

Land in the vicinity of the site could be adversely affected by any increase in contaminant movement to that land from the Project site through soil and dust, caused by the disturbance of the demolition and construction activities.

8.7 Impacts During Reclamation Construction

8.7.1 Impacts on the Marine Environment

The reclamation activities may cause the movement of some contaminated materials into the infill site (and hence to the marine environment) as a result of surface water runoff, the loosening of soil and the effects of plant and equipment.

8.7.2 Effects on Workers

There could be potentially adverse effects on the workers on site due to their exposure to hazardous materials in the soil, surface deposit, fume and dust. It is considered that the level of impact will diminish as the operation proceeds and as the surface deposit is covered.

8.7.3 Implications for Future Land Uses on Site

It is understood that the final profile of the site rises from sea level to +5 mPD. As a result, the potentially contaminated surface material would be covered by varying thicknesses of infill, with no covering, or only a very thin covering, at the shoreward extent of the site. The impacts of the contamination on future land uses will be predicted by comparing the results of the soil contamination analyses with established guidelines noted in Section 8.2. For example, a high level of metal in the soil would indicate that the land may be unsuitable for leaving as bare ground, and high levels of phenol in the surface materials may indicate that care would be required in the choice of building materials, in order to minimise deleterious effects. Where the material is covered by inert waste, the implications for the future use of the site will depend on the nature and level of contaminants present and the depth of fill.

8.8 Mitigation Measures

The optimal measure to minimise the exposure of sensitive receivers to the contaminants during the site activities will depend on the nature and level of contaminants at the site. Three possible options of action are proposed depending on the results of the contamination survey and are as follows:

8.8.1 Unpolluted or Very Low Contamination Levels

If the surface material is determined to be "un-polluted" or if contamination is found to be at very low levels, such that it would be unlikely to affect the sensitive receivers even if the material is exposed on the surface (ie. not covered by infill), then the best environmental option would be to leave the surface material in place following the clearance of the site.

8.8.2 Moderate Contamination Levels

If the level of contamination is found to be below the level which would require removal from the site, but at a level which may cause some adverse effects on the sensitive receivers if left exposed, it is recommended that the material is deposited at depth within the infill area, in a position where there would be no adverse effect on the future land uses or other sensitive receivers. This option would result in less environmental impact than if the material were left in place.

If the material is to be deposited within the infill area, the proposed location needs to be carefully determined following the soil contamination survey. The depth of fill will vary across the site from less than 1 m to about 5 m from its shoreward limit to the seawall. The material needs to be deposited at a point where it would be covered by as much of the infill material as possible, (ie. it would need to be as close to the seawall as possible), in order to minimise the risk of contamination reaching the surface through any future piling or excavation on site. However, if it is deposited at a low level at depth near the seawall, and therefore below sea level, there is a risk of adverse effects on marine water quality during the filling process. From this assessment it is considered that an optimal location would be at a height above the high tide level, about +2.5 mPD where it would then be covered by about 2.5 m of infill material.

8.8.3 High Contamination Levels

If the level of contamination is determined to be above that considered acceptable for the different media and sensitive receivers noted above, even if buried at depth in the reclamation (as described in option 8.8.2), and if/or the contamination is such that it should be classified as chemical waste, it may be necessary to recommend that the loose surface deposit, and possibly some soil and the contaminated concrete surface, is stripped from site and disposed of in a suitable landfill site before infilling of the area can commence. This would also avoid any possible objection to the disposal of contaminated material in a reclamation site which is designed for only "clean" construction waste.

This option would have the following benefits:

- Reducing the discharge of contaminated sediment to the marine environment during all phases of activity;
- Reducing the risk of contaminant movement to the adjacent sites;
- Minimising adverse effects on the contractors working on site; and
- Providing fewer constraints on the development potential of the site.

However, this would be an expensive option and one which should be considered only if the level of contamination is so high that the other options are considered unsuitable.

8.9 Land Contamination Summary

It is considered that there is the potential for contamination at the site as a result of past and current site activities and there is the potential for adverse effects on the sensitive receivers as a result of the site clearance, site construction and the operation of the proposed works.

It is recommended that a soil contamination survey is undertaken to determine the nature and extent of contamination across the site. The results of the survey would serve as the basis from which:

- The results of this assessment concerning the nature and extent of contamination on site can be confirmed;
- The likely impacts of the development and implications for the future use of the site can be identified; and
- The optimal mitigation or remedial measures can be developed.

8.10 Proposed Soil Contamination Assessment

It is recommended that the assessment should follow the EPD Land Contamination Assessment Standard Brief. The sampling requirements and procedures should be in accordance with EPD's Guidelines on Soil Contamination Sampling and Analysis. The assessment should be carried out by competent and experienced professionals who will supervise the sampling exercise and interpret the results in accordance to international references. Laboratory analysis should be carried out by a HOKLAS accredited laboratory or laboratory accredited under similar approved schemes.

8.10.1 Timing for Assessment

It is anticipated that the soil contaminated assessment will take at least three months to complete and, if the soil is found to be contaminated, remediation works may take several months to complete depending on the extent and nature of the contamination. In order to ensure the site will be available to receive public dump materials in early 1996, it is recommended that the assessment to be conducted as soon as access to the site can be secured prior to site clearance.

8.10.2 Area to be Assessed

It is recommended that the area of the Project site to be included in the soil contamination assessment should be limited to the land area, inclusive of the area between the high water mark (HWM) and the landward site boundary.

8.10.3 Soil Sampling Methodology

Soil sampling should be conducted in accordance with BS 3930: Code of Practice for Site Investigation and samples should be taken based on a regular grid pattern in line with international practices. The land area of Project site is about 3 hectares. A grid size of 31 m should be used which will enable the sampling exercise to locate an area of soil contamination which occupies 10% of a site with a 95% confidence limit. With this criterion, the proposed sampling locations are shown in Figure 8.1. Some of the sampling locations are close to the HWM. If they are found to be located below the HWM, samples will not be taken.

During field surveys, some locations (presented in Appendix C-2) were identified as "hot spots" which are potentially contaminated. These locations may not be covered by the regular grid sampling pattern. Additional samples should also be taken in these locations.

Samples can be taken by means of trial pits, boreholes, augers and driven probes. With respect to the depth to be sampled (limited to unsaturated zone, less than 3 m below existing ground level), the trial pit technique is recommended. It is easy to apply and relatively inexpensive. An ordinary excavator can easily excavate 15 pits with 1 m x 1 m area and 3 m deep per day. The whole sampling exercise can therefore be completed within a few days. Trial pits will also provide good access for inspection and soil sampling.

Samples should be taken at various depths, surface deposit (within 0.5 m below ground), 1.5 m and 3 m depths, within the unsaturated zone so that the penetration profile of the contamination can be delineated. Additional samples may be taken at depths where there is a change in geology or suspected patch of contamination.

Proper sample handling and storage are essential. Special precautions should be taken to avoid cross contamination. On completion of sampling, the sampling equipment should be thoroughly cleaned prior to use at the next location to avoid cross-contamination. The amount of sample to be taken depends on the types of analysis and the analytical laboratory should be consulted. Nevertheless, a minimum of 1 kg soil samples after the removal of large stones should be taken. The analytical laboratory should be consulted of the appropriate type of sample container to be used with respect the parameters to be analysed. Samples taken should be well contained, sealed and labelled. Samples should be transferred to the laboratory and analysed as soon as practicable. The samples, especially those containing relatively volatile contaminants, should be kept under chilled conditions i.e. 4 degree centigrade but not frozen during transportation and before analysis. This can be achieved by storing them in a cool box with ice packs.

Sampling containers should be clearly marked to show the following:

- Site name
- Sampling depth
- Unique sampling location reference
- Date of sample collection

The site sampling record sheet should include:

- Site name
- Sampling depth
- Unique sampling location reference
- Time and date of sampling
- Name of sampling staff
- Weather conditions and air temperature
- Appearance and condition of the sample
- Sample container used
- Sampling device used
- Weight of sample taken

8.10.4 Analysis

With respect to the nature of the shipyard activities, types of chemical/hazardous substances stored or used, it is proposed that each of the samples will be analysed for a range of components including those listed in Table 8.4.

Table 8.4 : Analysis Schedule

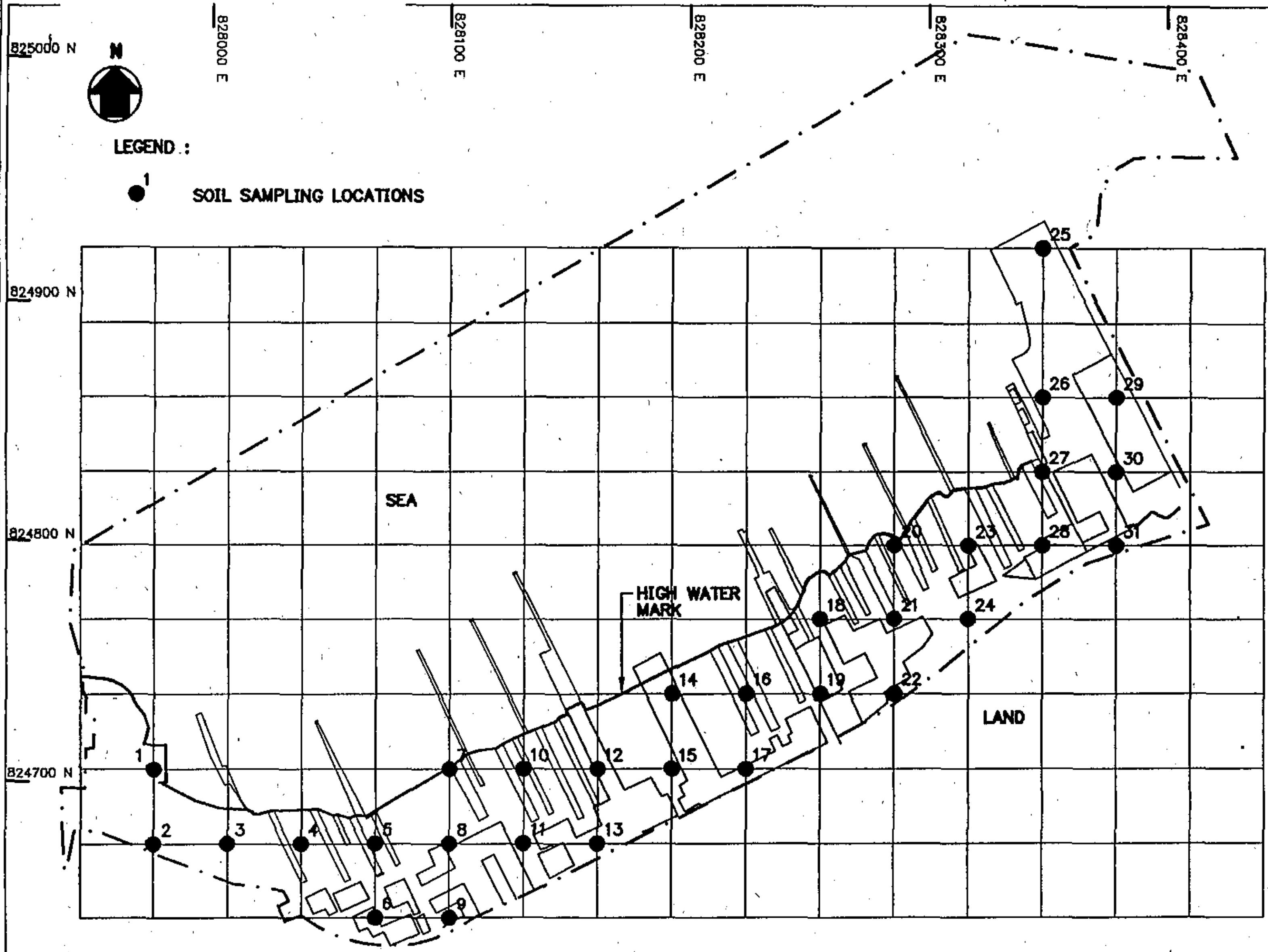
	Component
Organic and Petroleum Contamination	• Total Petroleum Hydrocarbons • BTEX (Benzene, Toluene, Ethylbenzene, Xylene) • PAHs (Polyaromatic Hydrocarbons) • Phenols • Toluene Extractable Materials
Inorganic Contamination	• Tributyltin Oxide • Cadmium • Lead • Copper • Tin • Chromium • Nickel • Zinc • Iron • Cyanide • Sulphates • Chloride • pH
Others	• Loss on Ignition
Notes:	Total Petroleum Hydrocarbons and BTEX which are highly volatile contaminants should be analysed within 24 hours after sampling.

8.10.5 Results

The results of the contamination analyses would be interpreted in accordance with the guidance documents referred to in the EPD Land Contamination Assessment Standard Brief, namely the Dutch Indicative Index and other international guidelines such as the published guidelines of the UK Interdepartmental Committee on the Redevelopment of Contaminated Land (ICRCL Guidance Note 59/83).

8.11 Further Studies

This assessment has been carried out without access to the detailed site investigation and testing data that is required to confirm the scale or location of any land contamination. The study has recommended that detailed sampling is carried out to confirm the results. The findings and recommendations of the assessment should be reviewed after completion of the detailed sampling.



SOIL SAMPLE SETTING-OUT TABLE

SETTING-OUT POINT	EASTING	NORTHING
1	827976	824705
2	827976	824674
3	828007	824674
4	828038	824674
5	828069	824674
6	828069	824643
7	828100	824705
8	828100	824674
9	828100	824643
10	828131	824705
11	828131	824674
12	828162	824705
13	828162	824674
14	828193	824736
15	828193	824705
16	828224	824736
17	828224	824705
18	828255	824767
19	828255	824736
20	828286	824798
21	828286	824767
22	828286	824736
23	828317	824798
24	828317	824767
25	828348	824922
26	828348	824860
27	828348	824829
28	828348	824798
29	828379	824860
30	828379	824829
31	828379	824798

Land Contamination Assessment - Soil Sampling Locations

Mouchel

Figure No. 8.1

9.0 CUMULATIVE PROJECTS

9.1 Cumulative Projects

Cumulative effects can be described as two or more individual effects which, when considered together, may compound or increase environmental impacts. Cumulative projects associated with this study include other proposed or planned projects that may be implemented during construction of the North Tsing Yi Reclamation Project that could result in cumulative impacts from combined emissions.

9.2 Cumulative Project List

Information was reviewed to determine planned or proposed projects that may be implemented during the construction and operation of this Project. These data included the ENPO (Tsing Yi) Progress Reports, the Technical Report on Predicted Traffic Data for Route 3 and information from the new Airport Projects Co-ordination Office. In addition, discussions were held with the Tsuen Wan District Planning Office. Table 9.1 lists cumulative projects in the Project area that may be implemented during the construction and operation period of the North Tsing Yi Reclamation Project between August 1995 to February 1998. These projects are depicted in Figure 9.1.

The shipyards presently occupying the Project site will be moved to another location prior to commencement of the Project. The shipyards may be moved west of the Project site, however, the location has not yet been confirmed. Cumulative impacts from these shipyards have not, therefore, been included in this assessment.

9.3 Determination of Cumulative Impacts

The cumulative impacts associated with construction and operation of the projects listed in Table 9.1 are addressed in the following Sections. Due to the lack of specific information on these projects (such as construction schedules, equipment used and amount of earth moving activities), this cumulative assessment is essentially a desktop evaluation of the potential for possible cumulative impacts and does not contain a detailed assessment of each project.

9.3.1 Noise/Air Quality

The main projects in the vicinity of the proposed Project that would generate noise and dust are construction works in Area 8 for public housing and the further reclamation of Tsuen Wan Bay in Area 35. The Tsuen Wan Bay project is of sufficient distance from the North Tsing Yi Project that if the government standards for noise and air quality are complied with then no individual or cumulative impacts would occur. Similarly, for Area 8, if the noise and air quality standards are complied with individually at these project sites and individual impacts do not occur at sensitive receivers then cumulative impacts would not likely occur.

9.3.2 Water Quality

The main projects in the vicinity of the proposed Project site that will have the potential for water quality impacts is the Tsuen Wan Bay Reclamation in Area 35, situated across the Rambler Channel from the Project site (see no. 16 on Figure 9.1). Although no specific information is available on the reclamation activities, it is not considered likely that cumulative impacts will occur since the water quality modelling for the North Tsing Yi Project has shown that the sediment plume generated by dredging activities will have a negligible impact on the surrounding water environment, thus any resulting cumulative effect should be minimal.

Table 9.1: Cumulative Project List

No.	Project	Construction Duration	
		Begin	Completed by
1.	Airport Railway		
	i) Rambler Channel Bridge(RCB) No:510	10 October 1994	1 March 1998
	ii) Tsing Yi Station and Foundation No.511C	10 October 1994	1 March 1998
	iii) Tsing Yi Tunnel and Viaduct No.512	10 October 1994	1 February 1998
2.	Route 3		
	i) Cheung Ching Tunnel (CCT) (HY/92/02)	5 March 1993	28 January 1997
	ii) Rambler Channel Bridge(RCB) (HY/92/03)	5 June 1993	3 June 1996
	iii) Kwai Chung Viaduct (HY/92/04)	6 May 1993	30 September 1996
3.	Tsing Yi Road West Road Improvement	July 1995	November 1996
4.	Lantau Fixed Crossing		
	i) Tsing Ma Bridge (HY/91/18)	May 1992	May 1997
	ii) North West Tsing Yi Interchange (HY/93/22)	September 1994	May 1997
5.	Ting Kau Bridge (HY/93/38)	September 1994*	Mid 1997*
6.	Duplicate Tsing Yi Bridge	December 1994*	January 1998*
7.	Tsing Yi North Coastal Road	1998*	2001*
8.	Container Terminal No.9	1995	1999
9.	Area 8 - HOS (plot ratio 5)	1996*	2000*
10.	Nga Ying Chau - Private Residential (plot ratio 5)	1996*	1998*
11.	Area 3		
	i) Residential (1,024 units)	Commenced	1995/96
	ii) Swimming Pool	Commenced	mid 1996
12.	Area 1 - cement plant (plot ratio 5.83)	1996*	1998*
13.	Area 1 - Community Use	Early 1996	Mid 1997
14.	Area 25 - Residential (880 units)	Mid 1995	1998
15.	Tsing Yi Airport Railway Station Development (3,500 residential units; 45,000 m^2 retail)	1995*	1999*
16	Tsuen Wan Bay - Further Reclamation Area 35	1997*	2000*

Note: * Denotes Tentative Date

9.3.3 Traffic

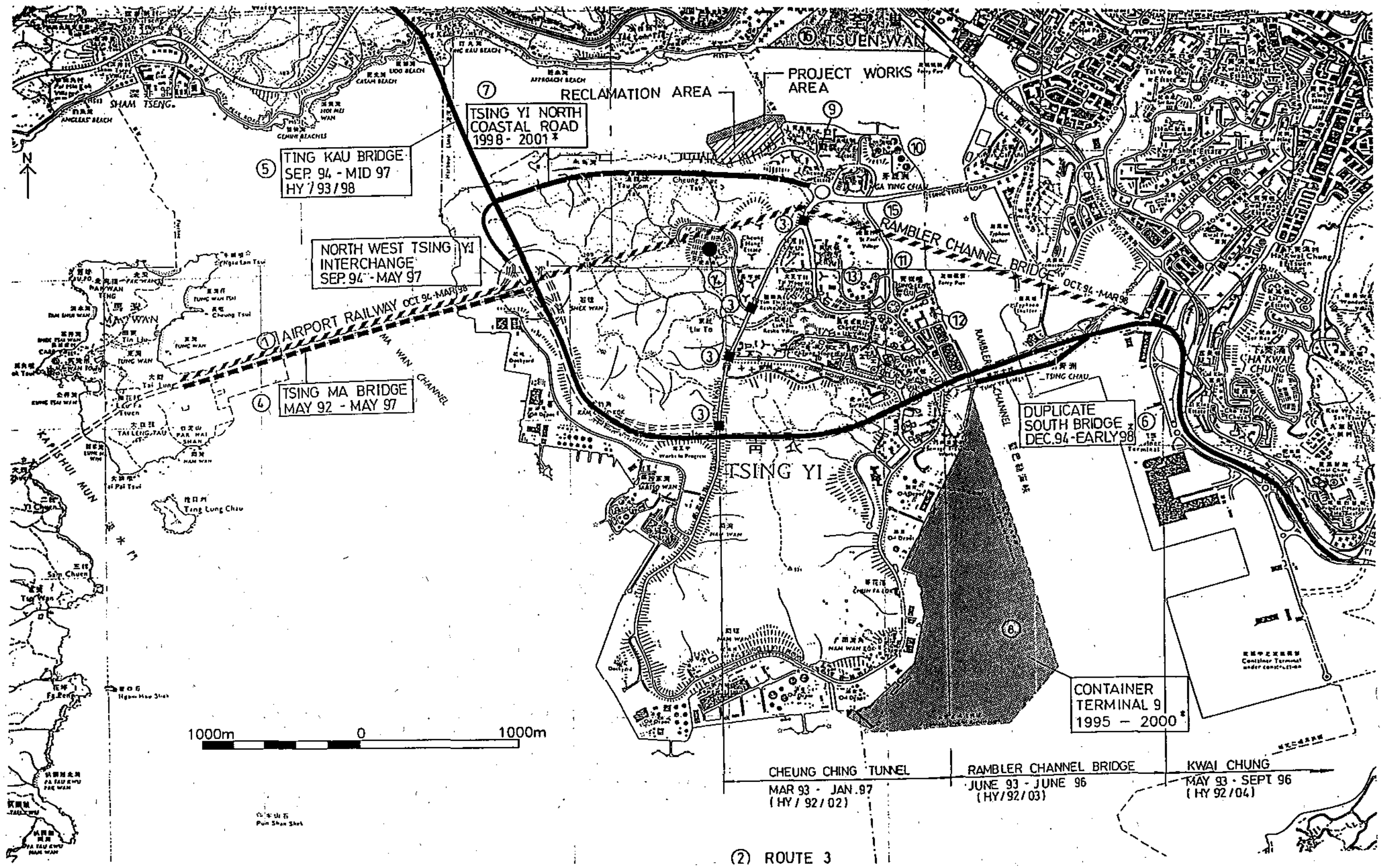
The majority of the projects on the cumulative list will be constructed during the same general time period as this Project. Many of these projects will generate construction traffic in the area, specifically on Tsing Yi Island and the bridge connections to Tsuen Wan Road.

Some of this traffic has been accounted for in the traffic impact assessment for this Project since traffic associated with the construction of on-going projects such as Route 3, Lantau Fixed Crossing and some of the residential developments would already have been present in the traffic count survey data. However, there will still be increases in construction related traffic travelling to and from Tsing Yi when construction of the other remaining project commences.

Projects that will generated traffic include the reclamation and construction on south-east Tsing Yi for the four berth Container Terminal No. 9, associated container back-up areas and industrial land uses, together with the construction of the Duplicate Tsing Yi Bridge. Construction of the Airport Railway, Tsing Yi Airport Railway Station and associated commercial/residential development will also have impacts on north Tsing Yi.

As with this Project, some of the construction-related traffic for these projects will be off-set by the removal of existing land uses which currently generate traffic. For example, the area adjacent to the south-east Tsing Yi reclamation is currently used for mid-stream container operations and was previously part occupied by oil terminals. The Airport Railway station will be built on a site which was until recently occupied by one of the largest container lorry parks in Tsuen Wan - Kwai Tsing District. Removal of these land uses will therefore also remove some the traffic currently travelling to and from Tsing Yi.

Without further information on the construction programme and details of these projects, it is not possible to provide an accurate assessment. However, even with some of the construction traffic being off-set by the removal of existing land uses, it is still likely that traffic conditions to and from Tsing Yi will remain close to capacity especially for traffic using Tsing Yi Bridge.



Cumulative Projects in the Tsing Yi Area

Mouchel

Figure No. 9.1

10.0 BENEFICIAL IMPACT ASSESSMENT

10.1 Introduction

Beneficial impacts are aspects of a project that result in a desirable effect upon the environment and/or society. The following is an overview of beneficial impacts that may result from the Project.

10.2 Environmental Issue Areas

10.2.1 Noise/Air Quality

The main benefit of this Project will be the removal of the incompatible land uses and the reduction of noise impacts on the residents of north-east Tsing Yi.

Residents and the schools around the Project site have been complaining about the industrial noise from the shipyards for several years. In spite of efforts by the shipyard operators, EPD and Kwai Tsing District Board to resolve the noise issue, little progress has been made.

While the proposed demolition, reclamation and dumping works have the potential to cause short-term noise and air quality impacts on sensitive receivers abutting on the site, the long-term beneficial impacts will be the replacement of a polluting source with a more compatible land use on the site and the creation of useful land for the much-needed GIC facilities and District Open Space in the North Tsing Yi area.

10.2.2 Marine Water Quality

The present activities of the shipyards constitute an actual source of pollution to the marine waters of the Rambler Channel which will be removed at this location as a result of the relocation of the shipyards to another site. However, as the shipyards will be relocated, they will become a potential pollution source at their selected site. The Environmental Impact Assessment of the proposed new location for the relocated shipyards is outwith the scope of this study, therefore, the following beneficial impacts are considered site specific.

The relocation of the shipyards will result in a reduction of the following impacts on the marine waters:

- Reduction in floatable waste entrained by tidal washing of the intertidal zone and carried out into the main channel;
- Reduction of Polycyclic Aromatic Hydrocarbon, Petroleum Hydrocarbon and other Organic Compounds washed from the intertidal zone; and
- Reduction of inputs of Tributyl Tin, Copper and other antifoulant compounds washed from the intertidal zone.

A positive enhancement of the marine environment will result from:

- The creation of a smoother coastline profile which will improve flushing of the area;
- The stability of the sea bed in the area will be enhanced;
- The rock armour facing of the seawall will provide a more diverse and less physically disturbed habitat which will result in a greater degree of biological diversity and hence productivity in the subtidal, intertidal and splash zones.

10.2.3 Traffic

Traffic that will be generated by the proposed Project will be similar to existing conditions and, therefore, will not result in beneficial impacts to traffic in the Project area. Once the reclamation is completed, traffic levels should reduce to significantly lower than the existing conditions, assuming that the land uses to be placed on the reclamation site do not generate large volumes of traffic.

10.3 Other Beneficial Impacts

The proposed Project will have a beneficial impact by effectively reusing waste materials and diverting construction waste from landfill sites. By reducing the amount of waste materials that are disposed of at the landfill sites the life of these landfills will be extended and the need for new or expanded landfills may be delayed in the future.

11.0 SUMMARY OF RECOMMENDATIONS AND CONCLUSION

11.1 Introduction

The Project activities that were assessed for potential environmental impacts in the EIA include site clearance, seawall and reclamation construction. The environmental issue areas that were evaluated include solid waste, traffic, noise, air quality, marine water quality and land contamination.

The purpose of the following Section is to provide a summary of the environmental impacts, recommendations and conclusions of each environmental issue. This Section does not provide full details of Project activities, environmental impacts or recommendations. For specific details of these issues the appropriate Sections of the EIA should be consulted.

11.2 Solid Waste

11.2.1 Waste Materials Requiring Removal

The Project site presently contains infrastructure for shipyards such as piers and structures. The shipyards use a variety of materials including paints, oils and welding materials. It is expected that a large portion of the waste materials and plant currently on site will be removed during relocation of the shipyards. The materials that are likely to remain on site after relocation include general waste such as the structures and slipways, chemical waste such as residual paint containers, oils and solvents and potentially contaminated materials such as soil and concrete.

Some of the materials remaining on the site may be suitable for recycling such as the steel, corrugated iron sheet, concrete and building debris. However, other materials remaining on the site may require investigation and special handling prior to site clearance and disposal. This may include determining contamination of soils and foundation materials at the site, testing for the presence of asbestos and handling and disposal of chemicals found on site.

11.2.2 Recommendations for Solid Waste

It is recommended that the following be undertaken:

- An asbestos survey should be carried out prior to demolition of any structures;
- Measures should be taken for the handling, collecting, treating and disposing of waste paints, oils and solvents;
- Recyclable waste materials should be separated and recycled;
- Uncontaminated concrete from building structures should be stockpiled for use as reclamation fill material; and
- Contaminated concrete should be segregated and disposed of to landfill.

The recommended measures are considered to be adequate for encouraging recycling and allowing for proper handling and disposal of waste materials.

11.3 Traffic

11.3.1 Traffic Impacts

The major junctions along roads which could be used for access to the Project site include:

- Tam Kon Shan Roundabout;
- Tsing Tsuen Road, Tuen wan Road and Texaco Road Interchange;
- Kwai Tsing Toad, Tsing Yi Road, Tsing Yi Heung Sze Wui Road Roundabout; and
- Kwai Tsing Road, Tsuen Wan Toad, Hing Fong Interchange.

The Tam Kon Shan Roundabout and Tam Kong Shan Road will be the access points to the site.

Approximately 89 vehicle trips are generated from and attracted to the existing shipyards during morning commuter peak hours (07:30 to 09:00) and 110 vehicle trips are generated from and attracted to the shipyards during evening commuter peak hour traffic (17:15 to 18:15). The Project will generate only 18 vehicle trips per week for a period of 3 months during site clearance. There will thus be a decrease in traffic when compared with existing vehicle trips.

The Project will result in few, if any, vehicle trips during seawall construction. Therefore, there will be a net reduction in vehicle trips when compared with traffic generated at the existing shipyards.

Three scenarios have been considered for constructing the reclamation:

- Filling of the site within a 6 month period will result in an addition of 13 trips during the a.m. peak flows to the Public Dump (10.00 a.m. to 12.00 a.m.) and a reduction in vehicle trips during the p.m. period of 15.30 p.m. to 18.00 p.m;

- Filling of the site within a 12 month period will result in reductions of vehicle trips from 10.00 a.m. to 12.00 a.m. and from 15.30 p.m. to 18.00 p.m;

- Filling of the site within a 15 month period will result in reductions of vehicle trips from 10.00 a.m. to 12.00 a.m. and from 15.30 p.m. to 18.00 p.m.

Consideration of the impact of the changes in traffic volumes needs to take account of the timing of the normal peak hours on roads in the vicinity of the Project site. This normally occurs between 07:30 - 09:00 while for the Public Dumps the peak morning hour traffic is generally 10:00 to 12:00. Thus the additional vehicle trips for the 6 month scenario will be outside normal peak hour periods and there should be little or no increase in the peak hour.

11.3.2 Traffic Recommendations

It is recommended that the Dumping License should require use of the northern bridge rather than the more congested southern Tsing Yi South Bridge. It is also recommended that the site entrance should be located at the western end of the Site and the exit be located at the eastern end of the site to avoid queuing on Tam Kon Shan Road.

11.4 Noise

11.4.1 Noise Generated by the Project

Noise impacts were assessed in accordance with EPD's recommended noise criteria described in the Practice Notes for Professional Persons (No. PNDECC PN 2/93) of 75 dB(A) for dwellings and 70 dB(A) at schools (65 dB(A) during examinations). Traffic travelling on public roads was assessed in accordance with the HKPSG which stipulate a maximum L_{10} (1 hour) noise level from road traffic of 70 dB(A) at sensitive residential facades and 65 DB(A) at schools.

The equipment used for site clearance will include a truck, pneumatic breaker (excavator mounted), JCB Excavator, a mobile crane and blow torch and acetylene cylinders. The noise generated from site clearance will exceed the acceptable noise criteria of 75 dB(A) at several noise sensitive receivers unless mitigation is applied. The acceptable noise criteria of 65 dB(A) during examinations will also be exceeded at the Queen's College Old Boy's Association Secondary School without mitigation. Noise from site clearance vehicles will not exceed the acceptable noise levels at any of the sensitive receivers.

The equipment used for seawall construction will include a grab dredger, barge, tug boat and derrick lighter. The seawall construction will generate noise levels within the acceptable noise criteria at surrounding NSRs. No vehicle trips are expected to occur from seawall construction therefore no traffic noise will be generated.

The reclamation construction will use powered equipment including a backhoe, bulldozer, loader, dump trucks, vibratory roller and trucks delivering material. The impacts will be as follows:

- Reclaiming the site in a 6 month period will result in the acceptable noise criteria being exceeded unless mitigation is applied. Noise generated from vehicles travelling to the Project site will also exceed acceptable noise criteria unless mitigation is applied.

- Reclaiming the site in a 12 month period will also cause the acceptable noise criteria to be exceeded unless mitigation is applied. Noise generated from vehicles travelling to Project site will not cause any unacceptable impacts.

- Reclaiming the site in a 15 month period will cause the acceptable noise criteria to be exceeded unless mitigation is applied. Noise generated from vehicles travelling to the Project site will not cause any unacceptable impacts.

11.4.2 Recommendations for Noise Impacts

The noise can be mitigated by utilizing quiet equipment and noise enclosures and by planning work schedules during certain periods.

It is recommended that the Contractor should:

- Comply with the Noise Control Ordinance;
- Use truck, bull dozer and dump truck with a sound power level at or lower than 109 dB(A), 109 dB(A) and 111 dB(A) respectively unless the Contractor can prove that noise levels from other plant will meet the noise control criteria;
- Prepare a list of equipment and provide a schedule of activities prior to site clearance or reclamation activities that demonstrate that no noise impact will occur at any NSR;
- Apply other measures such as situating, selecting, operating and maintaining equipment in such a manner to reduce noise and selecting noise barriers or earth embankments to screen NSRs as required; and
- Establish community relations between the Contractor, the Engineer's Representative, surrounding residents and school administrators.

With implementation of the above recommendations, noise levels will be reduced to an acceptable level except that noise levels from vehicles delivering materials to the site under the 6 month filling scenario will exceed the noise criteria by up to 1.7 dB(A). This is undesirable however there are no practical or cost effective mitigation measures that can be applied.

11.5 Air Quality

11.5 Air Quality

11.5.1 Air Quality Impacts

Air quality impacts were assessed in accordance with the Air Quality Objectives (AQO) which specify the following: total suspended particulate (TSP), 260 $\mu g/m^3$ for 24 hours, 80 $\mu g/m^3$ for 1 year and respirable suspended particulates (RSP), 180 $\mu g/m^3$ for 24 hours and 55 $\mu g/m^3$ for 1 year. In addition, a 1-hour level of 500 $\mu g/m^3$ has been used for TSP. The EIA found that the Project will not generate significant quantities of dust during site clearance or from seawall construction. Earth moving and vehicles will cause dust impacts during construction of the reclamation and there were found to have the potential to exceed the AQO.

The dust modelling results showed that the Project would likely result in exceedance of the hourly dust criteria at sensitive receivers at Queen's College Old Boys' Association Secondary School, On Hoi House at Cheung On Estate, and Tung Tai House, Shing Tai House, Chun Tai House, Hong Tai House and Po Tai House at Ching Tai Court unless mitigation is applied. The daily average could be exceeded at Tung Tai House.

11.5.2 Recommendations for Air Pollution Impacts

Dust impacts can be mitigated to an acceptable level by implementing the following mitigation measures:

- Watering the site four times a day;
- Reducing the vehicle speed along the haul road to 8 kph;
- Paving the haul road (if necessary);
- Providing a comprehensive vehicle washing facility;
- Proper cleaning of the access road;
- Watering the stockpiled materials twice daily and providing windbreaks on three sides; and
- Hydroseeding the reclaimed areas progressively as the reclaimed areas reach the final fill level.

It is recommended that these mitigation measures are applied in which case the impact will be reduced to acceptable levels.

11.6 Marine Water

11.6.1 Marine Water Impacts

The Project is located within the Western Buffer Water Quality Zone (WBZ) and is near the boundary of the Victoria Harbour Water Quality Zone (VHZ). Impacts to marine water quality were assessed in accordance with the standards as specified in beneficial uses for marine water quality for the WBZ and VHZ, the Marine Water Quality Objectives for the WBZ and VHZ and water quality targets for flushing and cooling water.

Site clearance could affect the marine environment during removal of buildings, plant, piled piers and slipways and from onshore activities such as spillage of fuels, oils, paints, thinners and other chemicals.

Potential impacts during seawall construction include the dredging, transport and disposal of contaminated sediment materials (Class C) which may impact water quality. The loss of fines during the placement of sand material, the core fill and placement of secondary rock are not expected to result in impacts to the marine environment.

Potential marine water quality impacts associated with reclamation construction included the potential formation of static water in the event that the seawall is completed in full prior to completion of the reclamation. Other reclamation impacts include the generation of suspended sediments during placement of fill materials, loss of floatable materials to the channel, impacts from vehicle wheel washing and maintenance areas and impacts from staff facilities. The Project was not found to have any adverse effect on the hydrodynamics of the Rambler Channel.

11.6.2 Recommendations for Marine Water Quality

The EIA recommended measures to reduce potential impacts on the marine environment. These recommendations are summarised as follows:

- Solid waste containers should be provided during site clearance in a secure area at least 5m from the mean high tide level;
- Slipway runners are to be only removed at low tide during slack water;
- Contaminated sediment should be dredged by using a suitable grab dredger using a close grab within a silt curtain at all times.
- Silt curtains should be inspected to ensure that they are adequately moored and marked to avoid danger to marine traffic.
- Dredging, transport and disposal of sediments, should meet all standards contained in the EPD Contaminated Sediment License Agreement as well as other precautionary measures listed;
- A containment curtain should be provided to collect floatables;
- The dumping license and waste monitoring requirements should be enforced;
- A vehicle wash and recirculation system should be provided and dispose of settled soils at the reclamation off site;
- Provide bunded contaminment areas should be provided for fuel tanks on site and should be regularly drained of rain water;
- Vehicle maintenance should be carried out on paved areas and any spillage should be controlled with adsorbents;
- Site offices and facilities should be connected to a sewer or provision of chemical toilet facilities; and
- The seawall should be progressively installed to allow 150m for flushing of the working area while providing sufficient area for the disturbed sediment to settle.

With implementation of the above recommendations, water quality impacts will be reduced to an acceptable level.

11.7 Land Contamination Assessment

11.7.1 Land Contamination Impacts

The Project site has been used for shipyard activities since 1967. The types of materials that are likely to have been used on the site include paints, solvents, oils and greases, fire glassing products and gases for welding and cutting. Other materials such as metal working wastes, lead ballast, copper from repair or disposal of electrical components, asbestos from lagging of boilers and steam pipes and insulation of hulls, bitumen paint and various acids and alkalis may also have been used on the site.

From a site inspection, it was considered that there is the potential for contamination of the bare soil and concrete surfaces of the buildings and shipyards areas. The main contaminants are expected to be oils, greases and solvents, and metals from the paints and swarf. In addition, there are expected to be localised areas of high oil contamination where activities such as winching the ships or storage of waste oil have been carried out. The potential land contamination may have an impact on the marine environment, construction workers, and surrounding land uses during site clearance and reclamation construction.

11.7.2 Recommendations for Land Contamination

The EPD has prepared a Draft Land Contamination Assessment Standard Brief and Guidelines on Sampling and Analysis to be used for the assessment of land contamination. Under these Guidelines, the EPD requires that the interpretation of the results of the soils analysis are undertaken according to international guidance levels such as the Dutch Indicative Index, the UK guidelines (published by the Interdepartmental Committee on Redevelopment of Contaminated Land) and specifications of the US Environmental Protection Agency.

It is recommended that a soil contamination survey be undertaken as soon as access to the site can be secured, prior to site clearance, to determine the nature and extent of contamination, the implications to future land uses at the site and the optimal mitigation or remedial measures that may need to be undertaken. The survey should be undertaken in accordance with the EPD Land Contamination Assessment Standard Brief and the EPD's Guidelines on Soil Contamination Sampling and Analysis.

11.8 Cumulative Impacts

Planned or proposed projects, aside from the North Tsing Yi Reclamation Project, that are to be implemented during the construction of the North Tsing Yi Reclamation Project have been identified. A non quantitative desktop assessment of potential cumulative impacts was carried out. It has been concluded that there is little or no potential for cumulative impacts with the exception of road traffic.

Many of the Projects that will be under construction at the same time as the North Tsing Yi Reclamation will generate traffic on Tsing Yi Island and the bridge connections to Tsuen Wan Road. Some of this traffic has been accounted for in the EIA from background traffic counts and some of it will be offset by removal of existing land uses. However, there would be an increase in construction related traffic travelling to and from Tsing Yi. Without detailed information on the construction programme for these projects, it is not possible to provide an accurate assessment of cumulative traffic impacts, however, even with some of the construction traffic being off-set by the removal of existing land uses, it is still likely that traffic conditions to and from Tsing Yi will remain close to capacity, especially for traffic using Tsing Yi Bridge.

11.9 Beneficial Impacts

The Project will result in a benefit to the area from the removal of incompatible land uses and the reduction of noise impacts that presently impact residents of the north-east Tsing Yi area from shipyard activities. The long-term beneficial impact will be the replacement of a polluting source with a more compatible land use on the Project site and the creation of useful land for the much needed GIC facilities and District Open Space in the North Tsing Yi.

The relocation of the shipyards may result in a reduction of the following impacts on the marine waters:

- Reduction of floatable waste entrained by tidal washing of the intertidal zone and carrried out into the main channel; and
- Reduction of pollutants washed from the intertidal zone.

The Project will also result in a positive enhancement of the marine environment from:

- The creation of a smoother coastline profile which will improve flushing of the area;
- The stability of the sea bed in the area will be enhanced; and
- The rock armour facing of the sea wall will provide a more diverse and less physically disturbed habitat which will result in a greater degree of biological diversity and hence productivity in the subtidal, intertidal and splash zones.

The reclamation construction will also have a beneficial impact on the environment by reusing waste materials by diverting construction waste from the potential end disposal at landfill sites. By reducing the amount of waste materials that are disposed of at the landfill sites, the life of these landfills will be extended and the need for new or expanded landfills will be reduced.

11.10 Conclusion

With implementation of the specified recommendations in the EIA, the Project activities would result in the following:-

1. The Project will meet the air quality and marine water quality criteria and will not impact sensitive receivers in the Project area.

2. The noise levels generated from Project works on site will be within the acceptable criteria. Noise from traffic during reclamation construction could exceed the standards by up to 1.7dB(A) in the event that the reclamation is constructed within a 6 month time period. If the reclamation is constructed within a 12 or 15 month period no noise impacts will occur.

3. The Project is not expected to result in cumulative impacts from combined emissions of other activities in the area.

4. The Project is not expected to result in an increase in traffic over existing conditions.

5. The Project will incorporate measures to handle solid waste materials on site and will require the carrying out of a land contamination assessment prior to proceeding.

6. Beneficial impacts to air, noise and marine water will occur and the Project will result in the recycling of construction waste materials.

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APPENDIX A

Project Brief

AGREEMENT NO. CE 50/93
RECLAMATION WORKS FOR DISTRICT OPEN SPACE AND GIC FACILITIES IN NORTH TSING YI

Environmental Impact Assessment Assignment
Consultancy Brief

1. Introduction

This Brief is to be read in conjunction with the Memorandum of Agreement, General Conditions of Employment for an Investigation Assignment, Special Conditions of Employment and Schedule of Fees.

2. Description of the Project

2.1 Under the Project "Reclamation Works for District Open Space and GIC Facilities in North Tsing Yi ", an area of about 7.62 ha is to be reclaimed from the water front in North Tsing Yi west of Ching Tai Court. The works will comprise construction of about 530 m of seawall, reclamation by public dumping of about 0.5 million m^3 of construction waste, extension of existing drainage services and other related activities. Works are programmed to commence in February 1995 with a construction period of 30 months. It is envisaged that the public dump will be opened approximately 15 months after commencement of construction.

2.2 The site is at present being occupied by 21 shipyards, 15 of which are on Government land on Short Term Tenancies and the remaining 6 are on private lots. These shipyards will be relocated before commencement of the reclamation works.

2.3 The future formed site is zoned District Open Space and Government/Institution/Community on the draft Tsing Yi Outline Zoning Plan but there is no definite programme for implementation.

3. Objectives of the Assignment

The objectives of this Assignment are as follows :

i) to describe the proposed Project and associated works together with the requirements for carrying out the proposed Project;

ii) to identify and describe the elements of the community and environment likely to be affected by the proposed Project, and/or likely to cause adverse impacts upon the proposed Project, including both the natural and man-made environment;

iii) to identify and quantify emission sources and determine the significance of impacts on sensitive receivers and potential affected uses;

iv) to propose the provision of infrastructure or mitigation measures so as to minimize pollution, environmental disturbance and nuisance during construction and operation of the Project;

v) to identify, predict and evaluate the residual (i.e. after practicable mitigation) environmental impacts and cumulative effects expected to arise during the construction and operation phases of the Project in relation to the sensitive receivers and potential affected uses;

vi) to identify, assess and specify methods, measures and standards, to be included in the detailed design, construction and operation of the Project, which are necessary to mitigate these impacts and reduce them to acceptable levels;

vii) to design and specify the environmental monitoring and audit requirements necessary to ensure the implementation and the effectiveness of the environmental protection and pollution control measures adopted;

viii) to investigate the extent of side-effects of proposed mitigation measures that may lead to other forms of impacts;

ix) to identify constraints associated with the mitigation measures recommended in the EIA; and

x) to identify any additional studies to fulfil the objectives to the requirements of this EIA.

xi) to identify the cost of proposed provision of infrastructure or mitigation measures where appropriate.

4. **Description of the Assignment**

The purpose of this Environmental Impact Assessment (EIA) Assignment is to provide information on the nature and extent of environmental impacts arising from the construction and operation of the proposed Reclamation Works in North Tsing Yi (hereinafter referred to as "the Project") and all related activities taking place concurrently. This information will contribute to decisions on :

i) the overall acceptability of any adverse environmental consequences that are likely to arise as a result of the proposed Project;

ii) the conditions and requirements for the detailed design, and operation of the proposed Project;

iii) the acceptability of residual impacts after proposed mitigation measures are implemented.

The Project area for the Project is shown in Drawing No. DEV 3143 in Appendix 1.

5 Deliverables

5.1 The assessment shall consist of at least the following:

i) an Inception Report should be prepared and submitted, within 4 weeks of the commencement of the Assignment, by the Consultants (its agents, sub-consultant or representative). The Inception Report shall include, inter-alia, the following:

a) the Consultants's understanding and appreciation of the objectives of the Assignment;

b) the approach and methodology for the various parts of the Assignment;

c) a work programme, with major work tasks and key decision points identified and briefly described;

d) a schedule detailing the submission of reports and Environmental Working Group meetings (where necessary); and

e) organisation and staffing of the environmental study team and the curricula vitae of the key study team members.

ii) An Initial Assessment Report which

a) provides an initial assessment and evaluation of the environmental impacts and cumulative effects arising from the proposed Project sufficient to identify those issues of key concern during the construction and operation of the proposed Project which are likely to influence decisions on the proposed Project;

b) defines measurable environmental parameters and environmental features likely to be affected by the proposed Project and identifies the environmental monitoring programmes which are required both to provide a baseline profile of existing environmental conditions and to monitor impacts and compliance during construction and operation of the proposed Project;

c) defines the environmental audit requirements for compliance and post-Project audit, which would include a review of the monitoring data both to identify compliance with regulatory requirements, policies and standards and to define any remedial works required to redress unanticipated or unacceptable consequential environmental impacts; and

d) proposes a detailed programme of investigation able to meet all other objectives of the EIA.

iii) Key Issue Reports covering those issues of key concern identified through the Initial Assessment Report or the review of the Initial Assessment Report by the Environmental Working Group;

iv) A Final Assessment Report which

a) fully satisfies the requirement of this brief in respect to the prediction and assessment of impacts, the identification of environmental impact mitigation measures and the associated residual impacts;

b) describes the agreed schedules and programmes for monitoring and audit requirements;

c) prescribes the specification for detailed design, construction and operation requirements of the proposed Project (in any case, the action(s) to restore and/or rehabilitate the site(s) to an acceptable level prior to handing over to Government or any legal successor(s) should be outlined and addressed); and

d) provides with the impacts summary, the EIA findings, conclusions, recommendations, cost estimates and a mechanism for implementation;

v) an Executive Summary in both English and Chinese of the EIA, highlighting the issues of concern to the community, the acceptability of residual environmental impacts and cumulative effects, requirements for implementation of the Project, and the basis for and implications of those requirements. It is intended that the information contained therein would assist the Government in undertaking Advisory Council on the Environment (ACE), District Board (DB) and other public consultation(s);

vi) all working papers comprising Initial Assessment Report, Key Issue Report and Final Assessment Report should be prepared and submitted in draft to the Environmental Working Group for comment; and

vii) any revisions or supplements to the above as might be required by the Environmental Working Group.

5.2 The Consultants shall submit the following reports to the Director's Representative (see para. 13.1) :

i)	an Inception Report	(30) copies
ii)	a draft Initial Assessment Report	(30) copies
iii)	a final Initial Assessment Report.....	(80) copies
iv)	Key Issue Reports	(30) copies (for each report)
v)	a draft Final Assessment Report	(30) copies
vi)	a Final Assessment Report	(80) copies
vii)	a draft Executive Summary Report	(30) copies
viii)	an Executive Summary Report*	(150) copies
ix)	an Environmental Monitoring & Audit Manual	(30) copies

* in both Chinese and English versions.

5.3 The Consultants shall also supply the government with appropriate copies of such reports, technical notes, working papers, briefs, supporting documents and other relevant inputs as may be required during the Assignment or any public consultation exercise.

5.4 The requirements in the PELB's General Circular 2/94 on the Public Access to Environmental Impact Assessment (EIA) Reports shall be complied with. The final EIA reports and the Executive Summary will be made available to the public according to the provisions in the circular. The EIA finding may be presented to the ACE.

6 Services to be Provided by the Consultants

6.1 General Requirements of the Environmental Impact Assessment

The Consultants shall meet the objectives outlined in Clause 3 above by:

i) carrying out the necessary background studies to identify, collect and analyze existing information relevant to the EIA;

ii) carrying out any necessary environmental surveys, site investigations and baseline monitoring work to achieve the objectives;

iii) quantifying, by use of models or other predictive methods, the residual and cumulative environmental impacts (specifying whether these are transient, long term and/or irreversible) arising from the construction and operation of the Project;

iv) proposing practical, effective and enforceable methods, measures and standards to effectively mitigate any significant environmental impacts in the short and long term; and

v) outlining a programme by which the environmental impacts of the Project can be assessed, monitored and audited.

In further defining the scope of the EIA, consideration should be given to beneficial and adverse effects, short and long term effects, secondary and induced effects, cumulative effects, synergistic effects and transboundary effects.

6.2 Technical Requirements of the Environmental Impact Assessment

The Consultants shall consider all aspects of the activities arising from the proposed Project in any stage/phase of implementation, and, observe the following guidelines in addition to the "Hong Kong Planning Standards and Guidelines" as well as other statutory requirements during the EIA.

6.2.1 Sensitive Uses/Restoration

Due consideration should be given to existing and committed future land-uses and sensitive receivers in the investigation area should be identified. Future land-uses should include those that will be occupied by the Project site during the construction and operation phases of the proposed Project. Restoration site(s) should be cleaned up and made good to conditions satisfactory to the Director of Environmental Protection (DEP).

6.2.2 Mitigation Measures

Effective mitigation measures should be proposed to reduce impacts to acceptable levels and to minimize the probability, occurrence and consequences of predicted impacts in terms of the layout and design of the Project, the duration of polluting activities, construction methods and equipment, operational procedures and administrative controls.

6.2.3 Residual Impacts

Residual environmental impacts should be identified and quantified and their acceptability should be determined against the Environmental Chapter of the "Hong Kong Planning Standards and Guidelines" and other statutory requirements as stated in para. 6.7.2.

If there are emissions of non-criterion pollutants with health implications, the Consultants should review relevant standards of other countries and international bodies, such as, World Health Organization (WHO), International Agency for Research on Cancer (IARC), US Environmental Protection Agency (USEPA), US National Research Council (USNRC), and propose for DEP's agreement on the appropriate reference criteria.

6.2.4 Noise Impact

The noise assessment should address the following:

i) background information and existing noise levels;

ii) identification of representative sensitive receivers, and/or, potentially affected uses;

iii) provision of an emission inventory of the noise sources;

iv) analysis of construction activities and noise levels generated;

v) analysis of operational activities (after commissioning);

vi) presentation of predicted future noise levels;

vii) evaluation of impact and proposals for noise control or mitigation to minimize impacts to an acceptable level; and

viii) noise from haul road traffic

6.2.5 Air Quality Impact

The air quality impact assessment shall include the following:

i) assess the background air quality in the investigation area for the purpose of evaluating the cumulative air quality impacts of the proposed Project;

ii) identify representative sensitive receptors and/or potential affected uses;

iii) conduct an emission appraisal for the aerial emissions from the proposed Project which should include, but not be limited to, the following:

   (a) air pollutants emissions including dust emission from the reclamation activities and the associated traffic; and

   (b) odour from the discharge of sewage and effluent from sewerage and drainage outfalls as well as from accumulation of sewage arising from embayment;

iv) assess and evaluate the net and cumulative impacts of the aerial emissions, identified in item iii), at the receptors identified in ii), the assessment methodology being agreed beforehand by DEP.

v) propose effective mitigation measures to reduce the cumulative impacts of the aerial emissions on the receptors to acceptable levels as compared with the following:

   (a) The Hong Kong Air Quality Objectives; and

   (b) 2 odour units measured at the site boundary and 5 odour units based on a prediction averaging time of 5 seconds at the receptors that will be affected by the operation.

6.2.6 Water Quality Impact (Marine, fresh and ground water)

Impact to the water bodies include physical, chemical and biological disruption of marine water. The water quality impact assessment shall address the following:

i) background information for the existing water systems and their water quality;

ii) analysis of activities related to the use of water;

iii) identification of any change of shoreline and change of flow regimes;

iv) provision of an emission inventory of the water pollution sources;

v) analysis of the generation of wastewater;

vi) assessment of the adequacy of sewerage infrastructure;

vii) assessment of the Water Quality Impacts, in quantifiable term, for any marine dredging activity, plume study, and the extent of the impacts;

viii) characterization of water quality, its dispersion and fate; and

ix) evaluation of impacts and proposals for water pollution control measures with regard to the beneficial uses of the water body.

6.2.7 Solid Waste Pollution

Solid waste assessment shall focus on:

i) identification of the sources of solid waste with details of the waste generation, waste characterization and waste separation;

ii) investigation on any secondary impacts such as, odour, gas emission, noxious leachate;

iii) evaluation of any proposed waste management strategy, waste handling, treatment or disposal methods, and mud dredging and dredged mud disposal methods; and

iv) incorporation of waste reduction/reuse/recycling/separation at source by any practical means where possible.

Attention should be given to the requirements in the Works Branch

Technical Circular No. 22/92 "Marine Disposal of Dredged Mud".

6.2.8 Land Contamination

The Consultants should investigate land contamination of the Project site. The investigation should include :

i) provision of a clear account on the past land history (including accident records as far as possible) and present use of the land (e.g. inventory of chemical/hazardous substances handled or stored with clear indication of their storage/location in a site map, etc.);

ii) identification of potential contaminations and associated impacts, risks or hazards;

iii) submission of proposal plan on contamination assessment for agreement with DEP and thereafter implementation of the assessment; and

iv) evaluation of the impacts and formulation of necessary remedial measures for agreement with DEP and inclusion of the agreed measures into the relevant contract documents for its implementation thereafter.

6.2.9 Traffic Impact

Traffic impact assessment shall include, but not necessarily be limited to, the following tasks :

(i) Determination of possible material sources for fill to the public dump and estimation of the number and rate of flow of vehicles generated. It shall be assumed that the public dump will be operational 6 days a week operating 8am to 6pm for the import of approximately 0.5 million m^3 of material.

(ii) General survey of predicted haul routes to the site and assessment of critical areas of congestion and the impact of project generated traffic on existing traffic flows.

(iii) Based on conclusions in (ii) above, determine the extent of an area in the vicinity of the site in which a detailed study is necessary. In particular traffic should be considered at Tam Kon Shan Road Roundabout and if necessary the study should include carrying out traffic counts, site observations and recording turning movements at principal road junctions.

(iv) Recommendations on mitigations measures to minimise likely adverse traffic impact. These may include the use of specified haul routes or other traffic management proposals, consideration of alternative methods of material transportation etc.

6.3 Conservation

The Consultants shall observe the importance of environmental conservation and incorporate it in any recommendation for the design, construction and operation of the Project, wherever possible. The general outlines shall address the following:

i) maintenance of the balance of the use of resources; and

ii) reduction, reuse and re-cycle resources wherever practical.

6.4 Use of EIA models/Survey Techniques/Analytical Methods

The use of models, survey protocols and analytical methods (includes laboratory techniques) proposed in the Inception Report shall be agreed and approved by the DEP (and/or by the Director of Agricultural and Fisheries, Commissioner of Transport where appropriate), prior to commencing with detailed studies. This shall include the following:

i) elaboration of background assumptions;

ii) confirmation with data validation;

iii) calibration of model;

iv) prescription of tool application (such as, questionnaire, numerical/stochastic algorithm); and

v) presentation of scenario projection and interpretation of results.

6.5 Impacts Summary

An EIA is based on different techniques, interpretations and measurements. It is important to present the findings in simple terms to sum up all environmental impacts and select the acceptable alternative for the proposed Project. The EIA shall address the following:

i) elaboration of alternatives, including where appropriate the 'do nothing' scenario;

ii) discussion of the extent of impacts and the proposed ranking system;

iii) presentation of the recommendations on overall acceptability;

iv) justification of the proposed methodology to be adopted for an impacts summary; and

v) application of impacts summary.

6.6 Environmental Monitoring and Audit (EM&A) Requirements

i) Environmental Monitoring

The Consultants shall identify and recommend environmental monitoring requirements for all construction, post-Project and operational phases of the development. These requirements shall include but not be limited to the identification of sensitive receivers, monitoring locations, monitoring parameters and frequencies, monitoring equipment to be used, and any other necessary programme for baseline monitoring, impact and compliance monitoring, and data management of monitoring results.

ii) Environmental Audit

The Consultants shall identify and recommend environmental audit requirements for all construction, post-Project and operational phases of the development. These requirements shall include but not be limited to:

(a) organisation and management structure, and procedures for auditing of the implementation of respective environmental mitigation measures for the detailed design, contract document preparation, construction, post-Project operation stages of the development;

(b) environmental quality performance limits for compliance auditing for each of the recommended monitoring parameters to ensure compliance with relevant environmental quality objectives, statutory or planning standards, or acceptance criteria by the EIA. These limits shall give indication of a deteriorating environmental quality and shall allow proactive responses to be taken. (The commonly used approach is a set of trigger, action and target levels);

(c) organisation and management structure, and procedures for reviewing the monitoring results and auditing the compliance of the monitoring data with the environmental quality performance limits (point (b) above), project contractual and regulatory and environmental policies and standards;

(d) Event/Action plans for impact and compliance monitoring;

(e) complaints handling, liaison and consultation procedures; and

(f) reporting procedures, report formats and reporting frequency including periodical reports and annual reviews to cover all construction and post-Project/operational phases of the development.

iii) The Consultants shall prepare an Environmental Schedule (Manual) which covers the requirements and recommendations in (i) and (ii) above. The Manual shall also contain a summary list of recommended environmental mitigation measures. This Manual shall be used as a guideline for environmental monitoring and audit during the construction and post-Project operational phases. This Manual shall be a stand-alone document and form part of the EIA report.

6.7 Compliance with Environmental Law

6.7.1 An EIA is a tool to identify potential environmental impacts arising from the proposed Project and to provide a basis for decisions for the implementation of the Project, but it does not automatically exempt the proposal from licensing requirements and the approvals from relevant authorities.

6.7.2 The Consultants shall comply with and observe all Ordinances, bye-laws, regulations and rules for the time being in force in Hong Kong governing the control of any form of pollution for environmental protection.

6.8 Liaison and Administration

6.8.1 The Consultants shall liaise with relevant Government departments and agencies, and all other parties involved in this and any other projects or developments likely to be affected by this development. Any correspondence, notes or minutes arising from this liaison shall be copied to the Environmental Working Group (see para. 14.2).

6.8.2 The Consultants should make himself/herself available to be present in the ACE, DB and/or any public consultation meeting(s)(if necessary) to brief his case against the relevant environmental impacts generated. The consultant should allow for attendance at up to six such consultation meetings.

7. Response to Queries

The Consultants shall respond to queries under Clause 20 of the General Conditions of Employment raised prior to a date six months after the final submission of the Deliverables required under the Agreement. The date shall be confirmed in writing to the Consultants by the Director's Representative.

8. Programme of Implementation

8.1 The due date for commencement of the Assignment is 1st July 1994.

8.2 The Assignment shall be completed within 26 weeks, working to an agreed programme. The Draft Final Assessment Report shall be completed within 20 weeks.

8.3 The Consultants shall produce the Programme referred to in Clause 26 of the General Conditions of Employment in draft form within 2 weeks of the commencement of the Assignment, detailing the main streams of the EIA, target dates for particular tasks and any decision dates that may be required for the uninterrupted progress of the EIA. The Consultants shall agree with the Director's Representative during this period the timing of submission of reports and plans for each of the main elements of the Assignment, for inclusion in the draft Programme.

8.4 The Consultants shall endeavour to ensure that the EIA is carried out in accordance with the Programme and shall submit regular programme reviews as part of the progress reports referred to in Clause 9 of this Brief.

9. Progress Reports

The Consultants shall submit to the Director's Representative progress reports at monthly intervals on all aspects relating to progress of the Programme referred to in Clause 8 of this Brief. The reports shall include a list of those parts of the Assignment the execution of which is behind the Programme, together with proposals to expedite the progress, so as to complete the work on time. The reports shall also include updated expenditure forecasts in accordance with Clause 10 of this Brief.

10. Financial Management

At monthly intervals or at such other intervals as the Director's Representative may require, the Consultants shall submit a report on the current and forecast expenditure on the Assignment and the fees due to the Consultants, in a form to be agreed by the Director's Representative.

11. Standards and Specifications

During the course of the Assignment, the Consultants shall adopt such technical and design standards and specifications as are currently in use by the Environmental Protection, Drainage Services, Civil Engineering and Transport Departments or, if non-existent, British Standard Codes of Practice and Specifications. Should instances arise for which suitable standards or specifications do not exist or for which the current standards or specifications appear to require modification or if by the adoption of current standards the Consultants would incur additional expenses not within reasonable contemplation, the Consultants shall submit recommendations on appropriate alternatives to the Director's Representative for agreement.

12. Variations and Other Commitments

Not used.

13. **Director's Representative**

13.1 The Director's Representative as defined in the General Conditions of Employment shall be the Government Civil Engineer/General of the Civil Engineering Office, Civil Engineering Department. However, all or some of the duties of the Director's Representative may be carried out by the Chief Engineer, Development and Airport Division, Civil Engineering Department or such other person as may be authorized by the Director or Director's Representative in writing and notified to the Consultants. The Director's Representative may delegate any of the powers and functions vested in him to other officers. If the Consultants are dissatisfied with a decision or instruction of any such officer the matter shall be referred to the Director's Representative for a ruling.

13.2 During the course of the Agreement the Consultants shall be responsible to the Director's Representative but shall liaise with the Environmental Working Group (see para. 14.2)

14. **Control of the Assignment**

14.1 A Steering Group chaired by Government Civil Engineer/General, Civil Engineering Office, or his representative, will function during the course of the Assignment and will meet when necessary to monitor progress, provide guidance and consider progress reports. The Project Director and other appropriate staff of the Consultants will be required to attend meetings of the Group at approximately monthly intervals and other regular and ad-hoc meetings during the Assignment period.

14.2 The EIA will be managed by an Environmental Working Group chaired by a representative of the Director of Environmental Protection. This shall be the forum for liaison with Government departments and agencies, providing guidance to the Consultants, and for comments and review on the work and outputs of the EIA. All secretarial services will be provided by the Consultants.

14.3 The Consultants shall attend all meetings held in connection with the EIA for presentation of papers, documents, progress reports and recommendations etc.

15. **Information and Facilities Provided by the Employer**

All available information relevant to the EIA will be provided to the Consultants, except those currently available from the sales section of the Information Services Department. In the case of plans and drawings, one transparency and two prints of each plan or drawing shall be provided free of charge if requested by the Consultants.

16. **Consultants' Office and Staffing**

16.1 The Consultants shall maintain for the duration of this Agreement an office in

Hong Kong under the control of the Project Director of the Consultants who shall be responsible for the Project. He shall have adequate authority and sufficient professional, technical and administrative support staff in all relevant disciplines to ensure progress to the satisfaction of the Director's Representative.

16.2 Staffing shall be outlined in the Consultants proposal and be committed to the Assignment. Other than in exceptional circumstances no staff changes will be permitted during the progress of the Assignment. Should a change be necessary, the Consultants shall seek prior approval in writing, informing the Director's Representative the circumstances that require the change and providing information on any replacement proposed.

16.3 Staff outlined in the Consultants' proposal shall be resident in Hong Kong for the length of their involvement in the EIA. Consultants in joint ventures shall give an assurance that each of the collaborating parties involved will be bound to the undertaking until the satisfactory completion of the Assignment.

17. Specialist and Sub-consultant Services

The Consultants shall provide all specialist and sub-consultant services required for the satisfactory completion of the Assignment. No additional fees or expenses for the provision of such services required locally or overseas shall be payable except as otherwise provided for in the Schedule of Fees.

18. Surveys

One positive transparency and two prints of topographical mapping at 1:20,000, 1:5,000 and 1:1,000 scales prepared by the Survey and Mapping Office of the Lands Department, where available, for the area covered by the Project, can be obtained free of charge on application to the Director's Representative. All field survey work required for the proper execution of the EIA shall unless otherwise provided for in the Agreement, be the duty of the Consultants. A copy of field notes, field data and resultant plans arising from these surveys shall be handed over to the Director's Representative upon completion of the Assignment. The accuracy as well as presentation of these surveys shall be of a standard agreed by the Director's Representative.

19. Insurance

The amount of insurance cover to be maintained in accordance with sub-clause (A) of Clause 47 of the General Conditions of Employment shall be HONG KONG Dollars

20. General References

The EIA should be carried out with due regard to the information, policies, regulations and procedures contained in :

i) All anti-pollution Ordinances, Technical Memoranda, advisory booklets, etc;

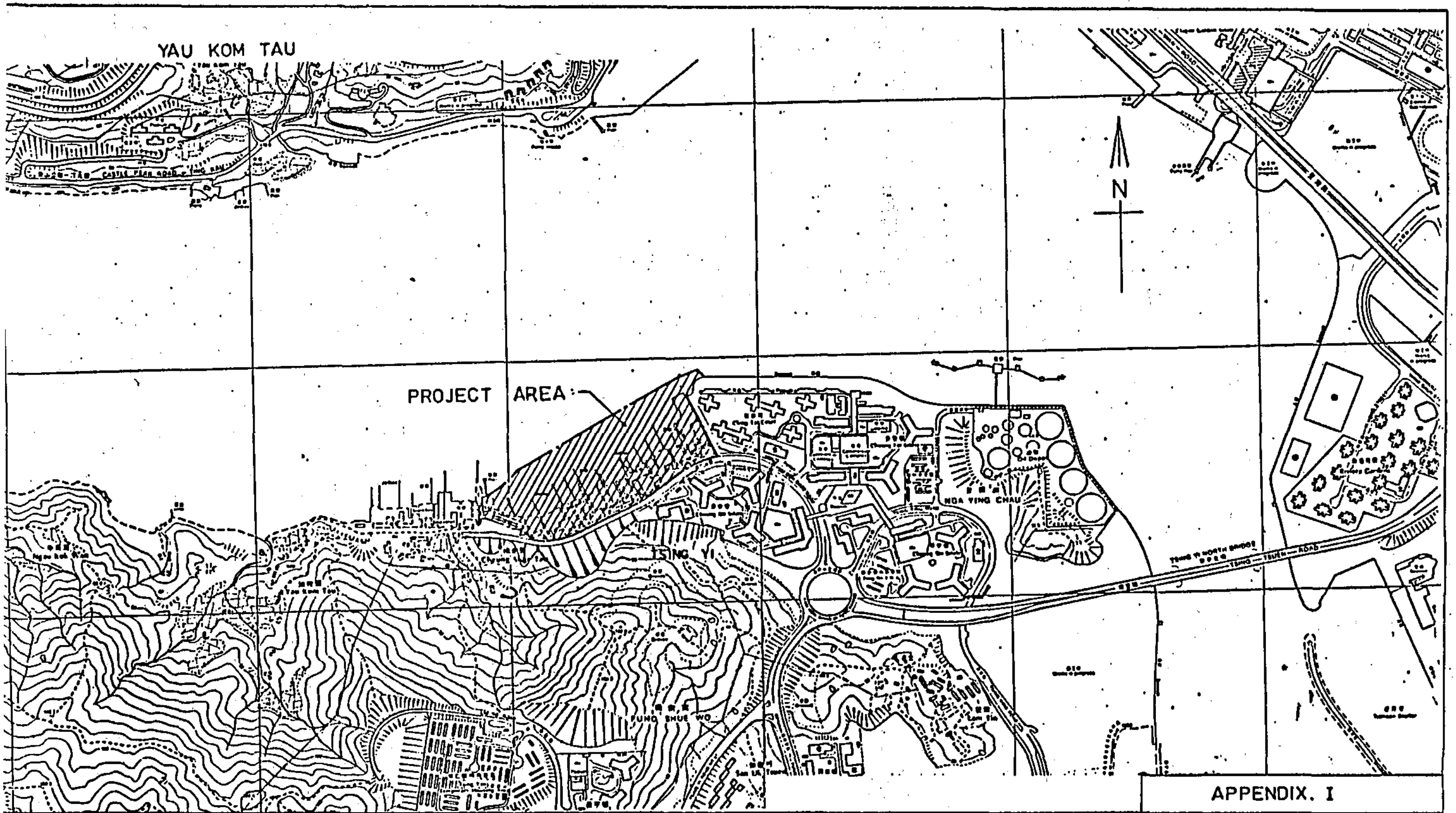
ii) EPD, July 1992 :"Application of the EIA process to major private sector projects" (Advice Note 2/92);

iii) PEL Branch, January 1992 :"Public access to EIA reports " (General Circular 2/92);

iv) EPD and Planning Department, April 1991 : "Environmental guidelines for planning in Hong Kong " (Chapter 9 of 'HKPSG');

v) EPD, 1993 : "Environment Hong Kong" (Annual Review of 1992)' and,

vi) Works Branch Technical Circular No. 22/92 : "Marine Disposal of Dredged Mud".



APPENDIX. I

JECT TITLE

ECLAMATION WORKS FOR DISTRICT OPEN SPACE AND
IC FACILITIES IN NORTH TSING YI

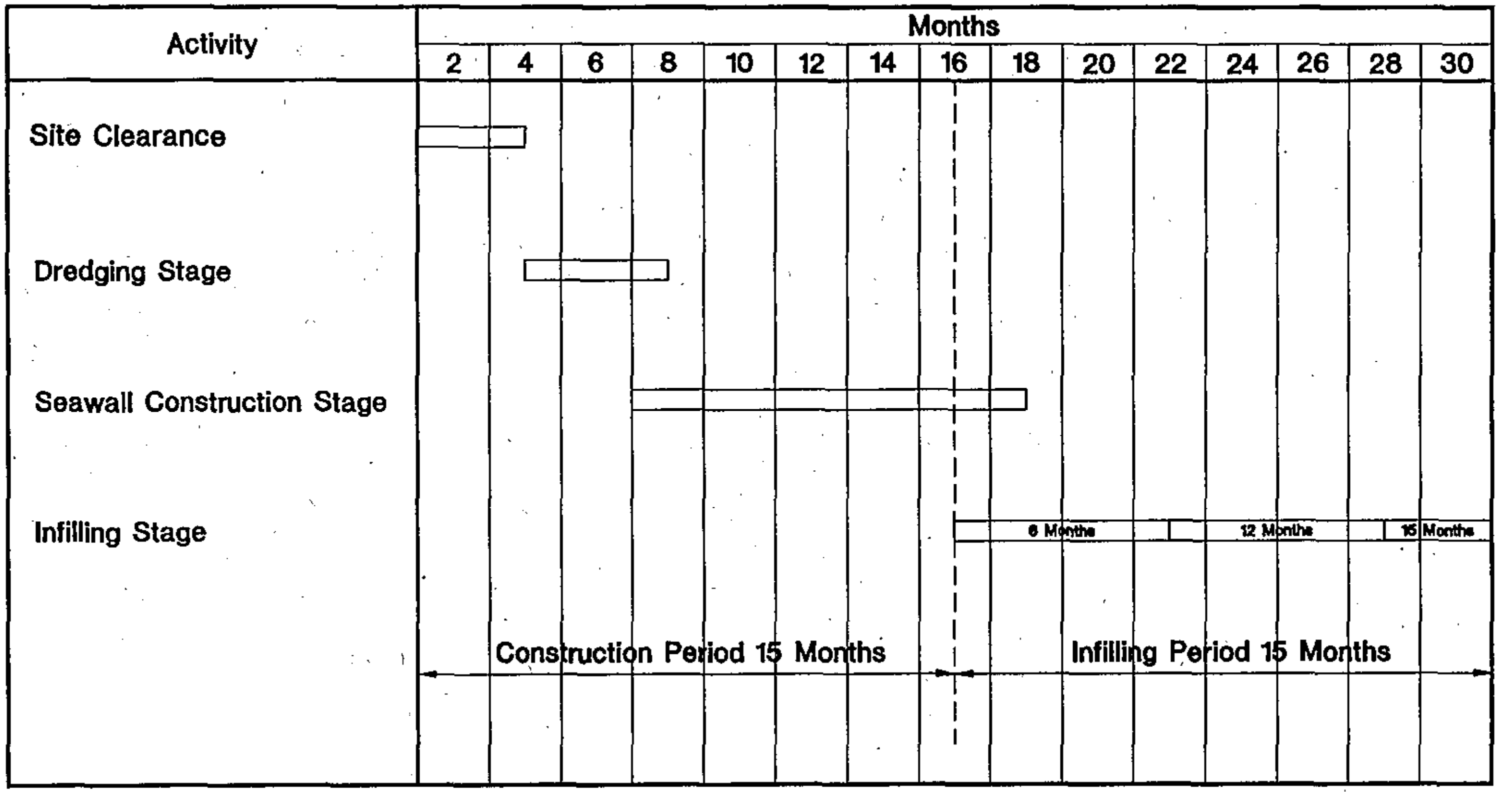
drawn by M. K. TONG	date 17.1.94	drawing no. DEV 3143	scale 1:10 000
approved K. L. MA	date 17.2.94	CIVIL ENGINEERING DEPARTMENT HONG KONG	
office DEVELOPMENT & AIRPORT DIVISION / CEO			

APPENDIX B

Construction Activities

Appendix B-1

Preliminary Project Schedule



Preliminary Project Schedule

Mouchel

Figure No. B-1.1

Appendix B-2

Estimated Demolition Waste on Project Site

Appendix : Estimated Demolition Waste on Site

No.	Name of Shipyard	Material		Area (m^2)	Volume (m^3)	Weight (Tonne)	No. of Plate	Bulk Factor	Bulk Volume (m^3)
1	Kowloon	Metal	Steel Beam		27.8	195		1.5	41.7
			Corrugated Tin Sheet	4030			1612		
			Steel Plate	337.5	1.4	9.8	56		
		Concrete			625.8			1.3	813.6
		Wood/Timber			35				
		Building Debris			16				
2	Kwong Fat Loong	Metal	Steel Beam		2.5	18		1.5	3.8
			Corrugated Tin Sheet	587			235		
			Steel Plate						
		Concrete			27.7			1.3	36
		Wood/Timber			49				
		Building Debris			20				
3	Delon	Metal	Steel Beam		3.4	24		1.5	5.1
			Corrugated Tin Sheet	352			141		
			Steel Plate	136	0.5	3.5	23		
		Concrete			46.1			1.3	59.9
		Wood/Timber			88				
		Building Debris			16				

Note : (1) Assume the size of each corrugated tin sheet is 2.5m x 1m
(2) Assume the size of each steel plate is 3m x 2m, average thickness is 4mm

Appendix : Estimated Demolition Waste on Site (Cont./...)

No.	Name of Shipyard	Material		Area (m^2)	Volume (m^3)	Weight (Tonne)	No. of Plate	Bulk Factor	Bulk Volume (m^3)
4	Ming Lee	Metal	Steel Beam		2.6	18		1.5	3.9
			Corrugated Tin Sheet	572			229		
			Steel Plate	149	0.6	4.2	25		
		Concrete			57.6			1.3	74.9
		Wood/Timber			81				
		Building Debris			28				
5	Cheong Kee	Metal	Steel Beam		2.1	15		1.5	3.2
			Corrugated Tin Sheet	497			199		
			Steel Plate						
		Concrete			34.4			1.3	44.7
		Wood/Timber			74				
		Building Debris			19				
6	Wing On Shing	Metal	Steel Beam		3.8	27		1.5	5.7
			Corrugated Tin Sheet	480.6			193		
			Steel Plate						
		Concrete			23.0			1.3	29.9
		Wood/Timber			44				
		Building Debris			15				

Note : (1) Assume the size of each corrugated tin sheet is 2.5m x 1m

(2) Assume the size of each steel plate is 3m x 2m, average thickness is 4mm

Appendix : Estimated Demolition Waste on Site (Cont./...)

No.	Name of Shipyard	Material		Area (m²)	Volume (m³)	Weight (Tonne)	No. of Plate	Bulk Factor	Bulk Volume (m³)
7	Hip Shing	Metal	Steel Beam		3.8	27		1.5	5.7
			Corrugated Tin Sheet	1121			448		
			Steel Plate	45.5	0.2	1.4	8		
		Concrete						1.3	
		Wood/Timber			12				
		Building Debris			27				
8	Supercraft	Metal	Steel Beam		0.7	5			1.1
			Corrugated Tin Sheet						
			Steel Plate						
		Concrete			386.8			1.3	502.8
		Wood/Timber			28				
		Building Debris			27				
9	Sui Lee	Metal	Steel Beam		5.3	37		1.5	8.0
			Corrugated Tin Sheet	802			321		
			Steel Plate						
		Concrete			46.1				59.9
		Wood/Timber			76				
		Building Debris			27				

Note : (1) Assume the size of each corrugated tin sheet is 2.5m x 1m
(2) Asume the size of each steel plate is 3m x 2m, average thickness is 4mm

Appendix : Estimated Demolition Waste on Site (Cont./...)

No.	Name of Shipyard	Material		Area (m^2)	Volume (m^3)	Weight (Tonne)	No. of Plate	Bulk Factor	Bulk Volume (m^3)
10	Dorman	Metal	Steel Beam		3	21		1.5	4.5
			Corrugated Tin Sheet	844			338		
			Steel Plate	196	0.8	5.6	33		
		Concrete			46.1			1.3	59.9
		Wood/Timber			56				
		Building Debris			18				
11	Halvorsen	Metal	Steel Beam		8.8	61.6		1.5	13.2
			Corrugated Tin Sheet	1963			785		
			Steel Plate	592	2.4	16.8	99		
		Concrete						1.3	
		Wood/Timber							
		Building Debris			53				
12	Sam Hing	Metal	Steel Beam		3.5	25		1.5	5.3
			Corrugated Tin Sheet	380			152		
			Steel Plate	176	0.7	4.9	29		
		Concrete			57.6			1.3	74.9
		Wood/Timber			88				
		Building Debris			20				

Note : (1) Assume the size of each corrugated tin sheet is 2.5m x 1m
(2) Assume the size of each steel plate is 3m x 2m, average thickness is 4mm

Appendix : Estimated Demolition Waste on Site (Cont./...)

No.	Name of Shipyard	Material		Area (m^2)	Volume (m^3)	Weight (Tonne)	No. of Plate	Bulk Factor	Bulk Volume (m^3)
13	Kwong Fat Loong	Metal	Steel Beam		4.3	30		1.5	6.5
			Corrugated Tin Sheet	1044			418		
			Steel Plate	358	1.4	9.8	60		
		Concrete			34.4			1.3	44.7
		Wood/Timber			84				
		Building Debris			29				
14	Lau Cheong Kee	Metal	Steel Beam		2.0	14		1.5	3.0
			Corrugated Tin Sheet	466			186		
			Steel Plate						
		Concrete			314.9			1.3	409.4
		Wood/Timber			107				
		Building Debris			26				
15	Wing On Shing	Metal	Steel Beam		5.7	40		1.5	8.6
			Corrugated Tin Sheet	1867			747		
			Steel Plate	636	2.5	17.5	106		
		Concrete			27.6			1.3	35.9
		Wood/Timber			43				
		Building Debris			54				

Note : (1) Assume the size of each corrugated tin sheet is 2.5m x 1m
(2) Assume the size of each steel plate is 3m x 2m, average thickness is 4mm

Appendix : Estimated Demolition Waste on Site (Cont./...)

No.	Name of Shipyard	Material		Area (m^2)	Volume (m^3)	Weight (Tonne)	No. of Plate	Bulk Factor	Bulk Volume (m^3)
16	Sik Cheong Shing	Metal	Steel Beam		2.8	20		1.5	4.2
			CorrugatedTin Sheet	696			278		
			Steel Plate						
		Concrete			23.0			1.3	29.9
		Wood/Timber			26				
		Building Debris			26				
17	Shun Woo	Metal	Steel Beam		2.1	14		1.5	3.2
			CorrugatedTin Sheet	446			178		
			Steel Plate						
		Concrete			27.6			1.3	35.9
		Wood/Timber			44				
		Building Debris			11				
18	King Hing Loong	Metal	Steel Beam		1.0	7		1.5	1.5
			Corrugated Tin Sheet	383			153		
			Steel Plate	66	0.3	2.1	11		
		Concrete							
		Wood/Timber			45				
		Building Debris			10				

Note : (1) Assume the size of each corrugated tin sheet is 2.5m x 1m
(2) Assume the size of each steel plate is 3m x 2m, average thickness is 4mm

Appendix : Estimated Demolition Waste on Site (Cont./...)

No.	Name of Shipyard	Material		Area (m^2)	Volume (m^3)	Weight (Tonne)	No. of Plate	Bulk Factor	Bulk Volume (m^3)
19	Tsang Pui Kee	Metal	Steel Beam		4.3	30		1.5	65
			CorrugatedTin Sheet	813.5			325		
			Steel Plate	195	0.8	5.6	33		
		Concrete			57.6			1.3	74.9
		Wood/Timber			54				
		Building Debris			21				
20	Others (Stores and Restaurants)	Metal	Steel Beam		0.2	1.4		1.5	0.3
			Corrugated Tin Sheet	1212.5			485		
			Steel Plate						
		Concrete			169.7			1.3	220.6
		Wood/Timber			30.3				
		Building Debris			170				

Note : (1) Assume the size of each corrugated tin sheet is 2.5m x 1m
(2) Assume the size of each steel plate is 3m x 2m, average thickness is 4mm

Appendix B-3

Dredged Mud Calculations for Seawall Construction

Calculation of the Volume of Dredged Mud

To calculate the volume of mud to be dredged, we divided the length of the seawall into separate sections which were determined by the proposed drillhole locations set along the line of the seawall given in the Site Investigation Drawing DEV 3053B(DH7, DH8, DH10, DH11, DH13,DH14 and DH15).

However, due to shipyard activities during the Site Investigation, two of these drillholes could not be taken(DH8 and DH10) and two of the drillholes(DH11 and DH13) were taken far from their originally intended location.

Therefore, to determine the depth of the marine deposit along the length of the seawall, existing drillhole data DH8, DH10, DH11 and DH13 were used to interpolate the depths of the marine mud deposits for our intended locations . The estimated seabed levels and bottom of marine mud levels are shown in the table below with the drillholes that were interpolated depicted with the drillhole number and an attached 'a' .

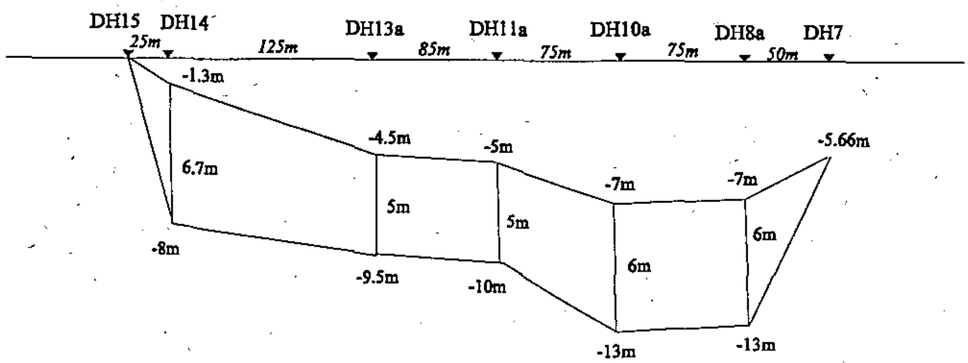
Drillhole	Seabed Level	Bottom of Marine Mud
DH7	-5.66m	Fill
DH8a	-6.8m(1)	-13m(2)
DH10a	-7m(1)	-13m(2)
DH11a	-5m(1)	-10m(2)
DH13a	-4.5m(1)	-9.5m(2)
DH14	-1.3m	-8m(3)

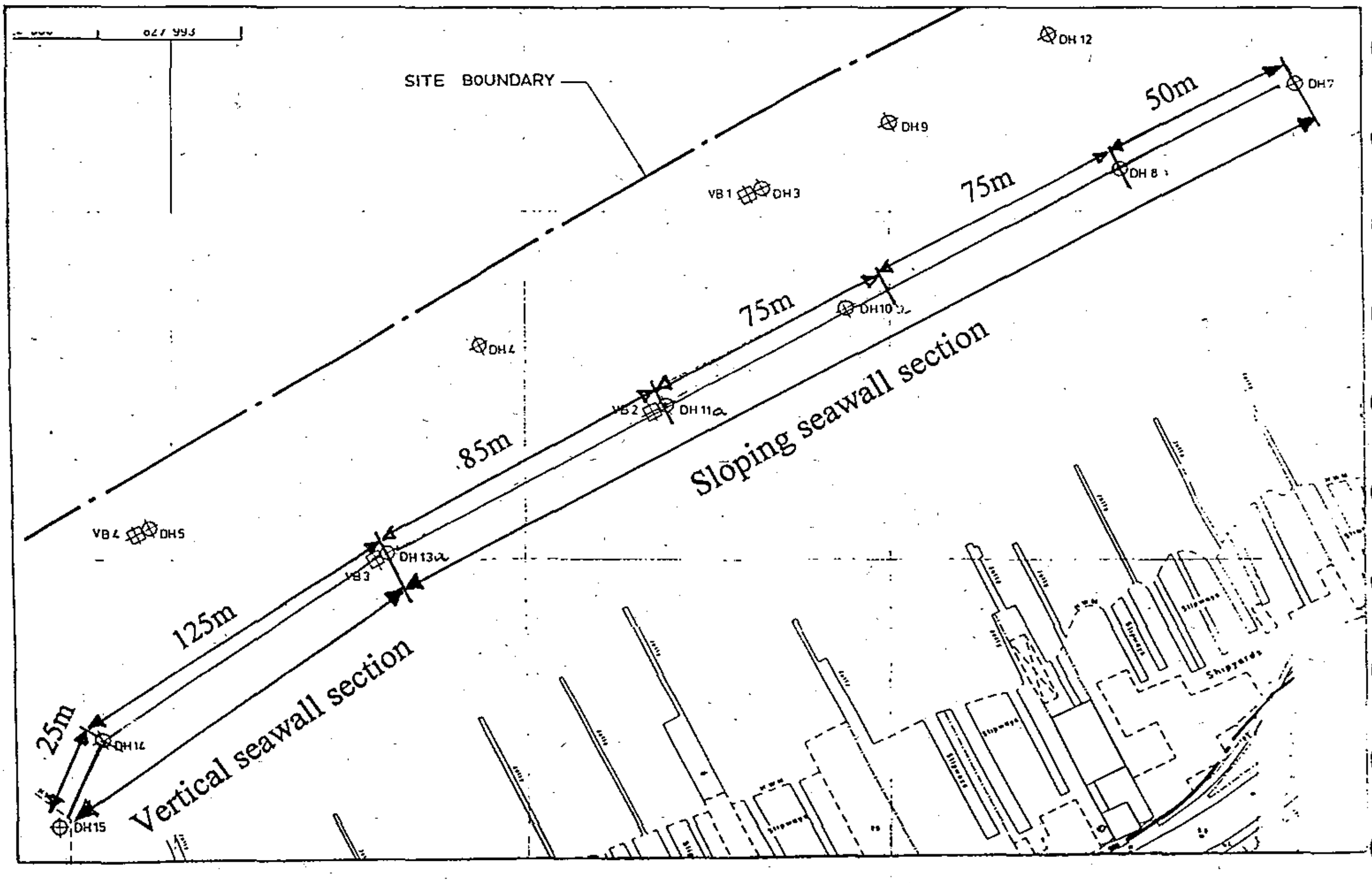
Note:(1) Estimated from Sounding Survey
(2) Estimated from interpolation from existing drillholes
(3) Calculated by looking at the drill log data

A cross-section at each of the above stated drillhole location was calculated and the volume for each section was subsequently calculated (See Appendix A).The Estimated Total Volume of Dredged Mud was calculated as 105,040m^3.

It should be noted that these calculations are an estimate based on the limited amount of information available and should not be used for contractual purposes.

Calculation of the Volume of Dredged Mud





Calculation of the Volume of Dredged Mud

Sloping seawall section

Section DH7 to DH8a = 8,250m^3
Section DH8a to DH10a = 24,975m^3
Section DH10a to DH11a = 22,256m^3
Section DH11a to DH13a = 21,358m^3

Vertical seawall section

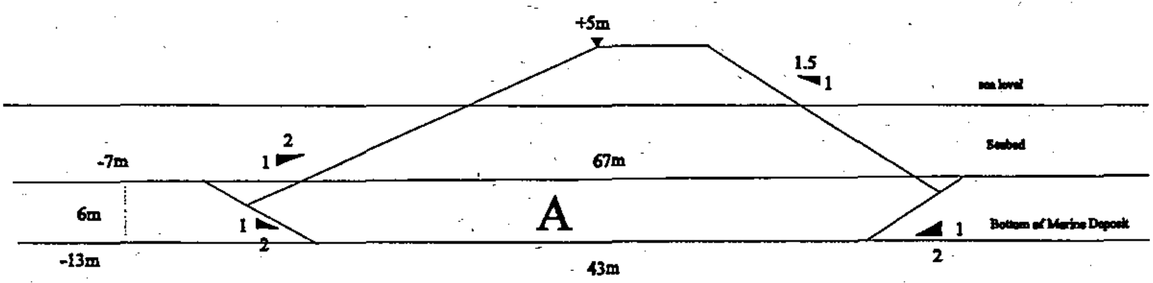
Section DH13a to DH14a = 25,188m^3
Section DH14a to DH15 = 3,013m^3

Total Estimate of Mud to be Dredged = **105,040m^3**

Signed: [signature] Checked By: [signature]

Calculation of the Volume of Dredged Mud

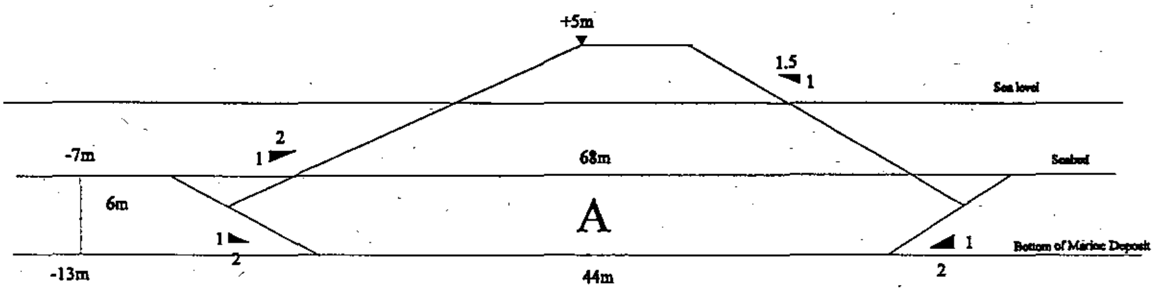
Calculation of the Cross-sectional Area for DH8a
Section DH8a



Area $= 6m \times 1/2(67m + 43m)$
$= 330m^2$

Calculation of the Cross-sectional Area for DH10a

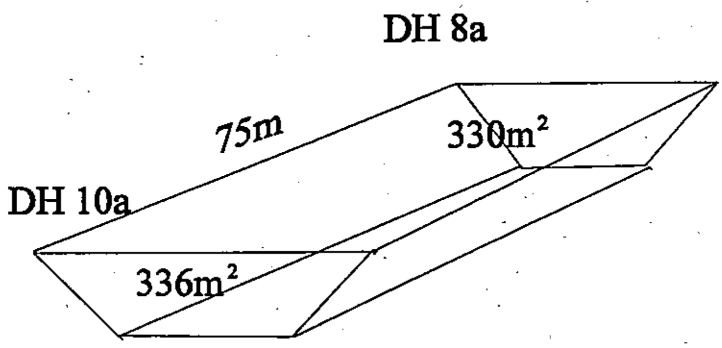
Section DH10a



Area $= 6m \times 1/2(68m + 44m)$
$= 336m^2$

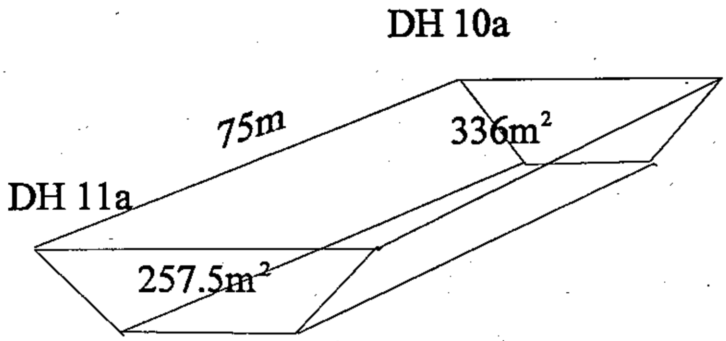
Calculation of the Volume of Dredged Mud

Calculation of the Volume From Section DH8a to DH10a



Volume of Section DH8a to DH10a
$= 75m \times 1/2(330m^2 + 336m^2) = \mathbf{24{,}975m^3}$

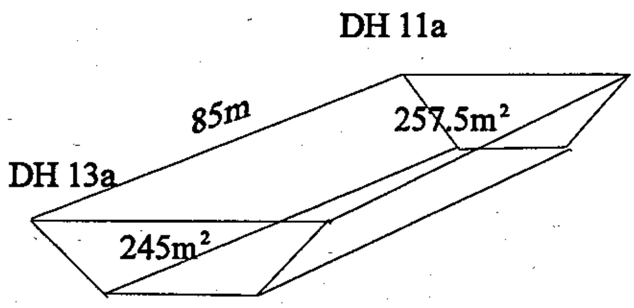
Calculation of the Volume From Section DH10a to DH11a



Volume of Section DH10a to DH11a
$= 75m \times 1/2(336m^2 + 257.5m^2) = \mathbf{22{,}256m^3}$

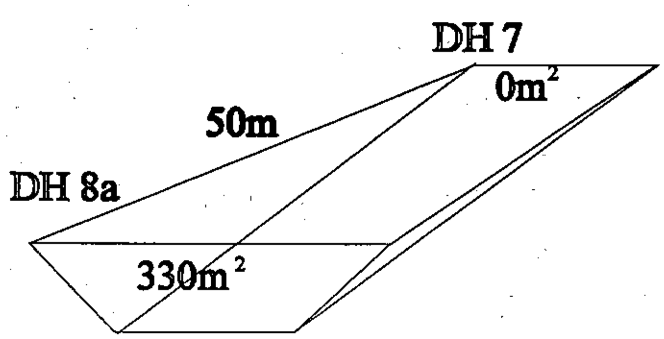
Calculation of the Volume of Dredged Mud

Calculation of the Volume From Section DH11a to DH13a



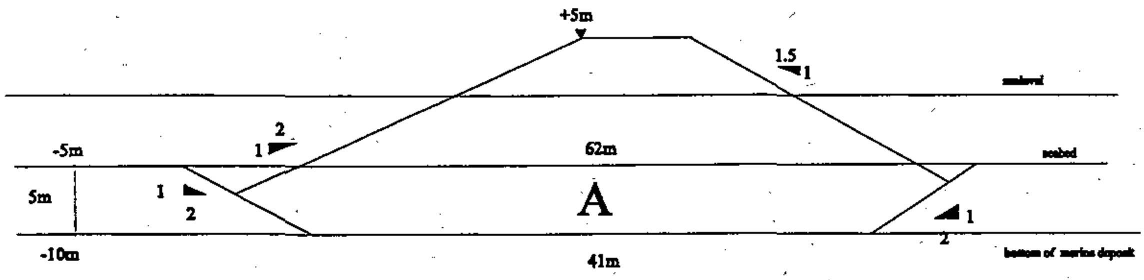
Volume of Section DH11a to DH13a
$= 85m \times 1/2(257.5m^2 + 245\ m^2) =$ **$21{,}356m^3$**

Calculation of the Volume From Section DH7 to DH8a



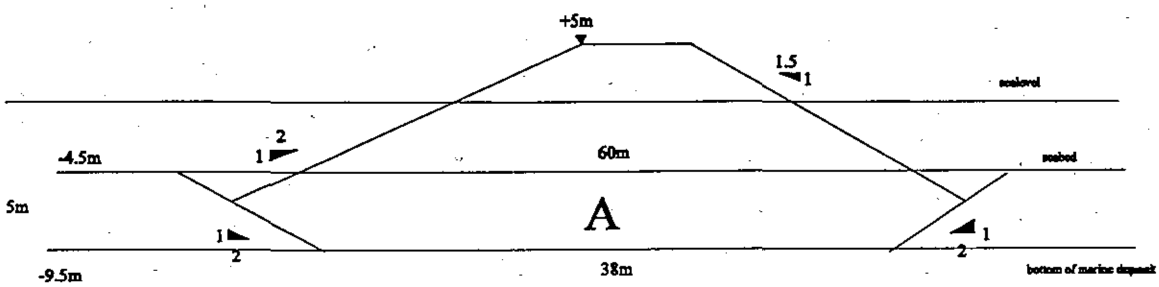
Volume of Section DH7 to DH8a
$= 50m \times 1/2(330m^2 + 0m^2) =$ **$8{,}250m^3$**

Calculation of the Cross-sectional Area for DH11a
Section DH11a



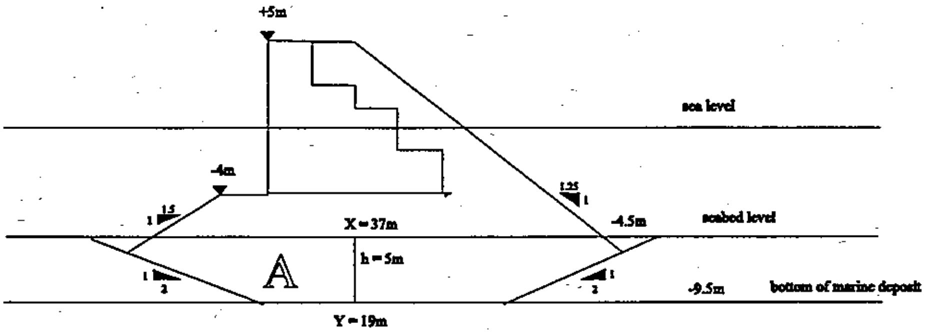
Area 1 = 5m x 1/2(62m + 41m)
= $257.5m^2$

Calculation of the Cross-sectional Area for DH13a
Section DH13a



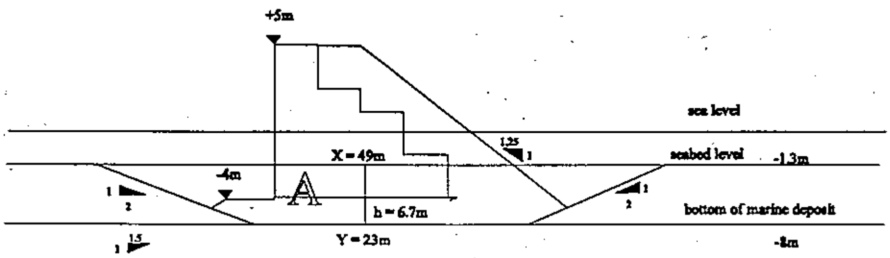
Area = 5m x 1/2(60m + 38m)
= $245\ m^2$

Calculation of the Cross-sectional Area of a typical vertical seawall for DH13a
Section DH13a



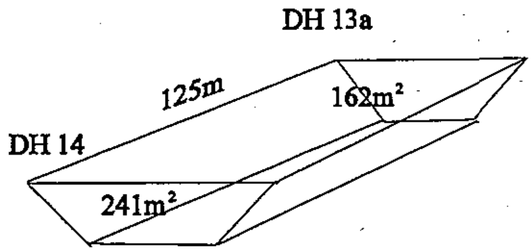
Calculation of Area A = 1/2(38m + 19m) x 5m = 142.5m^3

Calculation of the Cross-sectional Area of a typical vertical seawall for DH14
Section DH14



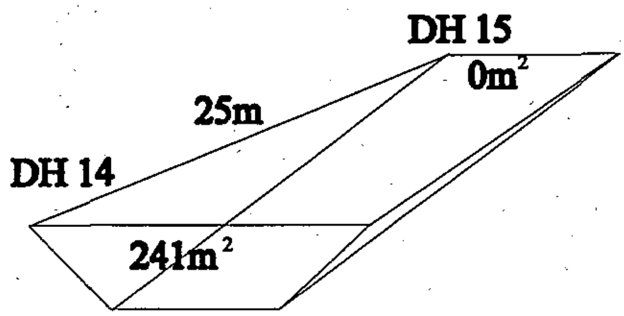
Calculation of Area A = 1/2(49m + 23m) x 6.7m = 241m^3

Calculation of the Volume From Section DH13a to DH14



Volume of Section DH13 to DH14
= 125m x 1/2(162m^2 + 241m^2) = **25,188m^3**

Calculation of the Volume From Section DH14 to DH15



Volume of Section DH14 to DH15
= 25m x 1/2(241m^2 + 0m^2) = **3,013m^3**

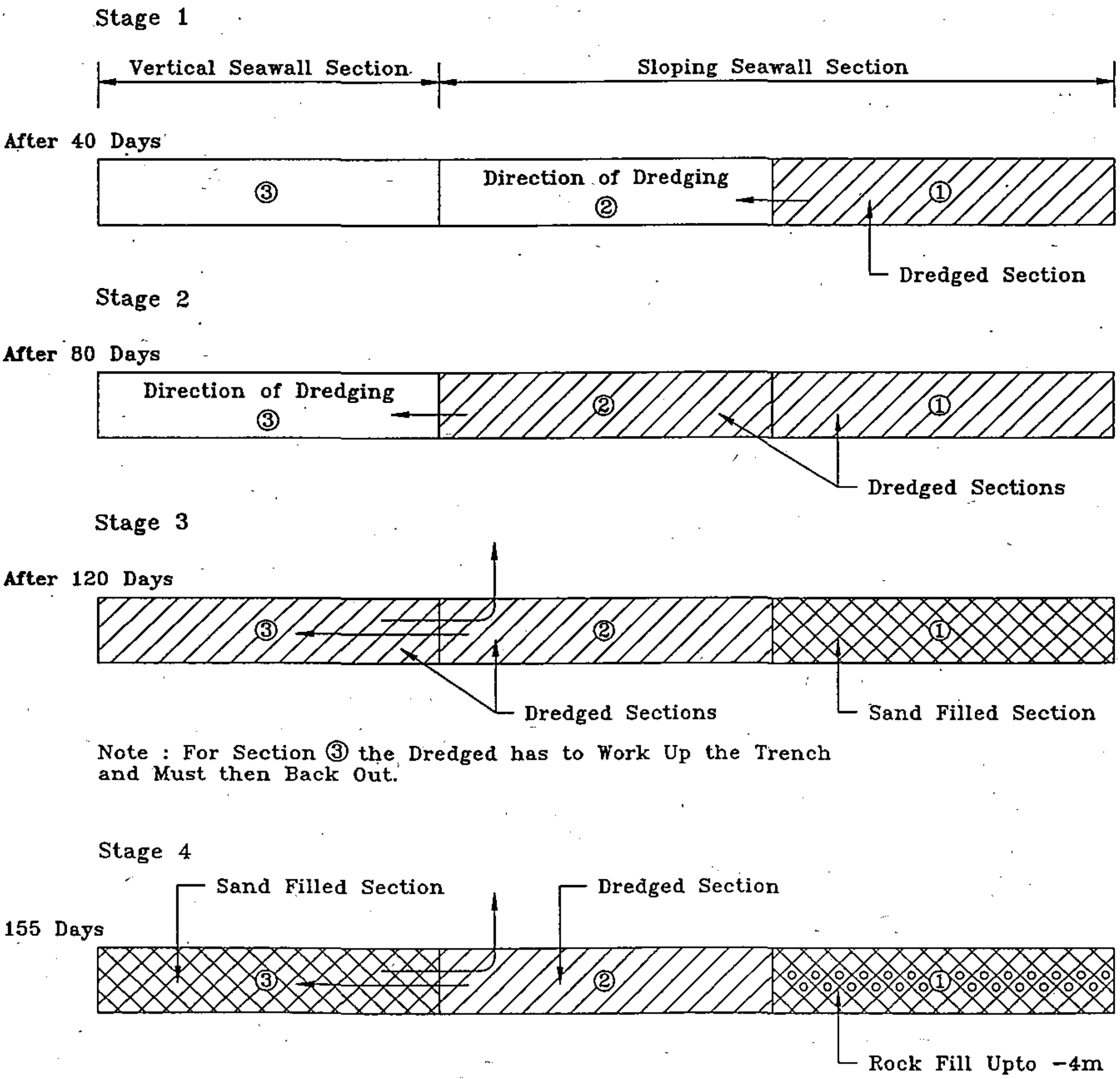
Appendix B-4

Sequencing of Dredging Seawall Construction Phases

Sequencing of Dredging/Construction Phases

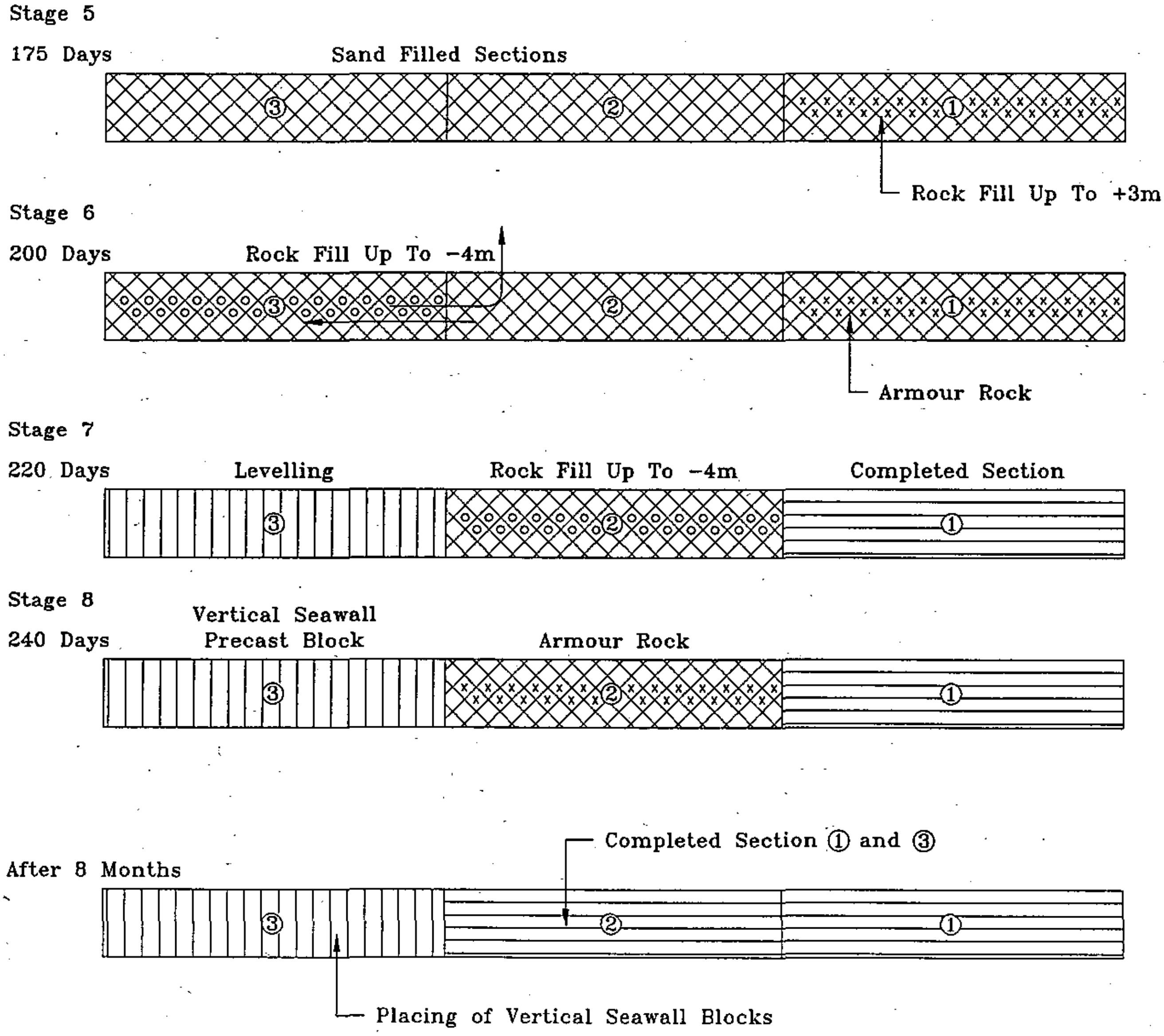
Dredging - assume $3m^3$ Grab Dredger working for 10 hours of actual dredging (0700-1900) at a rate of $1020m^3$/day. It will take 103 days to dredge 105,060 m^3

Sequence



Signed:

Checked By:



Signed: [signature] Checked By: [signature]

Appendix B-5

Public Dumping Licence Agreement

CIVIL ENGINEERING DEPARTMENT
土木工程署

DUMPING LICENCE NO.
傾卸泥土執照第 號

(Issued under the Crown Land Ordinance Cap. 28)
（根據香港法例第二十八章官地條例之規定而發）

Licensee :
執照持有人：

Lorry No. :
泥頭車號碼：

Licence valid up to :
有效期至 止

The licensee is hereby authorised to dispose of material at public dumps in accordance with the conditions listed below (Chinese version printed overleaf):
現批准執照持有人依照下列各項條件在公眾卸泥區傾卸物料（中文譯本印於背面）：

CONDITIONS

1. This licence is not transferable.
2. The licence must be carried by the licensee/lorry driver and produced on demand to the Dump Supervisor.
3. The licence is issued together with a windscreen label which must be prominently displayed on the vehicle.
4. The licence is issued on the express understanding that the Hong Kong Government accepts no responsibility for any accident which may befall the staff or vehicles employed by the licensee at the dump. The licensee shall ensure that every safety precaution is taken when operating the dump.
5. The licensee will be responsible for the cost of any repairs necessary as a result of damage caused by dumping under this licence.
6. Dumping may be carried out on all days except Sundays and public holidays between the hours as advertised in the press and posted at individual sites.
7. The following materials may be dumped under this licence:
   (a) earth,
   (b) building debris, and
   (c) broken rock and concrete.
   The materials shall be free from marine mud, household refuse, plastic, metal, industrial and chemical waste, animal and vegetable matter, and other material considered unsuitable by the Dump Supervisor. Small quantities of timber mixed with otherwise suitable material will be permitted.
8. The materials shall be dumped at the location and in the manner instructed by the Dump Supervisor.
9. The licensee/lorry driver shall report the source of material when required by the Dump Supervisor.
10. Care shall be taken to prevent any material being dropped from lorries onto public roads.
11. Non-compliance with these conditions will entail withdrawal of the licence without notice and may result in legal action being taken.
12. The right is reserved to cancel this licence at any time before the date of expiry and/or to close any dump without prior notice and without provision of an alternative dumping site.

Dated
日期

....

( )
under delegated authority of the Director of Building and Lands

( )
屋宇地政署署長授權

CEngD(CEO73)

Appendix B-6

Fill Requirements and Surplus Data Form

FILL REQUIREMENTS AND SURPLUS DATA FORM

PROJECT NAME	RECLAMATION WORKS FOR DOS & GIC FACILITIES IN NORTH TSING YI	CLIENT	PM/NTW, T.D.D.	GOVT./PRIV.	
CONTRACT NAME		CONTRACT NO.			
CONTRACTOR		DEVELOPER			
CONSULTANT (Pre-contract)		CONSULTANT (Contract)			
GOVT.REP. (Pre-contract)	CE/DFA, CEO, CED	GOVT.REP. (Contract)	CE/DFA, CEO; CED		
KEY DATES	Tender Documents 01/10/1994 ; Call Tenders 01/03/1995	Award Contract	01/06/1995	Contract completed	30/11/1997

	ANNUAL FILL REQUIREMENTS									ANNUAL SURPLUSES				
	GENERAL FILL				SPECIAL ROCK FILL									
	Marine Sand	Land Sourced	Public Dump	PFA	Filter	< 225 mm crush/screen	Rock Fill	Armour 500-2000kg	Armour > 2000kg	Mud * Contam.	Mud * Uncontam.	Rock	Soft Material	Other Material
Top Size					150 mm		500 Kg	2000 kg	3000 kg					
Bottom Size					1 mm		10 kg	500 kg	2000 kg					
Start Date	/ /	/ /	01/06/1996	/ /	01/07/1995	/ /	01/07/1995	01/11/1995	01/12/1995	01/06/1995	/ /	/ /	/ /	01/06/1995
Finish Date	/ /	/ /	01/05/1997	/ /	01/01/1996	/ /	01/03/1996	01/06/1996	01/07/1996	01/02/1996	/ /	/ /	/ /	01/08/1995
YEAR	Mil.cu.m.	Mil.cu.m.	Mil.cu.m.	Mil.cu.m.	Mil.cu.m.	Mil.cu.m.	Mil.cu.m.	Mil.cu.m.	Mil.cu.m.	Mil.cu.m.	Mil.cu.m.	Mil.cu.m.	Mil.cu.m.	Mil.cu.m.
1994														
1995					0.09		0.08	0.01	0.01	0.07				0.01
1996			0.32		0.01		0.03	0.02	0.02					
1997			0.18											
TOTAL	0.00	0.00	0.50	0.00	0.10	0.00	0.11	0.03	0.03	0.07	0.00	0.00	0.00	0.01
FILL SOURCE / DISPOSAL SITE (If Finalised)			PUBLIC DUMP											
Allocated														

REMARKS	DELIVERY RATE OF PUBLIC DUMP MATERIALS ASSUMED TO BE 250-300 TRUCK LOADS PER DAY						For FMC Secretariat Use Only	Zone
FORM FILLED BY	Name	LEE WING HONG	Office	CE/DFA, CED	Phone 7625659	Fax 7140079	Date	/ /

NOTE: Annual quantities (in million cubic metres) should be entered to the nearest TWO decimal places.
* Mud Quantities to the nearest THREE decimal places.

Fill Management Committee Secretariat
Geotechnical Engineering Office, CED.

Appendix B-7

FMC Surplus Material From Projects Between February 1995 - August 1997

SURPLUS FROM PROJECTS BETWEEN 1 FEBRUARY 1995 TO 31 AUG 1997

PROJECT NAME	CONTRACT NAME	CONTACT PERSON/OFFICE	PHONE	FAX	SURPLUS VOLUME Mm³ ROCK	SOFT	OTHER	START DATE	END DATE
NORTH LANTAU DEVELOPMENT (ACP)	NORTH LANTAU EXPRESSWAY TAI HO SECT.(SEWAGE TREATMENT WORKS)	M.WHITE/MOTT MACDONALD	8285757	8271823	0.00	1.31	0.09	01/06/92	01/05/96
* CASTLE PEAK POWER STATION - ASH	* CASTLE PEAK POWER STATION -ASH	G. DUNN/CL&P	3606580	3606109	0.00	0.00	0.95	01/01/93	31/12/95
ROUTE 3 (ACP)	ROUTE 3 - TSING YI SECTION - CHEUNG CHING TUNNEL	K.S. CHENG/CE/R3,HyD	7623631	7145198	0.40	0.00	0.00	01/03/93	30/04/95
TIN WAN ESTATE REDEVELOPMENT SITE FORMATION & ASS. WORKS	SITE FORMATION & ASSOCATED WORKS AT TIN WAN ESTATE	L.C.K. CHIU/HD	8854435	5673087	0.01	0.01	0.00	15/03/93	14/03/95
REHABILITATION OF CHAI WAN ROAD	REHABILITATION OF CHAI WAN ROAD	A.A. BOWLEY/RHE, HK	3690175	7396648	0.00	0.00	0.04	01/04/93	30/06/95
WEST KOWLOON EXPRESSWAY (ACP)	SOUTH CONTRACT	C.K. LIN/GE/WHL,HyD	7623615	7145224	0.00	0.14	0.00	01/06/93	30/04/95
SENT LANDFILL	DEVELOPMENT & MANAGEMENT OF SENT LANDFILL	TOM K L LAI	8351174	5910636	7.87	3.20	0.00	09/09/93	31/12/04
WEST KOWLOON CORRIDOR, YAU MA TEI SECTION, PHASE II	168TH - WEST KOWLOON CORRIDOR, YAU MA TEI SECTION, PHASE II	LEE PING KWAN/HyD	7805435	7814042	0.00	0.03	0.00	01/11/93	31/08/96
WESTERN HARBOUR CROSSING (ACP)	WESTERN HARBOUR CROSSING - IMT	C.M. CHAN/HyD	7823610	7145224	0.14	0.52	0.10	01/01/94	31/12/96
* CASTLE PEAK POWER STATION - ASH	* CASTLE PEAK POWER STATION -ASH	G. DUNN/CL&P	3606580	3606109	0.00	0.00	2.40	01/01/94	31/12/99
* CASTLE PEAK POWER STATION - ASH	* CASTLE PEAK POWER STATION -ASH	G. DUNN/CL&P	3606580	3606109	0.00	0.00	0.40	01/01/94	31/12/99
REHABILITATION OF ANDERSON ROAD QUARRIES	AT AREA NO.3	C.S. CHAN/GEO, CED	7625479	7140193	0.00	4.59	0.00	01/01/94	31/12/11
REHABILITATION OF ANDERSON ROAD QUARRIES	AT TAI SHEUNG TOK, ANDERSON ROAD	C.S. CHAN/GEO, CED	7625479	7140193	0.00	5.13	0.00	01/01/94	31/12/13
PILLAR POINT VALLEY LANDFILL	CONTRACT F - SANITARY LANDFILL AND ASSOCIATED WORKS	G.C.S. PANG/CE/SW,CEO	7825654	7141294	0.00	0.70	0.00	15/03/94	19/02/97
NORTH LANTAU WATER SUPPLY PROJECT	SIU HO WAN TO SILVERMINE BAY AQUEDUCT	ROBERT YUE/PHH/SWK	8663688	5295056	0.06	0.01	0.00	01/04/94	31/12/95
REHABILITATION OF NEW CLEAR WATER BAY ROAD	REHABILITATION OF NEW CLEAR WATER BAY ROAD	A.A. BOWLEY/Peter Fraenicel BMT	3690175	7396648	0.00	0.00	0.04	01/04/94	31/12/95
RECONSTN. OF CASTLE PEAK RD (FROM FU TEI TO PING SHAN)	RECONSTN. OF CASTLE PEAK RD (FROM FU TEI TO PING SHAN)	C.W. NG/RHE/NT,HyD	7623525	7145289	0.00	0.00	0.06	01/04/94	30/11/96
DISTRICT ADMIN. & MAINT. WORKS - KOWLOON EAST & CENTRAL	HIGHWAYS DEPARTMENT TERM CONTRACT(KOWLOON EAST & CENTRAL)	K.H. WONG/RHE/K,HyD	7605289	7143180	0.00	0.70	0.00	01/04/94	31/12/05
DISTRICT ADMIN. & MAINT. WORKS - KOWLOON WEST	HIGHWAYS DEPT. TERM CONTRACT (KOWLOON WEST)	C.Y. TANG/HYD/K	7605261	7143180	0.00	0.47	0.00	01/04/94	31/12/05
LUNG CHEUNG ROAD & CHING CHEUNG ROAD IMPROVEMENTS		K.K. WONG/CE/C, H/K	7605411	7614042	0.00	0.29	0.00	01/05/94	31/12/96
IMPROVEMENT TO TUEN MUN ROAD	IMPROVEMENT TO TUEN MUN ROAD	K.C. WONG/RHE/NT,HyD	7623537	7145289	0.37	0.62	0.00	15/05/94	28/02/96
MA ON SHAN TREATMENT WORKS AND WATER TRANSFER FACILITIES	CONSTN.OF TREATMENT WORKS, PUMPING STATN.& PRIMARY SERV.RES.	T.Y. CHAN/CE/CM,WSD	8294440	8240578	0.27	0.19	0.00	16/05/94	01/11/96
AIRPORT RAILWAY (ACP)	TSING YI TUNNEL	J.R. WALKER/MTRC	7512209	7562225	0.17	0.20	0.00	30/06/94	31/12/95
AIRPORT RAILWAY (ACP)	TSING YI STATION (COMBINED)	J.R. WALKER/MTRC	7512209	7562225	0.01	0.12	0.00	01/07/94	01/07/95
AIRPORT RAILWAY (ACP)	TUNG CHUNG STATION & TUNNEL	J.R. WALKER/MTRC	7512209	7562225	0.00	0.45	0.09	01/07/94	31/12/95
NORTH LANTAU DEVELOPMENT (NON ACP)	TUNG CHUNG PHASE II LAND FORMATION	M.WHITE/MOTT MACDONALD	8285757	8271823	0.25	0.87	0.00	01/07/94	30/06/96
YUEN LONG WATER SUPPLY	WANG CHAU SERVICE RESERVOIR STAGE II	ALBERT K.M. CHEUNG/CE/P,WSD	8294429	8240578	0.09	0.50	0.00	01/07/94	31/12/97
STRATEGIC SEWAGE DISPOSAL SCHEME - STAGE 1	EXCAVATION OF PRODUCTION SHAFTS AND PUMPING STATN. FOUNDATN.	C.M. HOWLEY/MOTT CONNE.	8285757	8271823	0.04	0.02	0.00	26/06/94	30/03/95
YUEN LONG WATER SUPPLY - REMAINING WORKS	CONSTRUCTION OF TAN KWAI TSUEN FRESH WATER SERVICE RESERVOIR	H.Y. LAI/WSD	8294475	8240578	0.20	0.06	0.00	01/09/94	01/05/95
AIRPORT RAILWAY (ACP)	LAI KING STATION & TUNNEL	J.R. WALKER/MTRC	7512209	7562225	0.14	0.02	0.00	01/09/94	31/12/95
SHEK KIP MEI NO.2 FRESH WATER SERV. RESERVOIR & ASSO. MAINL.		C.K. TAI/DES, WSD	8294494	8240578	0.02	0.13	0.00	30/09/94	31/03/95
AIRPORT RAILWAY (ACP)	KOWLOON STATION & TUNNELS	J.R. WALKER/MTRC	7512209	7959981	0.01	0.86	0.00	01/11/94	31/10/95
AIRPORT RAILWAY (ACP)	HONG KONG CENTRAL SUBWAY	J.R. WALKER/MTRC	7512209	7562225	0.00	0.10	0.02	01/11/94	31/12/96
STRATEGIC SEWAGE DISPOSAL SCHEME - STAGE 1	DIAPHM.WALLS & EXCAV.OF STONECUTTERS MAIN PUMPG.STATN.& P.S.	C.M. HOWLEY/MOTT CONN.	8285757	8271823	0.00	0.06	0.00	09/11/94	28/02/95
SHEUNG SHUI/FANLING WATER SUPPLY - STAGE II	CONSTN. OF KWU TUNG FRESH WATER SERVICE RESERVOIR	C.M. LAU/DES., WSD	8294473	8240578	0.10	0.02	0.00	01/12/94	30/11/95
EXTENSION OF CHLORINATION FACILITIES AT TAI LAM CHUNG RESER.		W.S. WONG/DES., WSD	8294485	8240578	0.00	0.03	0.00	12/12/94	31/03/95
NORTH LANTAU DEVELOPMENT (NON ACP)	TUNG CHUNG PHASE II RECLAMATION	M.WHITE/MOTT MACDONALD	8285757	8271823	0.00	0.00	0.10	01/01/95	31/03/95
EXPLOSIVES COMPLEX AT KAU SHAT WAN		CHIU MAU FAT/CE/PW,CEO	7625549	7140113	0.18	0.00	0.00	01/01/95	15/09/95
* 825 KING'S ROAD, HONG KONG		JOSEPH HO/HARRIS & S	8809788	5655561	0.01	0.00	0.02	01/01/95	31/12/95
* LDC - PROJECT H6	* LDC - PROJECT H6	ANTHONY WAI/MCAL	3762299	3762070	0.00	0.18	0.00	01/01/95	31/12/95
AIRPORT RAILWAY (ACP)	KWAI CHUNG PARK	J.R. WALKER/MTRC	7512209	7562225	0.00	0.10	0.10	01/01/95	31/12/95
AIRPORT RAILWAY (ACP)	RAMBLER CHANNEL BRIDGE	J.R. WALKER/MTRC	7512209	7562225	0.00	0.01	0.00	01/01/95	31/12/95
AIRPORT RAILWAY (ACP)	DEPOT AT SIU HO WAN	J.R. WALKER/MTRC	7512209	7562225	0.00	0.05	0.00	01/01/95	31/12/95
NORTH LANTAU DEVELOPMENT (ACP)	SEWAGE OUTFALL - SIU HO WAN	C.M.SPEARING/MOTT MACDONALD	8285757	8271823	0.00	0.01	0.00	01/01/95	31/12/95
ROUTE 3 - TING KAU BRIDGE AND APPROACH VIADUCT		S.H. LAM/LFCPMO,HyD	8021107	8276566	0.15	0.45	0.00	01/01/95	31/12/96
TSUEN WAN & KWAI TSING SEWERAGE	TSUEN WAN & KWAI TSING SEWERAGE - STAGE I PHASE I	LAM WAI CHUEN/CE/CM,DSD	5947270	8278526	0.00	0.00	0.04	01/01/95	30/06/97
ROUTE 3 - TAI LAM TUNNEL & YUEN LONG APPROACH ROAD		OLIVER WONG/WHL, HyD	7623611	7145224	7.00	0.00	0.00	01/01/95	31/12/97
AIRPORT RAILWAY (ACP)	LANTAU TUNNEL	J.R. WALKER/MTRC	7512209	7562225	0.08	0.00	0.00	07/01/95	21/01/96
FORMATION OF PO LAM ROAD PLATFORM	FORMATION OF PO LAM ROAD PLATFORM	Y.K. SHIU/GEO/A	7625285	7140214	1.25	0.73	0.00	01/02/95	31/10/97
STRATEGIC SEWAGE DISPOSAL SCHEME - STAGE 1	STAGE 1 OUTFALL	C.M. HOWLEY/MONTG.WAT.	8285757	8271823	0.05	0.00	0.00	30/03/95	22/08/96
FURTHER IMPROV. OF FRESH WATER SUPPLY TO KOWLOON SE AREA		P.K. YIM/WSD	8294742	8240578	0.00	0.09	0.00	01/04/95	31/12/95
NORTH LANTAU WATER SUPPLY PROJECT	YAM O TUK SERVICE RESERVOIRS	K.K. LI/CE/NL,WSD	8294717	824057	0.12	0.10	0.00	01/04/95	31/12/95
SAU MAU PING REDEVELOPMENT PHASE 5 & 6	SITE FORMATION AND REALIGNMENT OF SAU MAU PING ROAD	S.T. IP/HD	7615152	7114401	0.55	0.85	0.00	01/04/95	31/12/96

DATE : 12/08/1994

SURPLUS FROM PROJECTS BETWEEN 1 FEBRUARY 1995 TO 31 AUG 1997

PROJECT NAME	CONTRACT NAME	CONTACT PERSON/OFFICE	PHONE	FAX	SURPLUS VOLUME Mm³			START DATE	END DATE
					ROCK	SOFT	OTHER		
TAI PO EAST LOW LEVEL SERVICE RESERVOIR	TAI PO EAST LOW LEVEL SERVICE RESERVOIR	Y.S. WONG/DES., WSD	8294480	8240578	0.04	0.00	0.00	03/04/95	06/01/96
STRATEGIC SEWAGE DISPOSAL SCHEME - STAGE 1	TUNNELS FROM TSEUNG KWAN O & CHAI WAN TO KWUN TONG	C.M. HOWLEY/MOTT CONN.	8285757	8271823	0.19	0.00	0.00	01/05/95	31/07/96
STRATEGIC SEWAGE DISPOSAL SCHEME - STAGE 1	TUNNELS FROM KWUN TONG & KWAI CHUNG TO STONECUTTERS	C.M. HOWLEY/MOTT CONN.	8285757	8271823	0.22	0.00	0.00	03/05/95	31/12/96
RECLAMATION WORKS FOR DOS & GIC FACILITIES IN NORTH TSING YI		LEE WING HONG/CE/D&A,CED	7625659	7140079	0.00	0.00	0.01	01/06/95	01/08/95
DIAMOND HILL DEVELOPMENT - REMAINING WORKS	DIAMOND HILL DEVELOPMENT - REMAINING WORKS	Y.S. SZ/CE/D&A,CED	7625677	7140079	0.05	0.01	0.00	01/08/95	31/05/95
AIRPORT RAILWAY (ACP)	HONG KONG STATIONS & TUNNELS	J.R. WALKER/MTRC	7512209	7562225	0.01	0.60	0.00	01/08/95	31/12/96
* MAU TIN HARBOUR	* MAU TIN HARBOUR - RESIDENTIAL & MARINA DEV. - PHASE 3	K.C. LEE/HO TIN	8952238	8906872	0.00	0.05	0.00	01/10/95	31/12/95
IMPROVE.OF FRESH & SALT WATER SUPPLY TO TUEN MUN WEST. AREAS	CONSTRUCTION OF SIU LANG SHUI & BLACK PTS. F.W. SERVICE RES.	W.K. LAI/DES., WSD	8294474	8240578	0.09	0.03	0.00	01/10/95	31/12/96
MAIN DRAIN.CHANN.& POLDERED VILL.PROTN.SCHE.FOR SAN TIN,NWNT	PHASE 1-VILLAGE FLOOD PROTECTION WORKS FOR SAN TIN VILLAGES	LAM YU CHAU/CE/D, DSD	5947344	8278700	0.00	0.06	0.00	01/10/95	31/03/98
TIU KENG LENG SITE FORMATION	TIU KENG LENG - SITE FORMATION & INFRASTRUCTURE WORKS	K.S. SIU/CE SEC./HD	7159753	7687465	1.09	0.47	0.00	01/12/95	30/04/99
MAIN DRAIN.CHANN.& POLDERED VILL.PROTN.SCHE.FOR SAN TIN,NWNT	PHASE 2-VILLAGE FLOOD PROTECTION WORKS FOR CHAU TAU	LAM YU CHAU/CE/D, DSD	5947344	8278700	0.00	0.07	0.00	01/01/96	30/12/97
ADDITIONAL TREATMENT & TRANSFER FACILITIES FOR NORTH NWNT	NGAU TAM MEI TREATMENT WORKS & PRIMARY SERVICES RESERVOIR	M.K. CHOI/CE/CM, WSD	8294441	8240578	0.00	0.20	0.00	01/02/96	31/07/97
YUEN LONG / KAM TIN DRAINAGE CHANNELS - (PWP ITEM 22CD)	YUEN LONG / KAM TIN DRAINAGE CHANNELS - STAGE II, PHASE 1	CHUNG CHI MING/DP DIV/DSD	5947340	8278700	0.00	0.07	0.00	01/03/96	30/09/98
METROPOLITAN AREA & NENT - ADDITIONAL TREATMENT FACILITIES	METROPOLITAN AREA & NENT - ADDITIONAL TREATMENT FACILITIES	K.K. CHAN/WSD	8294407	8240578	0.67	0.49	0.00	01/04/96	30/04/98
TUEN MUN AREA 38 SPECIAL INDUSTRIES-RECLAMATION & SERVICING	ROAD & JUNCTION IMPROVEMENTS WITHIN TUEN MUN	K.Y. LO/RHE/NT,HyD	7623595	7145289	0.00	0.00	0.03	01/06/96	30/06/98
TSING YI WATER SUPPLY STAGE IV	TSING YI CENTRAL FRESH WATER SERVICE RESERVOIR	S.F. WONGG/WSD	8294798	8240578	0.08	0.12	0.00	01/08/96	31/12/97
BELCHER BAY LINK AND BELCHER BAY RECLAMATION	BELCHER BAY LINK	K.T. POOLE/PYPUN	8663688	5295056	0.00	0.00	0.01	05/09/96	02/10/96
HIRAM'S HIGHWAY IMPROVEMENT - STAGE 1 - PHASE 2	HIRAM'S HIGHWAY IMPROVEMENT - STAGE 1 - PHASE 2	GREG LEUNG/RHE/NT,HyD	7623521	7145289	0.03	0.04	0.00	16/09/96	15/12/96
MAIN DRAIN.CHANN.& POLDERED VILL.PROTN.SCHE.FOR SAN TIN,NWNT	PHASE 3 - DRAINAGE CHANNELS FOR SAN TIN	LAM YU CHAU/CE/D, DSD	5947344	8278700	0.00	0.20	0.00	01/11/96	30/11/99
* DIAMOND HILL TO MA ON SHAN EXTENSION	* DIAMOND HILL TO MA ON SHAN EXTENSION	J.R. WALKER/MTRC	7512209	7512225	0.16	0.93	0.00	01/01/97	31/12/97
* NWNT EXTENSION (TSUEN WAN TO YUEN LONG)	* NWNT EXTENSION (TSUEN WAN TO YUEN LONG)	J.R. WALKER/MTRC	7512209	7512225	0.28	0.18	0.00	01/01/97	31/12/97
HIRAM'S HIGHWAY IMPROVEMENT - STAGE 1 - PHASE 3		BEN LO/RHE/NT,HyD	7623509	7145289	0.02	0.02	0.00	01/01/97	31/12/97
NORTH LANTAU DEVELOPMENT (NON ACP)	TAI HO PHASE II RECLAMATION	M.WHITE/MOTT MACDONALD	8285757	8271823	0.00	0.00	0.78	01/01/97	31/12/97
ROUTE 5 - SECTION BETWEEN SHEK WAI KOK AND CHAI WAN KOK	ADVANCE CONTRACT	NGAN MAN FAT/RHE/NT,HyD	7623524	7145289	0.00	0.02	0.00	01/01/97	31/12/97
* TSEUNG KWAN O EXTENSION	* TSEUNG KWAN O EXTENSION	J.R. WALKER/MTRC	7512209	7512225	0.20	0.14	0.00	01/01/97	31/12/98
CENTRAL KOWLOON ROUTE STUDY	CENTRAL KOWLOON ROUTE STUDY	OLIVER WONG/GE/WHL,HyD	7623611	7145224	0.32	0.28	0.05	01/01/97	31/12/00
TSING YI NORTH COASTAL ROAD	TSING YI NORTH COASTAL ROAD	CHOW WING KWONG/RHE/NT,HyD	7623528	7145289	0.23	0.36	0.00	01/01/97	31/12/00
WATER SUPPLY FROM CHINA BEYOND 1994 - REMAINING WORKS	WATER SUPPLY FROM CHINA BEYOND 1994 - REMAINING WORKS	PAUL HO/WSD	8294716	8240578	0.02	0.04	0.00	01/01/97	31/12/00
VILLAGE FLOOD PROTECTION FOR TIN SHUI WAI HINTERLAND	HA TSUEN MARSH CHANNEL	CHUNG CHI MING/CE/D, DSD	5947340	8278700	0.00	0.05	0.00	01/02/97	30/09/99
ROUTE 16 - FROM WEST KOWLOON TO SHATIN		W S MAK/NT.REG.HyD	7623518	7145289	0.28	0.06	0.00	01/04/97	31/12/99
STRATEGIC SEWAGE DISPOSAL SCHEME - STAGE 2	STAGE 2 (BORED TUNNEL OUTFALL OPTION)	J. BLACKWOOD/DSD	5838971	8274272	0.80	0.01	0.00	01/04/97	31/12/01
IMPROVEMENT TO CENTRAL L.L.F.W. SUPPLY	NEW KENNEDY TOWN S/R	Y.H. CHEUNG/CE/P,WSD	8294422	8240578	0.22	0.15	0.00	01/05/97	31/08/98
* LAMMA POWER STATION	* LAMMA POWER STATION - ASH LAGOON	H L WONG/HKEC	8433115	5211967	0.00	0.00	0.55	01/06/97	31/12/98

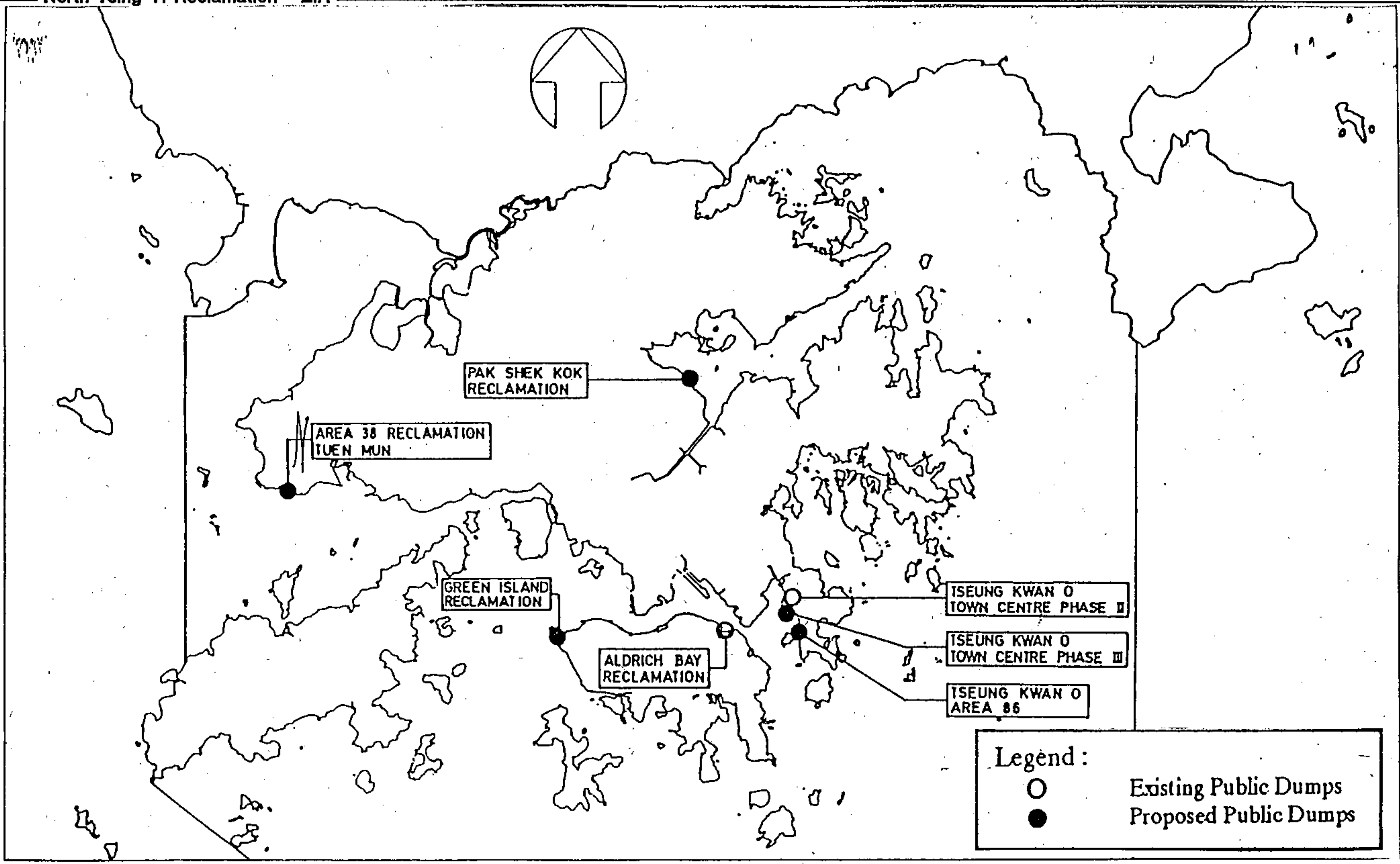
DATE : 12/08/1994

Appendix B-8

Location of Existing and Proposed Public Dumps

Table showing the tentative operational dates for Public Dumps (FMC Database August 1994)

Site	**Start**	**Finish**
Hong Kong Island		
Aldrich Bay Reclamation	21 Jun 1993	31 Dec 1995
Proposed Green Bay Island Reclamation	1996	2003
South East New territories		
Tseung Kwan O Town Centre Phase II	1 Sep 1996	30 Sep 1999
Proposed Tseung Kwan O Town Centre Phase III	1 Sep 1996	30 Sep 1999
Proposed Tseung Kwan O Area 86	1 Oct 1995	1 Mar 1997
North East New Territories		
Proposed Pak Shek Kok Reclamtion	11 Oct 1995	31 Dec 2005
North West New Territories		
Proposed Reclamtion Area 38	1 Jan 1995	31 Aug 1998
Proposed North Tsing Yi Reclamation	1 Jun 1996	1 May 1997



Location of Existing and Proposed Public Dumps

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Figure No. B-8.1

Appendix B-9

Location of FMC Projects in the Proximity of the Project Site

SURPLUS FROM PROJECTS BETWEEN 1 FEBRUARY 1995 TO 31 AUG 1997

REF. NO.	PROJECT NAME	CONTRACT NAME	CONTACT PERSON/OFFICE	PHONE	FAX	SURPLUS VOLUME Mm³ ROCK	SOFT	OTHER	START DATE	END DATE
1	NORTH LANTAU DEVELOPMENT (ACP)	NORTH LANTAU EXPRESSWAY TAI HO SECT.(SEWAGE TREATMENT WORKS)	M.WHITE/MOTT MACDONALD	8285757	8271823	0.00	1.31	0.09	01/06/92	01/05/96
2	* CASTLE PEAK POWER STATION - ASH	* CASTLE PEAK POWER STATION -ASH	G. DUNN/CL&P	3606580	3606109	0.00	0.00	0.95	01/01/93	31/12/95
3a	ROUTE 3 (ACP)	ROUTE 3 - TSING YI SECTION - CHEUNG CHING TUNNEL	K.S. CHENG/CE/R3,HyD	7623631	7145198	0.40	0.00	0.00	01/03/93	30/04/95
4	TIN WAN ESTATE REDEVELOPMENT SITE FORMATION & ASS. WORKS	SITE FORMATION & ASSOCATED WORKS AT TIN WAN ESTATE	L.C.K. CHIU/HD	8854435	5673087	0.01	0.01	0.00	15/03/93	14/03/95
5	REHABILITATION OF CHAI WAN ROAD	REHABILITATION OF CHAI WAN ROAD	A.A. BOWLEY/RHE, HK	3690175	7396648	0.00	0.00	0.04	01/04/93	30/06/95
6	WEST KOWLOON EXPRESSWAY (ACP)	SOUTH CONTRACT	C.K. LIN/GE/WHL,HyD	7623615	7145224	0.00	0.14	0.00	01/08/93	30/04/95
7	SENT LANDFILL	DEVELOPMENT & MANAGEMENT OF SENT LANDFILL	TOM K L LAI	8351174	5910636	7.87	3.20	0.00	09/09/93	31/12/04
8	WEST KOWLOON CORRIDOR, YAU MA TEI SECTION, PHASE II	168TH - WEST KOWLOON CORRIDOR, YAU MA TEI SECTION, PHASE II	LEE PING KWAN/HyD	7605435	7614042	0.00	0.03	0.00	01/11/93	31/08/98
9	WESTERN HARBOUR CROSSING (ACP)	WESTERN HARBOUR CROSSING - IMT	C.M. CHAN/HyD	7623610	7145224	0.14	0.52	0.10	01/01/94	31/12/96
2	* CASTLE PEAK POWER STATION - ASH	* CASTLE PEAK POWER STATION -ASH	G. DUNN/CL&P	3606580	3606109	0.00	0.00	2.40	01/01/94	31/12/99
2	* CASTLE PEAK POWER STATION - ASH	* CASTLE PEAK POWER STATION -ASH	G. DUNN/CL&P	3606580	3606109	0.00	0.00	0.40	01/01/94	31/12/99
10	REHABILITATION OF ANDERSON ROAD QUARRIES	AT AREA NO.3	C.S. CHAN/GEO, CED	7625479	7140193	0.00	4.59	0.00	01/01/94	31/12/11
10	REHABILITATION OF ANDERSON ROAD QUARRIES	AT TAI SHEUNG TOK, ANDERSON ROAD	C.S. CHAN/GEO, CED	7625479	7140193	0.00	5.13	0.00	01/01/94	31/12/13
11	PILLAR POINT VALLEY LANDFILL	CONTRACT F - SANITARY LANDFILL AND ASSOCIATED WORKS	G.C.S. PANG/CE/SW,CEO	7625654	7141294	0.00	0.70	0.00	15/03/94	19/02/97
12	NORTH LANTAU WATER SUPPLY PROJECT	SIU HO WAN TO SILVERMINE BAY AQUEDUCT	ROBERT YUE/PHH/SWK	8663688	5295056	0.06	0.01	0.00	01/04/94	31/12/95
13	REHABILITATION OF NEW CLEAR WATER BAY ROAD	REHABILITATION OF NEW CLEAR WATER BAY ROAD	A.A. BOWLEY/Peter Fraenicel BMT	3690175	7396648	0.00	0.00	0.04	01/04/94	31/12/95
14	RECONSTN. OF CASTLE PEAK RD (FROM FU TEI TO PING SHAN)	RECONSTN. OF CASTLE PEAK RD (FROM FU TEI TO PING SHAN)	C.W. NG/RHE/NT,HyD	7623525	7145289	0.00	0.00	0.06	01/04/94	30/11/96
15	DISTRICT ADMIN. & MAINT. WORKS - KOWLOON EAST & CENTRAL	HIGHWAYS DEPARTMENT TERM CONTRACT(KOWLOON EAST & CENTRAL)	K.H. WONG/RHE/K,HyD	7605289	7143180	0.00	0.70	0.00	01/04/94	31/12/05
16	DISTRICT ADMIN. & MAINT. WORKS - KOWLOON WEST	HIGHWAYS DEPT. TERM CONTRACT (KOWLOON WEST)	C.Y. TANG/HYD/K	7605261	7143180	0.00	0.47	0.00	01/04/94	31/12/05
17	LUNG CHEUNG ROAD & CHING CHEUNG ROAD IMPROVEMENTS		K.K. WONG/CE/C, H/K	7605411	7614042	0.00	0.29	0.00	01/05/94	31/12/98
18	IMPROVEMENT TO TUEN MUN ROAD	IMPROVEMENT TO TUEN MUN ROAD	K.C. WONG/RHE/NT,HyD	7623537	7145289	0.37	0.62	0.00	15/05/94	28/02/98
19	MA ON SHAN TREATMENT WORKS AND WATER TRANSFER FACILITIES	CONSTN.OF TREATMENT WORKS, PUMPING STATN.& PRIMARY SERV.RES.	T.Y. CHAN/CE/CM,WSD	8294440	8240578	0.27	0.19	0.00	16/05/94	01/11/96
20e	AIRPORT RAILWAY (ACP)	TSING YI TUNNEL	J.R. WALKER/MTRC	7512209	7562225	0.17	0.20	0.00	30/06/94	31/12/95
20d	AIRPORT RAILWAY (ACP)	TSING YI STATION (COMBINED)	J.R. WALKER/MTRC	7512209	7562225	0.01	0.12	0.00	01/07/94	01/07/95
20a	AIRPORT RAILWAY (ACP)	TUNG CHUNG STATION & TUNNEL	J.R. WALKER/MTRC	7512209	7562225	0.00	0.45	0.09	01/07/94	31/12/95
21	NORTH LANTAU DEVELOPMENT (NON ACP)	TUNG CHUNG PHASE II LAND FORMATION	M.WHITE/MOTT MACDONALD	8285757	8271823	0.25	0.87	0.00	01/07/94	30/06/96
22	YUEN LONG WATER SUPPLY	WANG CHAU SERVICE RESERVOIR STAGE II	ALBERT K.M. CHEUNG/CE/P,WSD	8294429	8240578	0.09	0.50	0.00	01/07/94	31/12/97
23	STRATEGIC SEWAGE DISPOSAL SCHEME - STAGE 1	EXCAVATION OF PRODUCTION SHAFTS AND PUMPING STATN. FOUNDATN.	C.M. HOWLEY/MOTT CONNE.	8285757	8271823	0.04	0.02	0.00	26/08/94	30/03/95
24	YUEN LONG WATER SUPPLY - REMAINING WORKS	CONSTRUCTION OF TAN KWAI TSUEN FRESH WATER SERVICE RESERVOIR	H.Y. LAI/WSD	8294475	8240578	0.20	0.06	0.00	01/09/94	01/05/95
20h	AIRPORT RAILWAY (ACP)	LAI KING STATION & TUNNEL	J.R. WALKER/MTRC	7512209	7562225	0.14	0.02	0.00	01/09/94	31/12/95
25	SHEK KIP MEI NO.2 FRESH WATER SERV. RESERVOIR & ASSO. MAINL.		C.K. TAI/DES, WSD	8294494	8240578	0.02	0.13	0.00	30/09/94	31/03/95
20i	AIRPORT RAILWAY (ACP)	KOWLOON STATION & TUNNELS	J.R. WALKER/MTRC	7512209	7959981	0.01	0.86	0.00	01/11/94	31/10/95
20j	AIRPORT RAILWAY (ACP)	HONG KONG CENTRAL SUBWAY	J.R. WALKER/MTRC	7512209	7562225	0.00	0.10	0.02	01/11/94	31/12/98
26	STRATEGIC SEWAGE DISPOSAL SCHEME - STAGE 1	DIAPHM.WALLS & EXCAV.OF STONECUTTERS MAIN PUMPG.STATN.& P.S.	C.M. HOWLEY/MOTT CONN.	8285757	8271823	0.00	0.06	0.00	09/11/94	28/02/95
27	SHEUNG SHUI/FANLING WATER SUPPLY - STAGE II	CONSTN. OF KWU TUNG FRESH WATER SERVICE RESERVOIR	C.M. LAU/DES., WSD	8294473	8240578	0.10	0.02	0.00	01/12/94	30/11/95
28	EXTENSION OF CHLORINATION FACILITIES AT TAI LAM CHUNG RESER.		W.S. WONG/DES., WSD	8294465	8240578	0.00	0.03	0.00	12/12/94	31/03/95
21b	NORTH LANTAU DEVELOPMENT (NON ACP)	TUNG CHUNG PHASE II RECLAMATION	M.WHITE/MOTT MACDONALD	8285757	8271823	0.00	0.00	0.10	01/01/95	31/03/95
29	EXPLOSIVES COMPLEX AT KAU SHAT WAN		CHIU MAU FAT/CE/PW,CEO	7625549	7140113	0.18	0.00	0.00	01/01/95	15/09/95
30	* 625 KING'S ROAD, HONG KONG		JOSEPH HO/HARRIS & S	8809788	5655561	0.01	0.00	0.02	01/01/95	31/12/95
31	* LDC - PROJECT H6	* LDC - PROJECT H6	ANTHONY WAI/MCAL	3762299	3762070	0.00	0.18	0.00	01/01/95	31/12/95
20g	AIRPORT RAILWAY (ACP)	KWAI CHUNG PARK	J.R. WALKER/MTRC	7512209	7562225	0.00	0.10	0.10	01/01/95	31/12/95
20f	AIRPORT RAILWAY (ACP)	RAMBLER CHANNEL BRIDGE	J.R. WALKER/MTRC	7512209	7562225	0.00	0.01	0.00	01/01/95	31/12/95
20b	AIRPORT RAILWAY (ACP)	DEPOT AT SIU HO WAN	J.R. WALKER/MTRC	7512209	7562225	0.00	0.05	0.00	01/01/95	31/12/95
21c	NORTH LANTAU DEVELOPMENT (ACP)	SEWAGE OUTFALL - SIU HO WAN	C.M.SPEARING/MOTT MACDONALD	8285757	8271823	0.00	0.01	0.00	01/01/95	31/12/95
3b	ROUTE 3 - TING KAU BRIDGE AND APPROACH VIADUCT		S.H. LAM/LFCPMO,HyD	8021107	8276566	0.15	0.45	0.00	01/01/95	31/12/96
32	TSUEN WAN & KWAI TSING SEWERAGE	TSUEN WAN & KWAI TSING SEWERAGE - STAGE I PHASE I	LAM WAI CHUEN/CE/CM,DSD	5947270	8278526	0.00	0.00	0.04	01/01/95	30/06/97
3c	ROUTE 3 - TAI LAM TUNNEL & YUEN LONG APPROACH ROAD		OLIVER WONG/WHL, HyD	7623611	7145224	7.00	0.00	0.00	01/01/95	31/12/97
20c	AIRPORT RAILWAY (ACP)	LANTAU TUNNEL	J.R. WALKER/MTRC	7512209	7562225	0.08	0.00	0.00	07/01/95	21/01/96
33	FORMATION OF PO LAM ROAD PLATFORM	FORMATION OF PO LAM ROAD PLATFORM	Y.K. SHIU/GEO/A	7625285	7140214	1.25	0.73	0.00	01/02/95	31/10/97
26b	STRATEGIC SEWAGE DISPOSAL SCHEME - STAGE 1	STAGE 1 OUTFALL	C.M. HOWLEY/MONTG.WAT.	8285757	8271823	0.05	0.00	0.00	30/03/95	22/06/96
34	FURTHER IMPROV. OF FRESH WATER SUPPLY TO KOWLOON SE AREA		P.K. YIM/WSD	8294742	8240578	0.00	0.09	0.00	01/04/95	31/12/95
35	NORTH LANTAU WATER SUPPLY PROJECT	YAM O TUK SERVICE RESERVOIRS	K.K. LI/CE/NL,WSD	8294717	824057	0.12	0.10	0.00	01/04/95	31/12/95
36	SAU MAU PING REDEVELOPMENT PHASE 5 & 6	SITE FORMATION AND REALIGNMENT OF SAU MAU PING ROAD	S.T. IP/HD	7615152	7114401	0.55	0.85	0.00	01/04/95	31/12/98

NOTE: REF. NO. APPLIES TO THE FIGURE FOR FMC DATABASE - SOURCE OF SURPLUS FILL

DATE: 12/08/1994

SURPLUS FROM PROJECTS BETWEEN 1 FEBRUARY 1995 TO 31 AUG 1997

REF. NO.	PROJECT NAME	CONTRACT NAME	CONTACT PERSON/OFFICE	PHONE	FAX	SURPLUS VOLUME Mm³ ROCK	SOFT	OTHER	START DATE	END DATE
37	TAI PO EAST LOW LEVEL SERVICE RESERVOIR	TAI PO EAST LOW LEVEL SERVICE RESERVOIR	Y.S. WONG/DES., WSD	8294480	8240578	0.04	0.00	0.00	03/04/95	06/01/96
38	STRATEGIC SEWAGE DISPOSAL SCHEME - STAGE 1	TUNNELS FROM TSEUNG KWAN O & CHAI WAN TO KWUN TONG	C.M. HOWLEY/MOTT CONN.	8285757	8271823	0.19	0.00	0.00	01/05/95	31/07/96
39	STRATEGIC SEWAGE DISPOSAL SCHEME - STAGE 1	TUNNELS FROM KWUN TONG & KWAI CHUNG TO STONECUTTERS	C.M. HOWLEY/MOTT CONN.	8285757	8271823	0.22	0.00	0.00	03/05/95	31/12/96
	RECLAMATION WORKS FOR DOS & GIC FACILITIES IN NORTH TSING YI		LEE WING HONG/CE/D&A,CED	7625659	7140079	0.00	0.00	0.01	01/06/95	01/08/95
41	DIAMOND HILL DEVELOPMENT - REMAINING WORKS	DIAMOND HILL DEVELOPMENT - REMAINING WORKS	Y.S. SZ/CE/D&A,CED	7625677	7140079	0.05	0.01	0.00	01/08/95	31/05/95
20)	AIRPORT RAILWAY (ACP)	HONG KONG STATIONS & TUNNELS	J.R. WALKER/MTRC	7512209	7562225	0.01	0.60	0.00	01/08/95	31/12/96
42	* MAU TIN HARBOUR	* MAU TIN HARBOUR - RESIDENTIAL & MARINA DEV. - PHASE 3	K.C. LEE/HO TIN	8952238	8908872	0.00	0.05	0.00	01/10/95	31/12/95
43	IMPROVE.OF FRESH & SALT WATER SUPPLY TO TUEN MUN WEST. AREAS	CONSTRUCTION OF SIU LANG SHUI & BLACK PTS. F.W. SERVICE RES.	W.K. LAI/DES., WSD	8294474	8240578	0.09	0.03	0.00	01/10/95	31/12/96
44	MAIN DRAIN.CHANN.& POLDERED VILL.PROTN.SCHE.FOR SAN TIN,NWNT	PHASE 1-VILLAGE FLOOD PROTECTION WORKS FOR SAN TIN VILLAGES	LAM YU CHAU/CE/D, DSD	5947344	8278700	0.00	0.06	0.00	01/10/95	31/03/98
45	TIU KENG LENG SITE FORMATION	TIU KENG LENG - SITE FORMATION & INFRASTRUCTURE WORKS	K.S. SIU/CE SEC./HD	7159753	7687465	1.09	0.47	0.00	01/12/95	30/04/99
46	MAIN DRAIN.CHANN.& POLDERED VILL.PROTN.SCHE.FOR SAN TIN,NWNT	PHASE 2-VILLAGE FLOOD PROTECTION WORKS FOR CHAU TAU	LAM YU CHAU/CE/D, DSD	5947344	8278700	0.00	0.07	0.00	01/01/96	30/12/97
47	ADDITIONAL TREATMENT & TRANSFER FACILITIES FOR NORTH NWNT	NGAU TAM MEI TREATMENT WORKS & PRIMARY SERVICES RESERVOIR	M.K. CHOI/CE/CM, WSD	8294441	8240578	0.00	0.20	0.00	01/02/96	31/07/97
48	YUEN LONG / KAM TIN DRAINAGE CHANNELS - (PWP ITEM 22CD)	YUEN LONG / KAM TIN DRAINAGE CHANNELS - STAGE II, PHASE 1	CHUNG CHI MING/DP DIV/DSD	5947340	8278700	0.00	0.07	0.00	01/03/96	30/09/98
49	METROPOLITAN AREA & NENT - ADDITIONAL TREATMENT FACILITIES	METROPOLITAN AREA & NENT - ADDITIONAL TREATMENT FACILITIES	K.K. CHAN/WSD	8294407	8240578	0.67	0.49	0.00	01/04/96	30/04/98
50	TUEN MUN AREA 38 SPECIAL INDUSTRIES-RECLAMATION & SERVICING	ROAD & JUNCTION IMPROVEMENTS WITHIN TUEN MUN	K.Y. LO/RHE/NT,HyD	7623595	7145289	0.00	0.00	0.03	01/06/96	30/06/98
51	TSING YI WATER SUPPLY STAGE IV	TSING YI CENTRAL FRESH WATER SERVICE RESERVOIR	S.F. WONGG/WSD	8294798	8240578	0.08	0.12	0.00	01/08/96	31/12/97
52	BELCHER BAY LINK AND BELCHER BAY RECLAMATION	BELCHER BAY LINK	K.T. POOLE/PYPUN	8663688	5295056	0.00	0.00	0.01	05/09/96	02/10/96
53	HIRAM'S HIGHWAY IMPROVEMENT - STAGE 1 - PHASE 2	HIRAM'S HIGHWAY IMPROVEMENT - STAGE 1 - PHASE 2	GREG LEUNG/RHE/NT,HyD	7623521	7145289	0.03	0.04	0.00	16/09/96	15/12/98
54	MAIN DRAIN.CHANN.& POLDERED VILL.PROTN.SCHE.FOR SAN TIN,NWNT	PHASE 3 - DRAINAGE CHANNELS FOR SAN TIN	LAM YU CHAU/CE/D, DSD	5947344	8278700	0.00	0.20	0.00	01/11/96	30/11/99
55	* DIAMOND HILL TO MA ON SHAN EXTENSION	* DIAMOND HILL TO MA ON SHAN EXTENSION	J.R. WALKER/MTRC	7512209	7512225	0.16	0.93	0.00	01/01/97	31/12/97
56	* NWNT EXTENSION (TSUEN WAN TO YUEN LONG)	* NWNT EXTENSION (TSUEN WAN TO YUEN LONG)	J.R. WALKER/MTRC	7512209	7512225	0.28	0.18	0.00	01/01/97	31/12/97
57	HIRAM'S HIGHWAY IMPROVEMENT - STAGE 1 - PHASE 3		BEN LO/RHE/NT,HyD	7623509	7145289	0.02	0.02	0.00	01/01/97	31/12/97
58	NORTH LANTAU DEVELOPMENT (NON ACP)	TAI HO PHASE II RECLAMATION	M.WHITE/MOTT MACDONALD	8265757	8271823	0.00	0.00	0.78	01/01/97	31/12/97
59	ROUTE 5 - SECTION BETWEEN SHEK WAI KOK AND CHAI WAN KOK	ADVANCE CONTRACT	NGAN MAN FAT/RHE/NT,HyD	7623524	7145289	0.00	0.02	0.00	01/01/97	31/12/97
60	* TSEUNG KWAN O EXTENSION	* TSEUNG KWAN O EXTENSION	J.R. WALKER/MTRC	7512209	7512225	0.20	0.14	0.00	01/01/97	31/12/98
61	CENTRAL KOWLOON ROUTE STUDY	CENTRAL KOWLOON ROUTE STUDY	OLIVER WONG/GE/WHL,HyD	7623611	7145224	0.32	0.28	0.05	01/01/97	31/12/00
62	TSING YI NORTH COASTAL ROAD	TSING YI NORTH COASTAL ROAD	CHOW WING KWONG/RHE/NT,HyD	7623528	7145289	0.23	0.36	0.00	01/01/97	31/12/00
63	WATER SUPPLY FROM CHINA BEYOND 1994 - REMAINING WORKS	WATER SUPPLY FROM CHINA BEYOND 1994 - REMAINING WORKS	PAUL HO/WSD	8294716	8240578	0.02	0.04	0.00	01/01/97	31/12/00
64	VILLAGE FLOOD PROTECTION FOR TIN SHUI WAI HINTERLAND	HA TSUEN MARSH CHANNEL	CHUNG CHI MING/CE/D, DSD	5947340	8278700	0.00	0.05	0.00	01/02/97	30/09/99
65	ROUTE 16 - FROM WEST KOWLOON TO SHATIN		W S MAK/NT.REG.HyD	7623518	7145289	0.28	0.06	0.00	01/04/97	31/12/99
66	STRATEGIC SEWAGE DISPOSAL SCHEME - STAGE 2	STAGE 2 (BORED TUNNEL OUTFALL OPTION)	J. BLACKWOOD/DSD	5838971	8274272	0.80	0.01	0.00	01/04/97	31/12/01
67	IMPROVEMENT TO CENTRAL L.L.F.W. SUPPLY	NEW KENNEDY TOWN S/R	Y.H. CHEUNG/CE/P,WSD	8294422	8240578	0.22	0.15	0.00	01/05/97	31/08/98
68	* LAMMA POWER STATION	* LAMMA POWER STATION - ASH LAGOON	H L WONG/HKEC	8433115	5211967	0.00	0.00	0.55	01/06/97	31/12/98

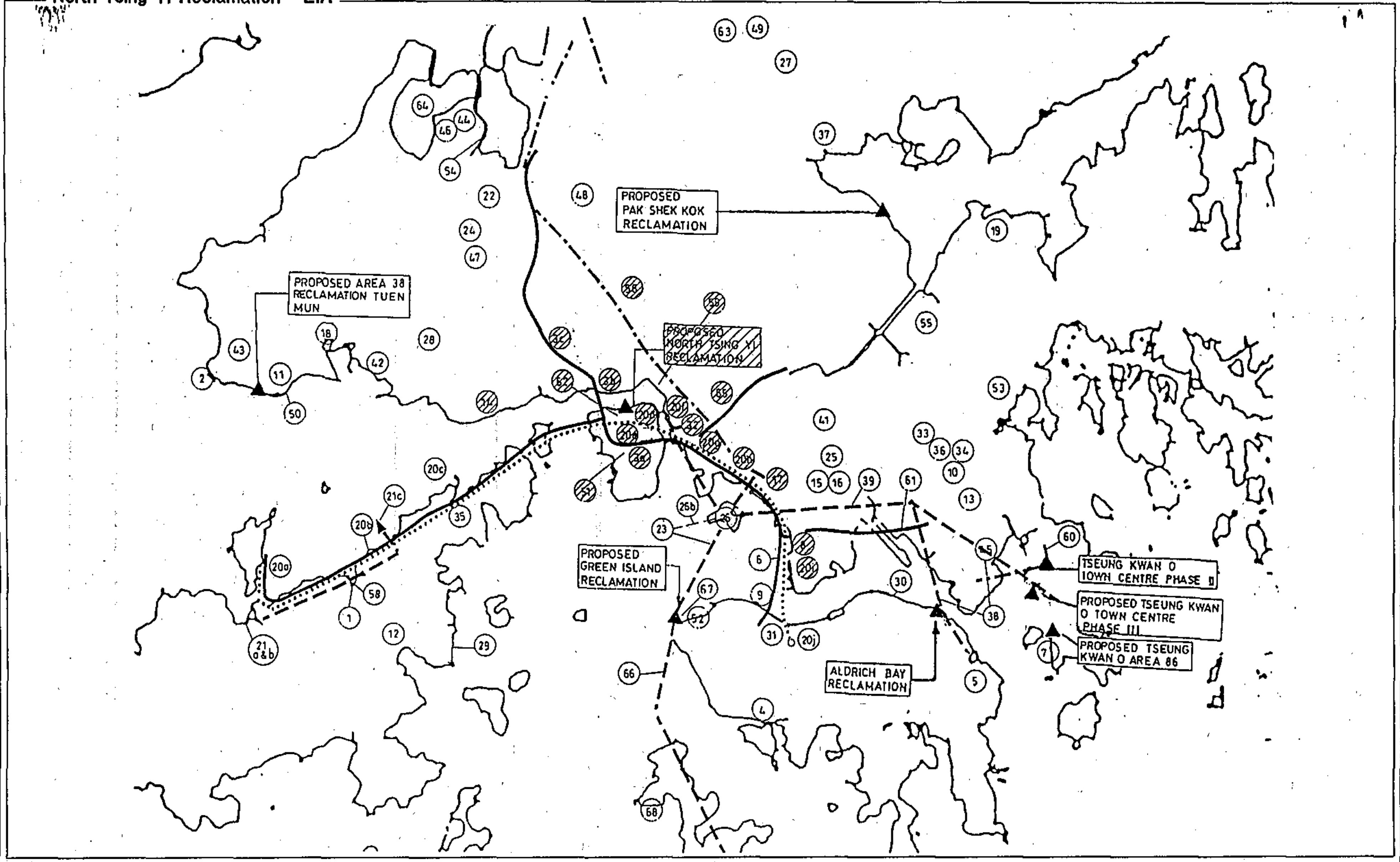
NOTE: REF. NO. APPLIES TO THE FIGURE FOR FMC DATABASE - SOURCE OF SURPLUS FILL

DATE : 12/08/1994

Table Showing the sources of fill to use the North Tsing Yi Reclamtion

Ref No.	Project	Start	Finish	Rock (Mm³)	Soft (Mm³)	Other (Mm³)	Rock(Mm³) 1994	Rock(Mm³) 1995	Rock(Mm³) 1996	Rock(Mm³) 1997	Soft(Mm³) 1994	Soft(Mm³) 1995	Soft(Mm³) 1996	Soft(Mm³) 1997	Other(Mm³) 1994	Other(Mm³) 1995	Other(Mm³) 1996	Other(Mm³) 1997
3a	Route 3 - Tsing Yi Section - Cheung Ching Tunnel	2 March 1993	1 May 1995	0.40	0.00	0.00	0.20	0.10										
3b	Route 3 - West Kowloon Expressway - South Contract	2 August 1993	1 May 1995	0.00	0.14	0.00					0.14							
3c	Route 3 - Tai Lam Tunnel & Yuen Long Approach Road	2 January 1995	1 January 1998	7.00	0.00	0.00		2.00	3.00	2.00								
8	West Kowloon Corridor, Yau Ma Tei Section ,Phase II	2 November 1993	1 September 1996	0.00	0.03	0.00					0.01	0.01	0.01					
14	Reconstruction of Castle Peak Road	2 April 1994	1 December 1996	0.00	0.00	0.06									0.02	0.02	0.02	
17	Lung Chung Road & Ching Cheung Road Improvements	2 May 1994	1 January 1997	0.00	0.29	0.00					0.10	0.10	0.09					
20d	Airport Railway - Tsing Yi Tunnel	1 July 1994	1 January 1996	0.17	0.20	0.00	0.06	0.11			0.07	0.13						
20e	Airport Railway - Tsing Yi Station	2 July 1994	2 July 1995	0.01	0.12	0.00	0.01				0.06	0.06						
20f	Airport Railway - Rambler Channel Bridge	2 January 1995	1 January 1996	0.00	0.01	0.00						0.01						
20g	Airport Railway - Kwai Chung Park	2 January 1995	1 January 1996	0.00	0.10	0.10						0.10				0.10		
20h	Airport Railway - Lai King Station and Tunnel	2 September 1994	1 January 1996	0.14	0.02	0.00		0.14				0.02						
32	Tseun Wan & Kwai Tsing Sewerage	2 January 1995	1 July 1997	0.00	0.00	0.04										0.01	0.02	0.01
51	Tsing Yi Central Fresh Water Service Reser.	2 August 1996	1 January 1998	0.08	0.12	0.00			0.04	0.04			0.06	0.06				
56	NWNT Extension (Tseun Wan to Yuen Long	2 January 1997	1 January 1998	0.28	0.18	0.00				0.28				0.18				
59	Route 5- Section between Shek Wai Kok and Chai Wan Kok	2 January 1997	1 January 1998	0.00	0.02	0.00								0.02				
62	Tsing Yi North Coastal Road	2 January 1997	1 January 2001	0.23	0.36	0.00				0.06				0.09				
65	Route 16 - West Kowloon to Shatin	2 April 1997	1 January 2000	0.28	0.06	0.00				0.10				0.02				
		Total Estimated Fill(Mm³)		8.59	1.65	0.20	0.27	2.35	3.04	2.48	0.38	0.43	0.16	0.37	0.02	0.13	0.04	0.01

Note:* likely to be served by North Tsing Yi and another nearby Public Dump



FMC Database - Source of Surplus Fill

Mouchel

Figure No. B-9.1

APPENDIX C

Solid Waste

Appendix C-1

Solid Waste Survey Questionnaire

公司名稱:______________________________

負責人 / 聯絡人姓名: ______________________________

聯絡電話: ______________________________

(一) 在船廠日常工序中,有否使用以下工業化學品或用品:

	有	無	每日平均用量(公升/公斤/個)	你怎樣處理淨餘或耗盡的物料(包括容器)?	有沒有把廢料回收?	回收數量
A) 油漆顏料						
1)含金屬油漆 防銹油						
(請註明類別) 紅鉛油						
白鉛油						
鋅油						
其他						
2)不含金屬油漆(請註明種類)						
3)樹脂						
B) 工業溶劑						
含鉻,鋅,銅或鎘金之電鍍溶液						
黏合劑						
有機劑包括:除油劑, 清潔劑,起漆水等						
酸性或鹼性溶液						

	有	無	每日平均用量 (公升/公斤/個)	你怎樣處理淨餘或耗盡的物料(包括容器)?	有沒有把廢料回收?	回收數量
C) 工業廢料						
工業油渣(請註明類別)						
工作後之金工廢料 (如:切割或鑽孔淨餘的金屬)						
燒焊用之焊接						
沙石, 鋼珠, 除銹的廢料						
舊或破爛的金屬 (如:鋅釘或電器)						
電池						
放射性物質(如螢光油或煙霧探測器)						
D) 石綿廢料						
(包括:包裹著鍋爐或蒸管的隔熱石棉,防火門之隔熱棉等)						
玻璃纖維						
E) 冷卻劑						
雪種(冷卻劑)						
CFC, 哈嚨						
阿摩尼亞						
其他冷卻劑						

物料	有	無	每日平均用量 (公升/公斤/個)	你怎樣處理淨餘或耗盡的物料(包括容器)?	有沒有把廢料回收?	回收數量
F) 用　料						
鉛碎石						
木料						
殺蟲劑或老鼠藥						
其他						
G) 廢　料						
海床挖出的泥土						
其他						

(二) 船廠將會於何時搬離現址?

預算日期:

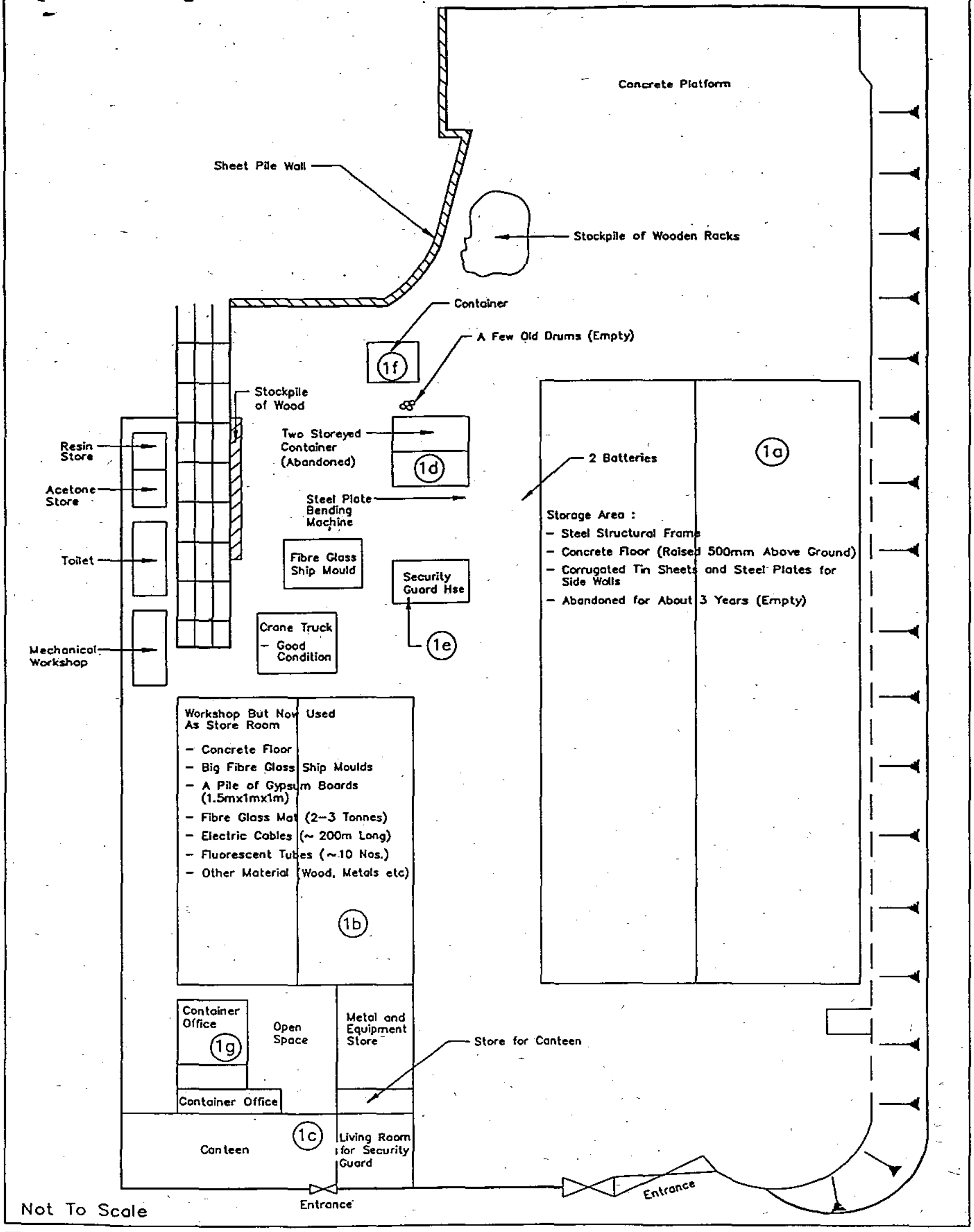
(三) 請簡單描述船廠之日常工作 (如: 打磨，燒焊或油漆等)

Appendix C-2

Waste Survey Maps of Shipyards (by Operator)

Figure No. C-2.1 is not used

North Tsing Yi Reclamation - EIA

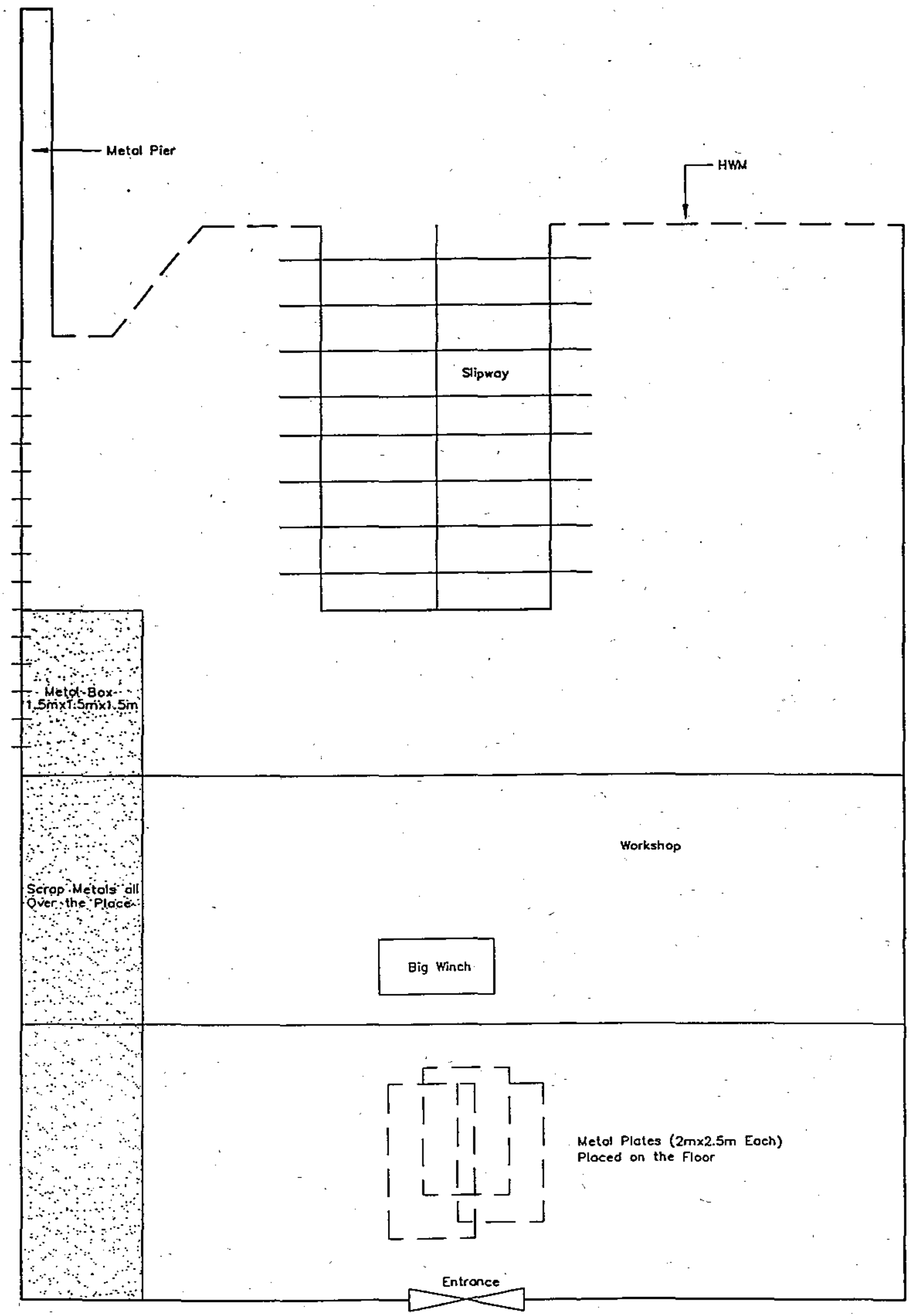


Kowloon Shipyard

Mouchel

Figure No. C-2.2

North Tsing Yi Reclamation - EIA



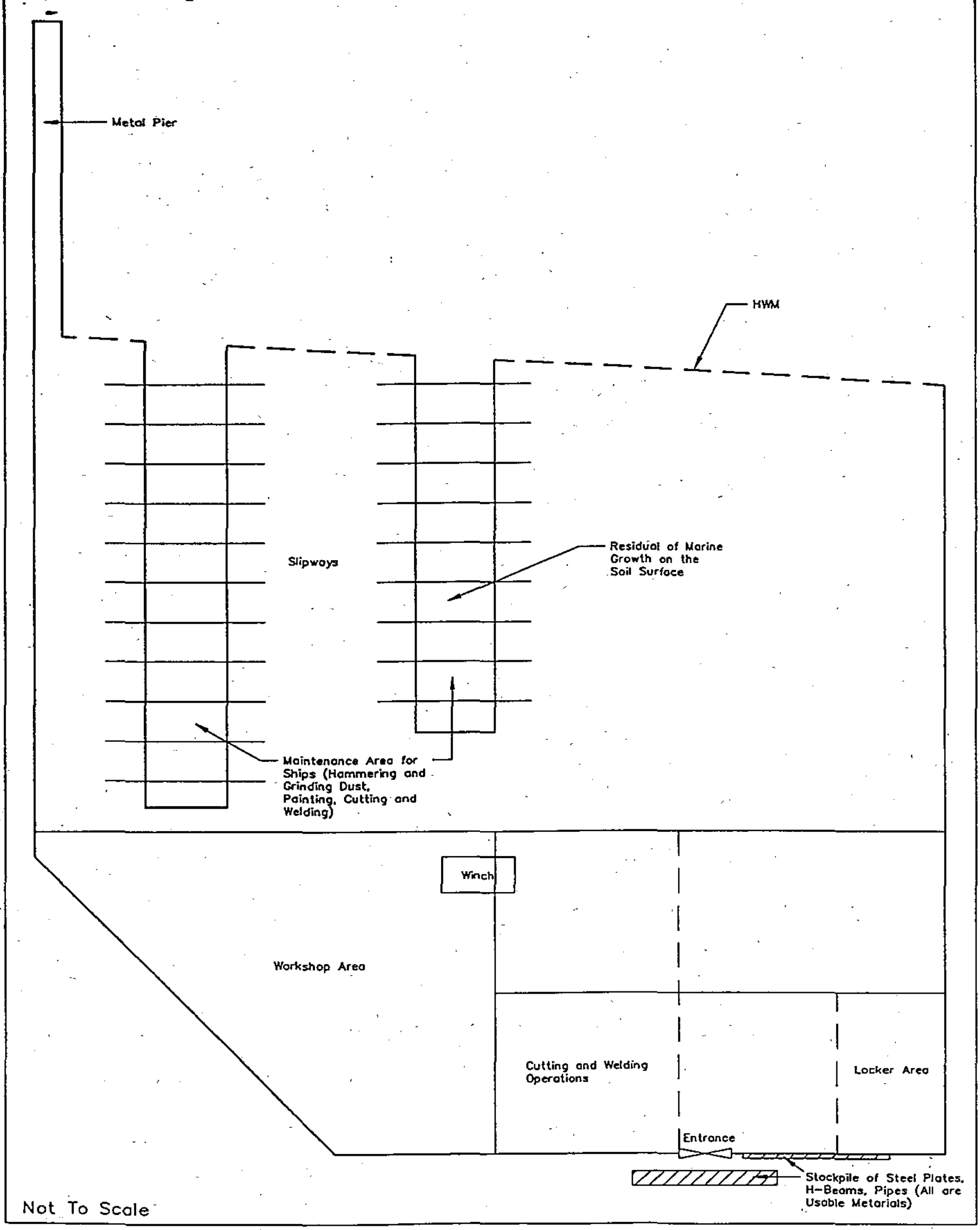
Not To Scale

Kwong Fat Loong Shipyard

Mouchel

Figure No. C-2.3

North Tsing Yi Reclamation - EIA

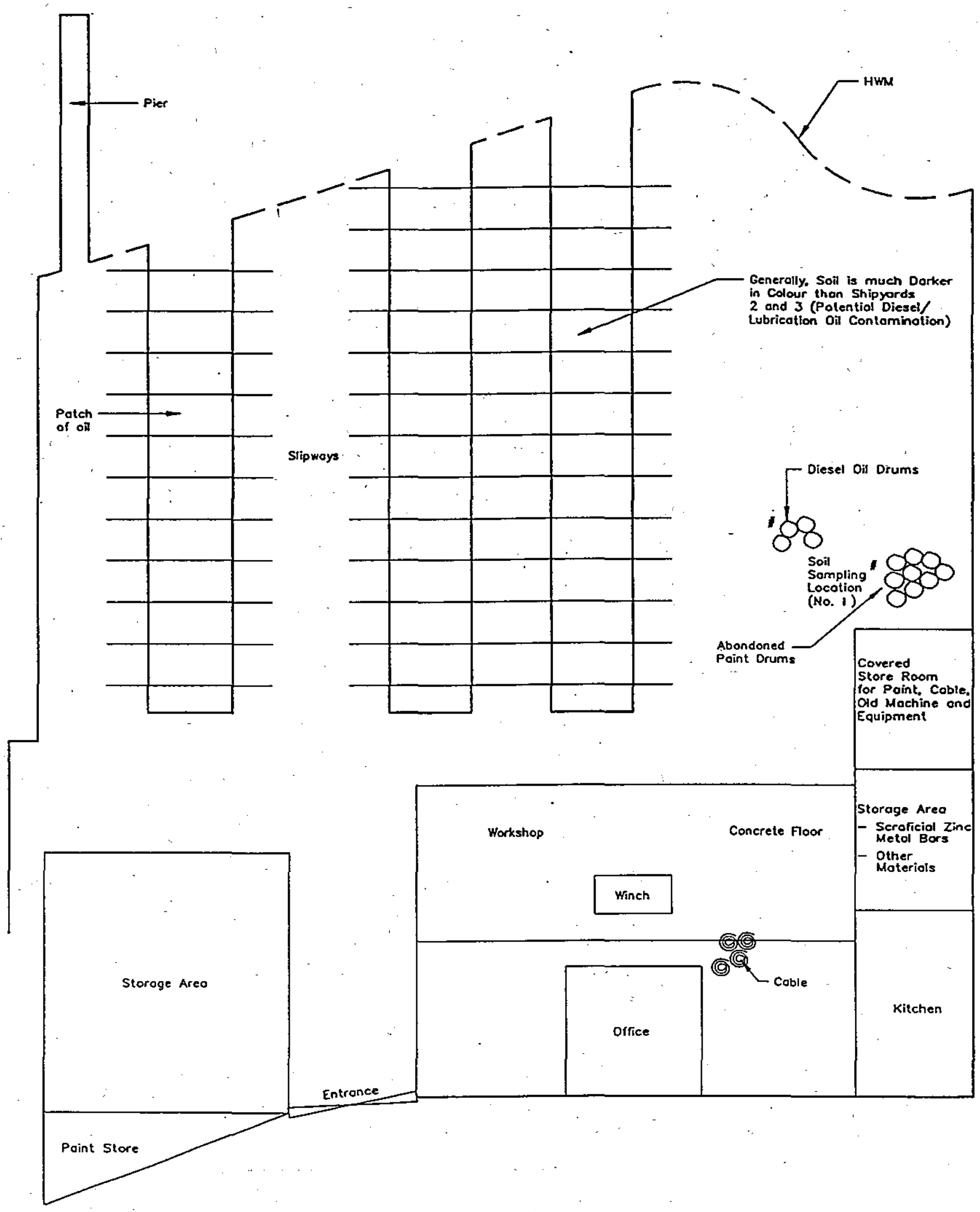


Delon Shipyard

Mouchel

Figure No. C-2.4

North Tsing Yi Reclamation - EIA



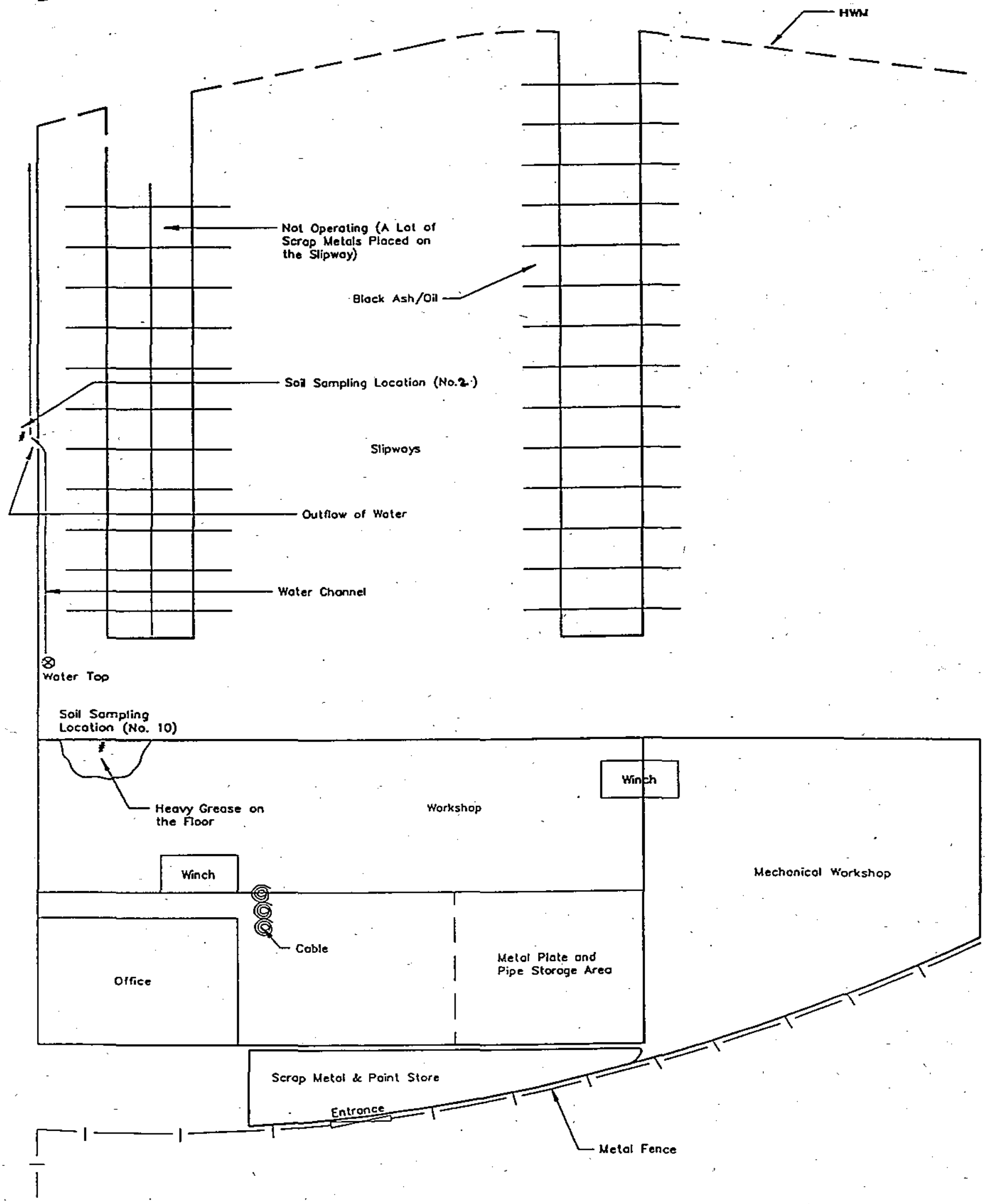
Not To Scale

Ming Lee Shipyard

Mouchel

Figure No. C-2.5

North Tsing Yi Reclamation - EIA

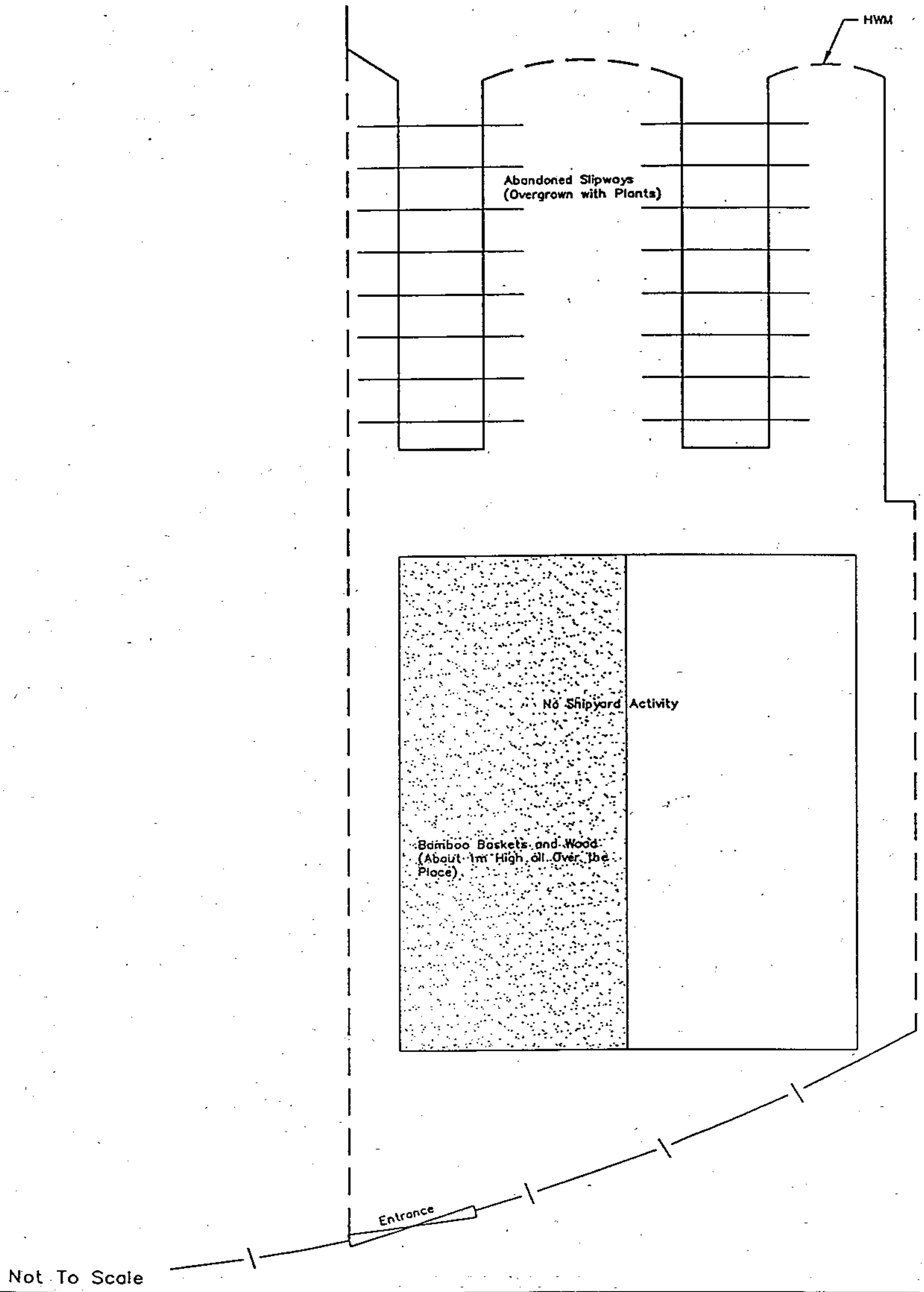


Not To Scale

Cheong Kee Shipyard

Mouchel

Figure No. C-2.6

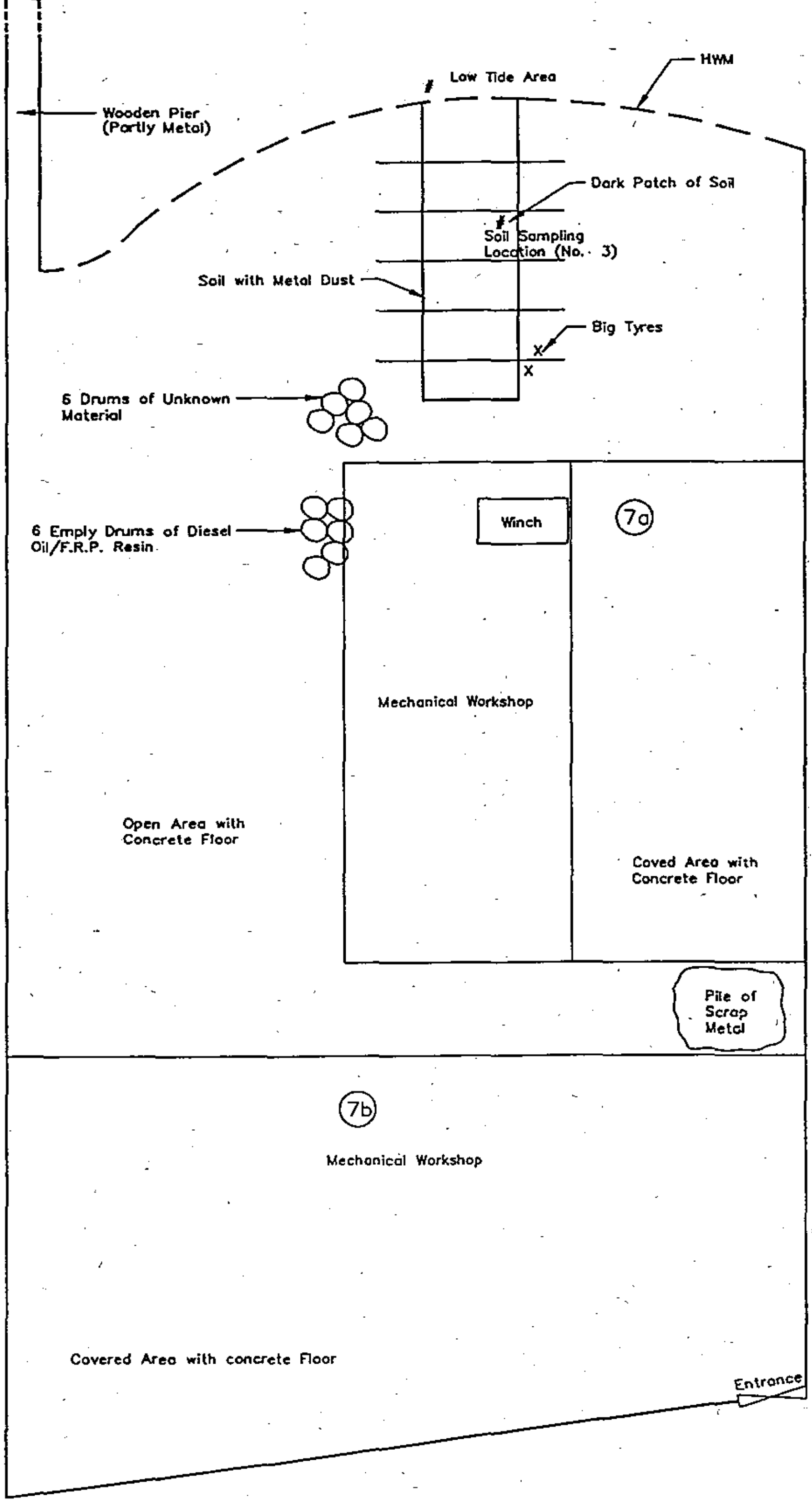


Wing On Shing Shipyard

Mouchel

Figure No. C-2.7

North Tsing Yi Reclamation - EIA

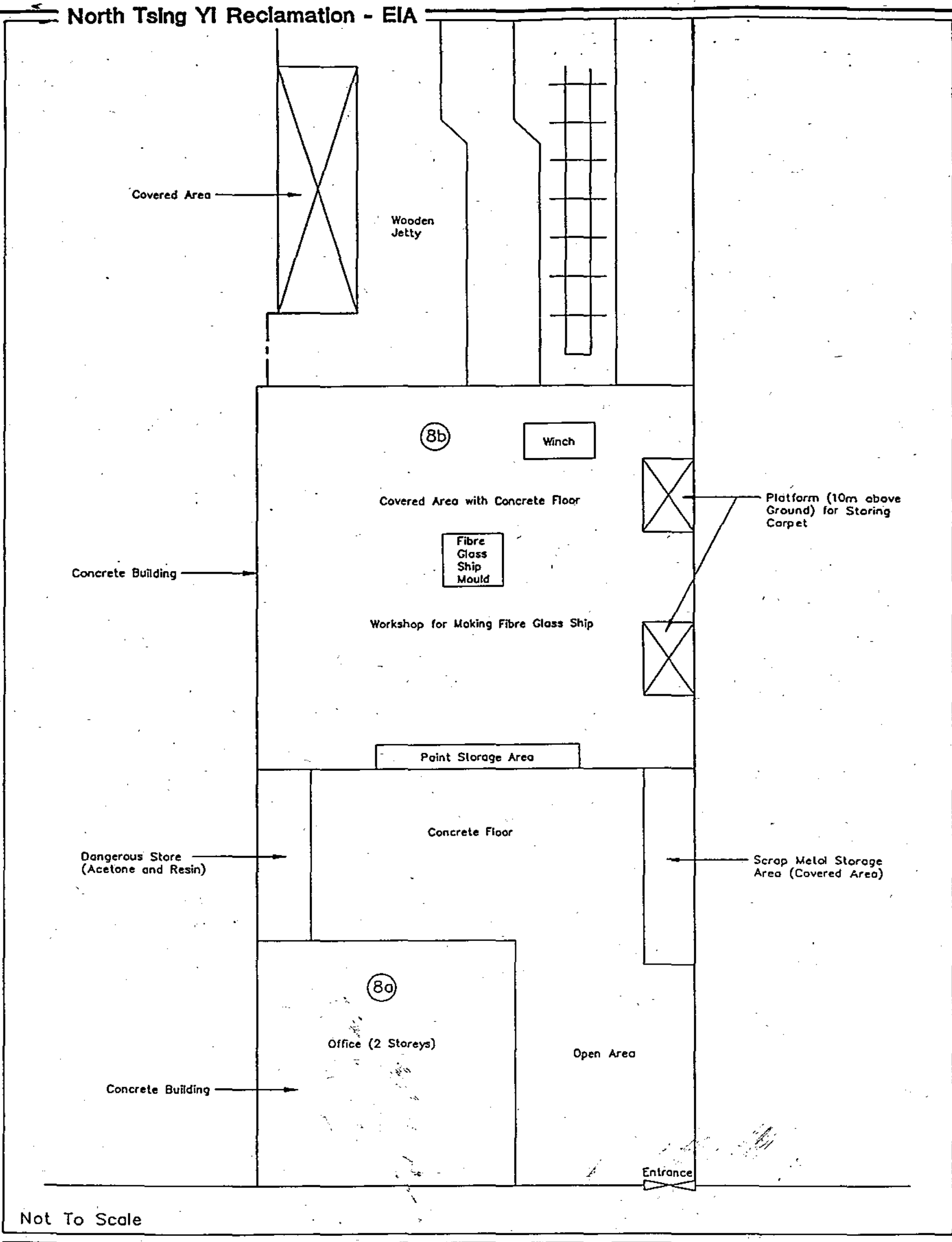


Not To Scale

Hip Shing Shipyard

Mouchel

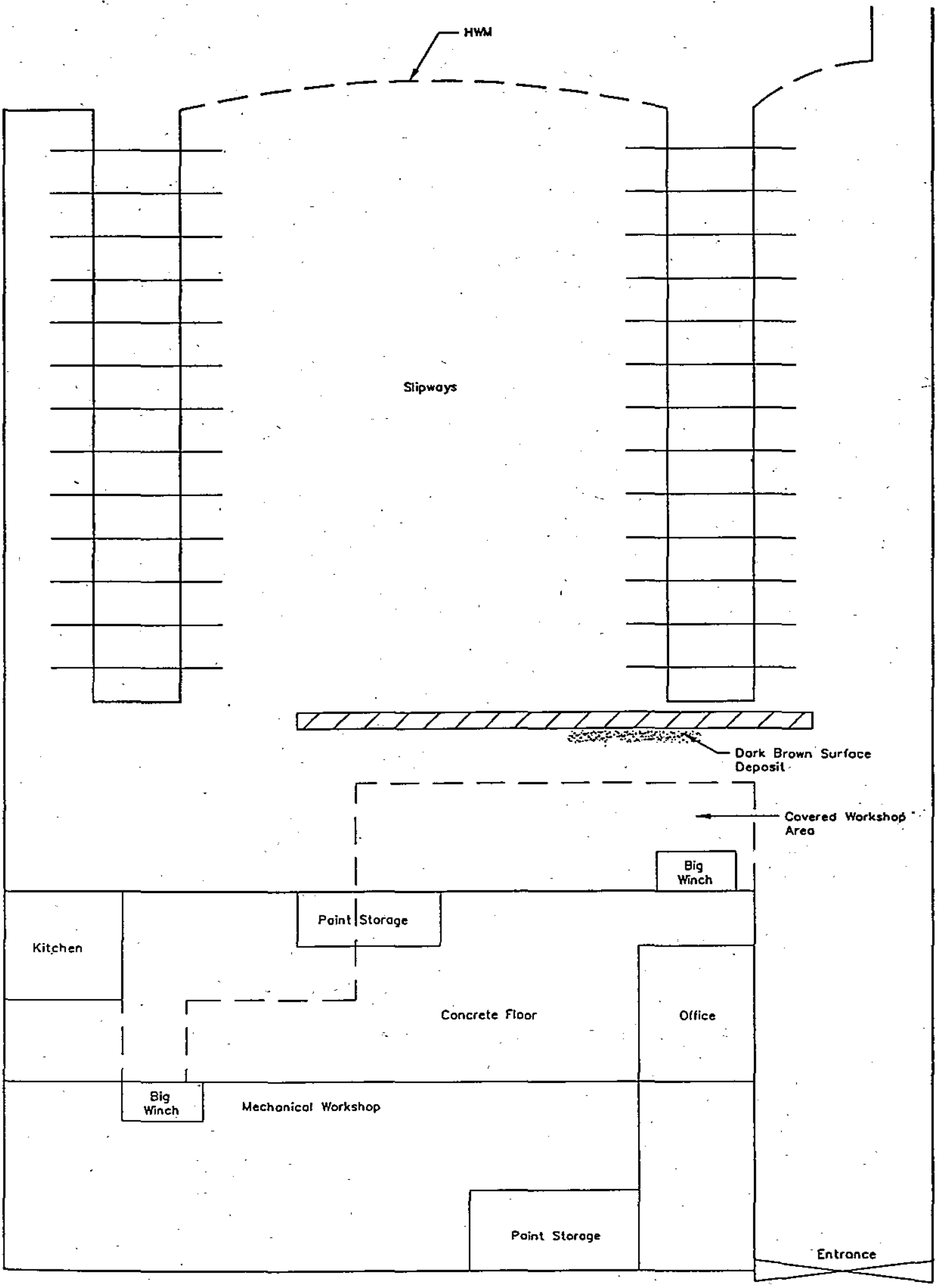
Figure No. C-2.8



Supercraft Shipyard

Mouchel

Figure No. C-2.9



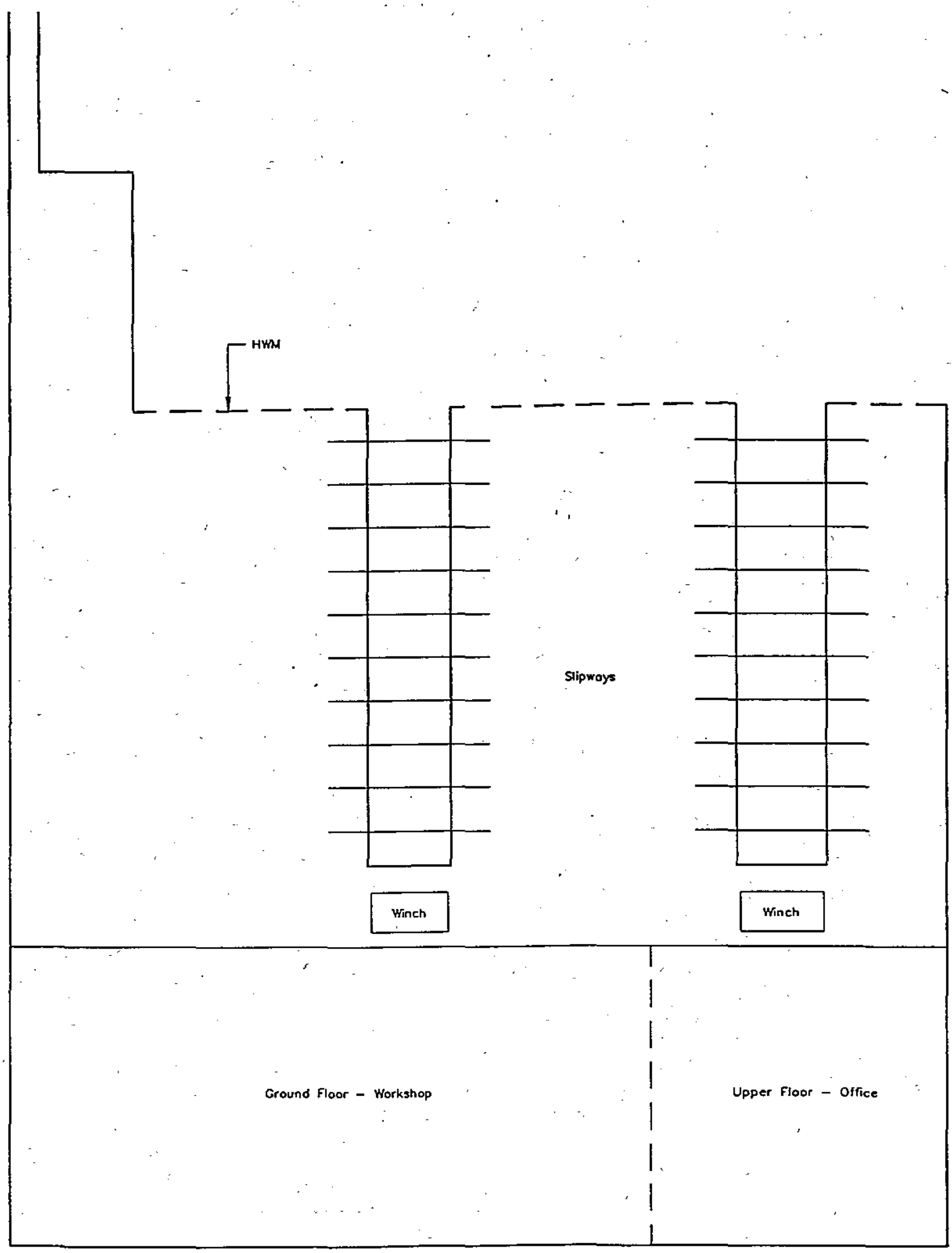
Not To Scale

Sui Lee Shipyard

Mouchel

Figure No C-2.10

North Tsing Yi Reclamation - EIA



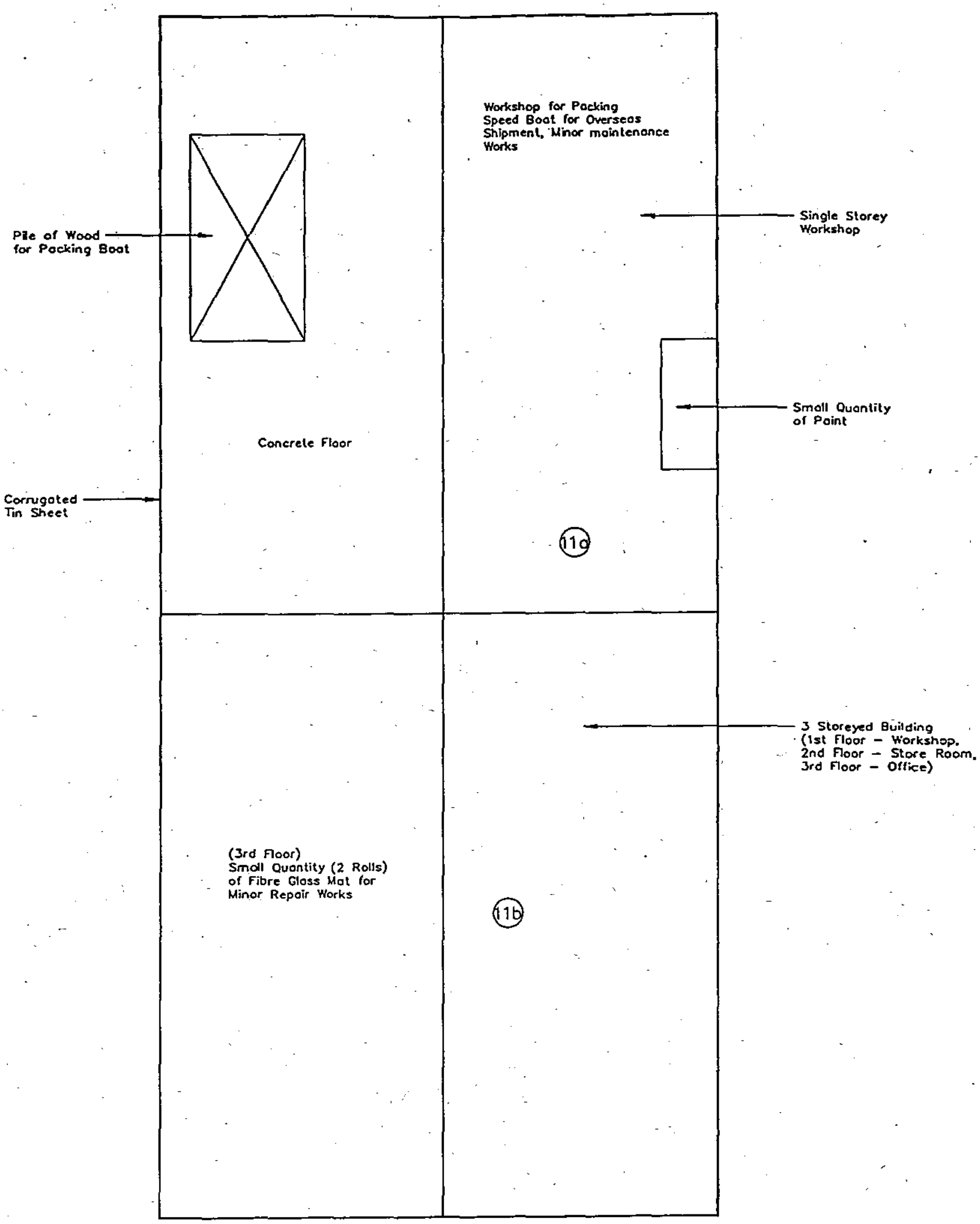
Not To Scale

Dorman Shipyard

Mouchel

Figure No. C-2.11

North Tsing Yi Reclamation - EIA



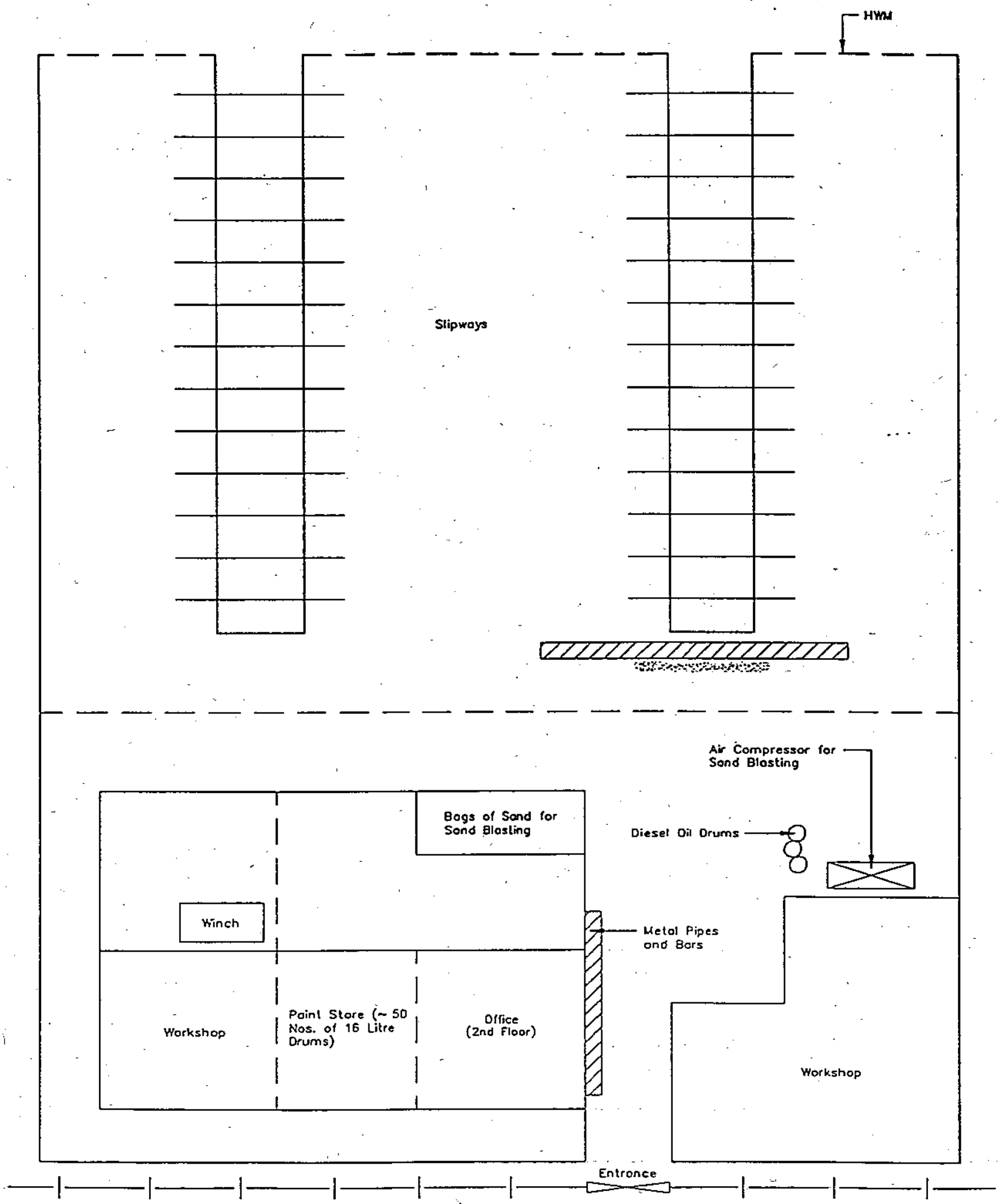
Not To Scale

Halvorsen Shipyard

Mouchel

Figure No. C-2.12

North Tsing Yi Reclamation - EIA



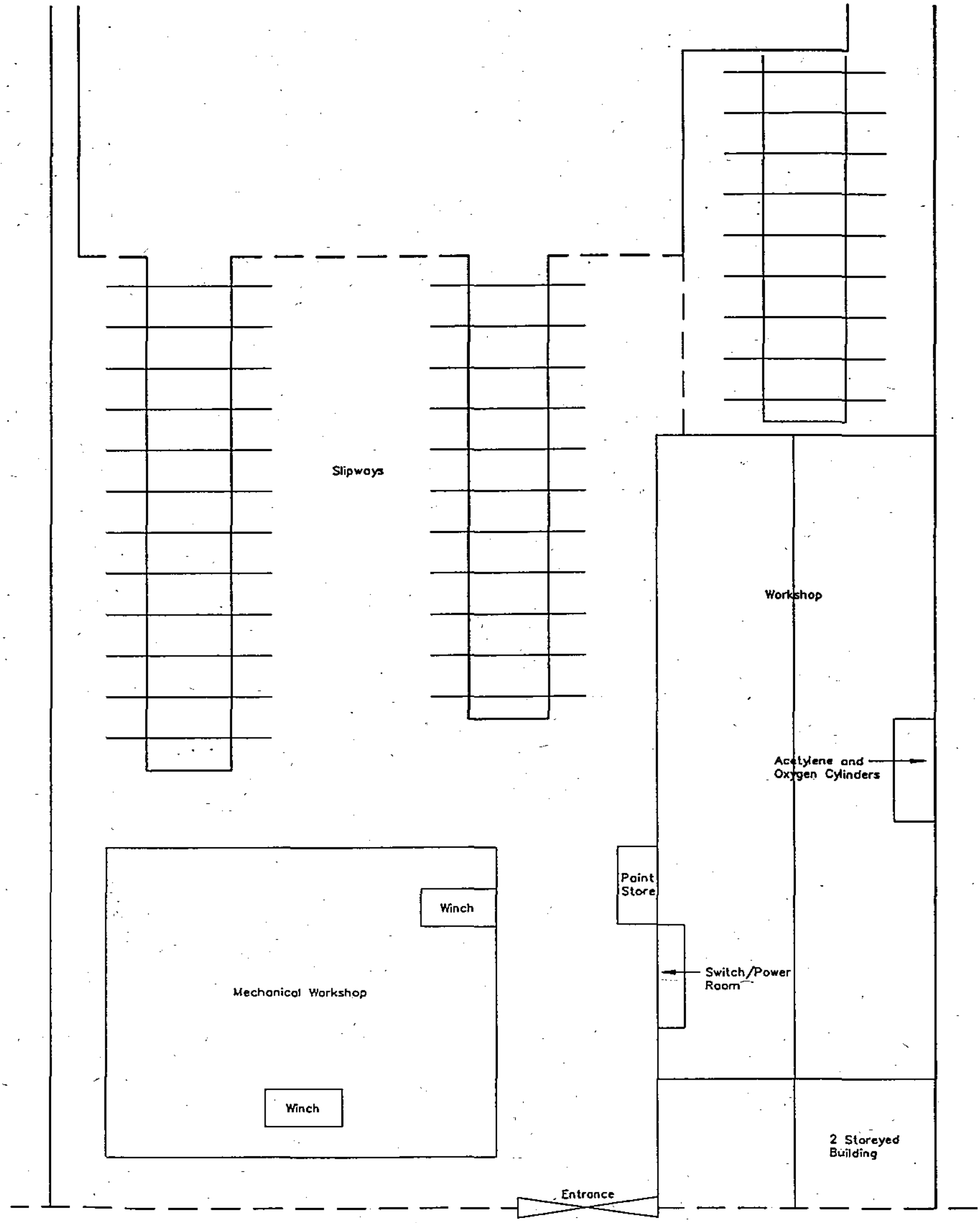
Not To Scale

Sam Hing Shipyard

Mouchel

Figure No C-2.13

North Tsing Yi Reclamation - EIA



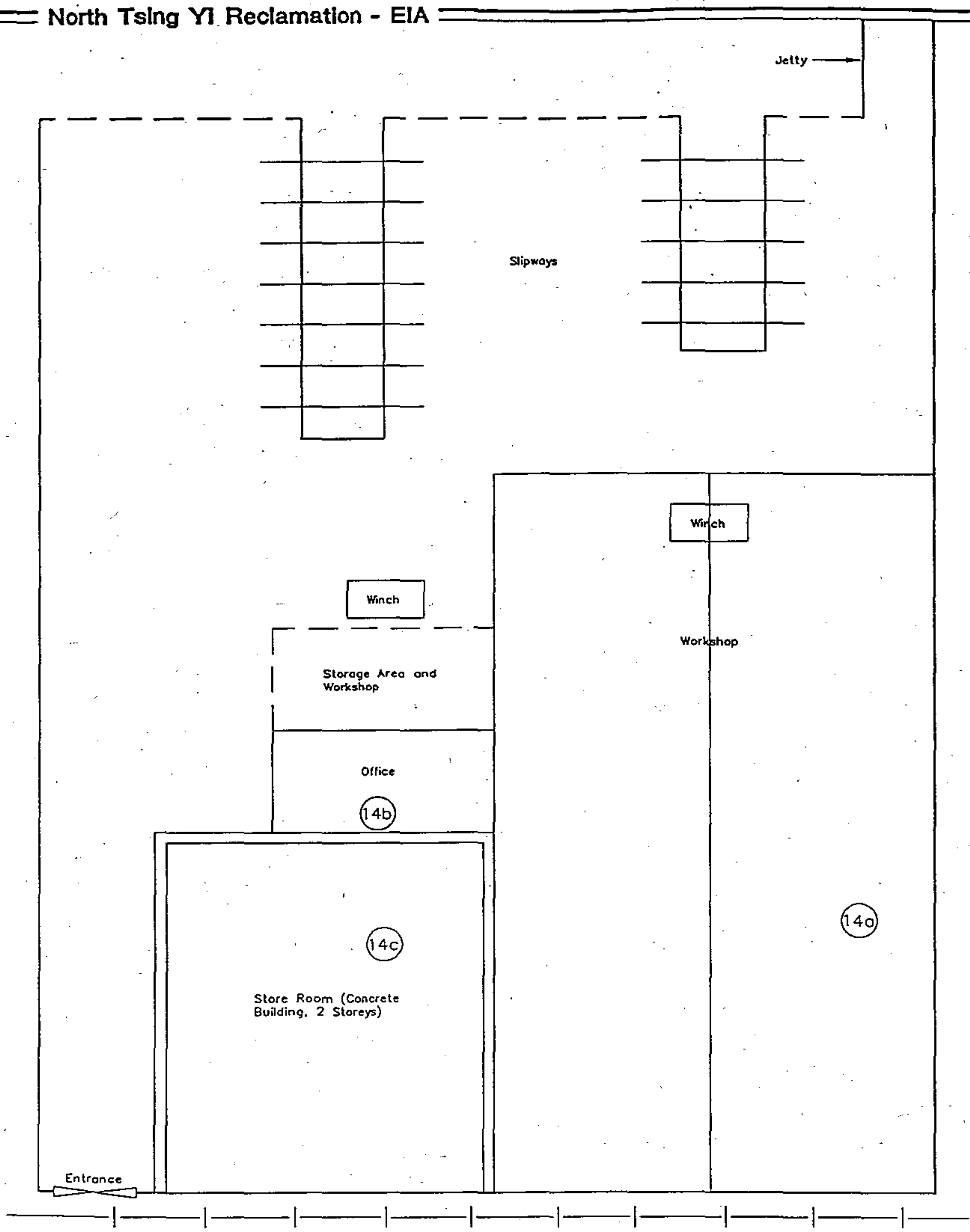
Not To Scale

Kwong Lee Cheung Shipyard

Mouchel

Figure No. C-2.14

North Tsing YI Reclamation - EIA



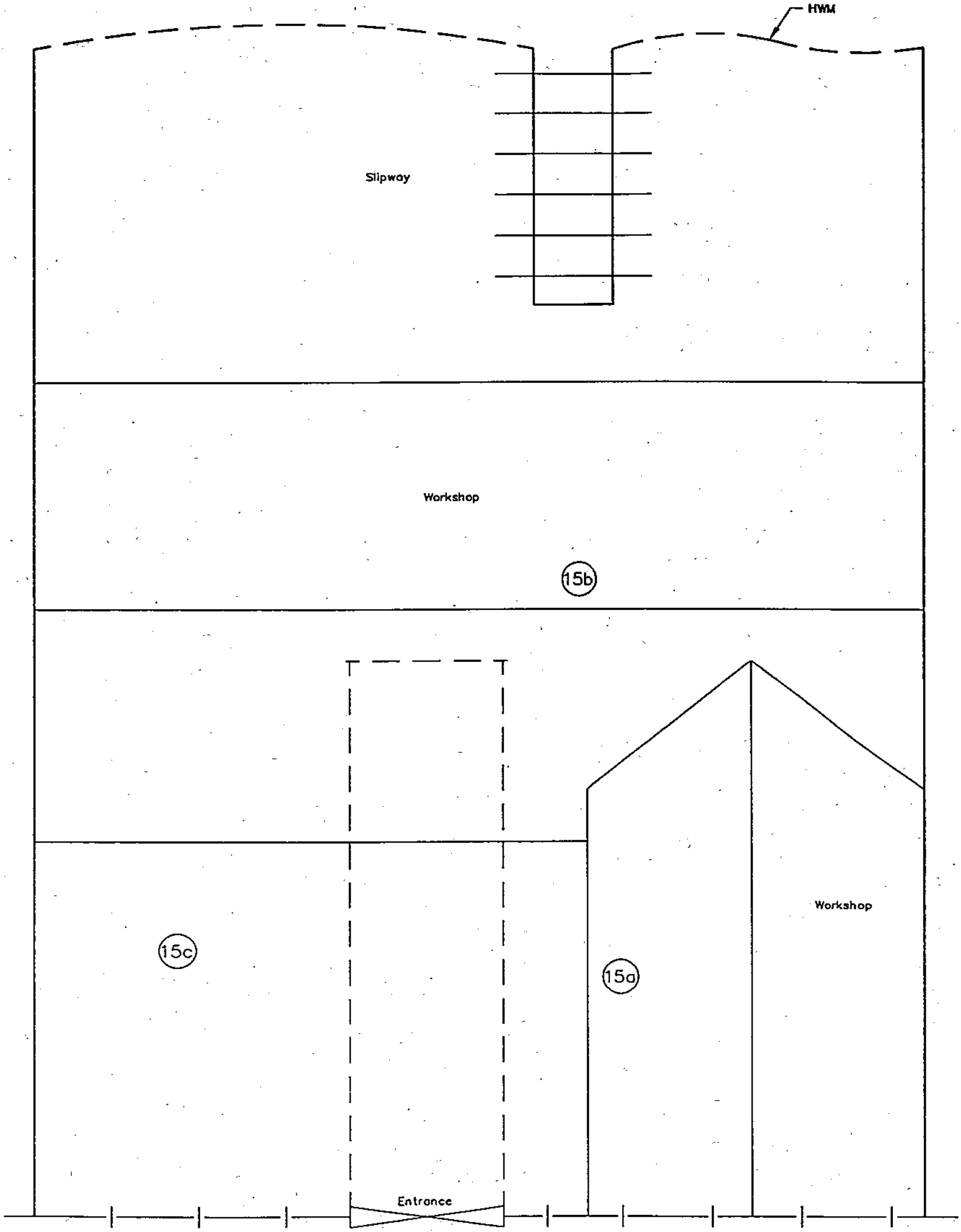
Not To Scale

Lau Cheung Kee Shipyard

Mouchel

Figure No C-2.15

North Tsing Yi Reclamation - EIA

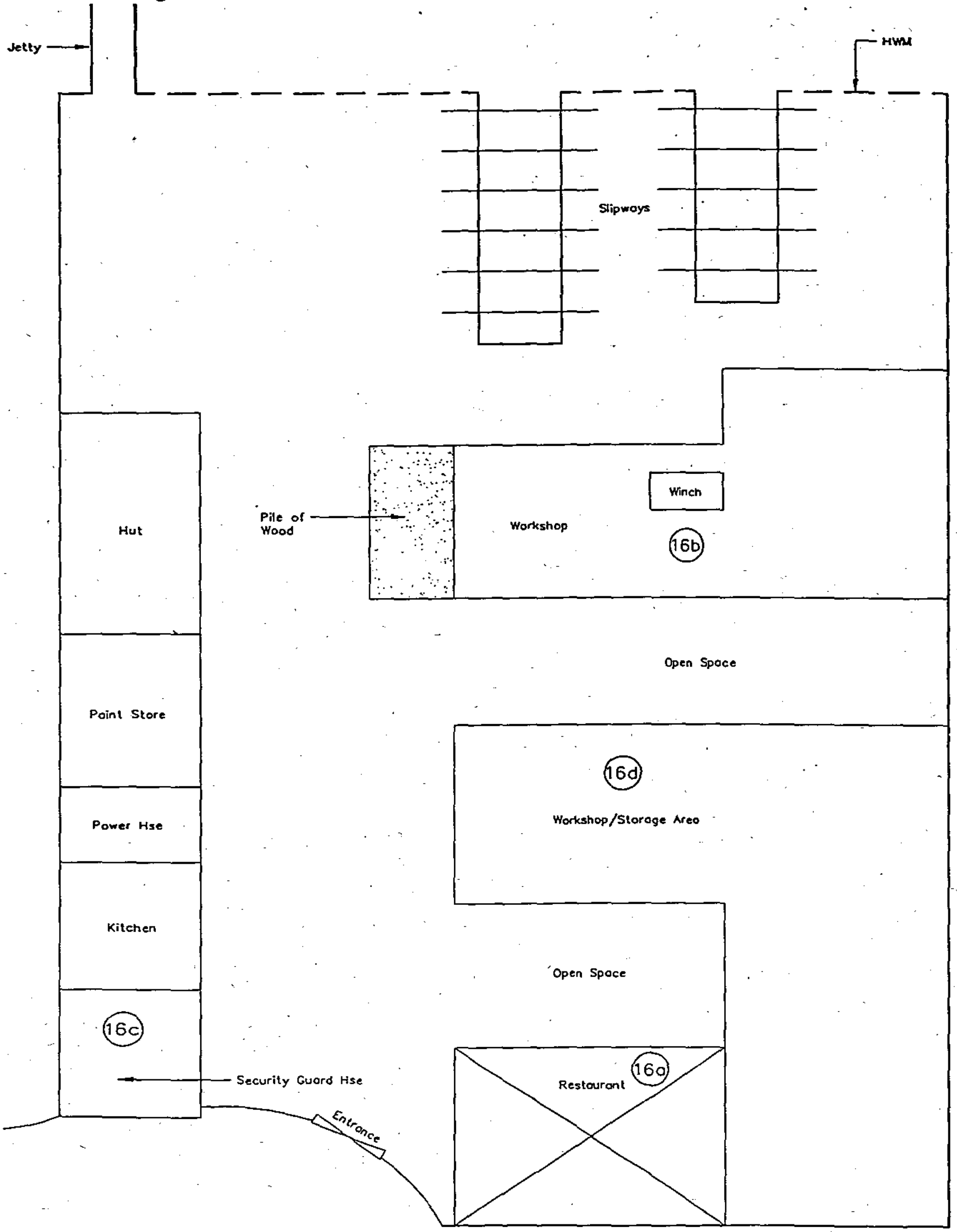


Wing On Shing Shipyard

Mouchel

Figure No. C-2.16

North Tsing Yi Reclamation - EIA



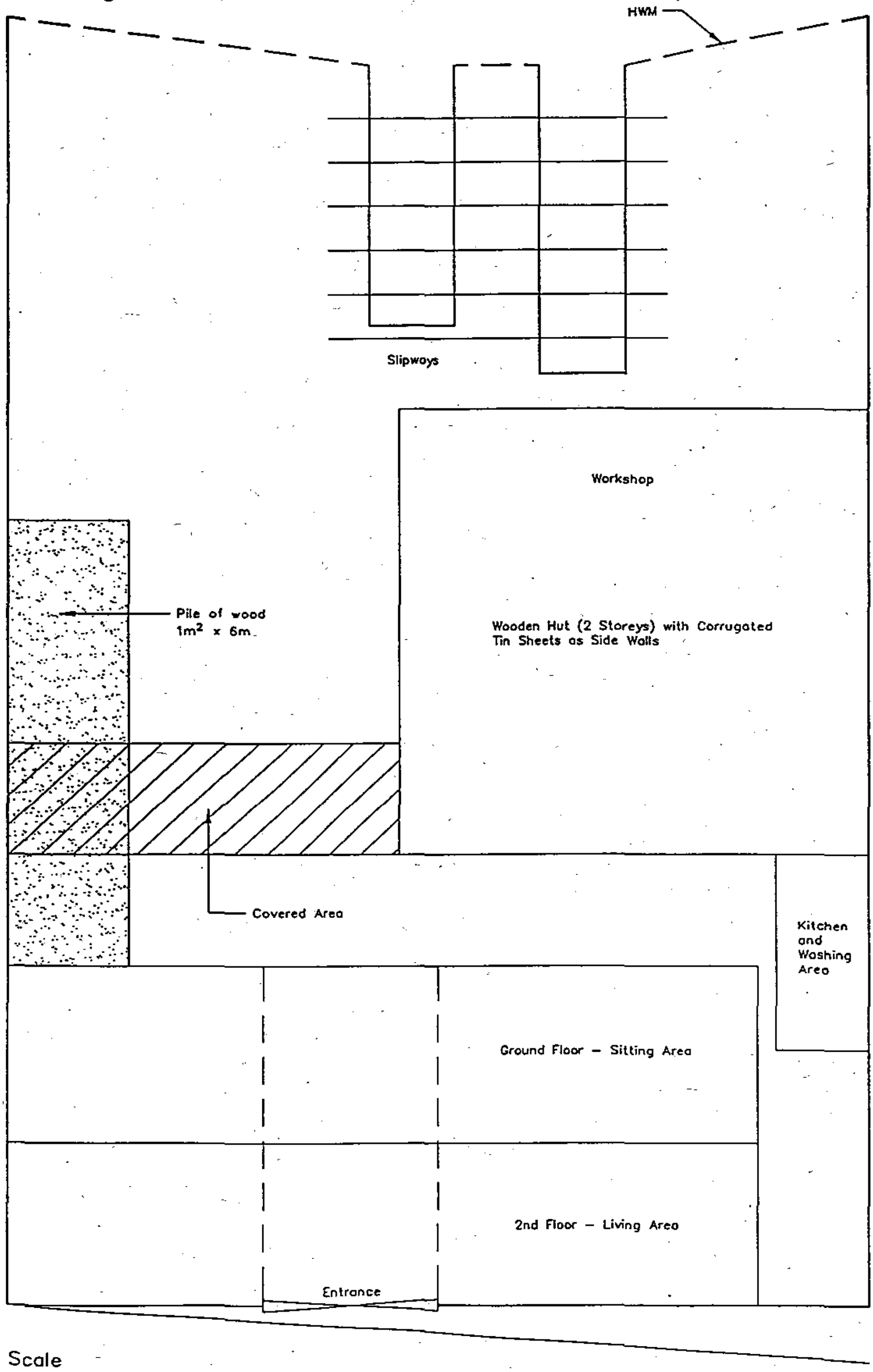
Not To Scale

Sik Cheong Shing Shipyard

Mouchel

Figure No. C-2.17

North Tsing Yi Reclamation - EIA

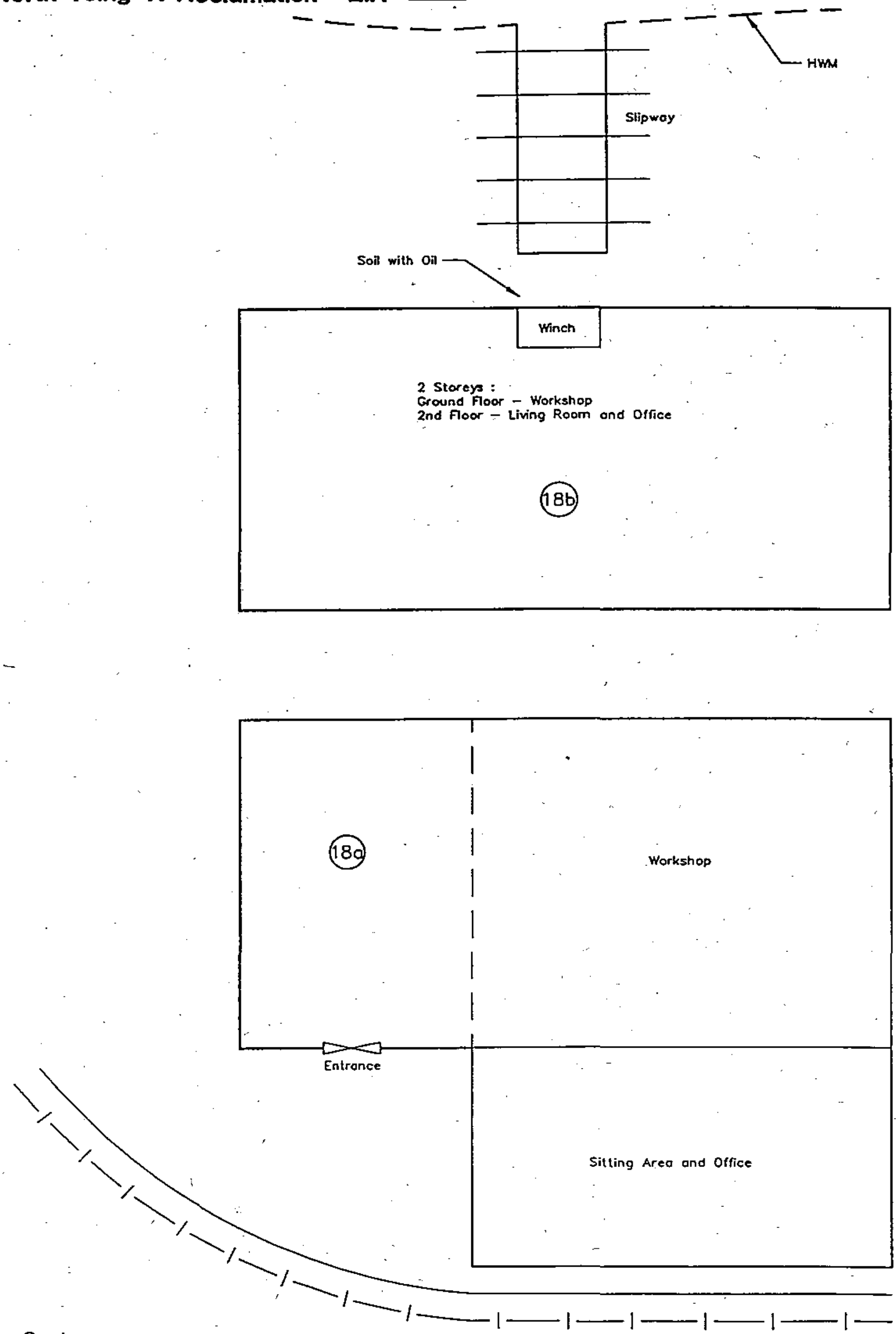


Not To Scale

Shun Woo Shipyard

Mouchel

Figure No. C-2.18



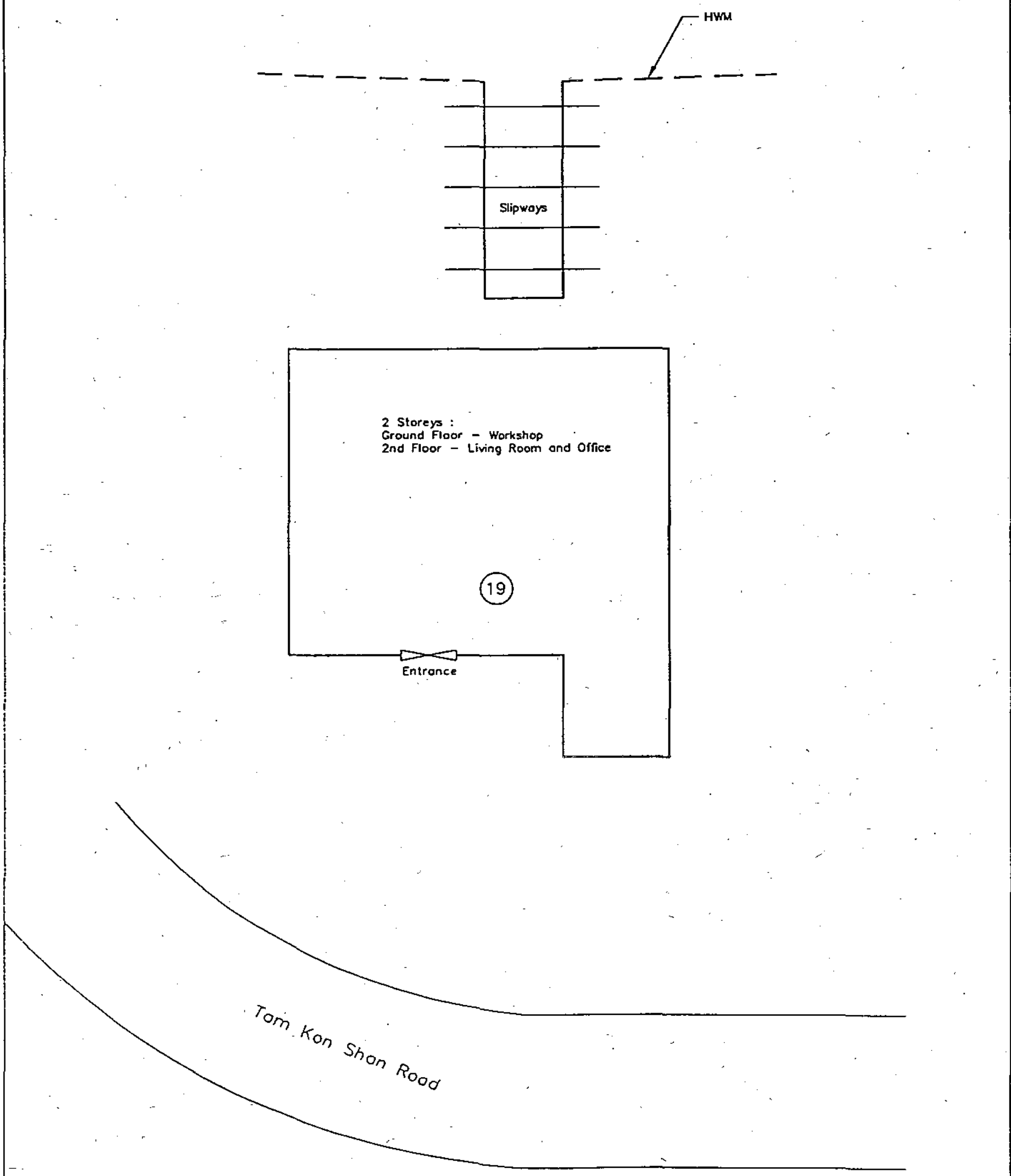
Not To Scale

King Hing Loong Shipyard

Mouchel

Figure No. C-2.19

North Tsing Yi Reclamation - EIA



Not To Scale

Tsang Pui Kee Shipyard

Mouchel

Figure No C-2.20

APPENDIX D

Noise

Appendix D-1

Background Noise Monitoring Programme

NOISE MONITORING

1 Measurement Schedule and Locations

Sampling Schedule and Locations of Noise Measurement

Measurement Conditions & Locations (NSRs)		Sampling Period
Station "A":	The facade facing southwest on roof level of Shing Tai House of Ching Tai Court.	0630 hrs on 03.11.94 to 0630 hrs on 04.11.94
Station "B":	The facade facing north on roof level of Queen's College Old Boy's Association Secondary School at the western end of Cheung On Estate.	0630 hrs on 03.11.94 to 0630 hrs on 04.11.94
Station "C":	The facade facing east on roof level On Tao House adjacent to Tam Kong Shan Road, the access road leading to North Tsing Yi Reclamation site.	0630 hrs on 25.10.94 to 1830 hrs on 25.10.94
Station "D":	The facade facing south on roof level of Greenview Terrace adjacent to Castle Peak Road.	0700 hrs on 25.10.94 to 0600 hrs on 26.10.94

2 Methodology

The noise monitoring was carried out by using two B&K 2231 Modular Precision Sound Level Meters with Application Module Type 7115 and one B&K type 4230 sound level calibrator. The parameters measured for the noise monitoring were A-weighted L_{10}, L_{90} and L_{eq} for 60 min period. Noise surveys were carried out at 4 noise sensitive receivers specified by the client.

- The serial no. of the two sound level meters, which were calibrated on 8.6.94 and 16.6.94, are 1684733 & 1588002 respectively. The serial no. of the calibrator, which was calibrated on 8.6.94, is 1639069. All the calibrations were carried out by *B&K Hong Kong Limited* accredited laboratory. Both before and after each noise measurement, the sound level meter was calibrated by the sound level calibrator.

For the equipment setup, the microphone of the sound level meter was established at a position 1 m from the exterior of the building facade and 1 m below the roof level using a metallic rod and extension cable during conducting noise measurement. Those setup were shown in Appendix IV.

The weather condition during the measurement period was fine with wind speed below 5 m/s.

3 Results of Noise Monitoring

The measured noise levels at location "A", "B", "C" & "D" are presented in the following tables:

Results of Noise Measurement at Station A

Date	Measurement Period (1 hour interval)		Noise Level dB(A)			Remarks
	Start	Finish	L_{10}	L_{90}	L_{eq}	
03/11/94	6:30 am	7:30 am	65.8	55.3	62.5	
	7:30	8:30	68.3	60.3	66.1	
	8:30	9:30	75.3	65.8	71.7	
	9:30	10:30	75.8	67.8	72.5	
	10:30	11:30	74.8	62.8	71.5	
	11:30	12:30 pm	66.8	57.3	64.8	
	12:30 pm	1:30	74.8	58.8	70.5	
	1:30	2:30	77.3	66.8	73.4	
	2:30	3:30	75.8	63.3	72.1	
	3:30	4:30	76.8	64.3	73.0	
	4:30	5:30	66.8	59.8	64.4	
	5:30	6:30	64.3	59.3	62.5	
	6:30	7:30	63.3	57.3	60.7	
	7:30	8:30	61.3	55.3	59.3	
	8:30	9:30	61.3	55.3	60.2	
	9:30	10:30	58.8	53.8	56.6	
	10:30	11:30	57.8	52.3	56.0	
	11:30	0:30 am	55.8	50.8	53.8	
04/11/94	0:30 am	1:30	56.8	50.3	54.5	
	1:30	2:30	52.3	48.8	50.9	
	2:30	3:30	51.3	47.8	49.7	
	3:30	4:30	51.8	46.8	49.7	
	4:30	5:30	55.8	47.8	53.2	
	5:30	6:30	58.8	50.8	56.2	
	6:30 am	7:30 am	64.8	55.8	61.5	

Note: 1) Dynamic range of Sound level meter : 30.8 - 103.8dB
2) Both before & after measurement, the calibrated level was 93.4 dB(A) at 1000Hz.

Results of Noise Measurement at Station B

Date	Measurement Period (1 hour interval)		Noise Level dB(A)			Remarks
	Start	Finish	L_{10}	L_{90}	L_{eq}	
03/11/94	6:30 am	7:30 am	70.0	56.5	66.2	
	7:30	8:30	72.0	63.0	69.2	
	8:30	9:30	73.5	67.0	71.1	
	9:30	10:30	74.5	67.5	71.9	
	10:30	11:30	74.0	64.5	71.4	
	11:30	12:30 pm	70.0	60.0	66.9	
	12:30 pm	1:30	73.5	60.5	69.9	
	1:30	2:30	76.0	65.5	72.4	
	2:30	3:30	78.0	63.5	73.9	
	3:30	4:30	77.5	66.5	74.1	
	4:30	5:30	71.5	61.5	68.2	
	5:30	6:30	69.0	58.0	65.9	
	6:30	7:30	66.5	56.0	63.8	
	7:30	8:30	63.0	53.5	60.8	
	8:30	9:30	65.0	53.5	62.3	
	9:30	10:30	62.0	52.0	59.5	
	10:30	11:30	59.5	51.0	57.8	
	11:30	0:30 am	59.5	50.0	56.9	
04/11/94	0:30 am	1:30	57.5	49.5	56.5	
	1:30	2:30	54.0	48.5	53.5	
	2:30	3:30	52.5	48.5	51.2	
	3:30	4:30	53.5	48.5	52.0	
	4:30	5:30	57.0	49.5	56.7	
	5:30	6:30	61.0	51.0	60.3	
	6:30 am	7:30 am	70.0	54.0	65.9	

Note: 1) Dynamic range of Sound level meter : 29.5 - 102.5dB
2) Both before & after measurement, the calibrated level was 93.4 dB(A) at 1000Hz.

Results of Noise Measurement at Station C

Date	Measurement Period (1 hour interval)		Noise Level dB(A)			Remarks
	Start	Finish	L_{10}	L_{90}	L_{eq}	
25/10/94	6:30 am	7:30 am	71.5	64.5	69.0	
	7:30	8:30	72.0	66.5	69.7	
	8:30	9:30	71.0	66.0	68.8	
	9:30	10:30	70.0	65.0	67.9	
	10:30	11:30	70.0	65.0	67.7	
	11:30	12:30 pm	70.5	65.0	68.6	
	12:30 pm	1:30	70.5	65.5	68.3	
	1:30	2:30	70.0	65.0	67.9	
	2:30	3:30	70.0	64.5	67.7	
	3:30	4:30	71.0	66.0	68.8	
	4:30	5:30	70.5	65.5	68.3	
	5:30	6:30	71.0	66.0	68.9	
	6:30	7:30	70.0	65.0	67.8	

Note:
1) Dynamic range of Sound level meter : 29.5 - 102.5dB
2) Both before & after measurement, the calibrated level was 93.4 dB(A) at 1000Hz.

Results of Noise Measurement at Station D

Date	Measurement Period (1 hour interval)		Noise Level dB(A)			Remarks
	Start	Finish	L_{10}	L_{90}	L_{eq}	
25/10/94	7:00	8:00	66.3	61.8	64.3	
	8:00	9:00	67.3	63.3	65.8	
	9:00	10:00	67.8	63.8	65.9	
	10:00	11:00	66.3	63.3	64.7	
	11:00	12:00 pm	65.8	61.3	63.9	
	12:00 pm	1:00	64.3	60.3	62.4	
	1:00	2:00	66.8	63.8	65.4	
	2:00	3:00	66.8	61.8	65.0	
	3:00	4:00	66.8	61.3	64.5	
	4:00	5:00	66.8	62.3	65.3	
	5:00	6:00	65.8	60.8	63.8	
	6:00	7:00	65.8	61.3	64.0	
	7:00	8:00	64.3	59.3	62.4	
	8:00	9:00	62.8	57.3	60.6	
	9:00	10:00	62.8	57.8	60.7	
	10:00	11:00	63.3	57.3	60.9	
	11:00	0:00 am	61.8	56.3	59.4	
	0:00 am	1:00	60.8	55.3	58.4	
26/10/94	1:00	2:00	60.3	55.3	58.2	
	2:00	3:00	59.3	54.8	57.2	
	3:00	4:00	58.8	54.3	56.6	
	4:00	5:00	59.3	53.8	56.5	
	5:00	6:00	60.3	53.8	57.3	
	6:00 am	7:00 am	63.8	56.8	61.1	

Note: 1) Dynamic range of Sound level meter : 30.8 - 103.8dB
2) Both before & after measurement, the calibrated level was 93.4 dB(A) at 1000Hz.

4 Possible Noise Sources and Observations

(a) Station "A"

As station "A" is facing the shipyard and a school, it is expected the major noise is generated by ship repairing works and activities inside the school. Station "A" is about 80m above ground level and 220 m away from the shipyard.

(b) Station "B"

As station "B" is facing the shipyard, it is expected the major noise is generated by ship repairing works. Station "B" is about 22m above ground level and 150m away from the shipyard.

(c) Station "C"

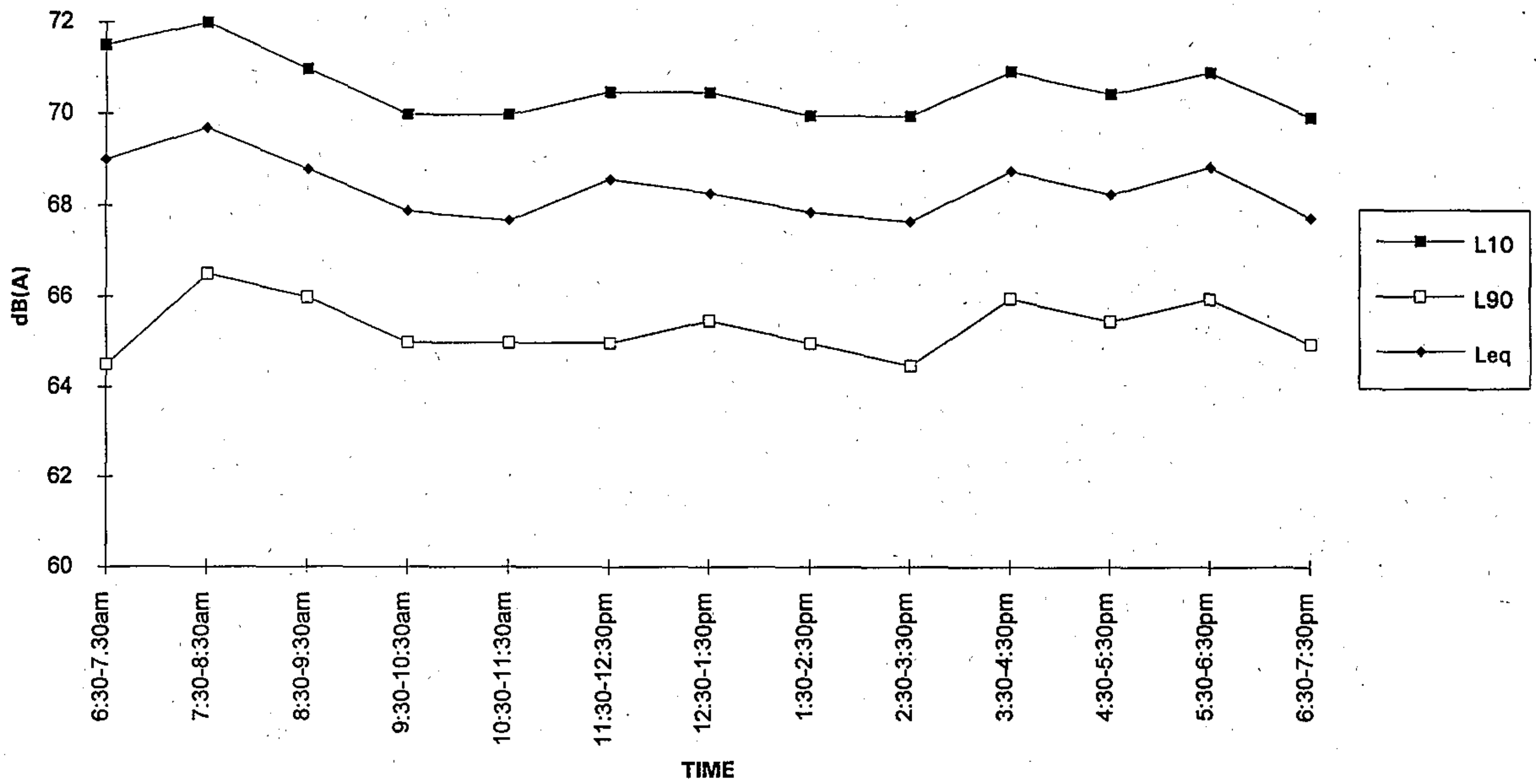
As station "C" is facing Tam Kong Shan Road, the major noise is generated by the road traffic noise at Tam Kong Shan Road. There are no observable reflecting surfaces located near the monitoring station that would affect the measurement results. Station "C" is about 70m above ground level & adjacent to Tam Kong Shan Road.

(d) Station "D"

Station "D" is located opposite to the Tsing Yi shipyard and the major noise is expected to be emitted from the road traffic at Castle Peak Road. There are no observable reflecting surfaces located near the monitoring station that would affect the measurement results. Station "D" is about 60m above ground level and 800m away from the shipyard.

Appendix D-2

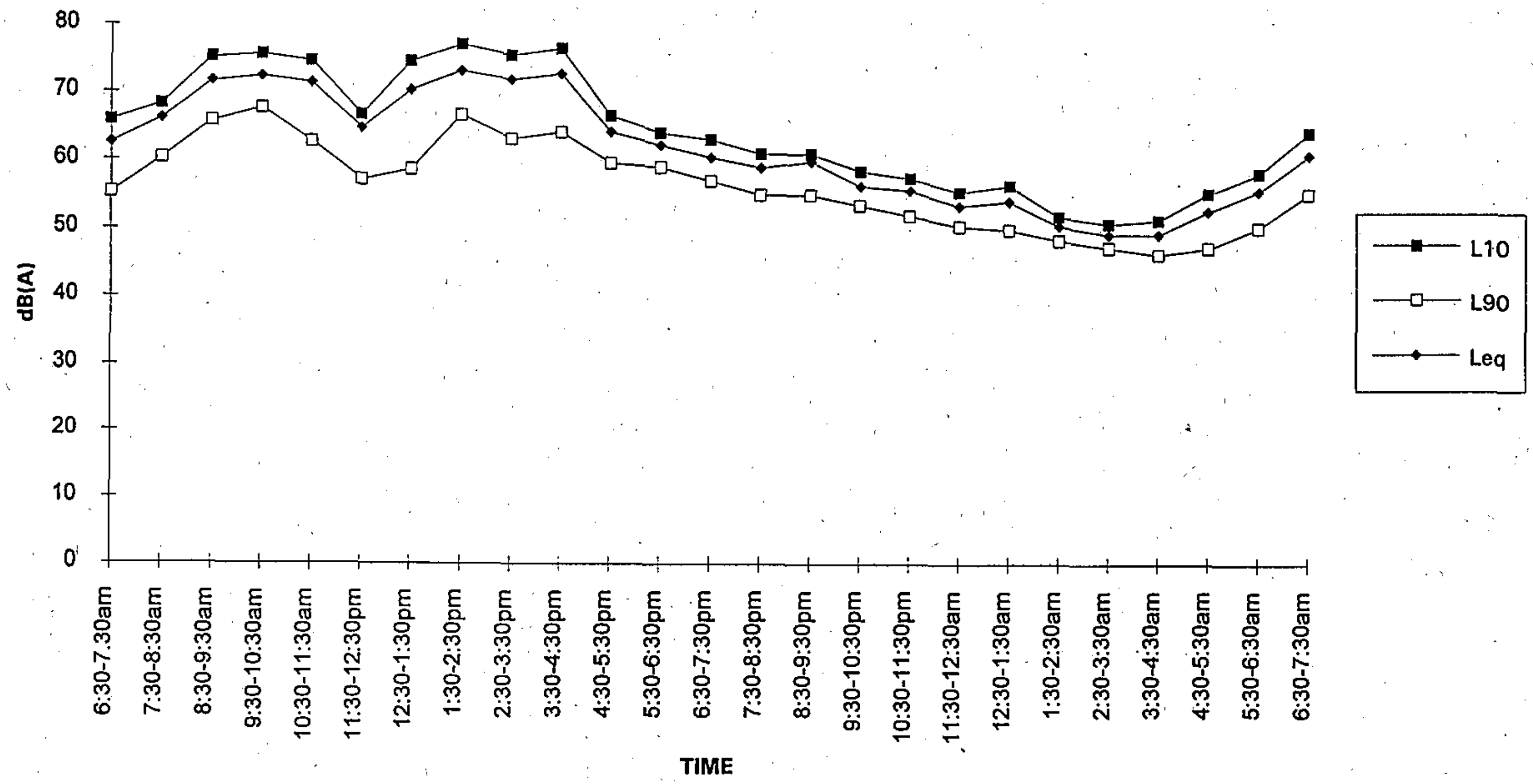
Hourly Results of Noise Monitoring Programme



Noise Measurement on Roof Level of on Tao House

Mouchel

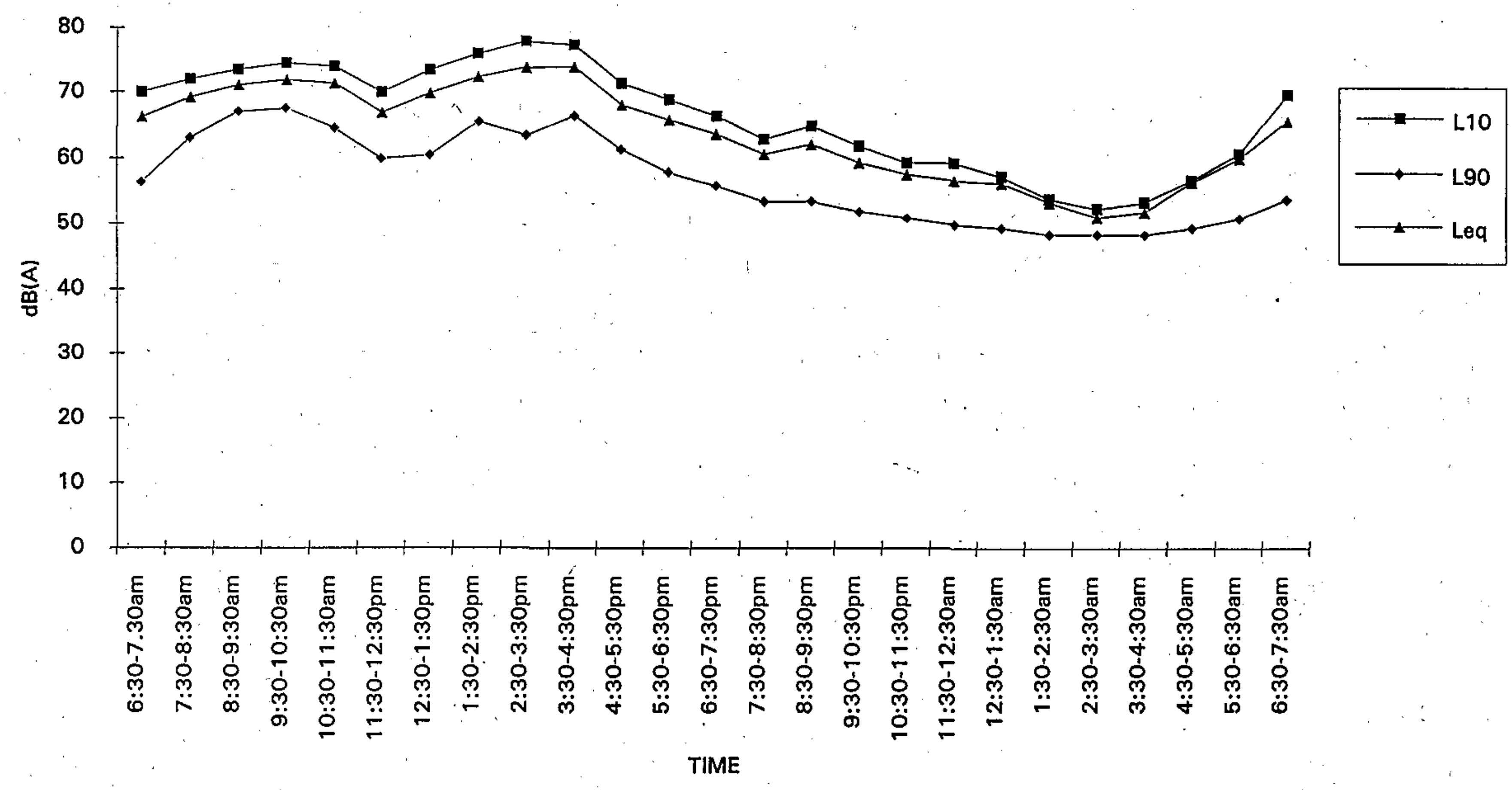
Figure No. D-2.1



Noise Measurement on Roof Level of Shing Tai House

Mouchel

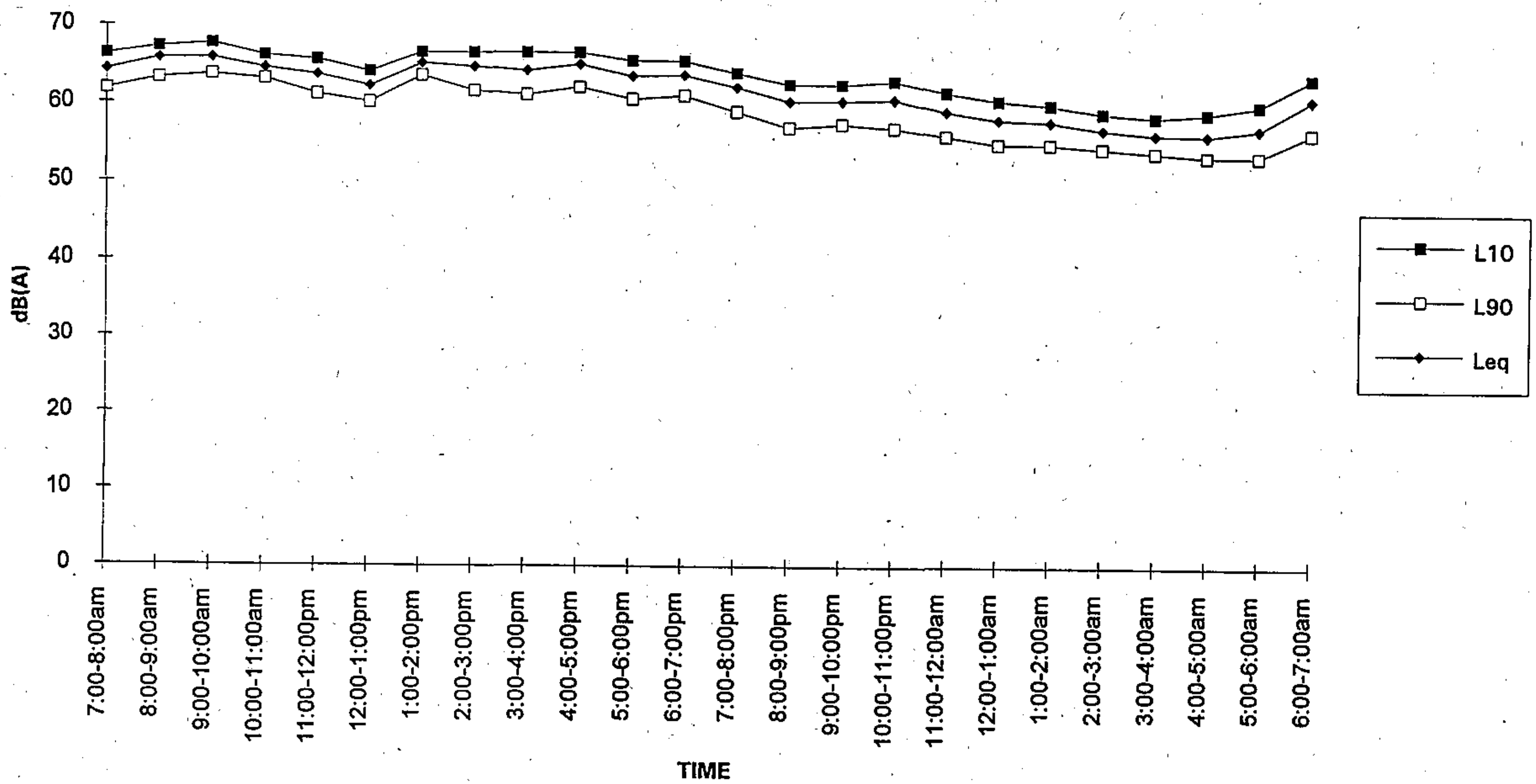
Figure No. D-2.2



Noise Measurement on Roof Level of Queen's College
Old Boy's Association Secondary School

Mouchel

Figure No. D-2.3



Moise Measurement on Roof Level of Greenview Terrace

Mouchel

Figure No. D-2.4

Appendix D-3

Facade Noise Levels at Representative NSRs during Construction Activities

Facade Noise Levels at Representative NSRs
(Construction of Seawall - Stage 1)

Sensitive Receiver	Section 1		Section 2		Section 3		Anticipated[2] Maximum Noise Level dB(A)
	Source-[1] Receiver Distance m	Noise Level dB(A)	Source-[1] Receiver Distance m	Noise Level dB(A)	Source-[1] Receiver Distance m	Noise Level dB(A)	
NSR1	64	70.0	221	0	377	0	73
NSR2	158	62.1	312	0	460	0	65
NSR3	220	59.3	360	0	-	0	62
NSR4	264	57.7	-	0	-	0	61
NSR5	129	69.6	239	0	379	0	67
NSR6	184	60.8	297	0	421	0	64
NSR7	284	57.0	394	0	514	0	60
NSR8	352	55.2	459	0	-	0	58
NSR9	447	53.1	-	0	-	0	56
NSR10	223	59.1	305	0	414	0	62
NSR11	167	61.6	223	0	329	0	65
NSR12[3]	198	60.2	194	0	274	0	48
NSR13	305	56.4	351	0	434	0	59
NSR14	705	49.1	713	0	761	0	52
NSR15	499	52.0	343	0	206	0	55

Notes:
(1) Based on the notional source position.
(2) A positive correction of 3 dB(A) facade effect has been included.
(3) A noise reduction of 15 dB(A) has been included.

Appendix D3-2 Facade Noise Levels at Representative NSRs (Construction of Seawall - Stage 2)

Sensitive Receiver	Section 1		Section 2		Section 3		Anticipated[2] Maximum Noise Level dB(A)
	Source-[1] Receiver Distance m	Noise Level dB(A)	Source-[1] Receiver Distance m	Noise Level dB(A)	Source-[1] Receiver Distance m	Noise Level dB(A)	
NSR1	64	0	221	59.2	377	0	62
NSR2	158	0	312	56.2	460	0	59
NSR3	220	0	360	55.0	-	0	58
NSR4	264	0	-	-[4]	-	0	-[4]
NSR5	129	0	239	58.5	379	0	62
NSR6	184	0	297	56.6	421	0	60
NSR7	284	0	394	54.2	514	0	57
NSR8	352	0	459	52.9	-	0	56
NSR9	447	0	-	-[4]	-	0	-[4]
NSR10	223	0	305	56.4	414	0	59
NSR11	167	0	223	59.1	329	0	62
NSR12[3]	198	0	194	60.3	274	0	48
NSR13	305	0	351	55.2	434	0	58
NSR14	705	0	713	49.0	761	0	52
NSR15	499	0	343	55.4	206	0	58

Notes:
(1) Based on the notional source position.
(2) A positive correction of 3 dB(A) facade effect has been included.
(3) A noise reduction of 15 dB(A) has been included.
(4) Noise level will be negligible as sensitive receiver will be completely screened from the work section(s) by other building(s).

Appendix D3-3 Facade Noise Levels at Representative NSRs (Construction of Seawall - Stage 3)

Sensitive Receiver	Section 1		Section 2		Section 3		Anticipated[2] Maximum Noise Level dB(A)
	Source-[1] Receiver Distance m	Noise Level dB(A)	Source-[1] Receiver Distance m	Noise Level dB(A)	Source-[1] Receiver Distance m	Noise Level dB(A)	
NSR1	64	65.9	221	0	377	54.6	69
NSR2	158	58.0	312	0	460	52.8	62
NSR3	220	55.2	360	0	-	-[4]	58
NSR4	264	53.6	-	0	-	-[4]	57
NSR5	129	59.8	239	0	379	54.5	64
NSR6	184	56.7	297	0	421	53.6	61
NSR7	284	52.9	394	0	514	51.9	58
NSR8	352	51.1	459	0	-	-[4]	54
NSR9	447	49.0	-	0	-	-[4]	52
NSR10	223	55.0	305	0	414	53.8	61
NSR11	167	57.5	223	0	329	55.8	63
NSR12[3]	198	56.1	194	0	274	57.3	48
NSR13	305	52.3	351	0	434	53.4	59
NSR14	705	45.0	713	0	761	48.5	53
NSR15	499	48.0	343	0	206	59.7	63

Notes:
(1) Based on the notional source position.
(2) A positive correction of 3 dB(A) facade effect has been included.
(3) A noise reduction of 15 dB(A) has been included.
(4) Noise level will be negligible as sensitive receiver will be completely screened from the work section(s) by other building(s).

Appendix D3-4 Facade Noise Levels at Representative NSRs (Construction of Seawall - Stage 4)

Sensitive Receiver	Section 1		Section 2		Section 3		Anticipated[2] Maximum Noise Level dB(A)
	Source-[1] Receiver Distance m	Noise Level dB(A)	Source-[1] Receiver Distance m	Noise Level dB(A)	Source-[1] Receiver Distance m	Noise Level dB(A)	
NSR1	64	65.9	221	0	377	50.5	69
NSR2	158	58.0	312	0	460	48.7	62
NSR3	220	55.2	360	0	-	-[4]	58
NSR4	264	53.6	-	0	-	-[4]	57
NSR5	129	59.8	239	0	379	50.4	63
NSR6	184	56.7	297	0	421	49.5	61
NSR7	284	52.9	394	0	514	47.8	57
NSR8	352	51.1	459	0	-	-[4]	54
NSR9	447	49.0	-	0	-	-[4]	52
NSR10	223	55.0	305	0	414	49.7	59
NSR11	167	57.5	223	0	329	51.7	62
NSR12[3]	198	56.1	194	0	274	53.2	46
NSR13	305	52.3	351	0	434	49.3	57
NSR14	705	45.0	713	0	761	44.4	51
NSR15	499	48.0	343	0	206	55.7	59

Notes:
(1) Based on the notional source position.
(2) A positive correction of 3 dB(A) facade effect has been included.
(3) A noise reduction of 15 dB(A) has been included.
(4) Noise level will be negligible as sensitive receiver will be completely screened from the work section(s) by other building(s).

Appendix 3-5 Facade Noise Levels at Representative NSRs (Construction of Seawall - Stage 5)

Sensitive Receiver	Section 1		Section 2		Section 3		Anticipated[2] Maximum Noise Level dB(A)
	Source-[1] Receiver Distance m	Noise Level dB(A)	Source-[1] Receiver Distance m	Noise Level dB(A)	Source-[1] Receiver Distance m	Noise Level dB(A)	
NSR1	64	0	221	55.1	377	51.5	60
NSR2	158	0	312	52.1	460	49.7	57
NSR3	220	0	360	50.9	-	-[4]	54
NSR4	264	0	-	-[4]	-	-[4]	-[4]
NSR5	129	0	239	54.4	379	51.4	59
NSR6	184	0	297	52.5	421	50.5	58
NSR7	284	0	394	50.1	514	48.8	55
NSR8	352	0	459	48.8	-	-[4]	52
NSR9	447	0	-	-[4]	-	-[4]	-[4]
NSR10	223	0	305	52.3	414	50.7	58
NSR11	167	0	223	55.0	329	52.7	60
NSR12[3]	198	0	194	56.2	274	54.2	46
NSR13	305	0	351	51.1	434	50.3	57
NSR14	705	0	713	44.9	761	45.4	51
NSR15	499	0	343	51.3	206	56.7	61

Notes:
(1) Based on the notional source position.
(2) A positive correction of 3 dB(A) facade effect has been included.
(3) A noise reduction of 15 dB(A) has been included.
(4) Noise level will be negligible as sensitive receiver will be completely screened from the work section(s) by other building(s).

Appendix D3-6 Facade Noise Levels at Representative NSRs (Construction of Seawall - Stage 6)

Sensitive Receiver	Section 1		Section 2		Section 3		Anticipated[(2)] Maximum Noise Level dB(A)
	Source-[(1)] Receiver Distance m	Noise Level dB(A)	Source-[(1)] Receiver Distance m	Noise Level dB(A)	Source-[(1)] Receiver Distance m	Noise Level dB(A)	
NSR1	64	65.9	221	0	377	51.5	69
NSR2	158	58.0	312	0	460	49.7	62
NSR3	220	55.2	360	0	-	-[(4)]	58
NSR4	264	53.6	-	0	-	-[(4)]	57
NSR5	129	59.8	239	0	379	51.4	63
NSR6	184	56.7	297	0	421	50.5	61
NSR7	284	52.9	394	0	514	48.8	57
NSR8	352	51.1	459	0	-	-[(4)]	54
NSR9	447	49.0	-	0	-	-[(4)]	52
NSR10	223	55.0	305	0	414	50.7	59
NSR11	167	57.5	223	0	329	52.7	62
NSR12[(3)]	198	56.1	194	0	274	54.2	46
NSR13	305	52.3	351	0	434	50.3	57
NSR14	705	45.0	713	0	761	45.4	51
NSR15	499	48.0	343	0	206	56.7	60

Notes:
(1) Based on the notional source position.
(2) A positive correction of 3 dB(A) facade effect has been included.
(3) A noise reduction of 15 dB(A) has been included.
(4) Noise level will be negligible as sensitive receiver will be completely screened from the work section(s) by other building(s).

Appendix D3-7 Facade Noise Levels at Representative NSRs (Construction of Seawall - Stage 7)

Sensitive Receiver	Section 1		Section 2		Section 3		Anticipated(2) Maximum Noise Level dB(A)
	Source-(1) Receiver Distance m	Noise Level dB(A)	Source-(1) Receiver Distance m	Noise Level dB(A)	Source-(1) Receiver Distance m	Noise Level dB(A)	
NSR1	64	66.9	221	55.1	377	0	70
NSR2	158	59.0	312	52.1	460	0	63
NSR3	220	56.2	360	50.9	-	0	60
NSR4	264	54.6	-	-(4)	-	0	58
NSR5	129	60.8	239	54.4	379	0	65
NSR6	184	57.7	297	52.5	421	0	62
NSR7	284	53.9	394	50.1	514	0	58
NSR8	352	52.1	459	48.8	-	0	57
NSR9	447	50.0	-	-(4)	-	0	53
NSR10	223	56.0	305	52.3	414	0	61
NSR11	167	58.5	223	55.0	329	0	63
NSR12(3)	198	57.1	194	56.2	274	0	48
NSR13	305	53.3	351	51.1	434	0	58
NSR14	705	46.0	713	44.9	761	0	52
NSR15	499	49.0	343	51.3	206	0	56

Notes:
(1) Based on the notional source position.
(2) A positive correction of 3 dB(A) facade effect has been included.
(3) A noise reduction of 15 dB(A) has been included.
(4) Noise level will be negligible as sensitive receiver will be completely screened from the work section(s) by other building(s).

Appendix D3-8 Facade Noise Levels at Representative NSRs (Construction of Seawall - Stage 8)

Sensitive Receiver	Section 1		Section 2		Section 3		Anticipated[2] Maximum Noise Level dB(A)
	Source-[1] Receiver Distance m	Noise Level dB(A)	Source-[1] Receiver Distance m	Noise Level dB(A)	Source-[1] Receiver Distance m	Noise Level dB(A)	
NSR1	64	66.9	221	0	377	0	70
NSR2	158	59.0	312	0	460	0	62
NSR3	220	56.2	360	0	-	0	59
NSR4	264	54.6	-	0	-	0	58
NSR5	129	60.8	239	0	379	0	64
NSR6	184	57.7	297	0	421	0	61
NSR7	284	53.9	394	0	514	0	57
NSR8	352	52.1	459	0	-	0	55
NSR9	447	50.0	-	0	-	0	53
NSR10	223	56.0	305	0	414	0	59
NSR11	167	58.5	223	0	329	0	62
NSR12[3]	198	57.1	194	0	274	0	60
NSR13	305	53.3	351	0	434	0	56
NSR14	705	46.0	713	0	761	0	49
NSR15	499	49.0	343	0	206	0	52

Notes:
(1) Based on the notional source position.
(2) A positive correction of 3 dB(A) facade effect has been included.
(3) A noise reduction of 15 dB(A) has been included.

Appendix D-4

Noise Measurement for Construction Equipment

NOISE MEASUREMENT FOR CONSTRUCTION EQUIPMENT

1. INTRODUCTION

A noise measurement was undertaken at Ma On Shan Public Dump on 24 November 1994 to determine the sound power levels of the truck with crane, bulldozer and dump truck during normal operation. Below is an account of the results of the measurement.

2. MEASUREMENT LOCATIONS

The noise measurement was made at open field while the 3 machineries were operated as they normally works.

3. METHODOLOGY

3.1 Instrumentation

Equivalent noise levels (Leq) and Maximum noise level (Lmax) were measured with an integrated sound level meter. It conforms with the International Electrotechnical Commission Publication 651:1980 and 840:1985 for Type precision sound level meters. The equipment used in the survey is listed below.

EQUIPMENT	MODEL NO.
Integrated sound level meter	B&K 2231
Condenser microphone	B&K 4155
Preamplifier	B&K 2639
Windscreen	B&K UA0237
Acoustic calibrator (94.0 dB)	B&K 4231

3.2 Measurement Procedure

Truck with crane (loading), bulldozer and dump truck (unloading)

Noise measurements were made on the circumference centred at the test machine with a radius of 10 meters. Sets of Leq over a typical operation cycle were recorded.

Truck with crane (running) and dump truck (running)

Noise measurements were made on the positions 7 meters away perpendicularly to the route of the test lorry. Sets of Lmax during the test equipment passing by the measurement points were recorded.

4. DETERMINATION OF SOUND POWER LEVELS

4.1 Measurement Results

Date of Measurement : 24 November 1993
Time of Measurement : 1300-1500 hours
Weather Condition : Cloudy
Wind Condition : Slight

Truck with Crane (Loading)

Measurement point	x-coordinates / m	y-coordinates / m	Height above ground / m	Measured Equivalent Noise Level / dB(A)
1	10	0	1.5	74.6
2	0	-10	1.5	73.4
3	-10	0	1.5	73.9
4	0	10	1.5	75.6
Logarithmic average Leq, dB(A)				74.5
Background noise level, dB(A)				54.4

Bulldozer (Spreading Fill)

Measurement point	x-coordinates / m	y-coordinates / m	Height above ground / m	Measured Equivalent Noise Level / dB(A)
1	10	0	1.5	79.8
2	0	-10	1.5	80.9
3	-10	0	1.5	82.9
4	0	10	1.5	80.7
Logarithmic average Leq, dB(A)				81.3
Background noise level, dB(A)				52.0

Dump Truck (Unloading)

Measurement point	x-coordinates / m	y-coordinates / m	Height above ground / m	Measured Equivalent Noise Level / dB(A)
1	10	0	1.5	83.2
2	0	-10	1.5	85.4
3	-10	0	1.5	81.8
4	0	10	1.5	82.4
Logarithmic average Leq, dB(A)				83.4
Background noise level, dB(A)				55.1

Truck with Crane (Running)

Measurement point	Perpendicular distance to the lorry route / m	Height above ground / m	Measured maximum noise level / dB(A)
1	7	1.5	82.4
2	-7	1.5	86.1
1 (replicate)	7	1.5	82.7
2 (replicate)	-7	1.5	83.4
Logarithmic average Lmax, dB(A)			83.9
Background noise level, dB(A)			57.2

Dump Truck (Running)

Measurement point	Perpendicular distance to the lorry route / m	Height above ground / m	Measured maximum noise level / dB(A)
1	7	1.5	85.7
2	-7	1.5	83.9
1 (replicate)	7	1.5	83.4
2 (replicate)	-7	1.5	84.8
Logarithmic average Lmax, dB(A)			84.6
Background noise level, dB(A)			56.5

4.2 Calculation

For stationary equipment:

Sound Power Level, SWL = $(Leq - K) + 20\log r + 8$

For moving equipment:

Sound Power Level, SWL = $(Lmax - K) + 20\log r + 8$

Where, K = Background Noise Correction, dB(A)
r = Distance of Measurement, m

Equipment	Leq dB(A)	Lmax dB(A)	K dB(A)	r dB(A)	SWL dB(A)
Truck with crane (loading)	74.5	-	0	10	102.5
Bulldozer (spreading fill)	81.3	-	0	10	109.3
Dump truck (unloading)	83.4	-	0	10	111.4
Truck with crane (running)	-	83.9	0	7	108.8
Dump truck (running)	-	84.6	0	7	109.5

APPENDIX E

Air Quality

Appendix E-1

Background Dust Monitoring Programme

PARTICULATE MONITORING

1 Sampling Schedule and Locations

Sampling Schedule and Locations of Dust Sampling

Sampling Locations		Sampling Period
Station "A":	The podium in front of Tung Tai House of Ching Tai Court.	8.11.94 to 22.11.94
Station "B":	The roof level and the ground level of Queen's college Old Boys' Association Secondary School at the western end of Cheung On Estate.	24.10.94 to 7.11.94
Station "C":	The canopy of On Tao House adjacent to Tam Kong Shan Road, the access road leading to North Tsing Yi Reclamation site.	8.11.94 to 22.11.94
Station "D":	The roof level of Greenview Terrace adjacent to Castle Peak Road.	24.10.94 to 7.11.94

2 Methodology

In carrying out the monitoring work, total suspended particulate (TSP) level was measured by General Metal Work Model GMWL 2000 High Volume Sampling Systems. On operation, TSP was sampled by drawing air through a piece of pre-weighted filter paper inside a high volume sampler. The filter paper with the retained particulate was brought back to the Council's laboratory for analysis by gravimetric method. The TSP level was calculated from the ratio of the mass of particulate retained in the filter paper to the total volume of air sampled.

Respirable suspended particulate (RSP) level was measured by a Model GMWL 2000 High Volume Sampling System fitted with a Model 1200 HVPM10 Size selective inlet. By definition, RSP is the suspended particulate of size less than 10 μm. The operation principle of RSP sampler is similar to TSP sampler except the former is equipped with an additional PM_{10} assembly which screens off all the particulate larger than 10 μm. The filter paper therefore only retains particulate of size 10 μm and below. The gain in weight of the filter paper is then used to calculate the RSP concentration.

Both TSP and RSP were measured for 1 and 24 hours. The sampling period were cross-checked by reference to the internal clock of the samplers to ensure adequate sampling time was achieved. In addition, the samplers are regularly inspected and calibrated to ensure maximum accuracy.

3 Results of Dust Monitoring

The results of the 24-hour dust measurements are summarised in tables 2 to 5 while the results of the 1-hour dust measurements are given in tables 6 to 9. The dust levels are expressed in $\mu g/m^3$ at one atmospheric pressure and at 25°C.

The results of 24-hr average TSP and RSP levels at Station D on 2.11.94 are void because of power supply suspension during the sampling period. In addition, the result of the third 1-hour RSP sample on the same date is also void due to damage of the filter medium.

Results of 24-hour Dust Measurement at Station A

Date	Station A	
	TSP	RSP
08.11.94	82	63
09.11.94	173	97
10.11.94	101	62
11.11.94	60	42
12.11.94	65	39
13.11.94	60	28
14.11.94	48	23
15.11.94	64	38
16.11.94	81	52
17.11.94	158	87
18.11.94	125	72
19.11.94	68	48
20.11.94	90	60
21.11.94	101	69

Results of 24-hour Dust Measurement at Station B

Date	Station B	
	TSP	RSP
24.10.94	125	84
25.10.94	142	82
26.10.94	131	77
27.10.94	217	122
28.10.94	123	85
29.10.94	124	86
30.10.94	123	95
31.10.94	120	58
01.11.94	94	50
02.11.94	111	57
03.11.94	99	59
04.11.94	143	93
05.11.94	156	97
06.11.94	138	92

Results of 24-hour Dust Measurement at Station C

Date	Station C	
	TSP	RSP
08.11.94	100	67
09.11.94	143	90
10.11.94	109	70
11.11.94	66	46
12.11.94	80	52
13.11.94	75	35
14.11.94	51	29
15.11.94	68	43
16.11.94	88	56
17.11.94	159	97
18.11.94	133	86
19.11.94	72	49
20.11.94	117	74
21.11.94	110	76

Results of 24-hour Dust Measurement at Station D

Date	Station D	
	TSP	RSP
24.10.94	121	85
25.10.94	129	77
26.10.94	108	68
27.10.94	203	115
28.10.94	133	81
29.10.94	133	80
30.10.94	137	90
31.10.94	132	74
01.11.94	96	52
02.11.94	Void*	Void*
03.11.94	108	60
04.11.94	128	86
05.11.94	162	86
06.11.94	132	78

Results of 1-hour Dust Measurement at Station A

Date	Station A					
	TSP (Start Time)			RSP (Start Time)		
08.11.94	194 (10:00)	138 (11:04)	152 (13:29)	165 (09:52)	85 (10:56)	103 (13:25)
09.11.94	119 (09:49)	85 (10:52)	179 (13:25)	87 (09:44)	61 (10:47)	104 (13:22)
10.11.94	143 (10:10)	239 (11:15)	176 (13:38)	81 (10:08)	84 (11:13)	87 (13:36)
11.11.94	91 (09:42)	95 (10:44)	61 (13:43)	41 (09:39)	23 (10:42)	21 (13:41)
12.11.94	61 (10:19)	69 (11:27)	65 (12:38)	32 (10:15)	41 (11:22)	32 (12:35)
13.11.94	50 (09:45)	78 (10:52)	34 (13:25)	41 (09:50)	12 (11:02)	22 (13:30)
14.11.94	96 (10:03)	77 (11:10)	37 (12:54)	21 (09:59)	22 (11:05)	21 (12:54)
15.11.94	49 (10:05)	57 (11:08)	56 (13:26)	20 (10:00)	30 (11:05)	31 (13:26)
16.11.94	62 (09:58)	53 (11:00)	65 (13:12)	28 (09:53)	43 (10:56)	31 (13:12)
17.11.94	93 (10:15)	114 (11:21)	215 (13:16)	53 (10:15)	70 (11:18)	123 (13:16)
18.11.94	80 (09:53)	170 (10:55)	114 (12:54)	59 (09:49)	60 (10:51)	41 (12:54)
19.11.94	81 (11:40)	83 (13:15)	91 (14:22)	64 (11:36)	51 (13:15)	39 (14:23)
20.11.94	84 (09:17)	85 (10:26)	62 (13:26)	45 (09:15)	63 (10:25)	44 (13:24)
21.11.94	191 (10:57)	148 (12:06)	192 (13:10)	112 (11:01)	77 (12:07)	90 (13:10)

Results of 1-hour Dust Measurement at Station B

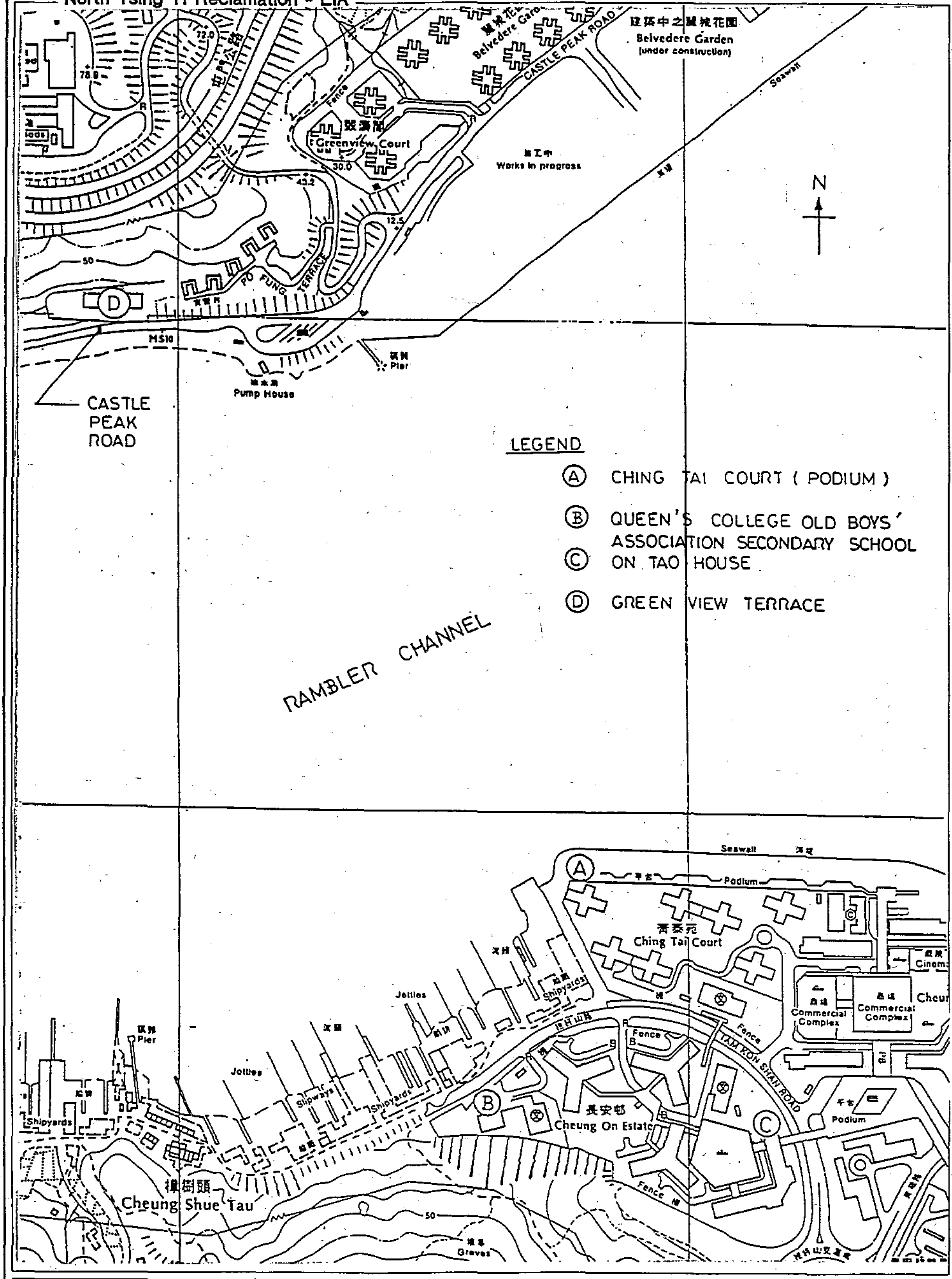
Date	Station B					
	TSP (Start Time)			RSP (Start Time)		
24.10.94	238 (15:35)	130 (16:40)	138 (17:45)	168 (15:30)	88 (16:35)	99 (17:40)
25.10.94	210 (10:05)	137 (11:08)	311 (13:45)	129 (10:10)	61 (11:12)	207 (13:50)
26.10.94	179 (10:18)	164 11:21)	194 (13:50)	106 (10:13)	146 (11:16)	152 (13:47)
27.10.94	166 (10:50)	212 (11:52)	523 (14:00)	142 (10:53)	172 (11:56)	299 (14:02)
28.10.94	341 (10:15)	122 (11:19)	137 (13:34)	182 (10:19)	90 (11:22)	77 (13:36)
29.10.94	186 (10:12)	206 (11:15)	147 (13:30)	169 (10:16)	111 (11:18)	143 (13:35)
30.10.94	221 (09:30)	186 (10:33)	233 (13:47)	205 (09:33)	128 (10:36)	191 (13:50)
31.10.94	146 (10:12)	105 (11:14)	204 (13:30)	111 (10:15)	103 (11:17)	160 (13:35)
01.11.94	199 (09:50)	178 (10:52)	162 (13:45)	127 (09:53)	116 (10:56)	160 (13:47)
02.11.94	143 (10:00)	152 (11:05)	375 (13:45)	134 (10:03)	115 (11:06)	205 (13:48)
03.11.94	137 (11:00)	116 (11:05)	132 (13:15)	104 (10:05)	100 (11:10)	90 (13:20)
04.11.94	141 (10:00)	131 (11:10)	208 (13:45)	120 (10:05)	123 (11:15)	115 (13:48)
05.11.94	200 (10:00)	262 (11:05)	218 (13:30)	147 (10:02)	149 (11:08)	134 (13:35)
06.11.94	216 (10:00)	160 (11:03)	208 (13:30)	129 (10:05)	118 (11:08)	134 (13:35)

Results of 1-hour Dust Measurement at Station C

Date	Station C					
	TSP (Start Time)			RSP (Start Time)		
08.11.94	271 (09:30)	119 (10:36)	145 (13:16)	198 (09:30)	84 (10:36)	95 (13:16)
09.11.94	83 (09:30)	116 (11:03)	165 (13:03)	52 (09:30)	91 (11:02)	95 (13:16)
10.11.94	138 (09:45)	293 (10:48)	249 (13:20)	75 (09:41)	155 (10:44)	127 (13:17)
11.11.94	122 (11:00)	80 (12:08)	97 (13:15)	85 (10:58)	71 (12:04)	70 (13:13)
12.11.94	100 (09:39)	102 (10:50)	90 (12:01)	84 (09:44)	85 (10:53)	68 (12:05)
13.11.94	54 (09:30)	70 (10:33)	60 (13:40)	38 (09:35)	38 (10:40)	29 (13:45)
14.11.94	81 (09:44)	160 (10:49)	64 (13:32)	17 (09:41)	23 (10:45)	38 (13:28)
15.11.94	72 (09:41)	98 (10:44)	70 (12:55)	40 (09:37)	53 (10:40)	42 (12:55)
16.11.94	76 (09:32)	76 (10:41)	81 (12:53)	33 (09:32)	39 (10:34)	34 (12:49)
17.11.94	111 (09:55)	83 (10:00)	274 (13:06)	78 (09:55)	44 (10:57)	168 (13:02)
18.11.94	133 (09:33)	139 (10:00)	134 (13:20)	100 (09:33)	95 (10:35)	102 (13:19)
19.11.94	115 (11:55)	84 (15:00)	99 (16:05)	98 (12:00)	39 (15:00)	56 (16:05)
20.11.94	66 (09:34)	54 (10:40)	97 (13:04)	30 (09:32)	23 (10:39)	59 (13:00)
21.11.94	197 (11:19)	180 (12:25)	180 (13:45)	113 (11:19)	151 (12:25)	150 (13:45)

Results of 1-hour Dust Measurement at Station D

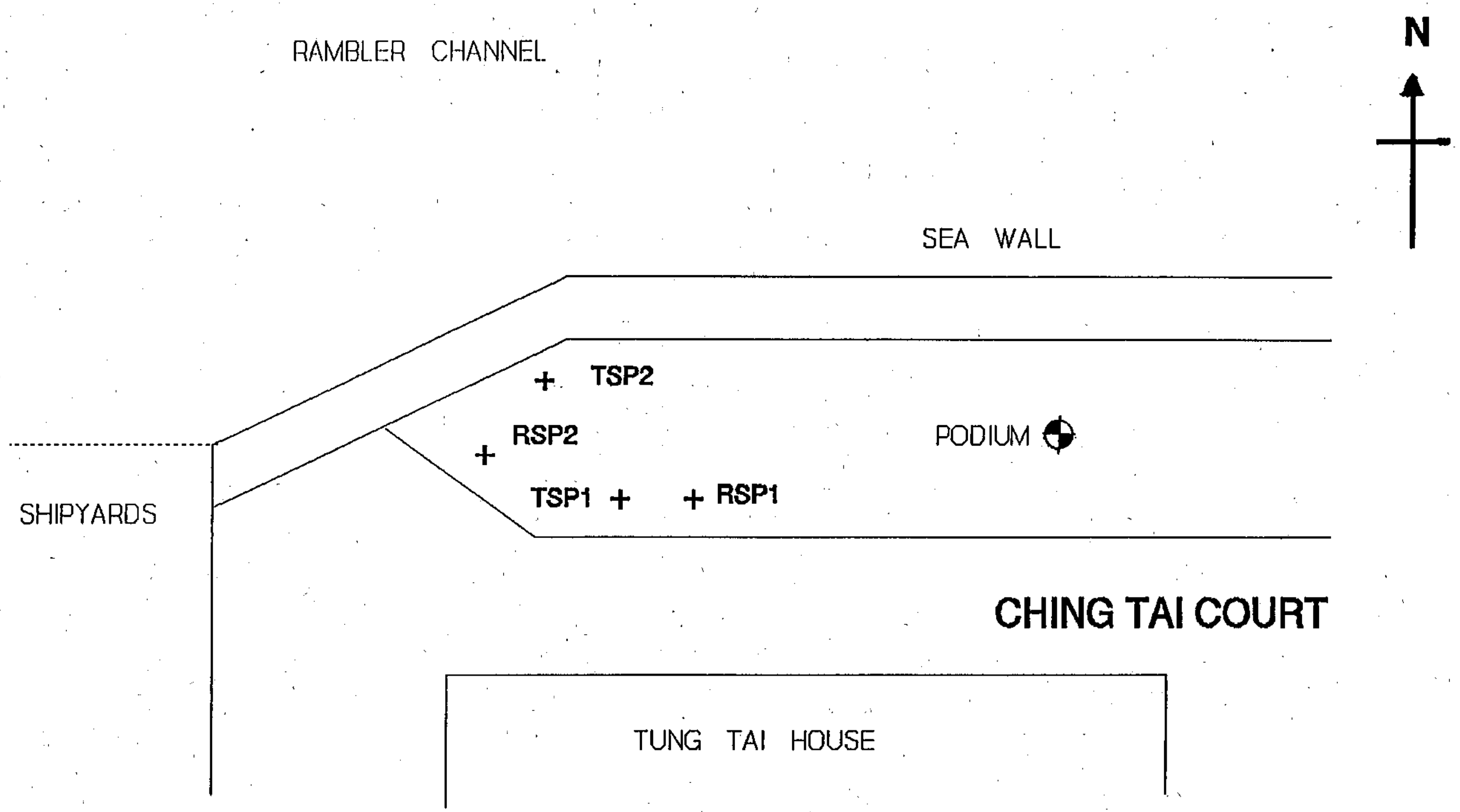
Date	Station D					
	TSP (Start Time)			RSP (Start Time)		
24.10.94	203 (12:23)	162 (13:36)	128 (14:40)	127 (12:27)	139 (13:36)	91 (14:39)
25.10.94	176 (09:52)	215 (10:54)	215 (13:17)	121 (09:55)	90 (10:58)	121 (13:20)
26.10.94	22 (09:43)	194 (10:45)	134 (11:02)	8 (09:46)	74 (10:49)	102 (12:05)
27.10.94	137 (09:32)	118 (10:33)	267 (13:05)	76 (09:34)	53 (10:37)	250 (13:07)
28.10.94	422 (09:35)	314 (10:40)	218 (13:14)	217 (09:37)	130 (10:45)	140 (13:16)
29.10.94	260 (10:08)	188 (11:20)	138 (14:00)	135 (10:09)	107 (11:24)	88 (14:00)
30.10.94	177 (10:20)	182 (11:22)	173 (14:00)	140 (10:23)	90 (11:25)	151 (14:05)
31.10.94	214 (09:56)	290 (11:02)	198 (13:15)	135 (10:01)	140 (11:10)	131 (13:17)
01.11.94	244 (10:17)	190 (11:23)	231 (13:53)	103 (10:25)	125 (11:35)	129 (13:50)
02.11.94	164 (10:19)	145 (11:22)	213 (12:26)	141 (10:24)	78 (11:28)	*Void
03.11.94	187 (09:37)	159 (10:40)	274 (13:12)	68 (09:41)	83 (10:48)	149 (13:16)
04.11.94	170 (09:47)	184 (10:50)	182 (13:03)	145 (09:551)	131 (10:56)	167 (13:06)
05.11.94	185 (09:58)	229 (11:04)	234 (13:30)	173 (10:007)	199 (11:12)	182 (13:37)
06.11.94	222 (10:22)	152 (11:30)	183 (13:46)	126 (10:24)	145 (11:33)	131 (13:49)



Location of Sampling Points

Mouchel

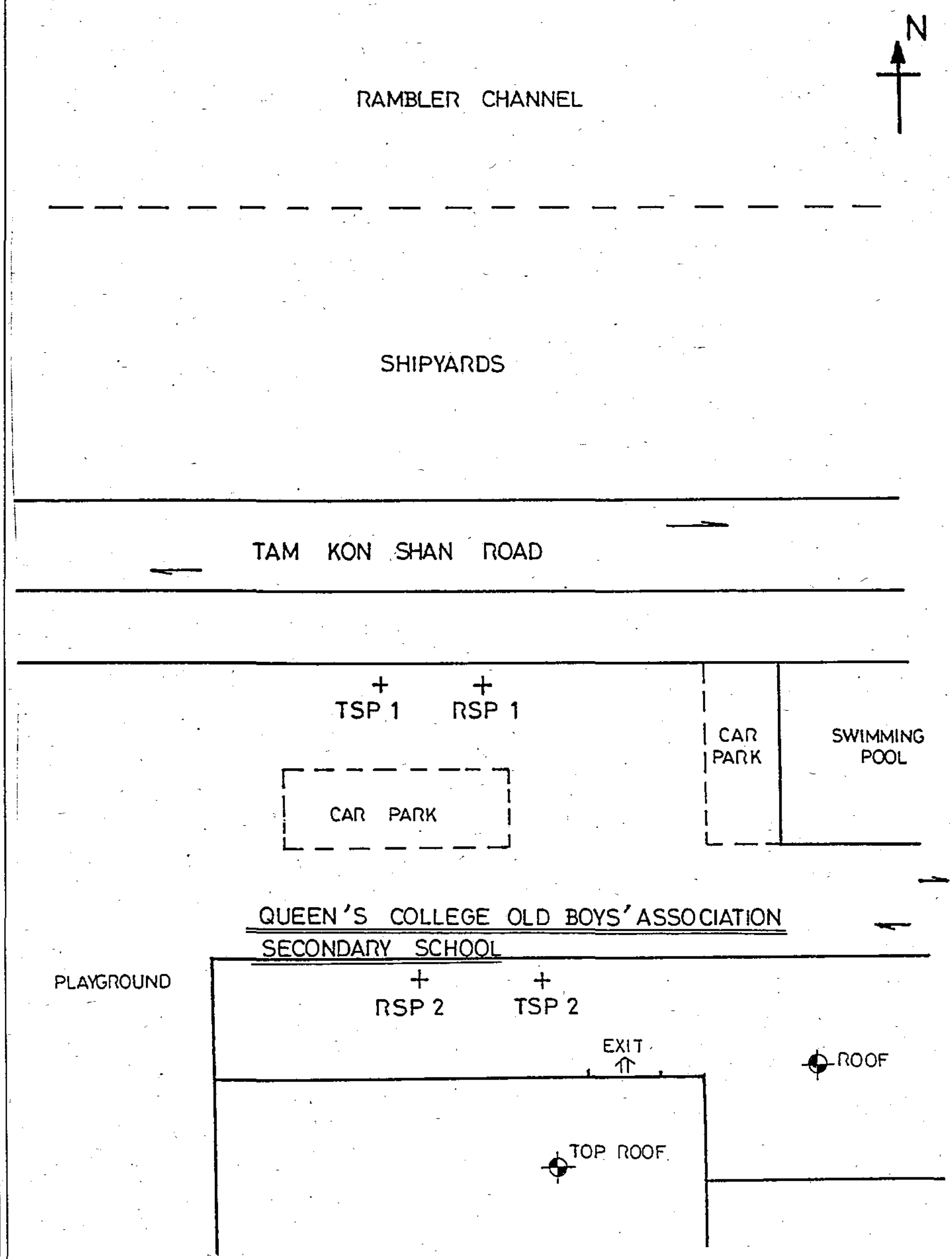
Figure No. E-1.1



Location of High Volume Samplers at Site "A"

Mouchel

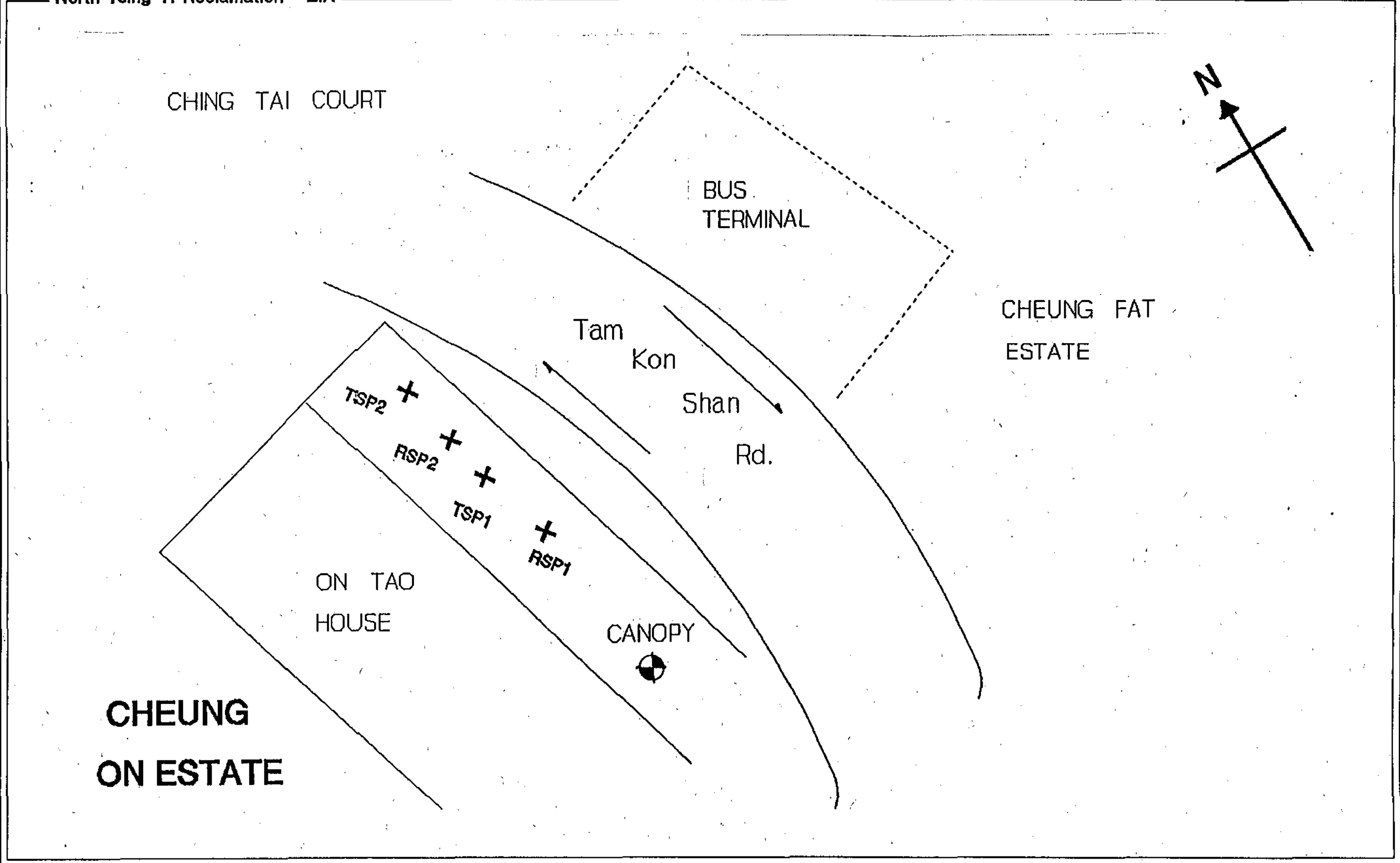
Figure No. E-1.2



Location of High Volume Samplers at Site "B"

Mouchel

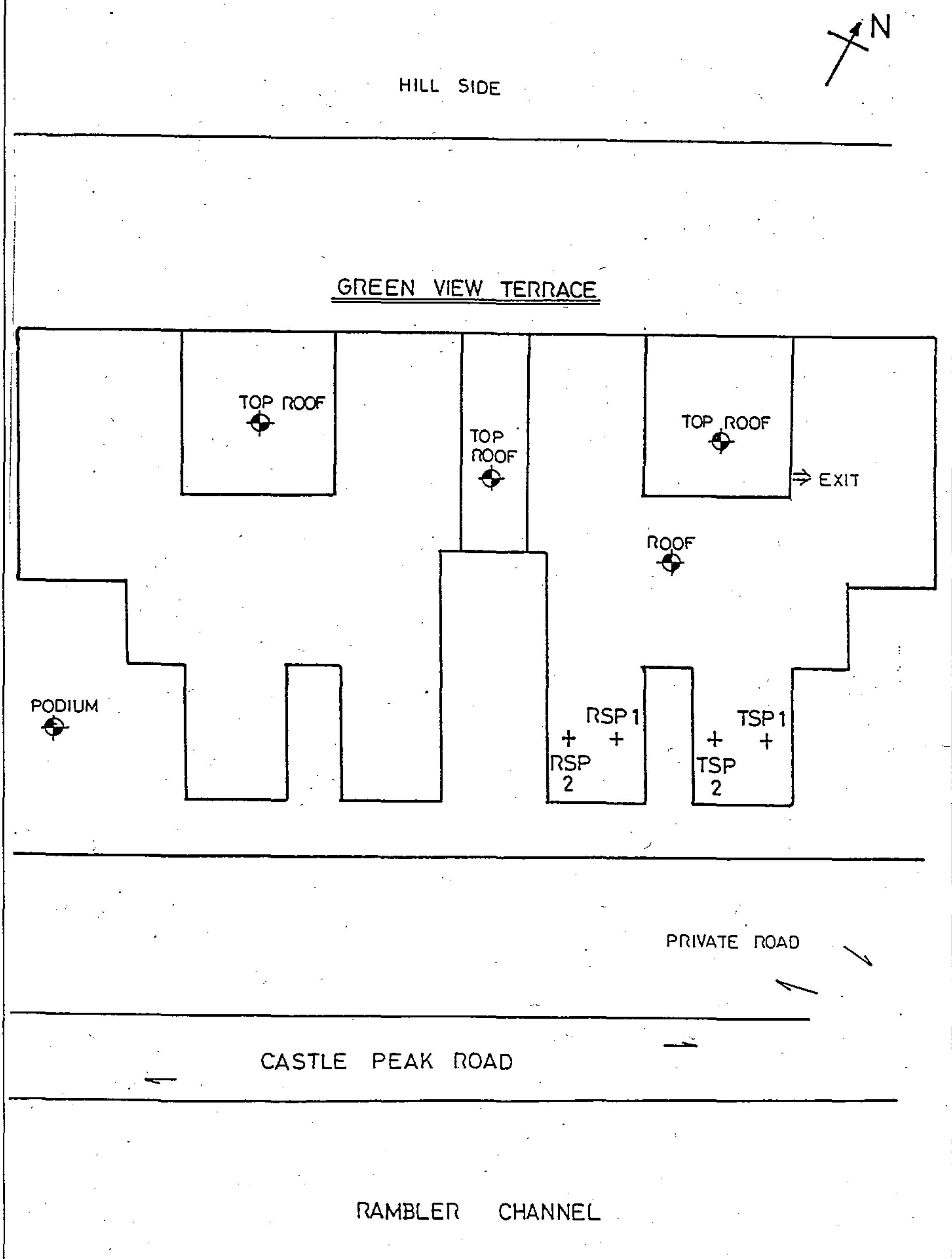
Figure No. E-1.3



Location of High Volume Samplers at Site "C"

Mouchel

Figure No. E-1.4



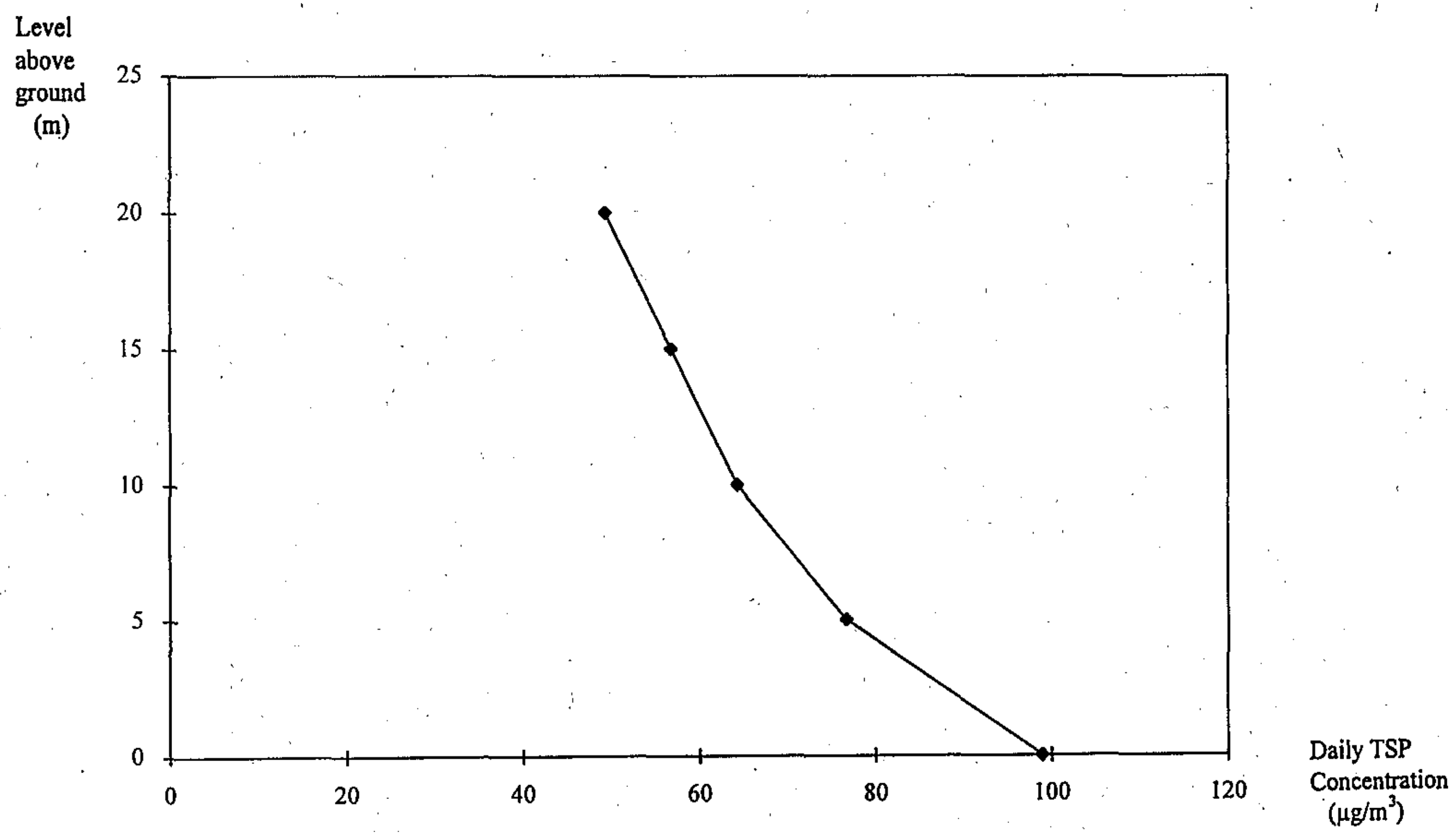
Location of High Volume Samplers at Site "D"

Mouchel

Figure No. E-1.5

Appendix E-2

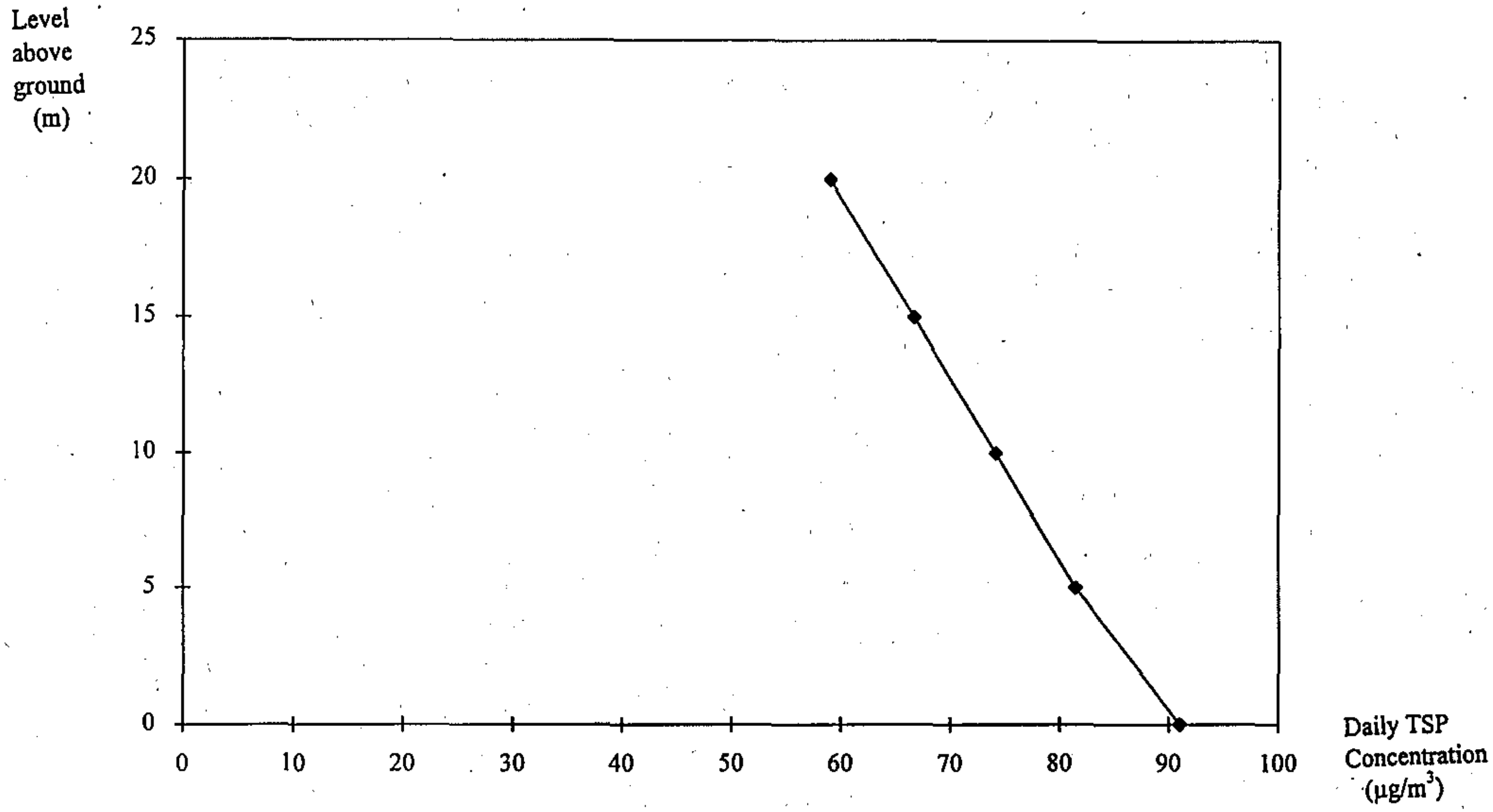
Vertical TSP Concentration Profile



Vertical TSP Concentration Profile (Queen's Old Boys' Ass. Sec. Sch.)

Mouchel

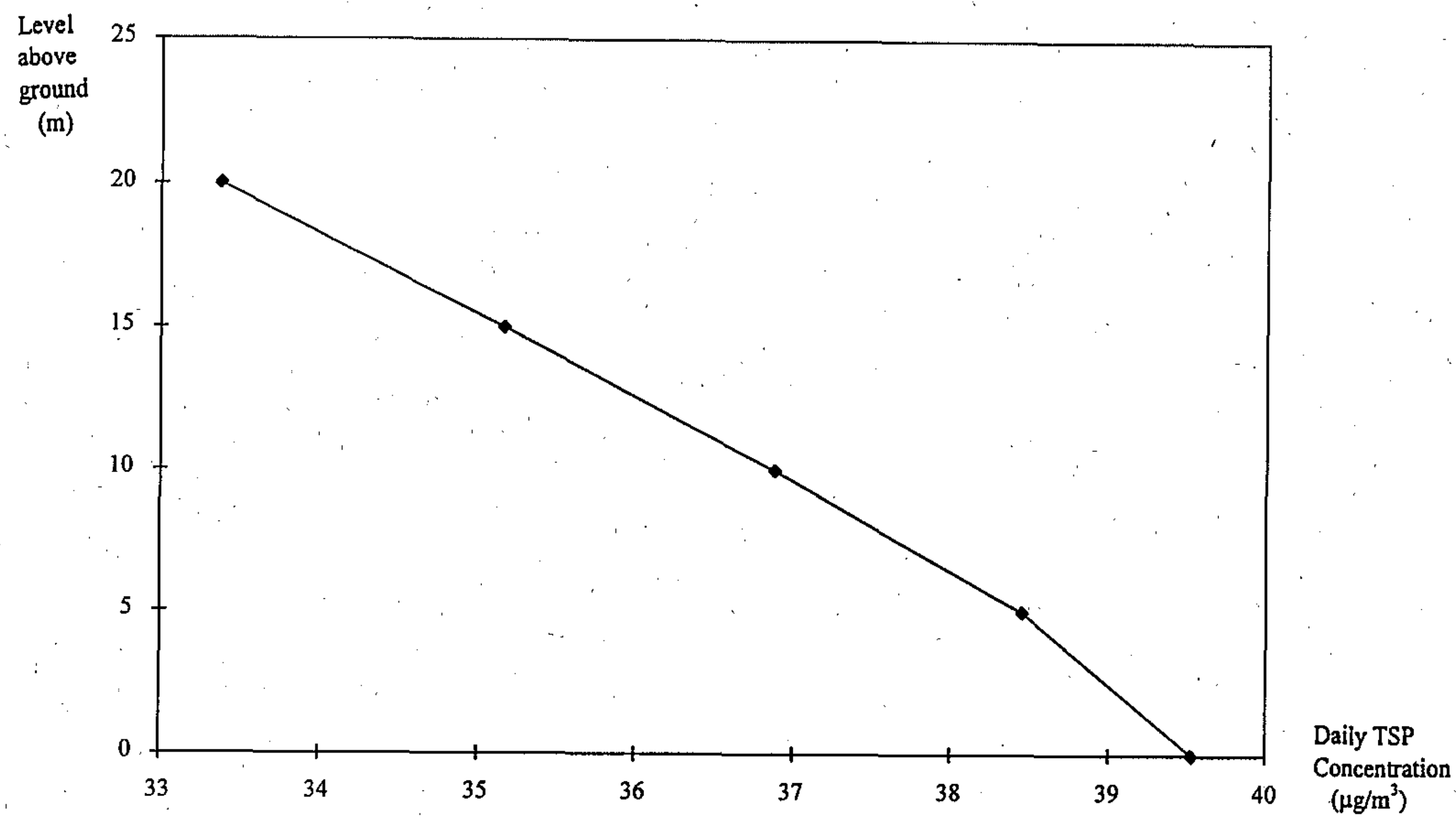
Figure No. E-2.1



Vertical TSP Concentration Profile (On Hoi House)

Mouchel

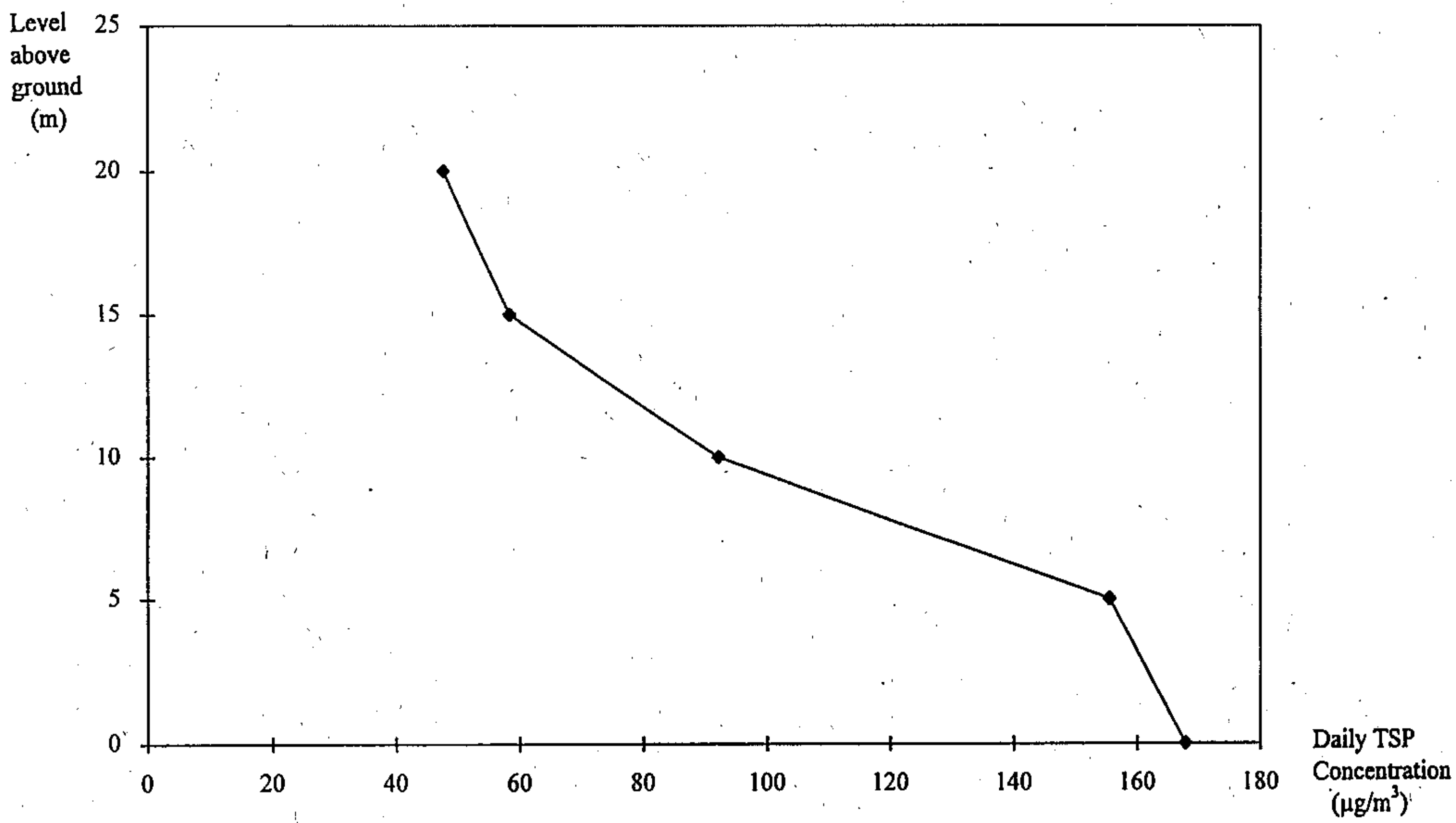
Figure No. E-2.2



Vertical TSP Concentration Profile (TWGH Wong See Sum Primary School)

Mouchel

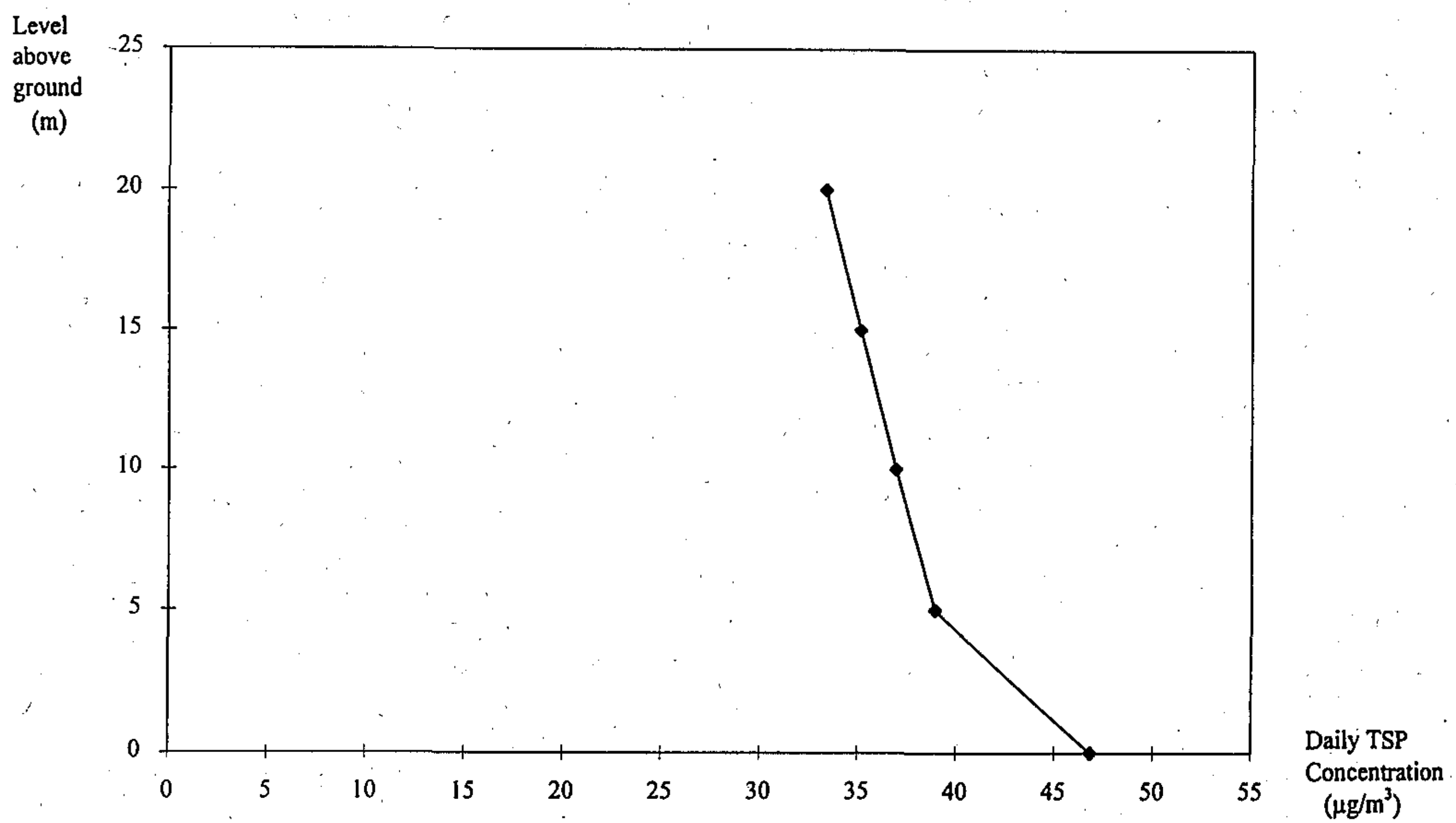
Figure No. E-2.3



Vertical TSP Concentration Profile (Tung Tai House)

Mouchel

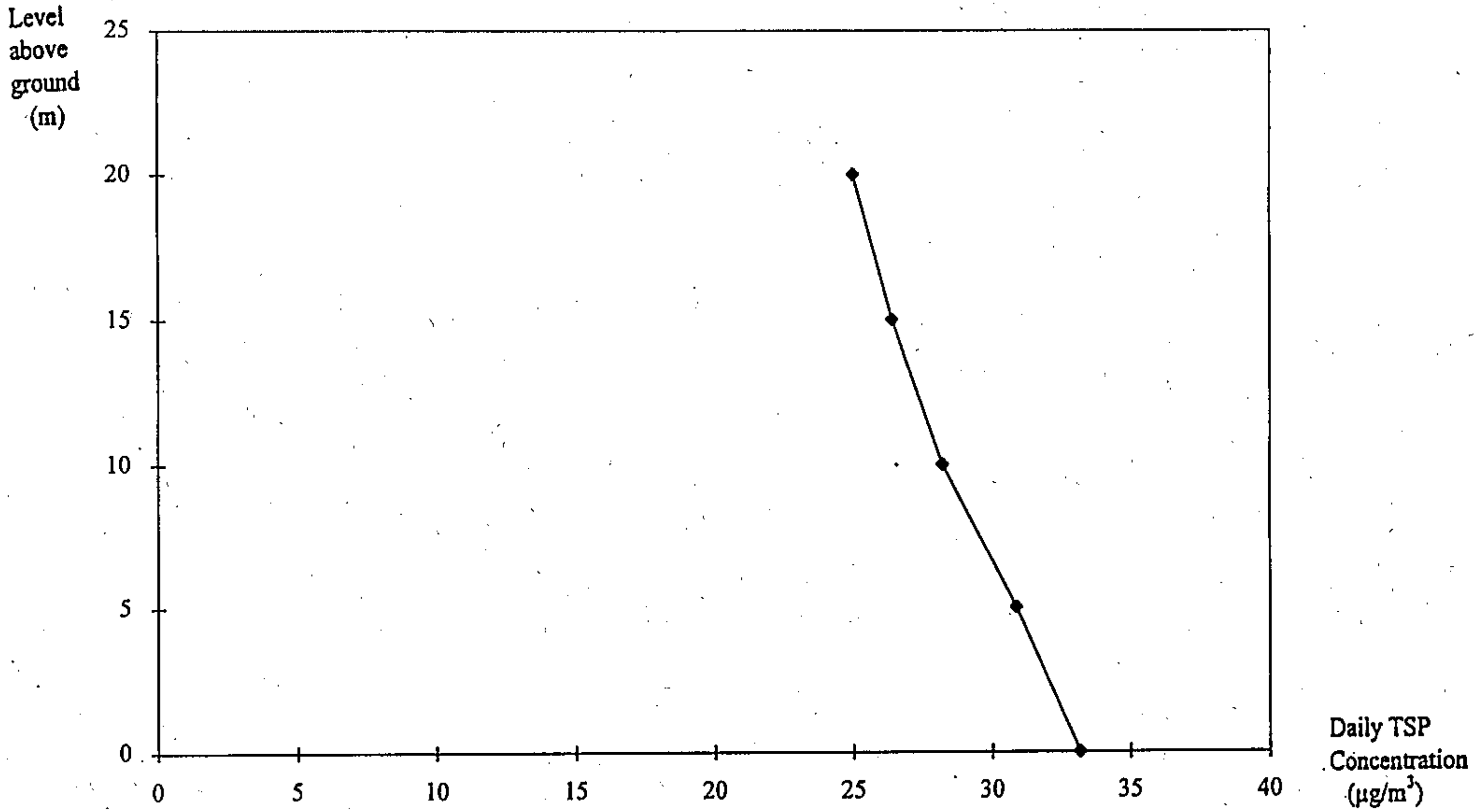
Figure No. E-2.4



Vertical TSP Concentration Profile (Lui Ming Choi Primary Sch.)

Mouchel

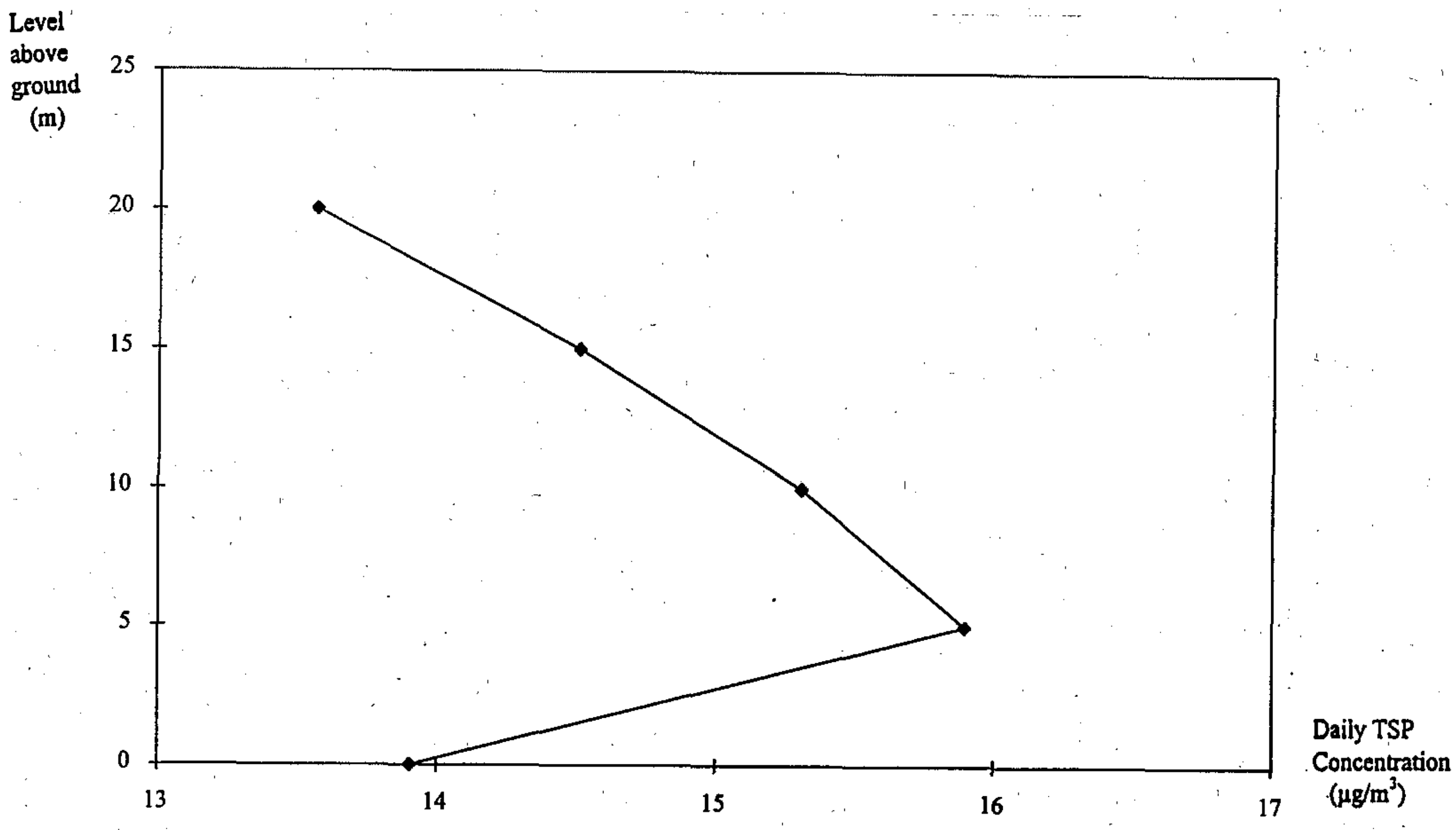
Figure No. E-2.5



Vertical TSP Concentration Profile (Chun Fat House)

Mouchel

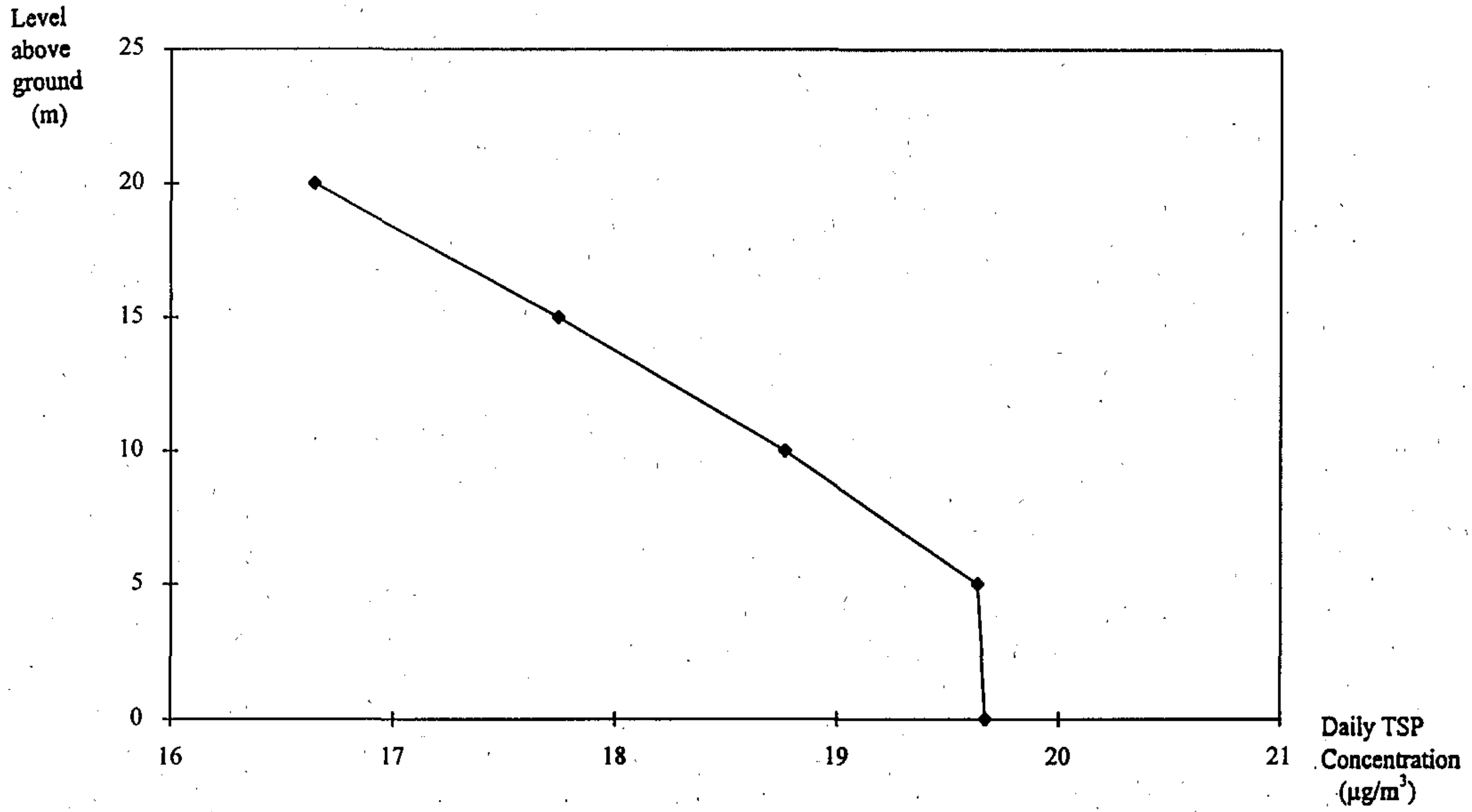
Figure No. E-2.6



Vertical TSP Concentration Profile (Tsing Fat THA)

Mouchel

Figure No. E-2.7



Vertical TSP Concentration Profile (Tsing ON THA)

Mouchel

Figure No. E-2.8

APPENDIX F

Marine Water/Sediments

Appendix F-1

Marine Water Quality Summary Statistics

Appendix : Marine Water Quality Summary Statistics

Summary of Water Quality for the Year 1993 for the two stations in the Western Buffer Zone

		WM3	WM4
Temperature	Surface	23.3 17.2-28.5	23.2 17.2-28.4
(deg C)	Bottom	22.7 17.2-27.2	22.6 16.8-27.7
Salinity	Surface	30.5 23.6-33.4	29.7 21.7-33.4
(ppt)	Bottom	31.6 19.4-33.3	32.4 31.0-33.3
Dissolved Oxygen	Depth Average	5.9 4.7-7.1	6.3 5.3-7.4
(mg/l)	Bottom	5.97 4.89-7.74	6.08 4.54-7.49
pH		8.2 8.0-8.4	8.2 8.0-8.3
Secchi disc (m)		1.5 1.0 - 2.0	1.4 1.0 -2.4
Turbidity (NTU)		10 4.0-25.7	10.3 2.4-25.0
Suspended Solids (mg/l)		12.3 5.0-41.8	10.8 3.2-22.7
BOD (mg/l)		0.5 0.2-1.7	0.5 0.2-1.0
Inorganic N (mg/l)		0.37 0.17-0.69	0.34 0.17-0.53
Total N (mg/l)		0.70 0.44-1.03	0.67 0.35-0.94
PO_4-P (mg/l)		0.05 0.03-0.10	0.04 0.02-0.13
Total P (mg/l)		0.09 0.04-0.18	0.08 0.04-0.16
Chlorophyll (μg/l)		0.60 0.33-0.97	0.62 0.37-1.30
E.coli (no/100ml)		452 67-3244	134 19-970

Appendix : Marine Water Quality Summary Statistics

Summary of Water Quality for the Year 1993 for the three stations in the Victoria Zone

Parameter	Depth	VM12	VM13	VM14
Temperature	Surface	22.3 11.4 - 28.5	22.7 16.1 -27.7	22.9 16.9-27.7
(deg C)	Bottom	22.2 17 - 27.3	22.5 17.2 - 27.3	22.7 17.4-27.6
Salinity	Surface	30.3 22.7 - 32.6	29.3 17.7 - 32.9	28.6 14.8-33.0
(ppt)	Bottom	32.4 31.3 - 33.8	31.1 24.7 - 33.1	29.8 20.6-33.1
Dissolved Oxygen	Depth Average	4.8 3.7-6.2	4.9 3.7-6.3	5.1 3.9-6.6
(mg/l)	Bottom	4.48 2.55-5.97	4.19 1.69-6.13	4.83 3.59-6.45
pH		8.1 8.0-8.2	8.1 8.0-8.2	8.1 8.1-8.2
Secchi disc (m)		1.5 0.8-2.6	1.2 0.7-2	1.5 1.0-2.8
Turbidity (NTU)		7.7 3.9-20.0	7.8 3.1-14.3	5.8 2.7-11.0
Suspended Solids (mg/l)		9.3 3-26.0	10.0 3.8-19.7	9.1 3.2-23.0
BOD (mg/l)		0.8 0.3-1.4	1.1 0.7-1.7	0.8 0.7-1.2
Inorganic N (mg/l)		0.52 0.34-0.75	0.65 0.38-1.11	0.51 0.27-1.30
Total N (mg/l)		0.86 0.48-1.21	1.01 0.52-1.76	0.87 0.47-1.93
PO_4-P (mg/l)		0.06 0.02-0.09	0.07 0.05-0.10	0.05 0.03-0.09
Total P (mg/l)		0.11 0.06-0.17	0.13 0.07-0.22	0.11 0.05-0.22
Chlorophyll (μg/l)		0.64 0.33-1.07	0.71 0.53-1.03	0.61 0.37-1.03
E.coli (no/100ml)		3172 1067-14467	10900 1966-73333	1276 267-5103

Appendix : Marine Water Quality Summary Statistics

Summary of Water Quality for the Year 1992 for the two stations in the Western Buffer Zone

Parameter	Depth	WM3	WM4
Temperature	Surface	22.1 15.3-28.5	22.3 15.4-28.2
(deg C)	Bottom	21.8 15.2-27.8	22.0 15.4-27.9
Salinity	Surface	30.9 28.6-33.1	30.4 24.4-33.7
(ppt)	Bottom	32.0 30.2-33.2	31.6 30.1-33.2
Dissolved Oxygen	Depth Average	6.3 4.2-9.0	6.3 4.2-8.5
(mg/l)	Bottom	6.55 4.22-10.62	6.44 4.07-10.10
pH		8.0 7.7-8.3	8.0 7.7-8.3
Secchi disc (m)		1.4 1.0-2.5	1.6 0.8-3.2
Turbidity (NTU)		8.9 4.1-14.5	9.5 3.3-20.7
Suspended Solids (mg/l)		12.0 3.5-24.2	12.9 2.0-28.7
BOD (mg/l)		0.9 0.4-1.4	0.9 0.4-1.7
Inorganic N (mg/l)		0.31 0.20-0.62	0.32 0.23-0.57
Total N (mg/l)		0.73 0.38-1.8	0.74 0.40-1.60
PO_4-P (mg/l)		0.03 0.01-0.06	0.03 0.02-0.05
Total P (mg/l)		0.14 0.06-0.20	0.15 0.05-0.34
Chlorophyll (μg/l)		0.48 0.20-0.80	0.42 0.20-0.63
E.coli (no/100ml)		309 57-3667	122 15-1200

Appendix : Marine Water Quality Summary Statistics

Summary of Water Quality for the Year 1992 for the three stations in the Victoria Harbour Zone

Parameter	Depth	VM12	VM13	VM14
Temperature	Surface	22.3 11.4-28.5	22.2 11.7-28.4	22.4 11.7-28.5
(deg C)	Bottom	22.0 11.5 - 28.2	22.2 11.6 - 28.3	22.2 11.7-28.2
Salinity	Surface	30.3 22.7-32.6	30.8 23.2-40.4	29.5 21.7-32.4
(ppt)	Bottom	30.8 24.4-32.6	31.0 23.9-40.5	30.1 23.6-32.6
Dissolved Oxygen	Depth Average	5.2 3.2-8.3	5.1 3.2-7.2	5.3 3.5-7.5
(mg/l)	Bottom	5.41 3.40-12.32	5.35 3.20-10.18	5.29 3.28-7.11
pH		7.9 7.8-8.2	8.0 7.8-8.1	8.0 7.9-8.2
Secchi disc (m)		1.5 0.8 - 2.7	1.4 1.0 - 2.2	1.75 0.5-3.1
Turbidity (NTU)		10.7 2.8-21.0	7.2 2.4-12.2	5.1 2.2-9.8
Suspended Solids (mg/l)		18.8 3-39	11.4 4.8 - 19.8	7.4 2.7-16.2
BOD (mg/l)		1.4 0.6-1.9	1.6 0.7 - 2.4	1.8 1.0-3.4
Inorganic N (mg/l)		0.46 0.27 - 0.82	0.46 0.29 - 1.00	0.87 0.47-1.93
Total N (mg/l)		0.82 0.64 - 1.2	0.82 0.52 - 1.38	0.51 0.27-1.30
PO_4-P (mg/l)		0.06 0.03- 0.08	0.06 0.03- 0.07	0.06 0.02-0.10
Total P (mg/l)		0.14 0.08-0.22	0.14 0.09-0.22	0.13 0.06-0.26
Chlorophyll (μg/l)		1.43 0.27-8.80	0.86 0.20-4.27	1.16 0.27-6.57
E.coli (no/100ml)		2220 360-23033	2411 400-41667	833 90-6533

Appendix : Marine Water Quality Summary Statistics

Summary of Water Quality for the Year 1991 for the two stations in the Western Buffer Zone

Parameter	Depth	WM3	WM4
Temperature	Surface	23.5 17.2-26.5	22.9 17.3-26.8
(deg C)	Bottom	21.4 17.0-24.4	21.3 17.1-24.4
Salinity	Surface	28.6 19.7-32.5	29.1 19.4-32.4
(ppt)	Bottom	32.7 30.9-33.6	32.5 31.0-33.3
Dissolved Oxygen	Deprth Average	6.0 3.6-8.7	6.2 4.5-8.4
(mg/l)	Bottom	6.01 2.87-10.13	5.83 2.99-9.51
pH		8.1 7.9-8.5	8.1 7.8-8.4
Secchi disc (m)		1.3 0.6-2.0	1.8 0.8-2.8
Turbidity (NTU)		6.7 2.0-15.7	7.3 1.9-21.3
Suspended Solids (mg/l)		9.2 2.0-21.0	10.7 2.2-32.3
BOD (mg/l)		0.8 0.3-2.0	0.8 0.3-1.3
Inorganic N (mg/l)		0.32 0.08 - 0.61	0.30 0.11 - 0.64
Total N (mg/l)		0.80 0.41-1.53	0.73 0.37-1.68
PO_4-P (mg/l)		0.04 0.01-0.06	0.03 0.01- 0.06
Total P (mg/l)		0.11 0.06-0.24	0.11 0.05-0.33
Chlorophyll (μg/l)		1.84 0.23-12.23	1.36 0.20-4.53
E.coli (no/100ml)		203 41-3347	78 18-497

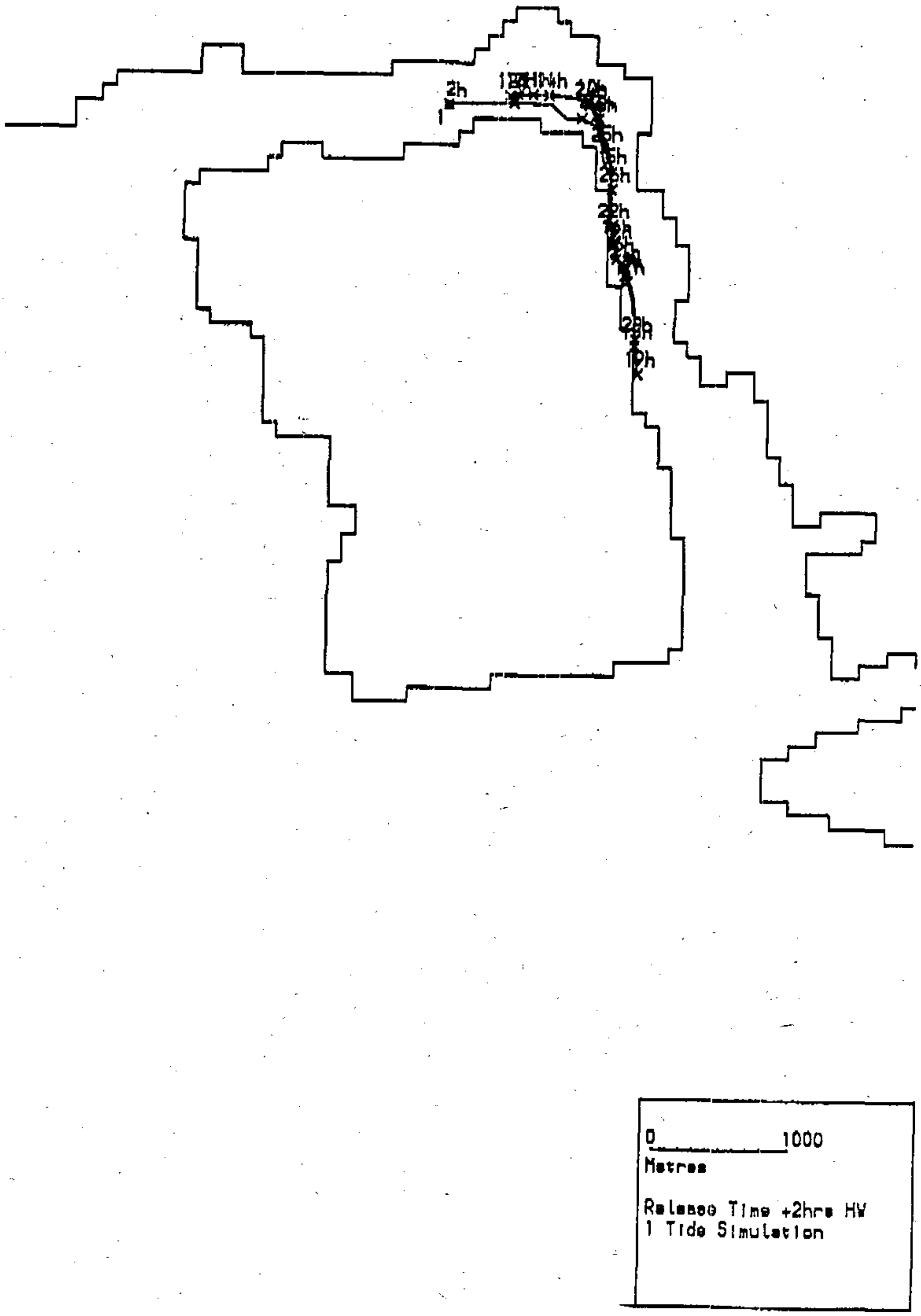
Appendix : Marine Water Quality Summary Statistics

Summary of Water Quality for the Year 1991 for the three stations in the Victoria Harbour Zone

Parameter	Depth	VM12	VM13	VM14
Temperature	Surface	22.1 16.8 - 25.7	22.2 16.8 -25.5	22.4 16.9-25.7
(deg C)	Bottom	21.7 16.7 -25.9	22.1 16.6 - 25.5	22.2 16.7-25.9
Salinity	Surface	30.5 24.3 - 32.7	29.9 21.5 - 32.6	29.1 18.8-32.1
(ppt)	Bottom	32.0 29.3 -33.2	30.9 25.2 - 32.8	30.5 24.1-32.9
Dissolved Oxygen	Depth Average	5.5 3.8-8.5	5.1 3.2-9.2	5.7 3.7-10.2
(mg/l)	Bottom	5.26 3.20-9.91	5.05 3.27-11.20	5.37 2.83-11.42
pH		8.1 7.8 - 8.4	8.1 7.8-8.6	8.1 8.0-8.5
Secchi disc (m)		1.5 0.6-2.6	1.3 0.6-2.6	1.5 0.6-2.4
Turbidity (NTU)		9.2 1.4-37.7	8.6 1.2-15.7	6.9 1.7-14
Suspended Solids (mg/l)		11.8 2.5-50.3	10.1 3-21	7.1 2.3-16.3
BOD (mg/l)		0.9 0.3 - 1.9	1.5 0.36-2.4	1.4 0.03-3.2
Inorganic N (mg/l)		0.42 0.20 - 0.86	0.45 0.21 - 0.78	0.44 0.20-0.92
Total N (mg/l)		0.81 0.41 -1.90	0.87 0.47 - 2.19	0.87 0.37-1.95
PO_4-P (mg/l)		0.06 0.03- 0.08	0.07 0.04- 0.10	0.06 0.01-0.15
Total P (mg/l)		0.12 0.05-0.23	0.13 0.06-0.28	0.12 0.04-0.32
Chlorophyll (μg/l)		1.19 0.23-8.47	1.33 0.27-7.93	2.27 0.2-19.3
E.coli (no/100ml)		673 143 -5467	1651 153 - 58000	638 29-32200

Appendix F-2

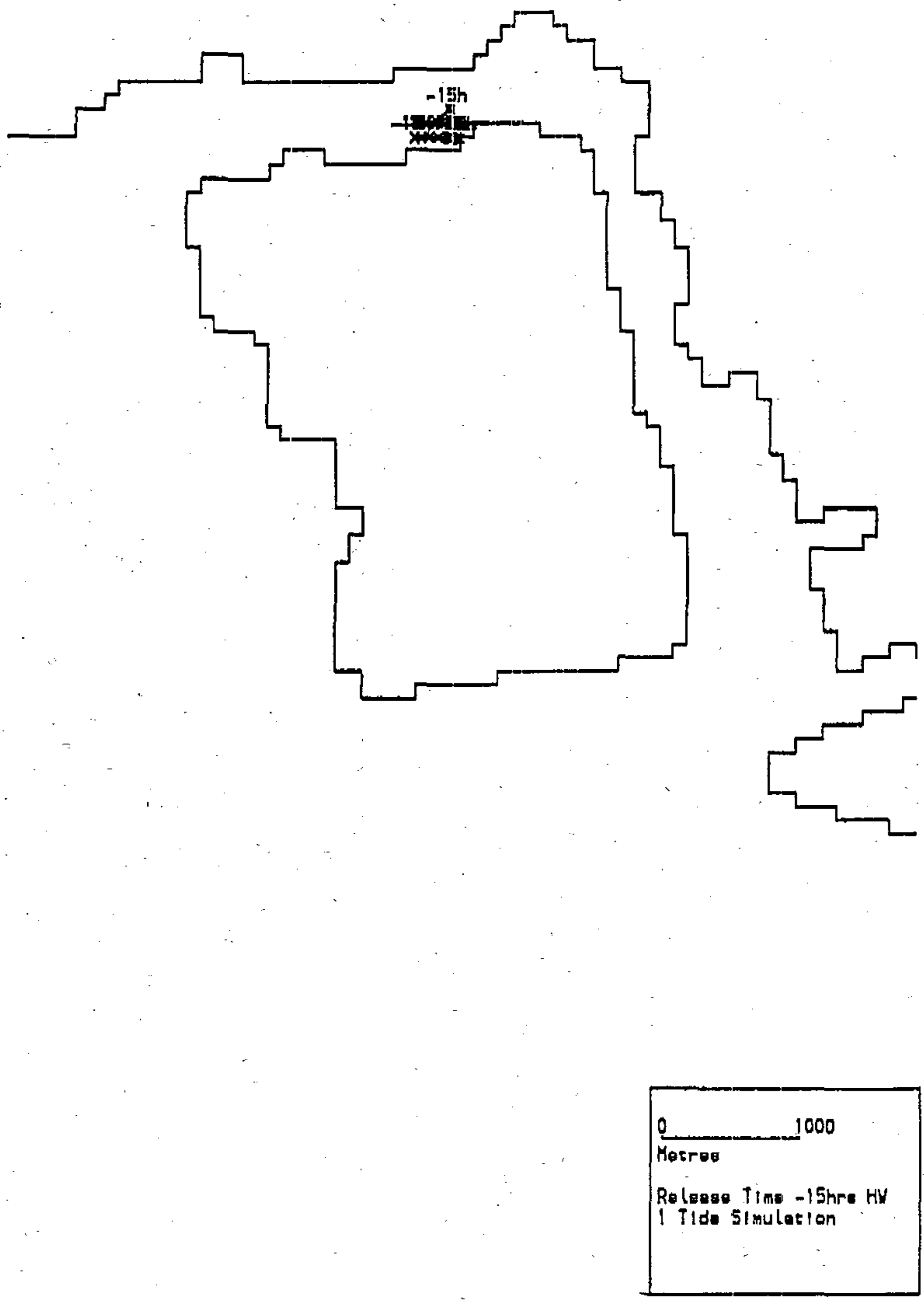
Simulated Float Tracks



North Tsing Yi Reclamation Simulated Float Tracks Dry Season Neap Tide Bed Layer

Mouchel

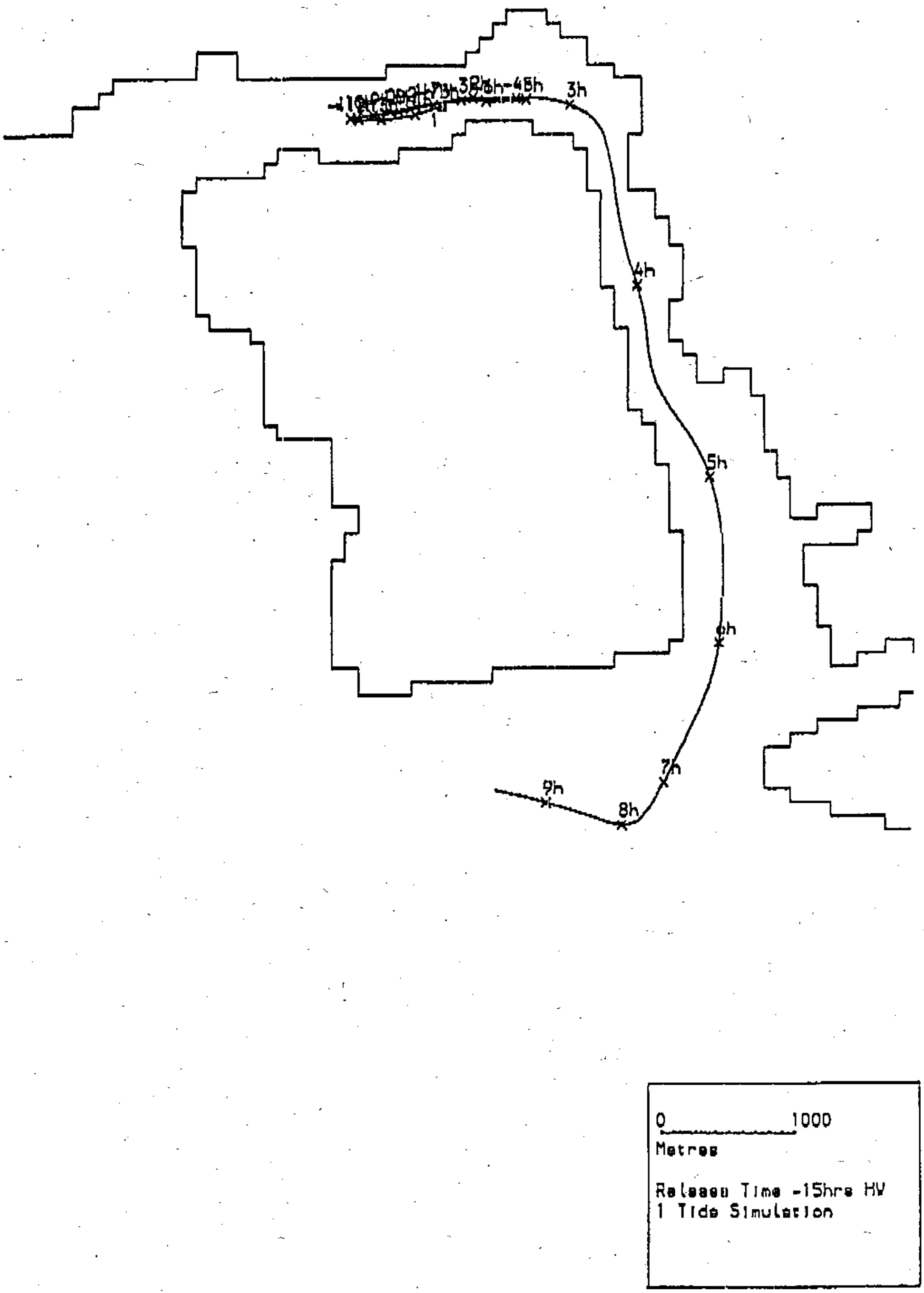
Figure No. F-2.1



North Tsing Yi Reclamation Simulated Float Tracks Dry Season Neap Tide Bed Layer

Mouchel

Figure No. F-2.2

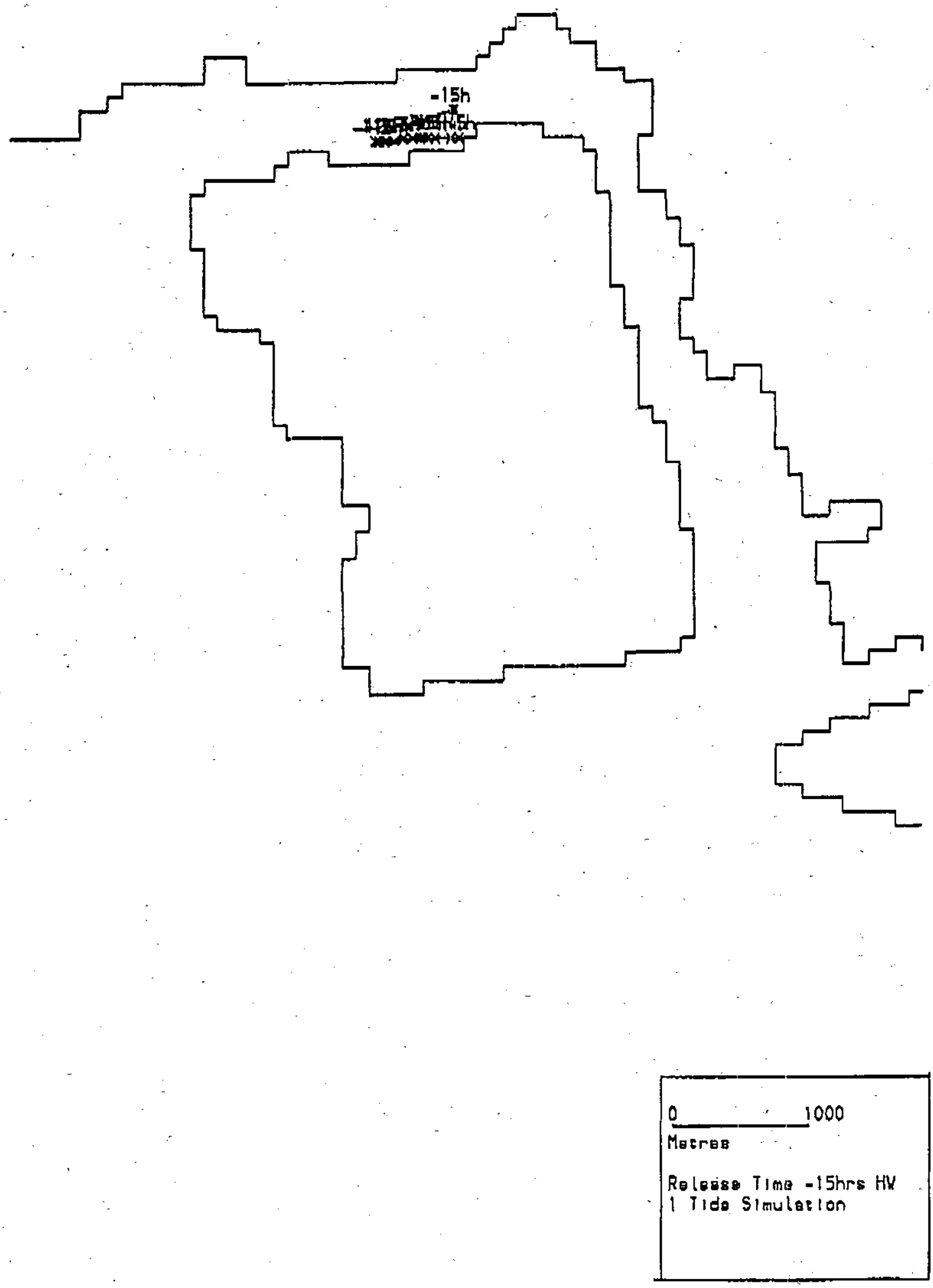


North Tsing Yi Reclamation Simulated Float Tracks Wet Season Spring Tide Surface Layer

Mouchel

Figure No. F-2.3

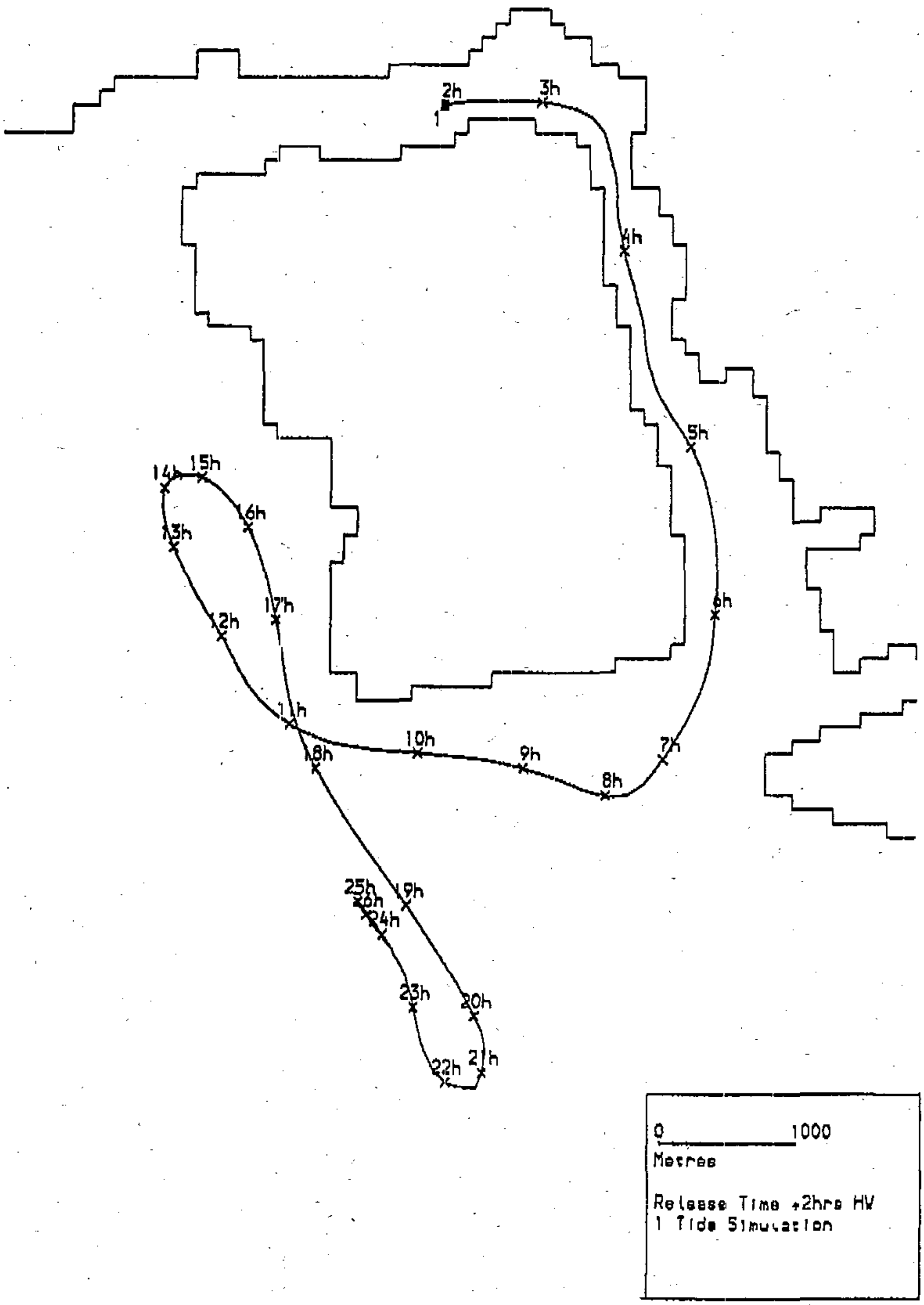
North Tsing Yi Reclamation -EIA



North Tsing Yi Reclamation Simulated Float Tracks Wet Season Spring Tide Bed Layer

Mouchel

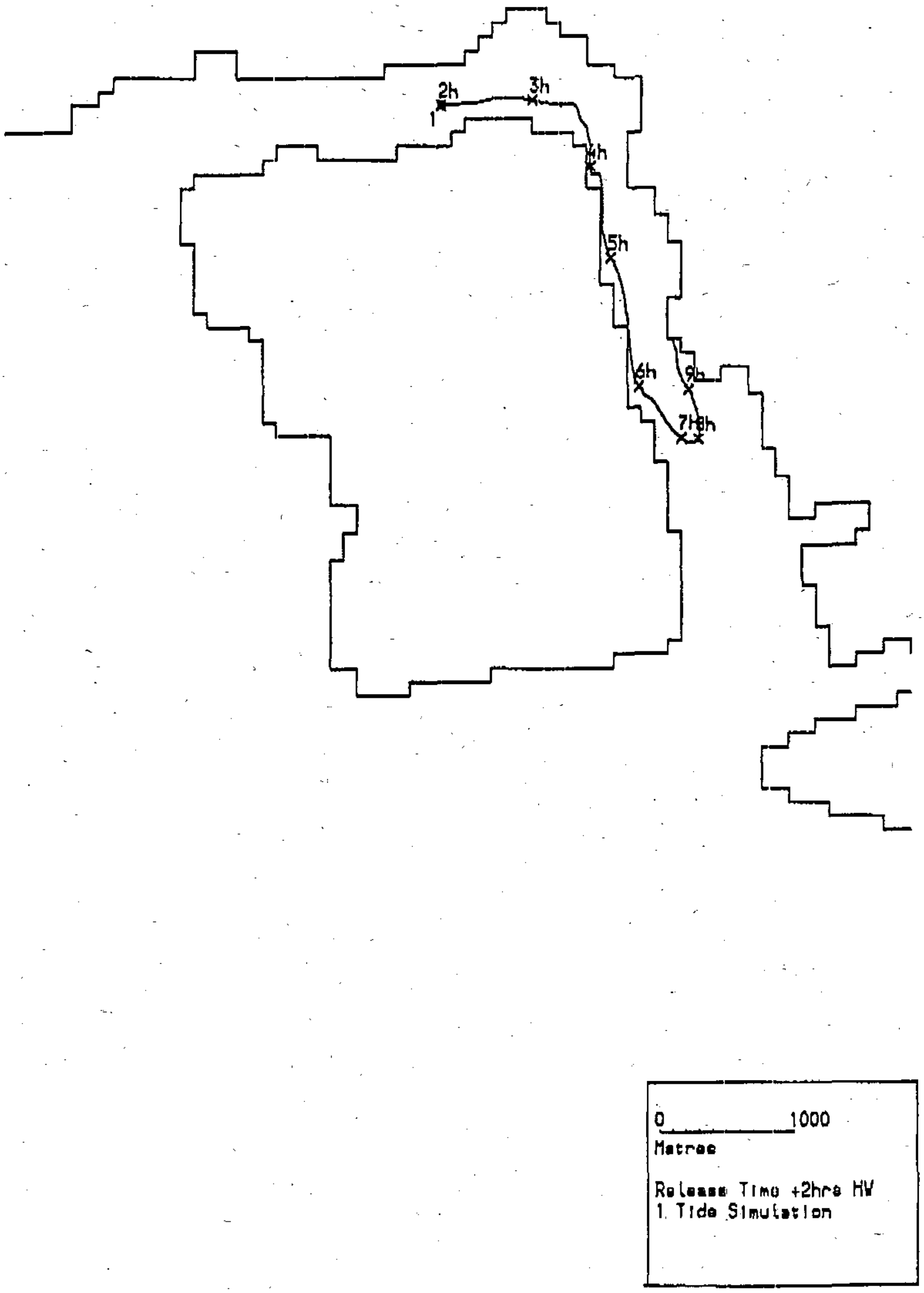
Figure No. F-2.4



North Tsing Yi Reclamation Simulated Float Tracks Wet Season Spring Tide Surface Layer

Mouchel

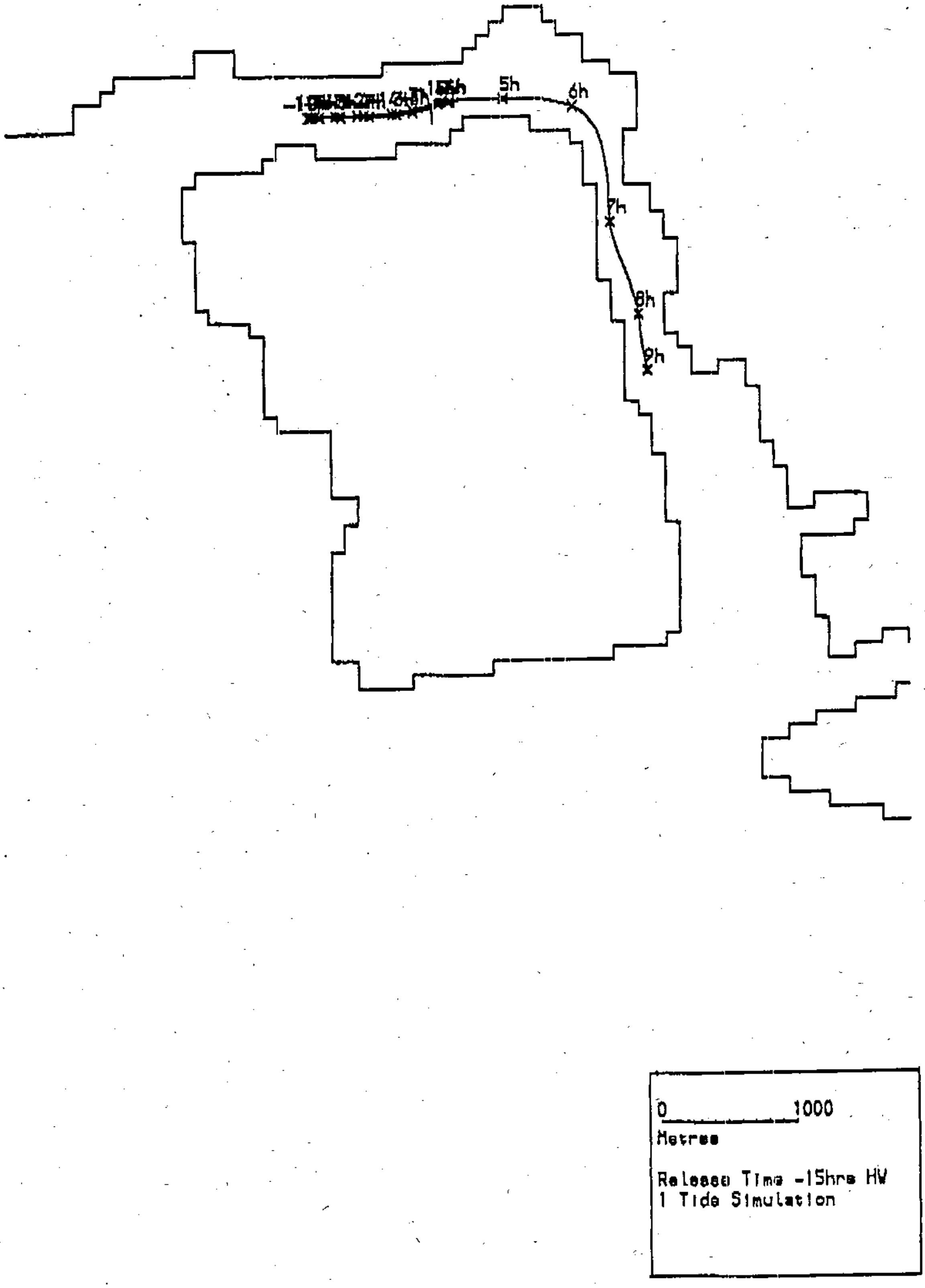
Figure No. F-2.5



North Tsing Yi Reclamation Simulated Float Tracks Wet Season Spring Tide Bed Layer

Mouchel

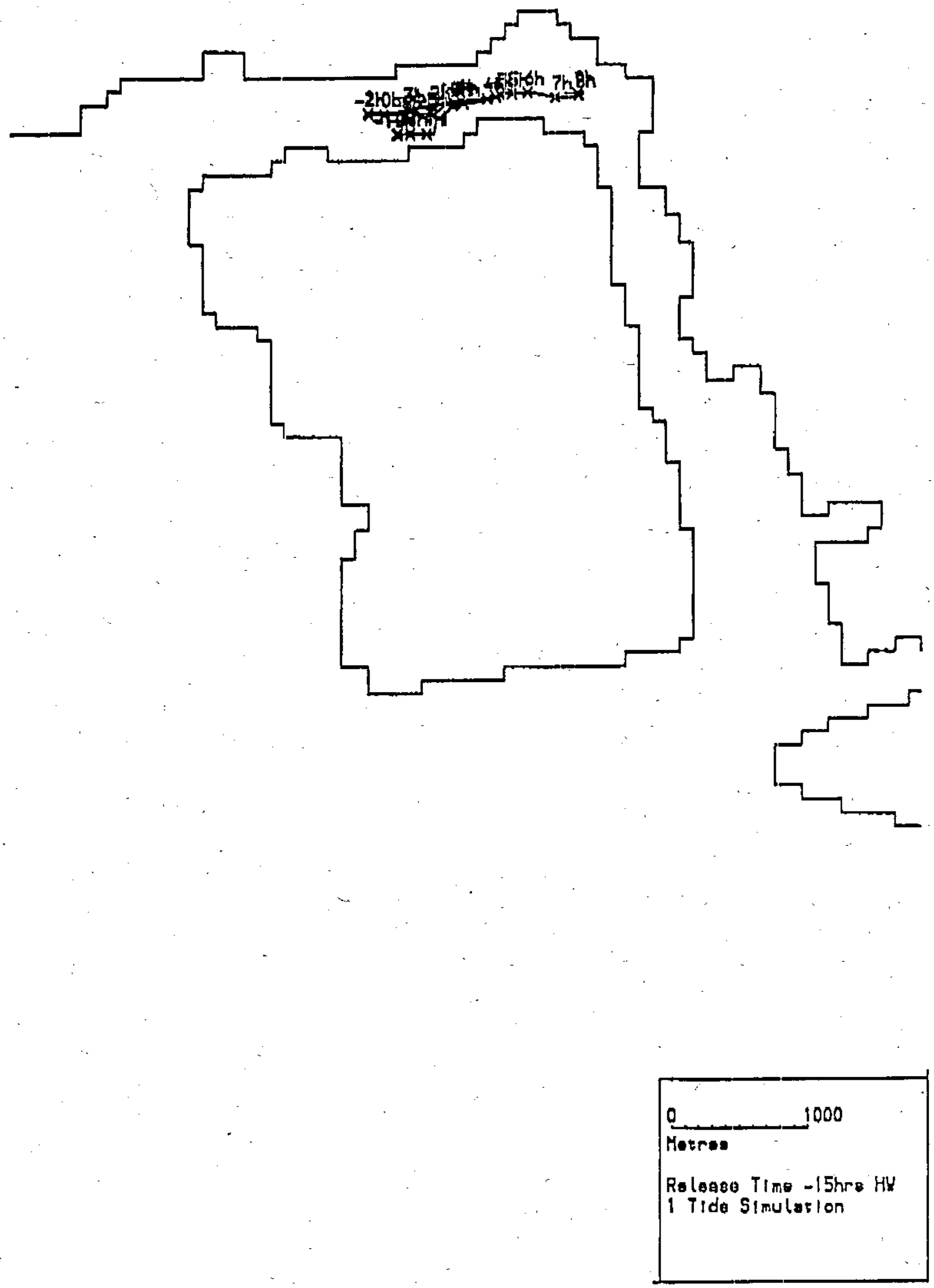
Figure No. F-2.6



North Tsing Yi Reclamation Simulated Float Tracks Wet Season Neap Tide Surface Layer

Mouchel

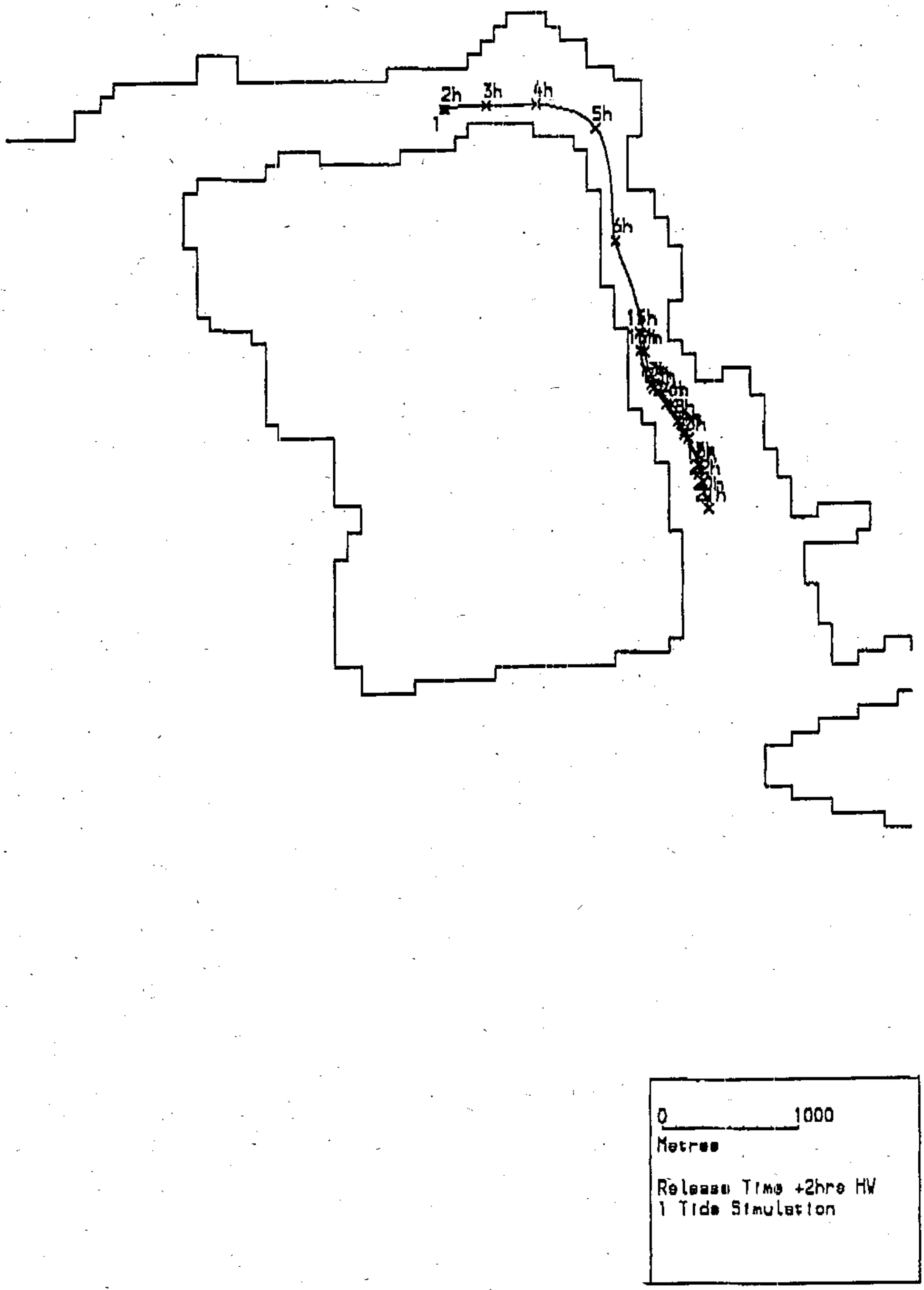
Figure No. F-2.7



North Tsing Yi Reclamation Simulated Float Tracks Wet Season Neap Tide Bed Layer

Mouchel

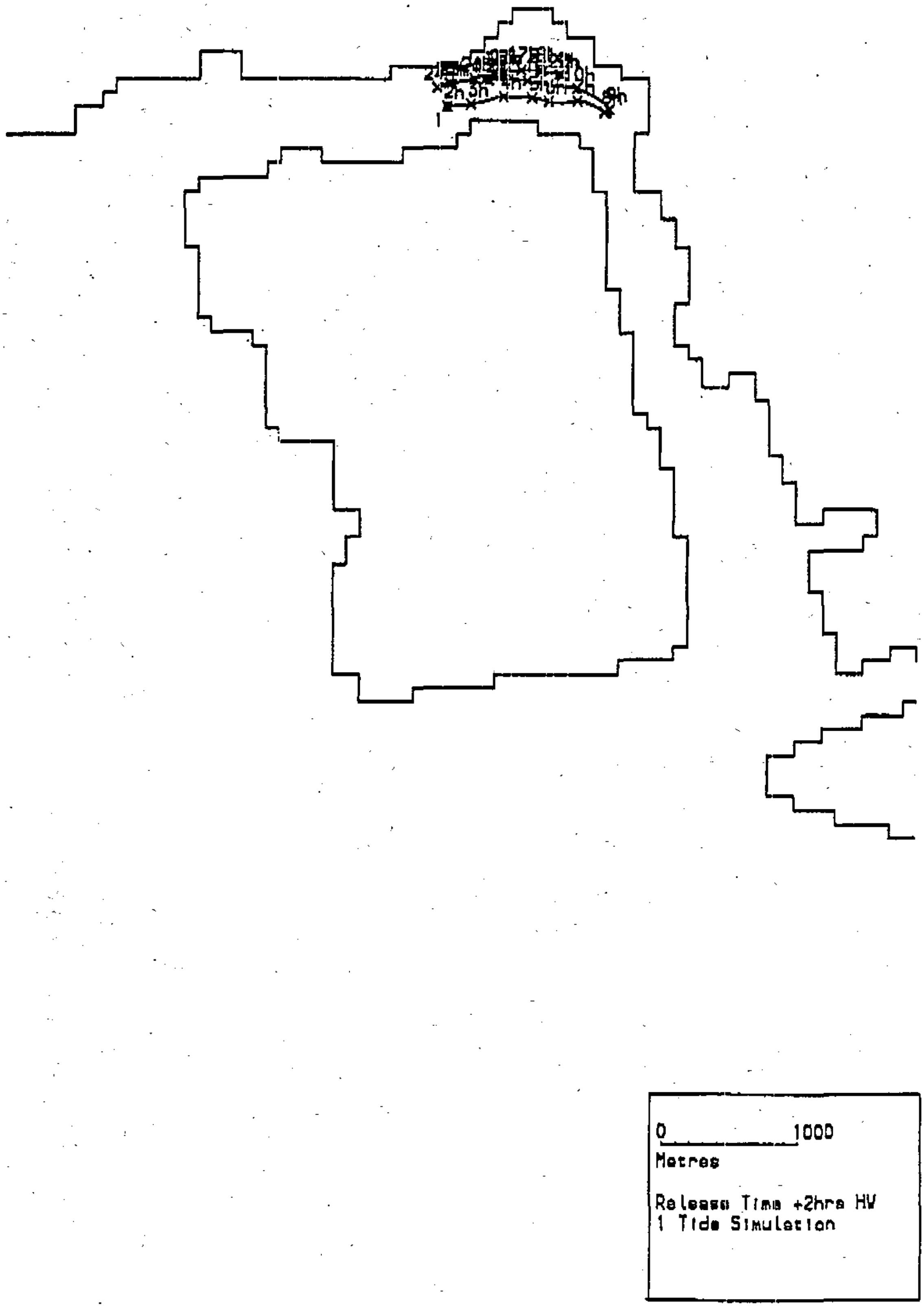
Figure No. F-2.8



North Tsing Yi Reclamation Simulated Float Tracks Wet Season Neap Tide Surface Layer

Mouchel

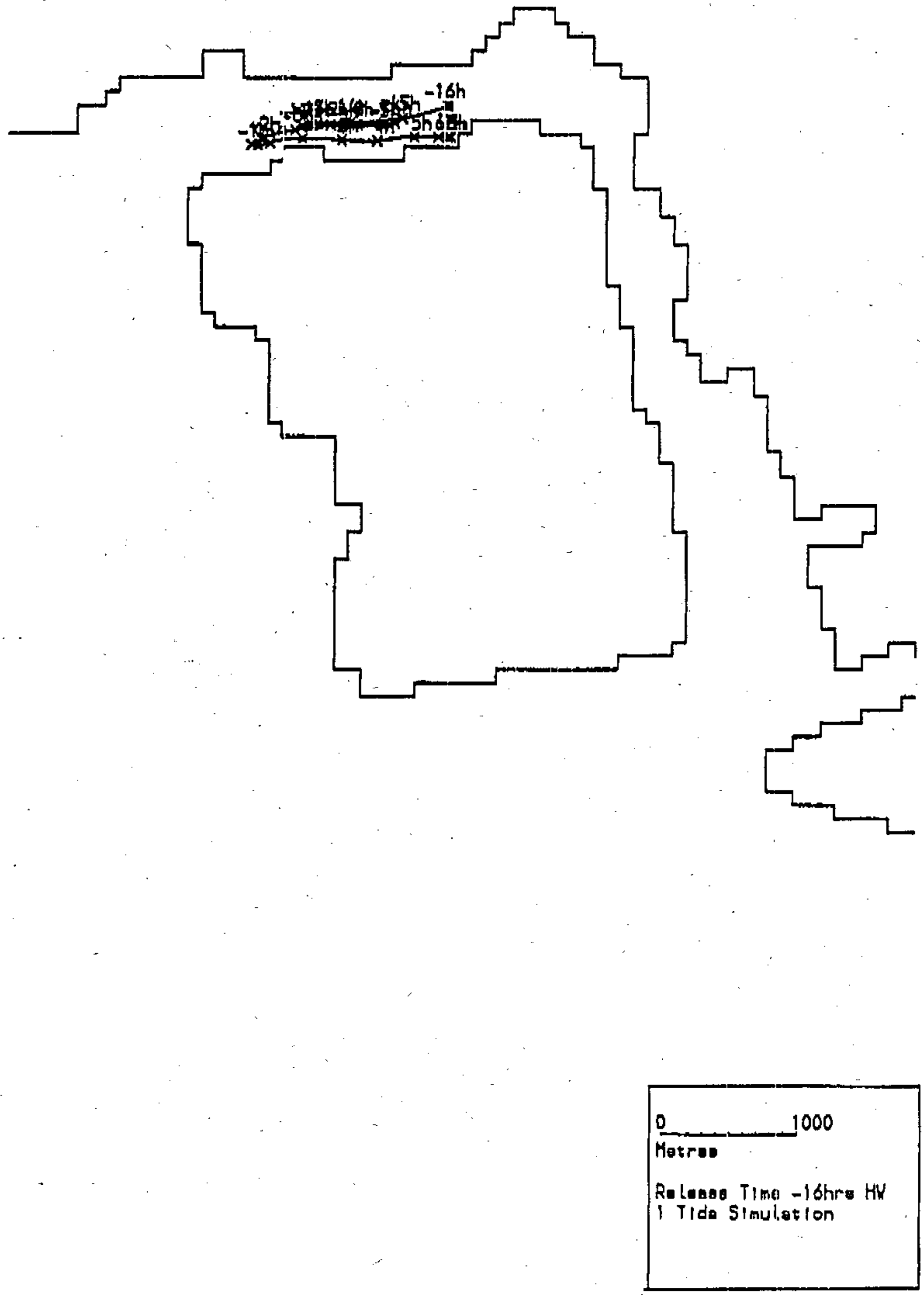
Figure No. F-2.9



North Tsing Yi Reclamation Simulated Float Tracks Wet Season Neap Tide Bed Layer

Mouchel

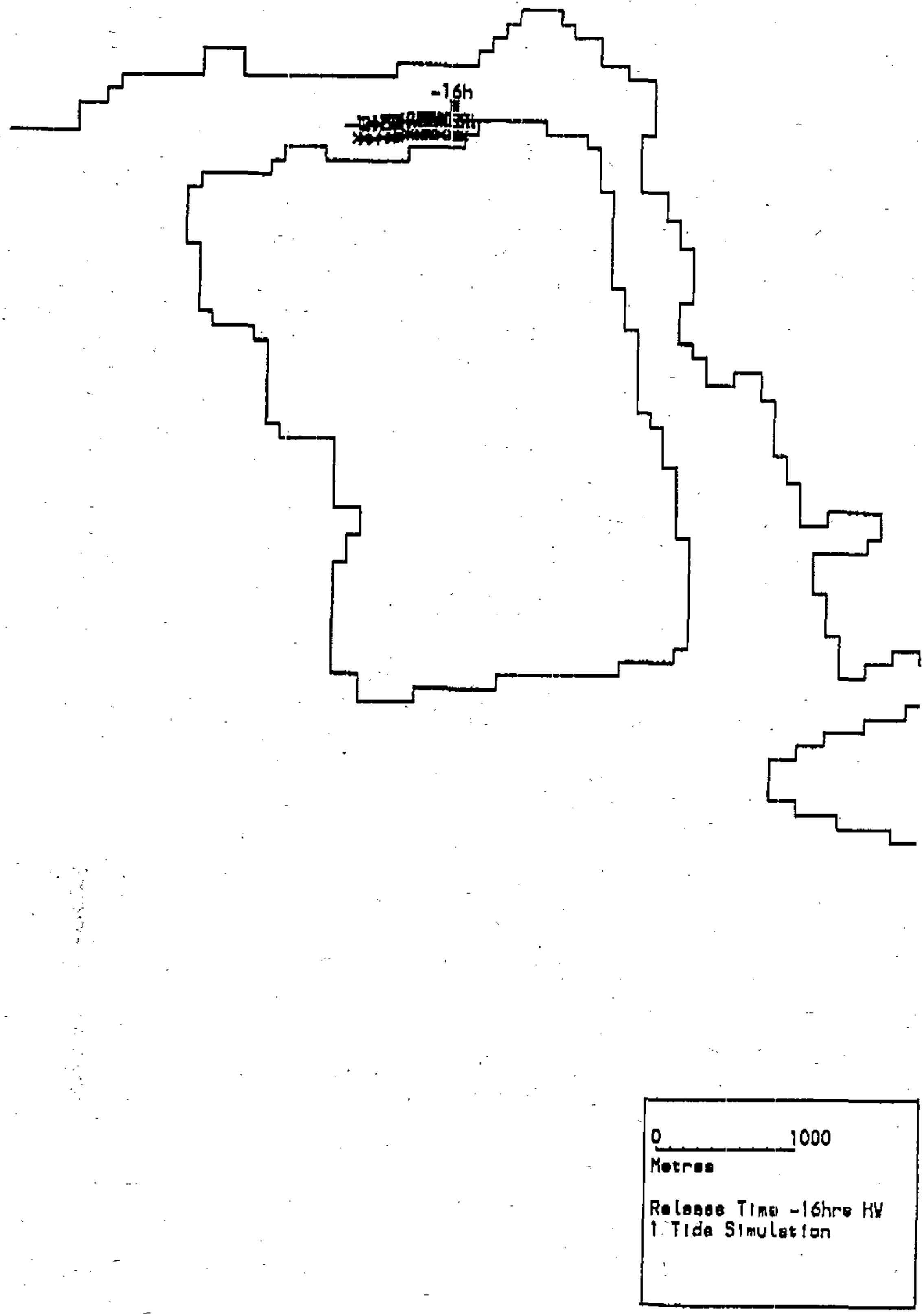
Figure No. F-2.10



North Tsing Yi Reclamation Simulated Float Tracks Dry Season Spring Tide Surface Layer

Mouchel

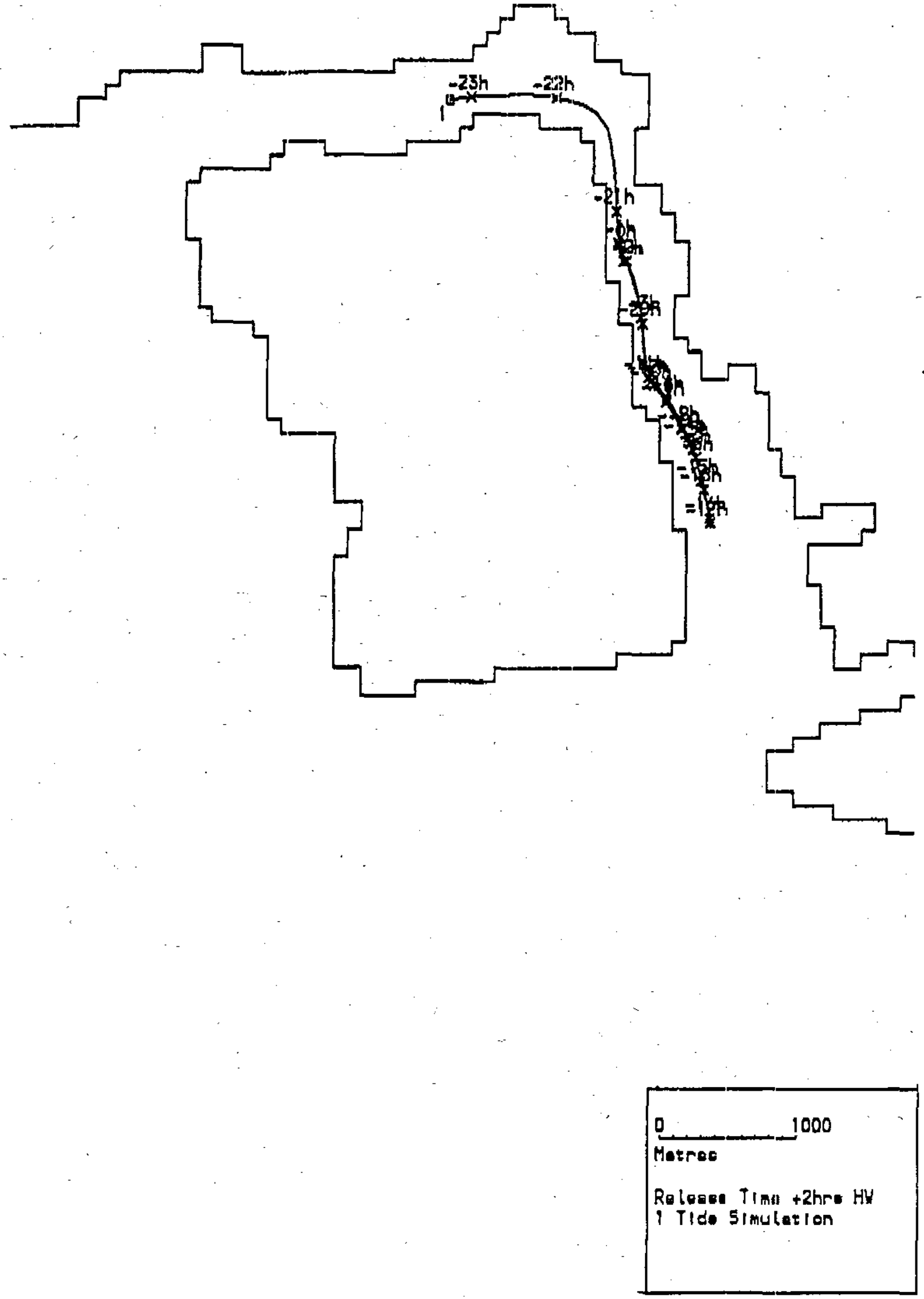
Figure No. F-2.11



North Tsing Yi Reclamation Simulated Float Tracks Dry Season Spring Tide Bed Layer

Mouchel

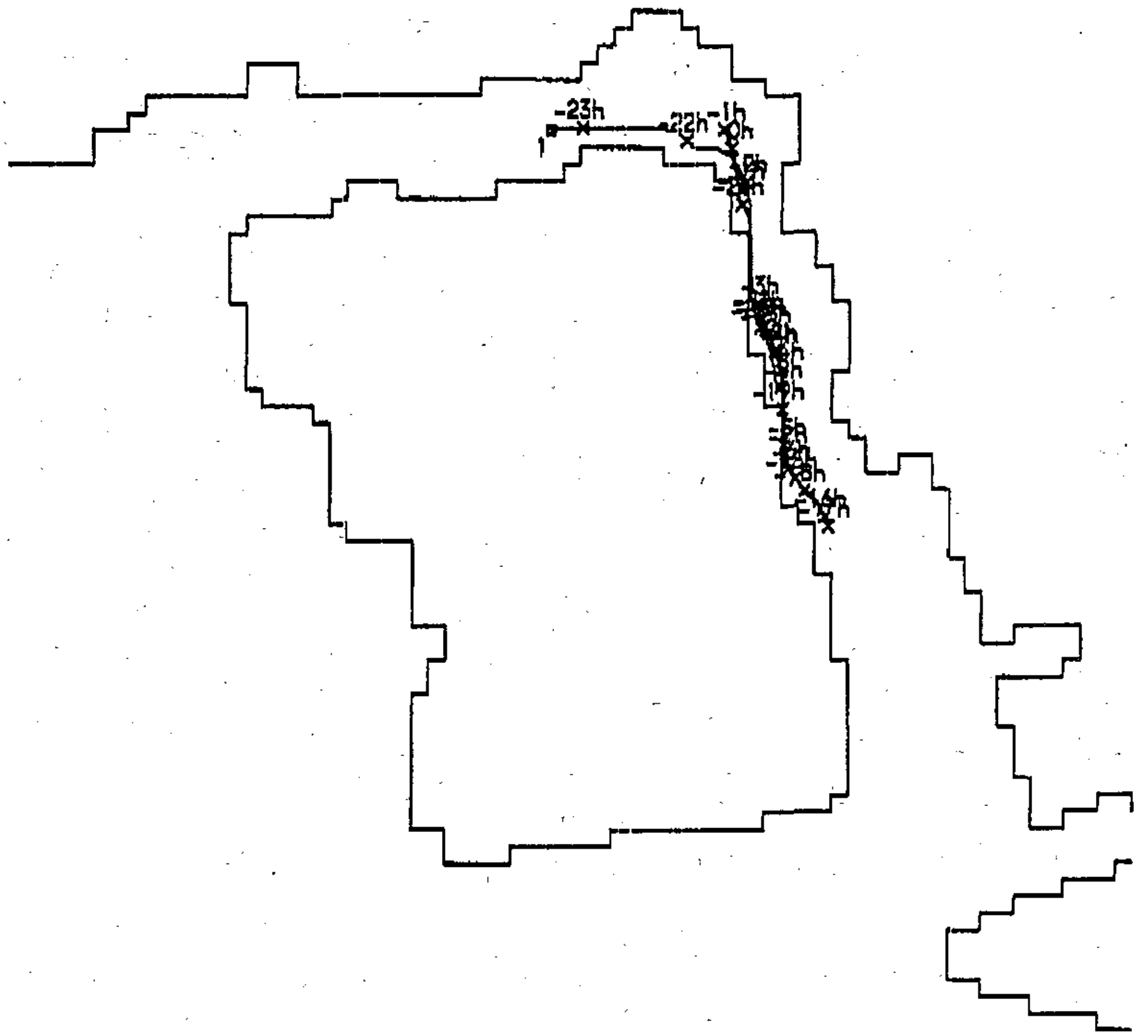
Figure No. F-2.12



North Tsing Yi Reclamation Simulated Float Tracks Dry Season Spring Tide Surface Layer

Mouchel

Figure No. F-2.13



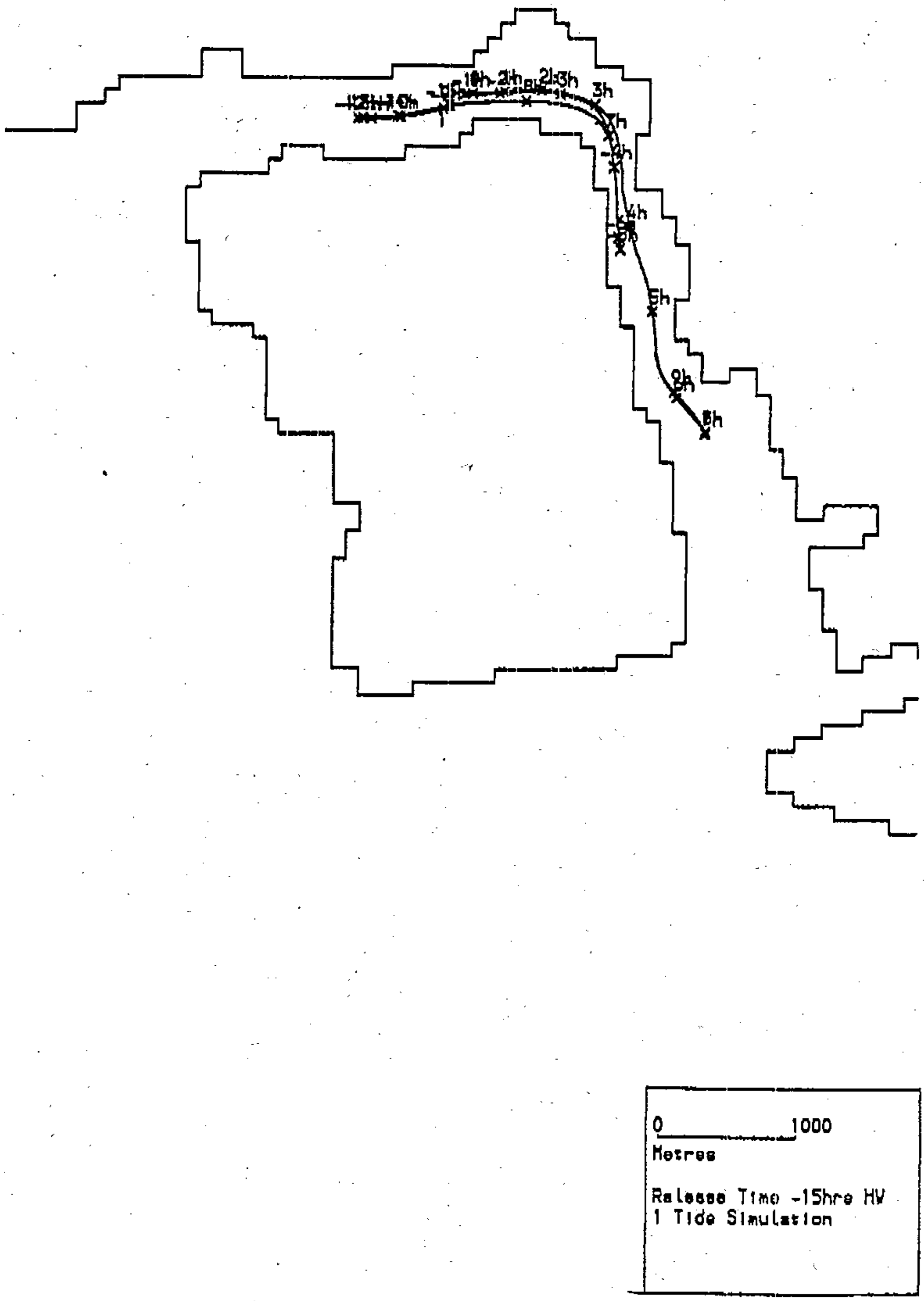
0 1000
Metres

Release Time +2hrs HW
1 Tide Simulation

North Tsing Yi Reclamation Simulated Float Tracks Dry Season Spring Tide Bed Layer

Mouchel

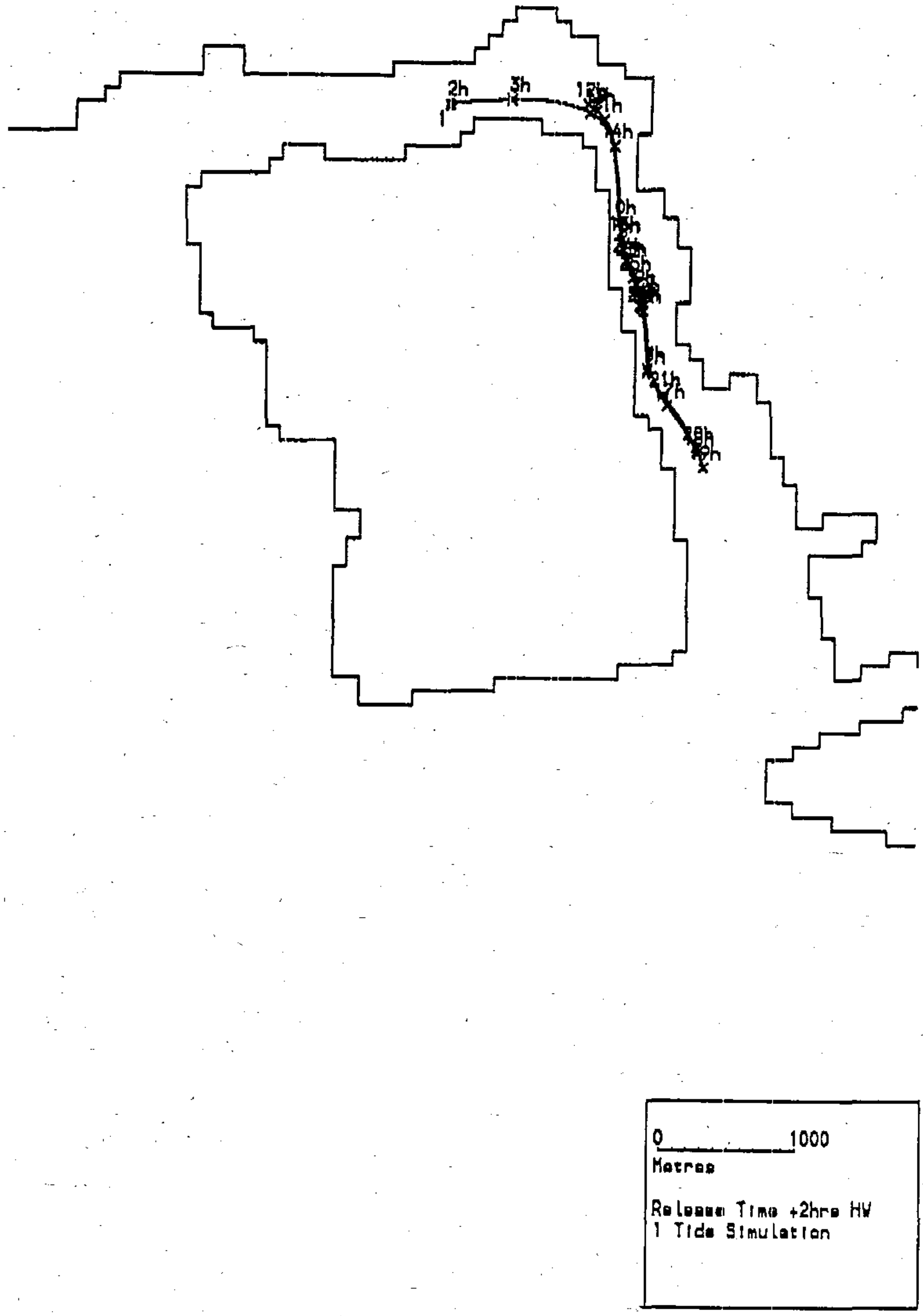
Figure No. F-2.14



North Tsing Yi Reclamation Simulated Float Tracks Dry Season Neap Tide Surface Layer

Mouchel

Figure No. F-2.15



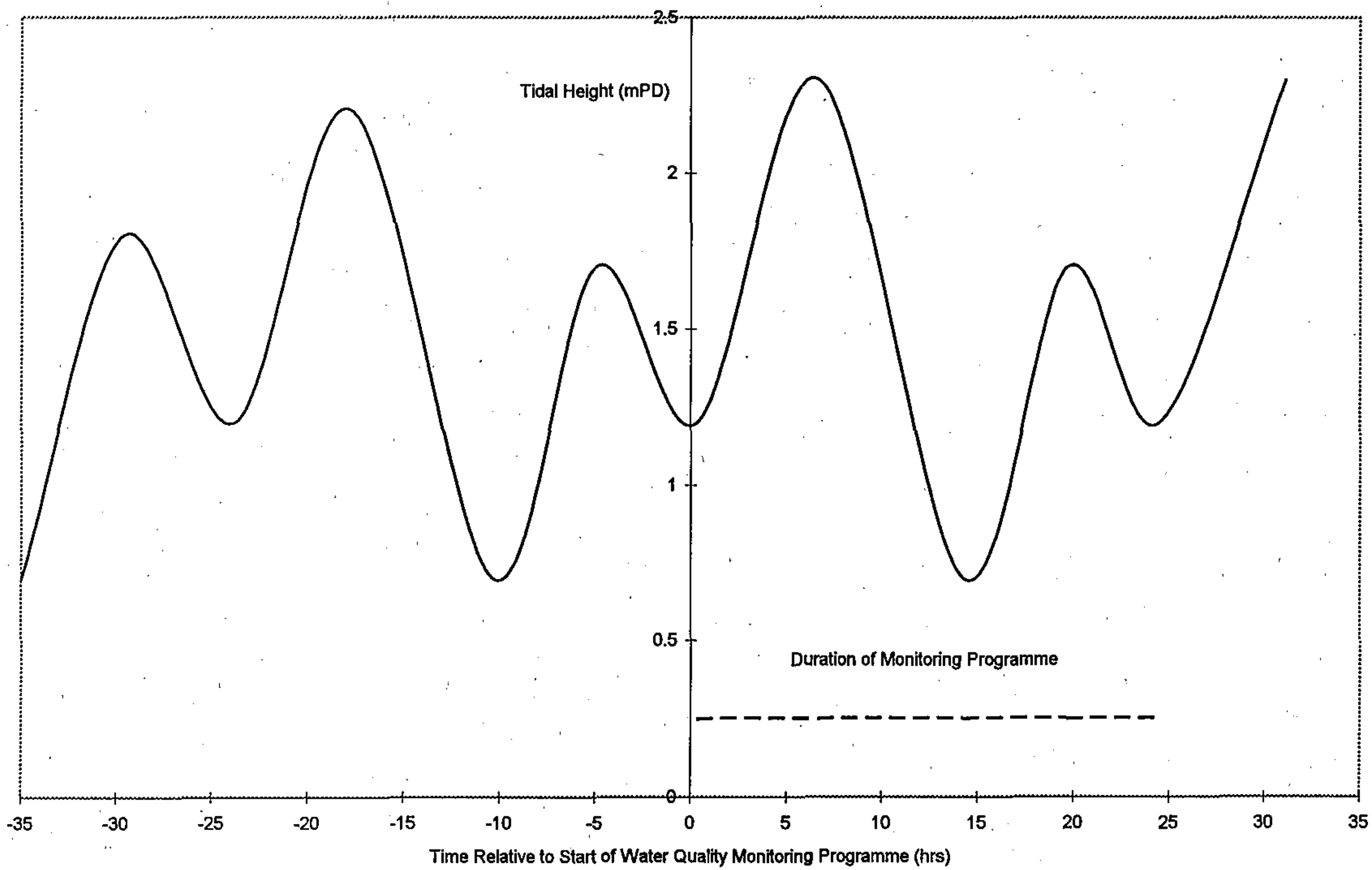
North Tsing Yi Reclamation Simulated Float Tracks Dry Season Neap Tide Surface Layer

Mouchel

Figure No. F-2.16

Appendix F-3

Variation in Predicted Tidal Height at Quarry Bay Gauging Station



Variation in Predicted Tidal Height at Quarry Bay Gauging Station

Mouchel

Figure No. F-3.1

Appendix F-4

Results of Marine Water Quality Sampling Programme

North Tsing Yi - Marine Water Quality Survey

Time	Site	Sea Bed Level	Depth	Temp	Salinity	Suspended Solids		Dissolved Oxygen	
		m	m	Deg C	ppt	NTU	mg/l	mg/l	% sat
20 October 1994									
15:00	P	11	10	27.3	32.6	8	12	5.2	79
			6	27.1	32.0	6	12	5.2	79
			1	27.1	32.0	6	10	5.3	80
17:20	P	11	10	27.3	32.8	11	14	5.5	83
			5	27.0	32.2	6	11	5.6	84
			1	27.0	32.1	6	10	5.7	86
18:59	P	11	10	27.2	32.5	6	15	4.8	73
			6	27.1	32.2	5	12	4.5	67
			1	27.0	32.0	4	11	4.1	62
21:00	P	12	11	27.1	32.4	15	18	3.5	52
			6	27.1	32.4	6	13	3.5	53
			1	27.0	32.4	6	13	3.6	54
22:55	P	12	11	27.1	33.3	18	11	5.0	76
			6	26.9	32.4	4	12	3.6	55
			1	27.0	32.4	4	11	3.5	54
21 October 1994									
1:38	P	13	12	27.0	33.7	9	14	5.2	79
			7	26.8	33.5	5	11	5.3	81
			1	26.8	33.3	5	10	5.3	80
3:00	P	12	11	26.8	33.2	9	17	5.3	80
			6	26.8	33.1	9	20	5.4	81
			1	26.7	33.1	8	19	5.4	81
5:42	P	12	11	26.7	33.1	11	21	5.3	80
			6	26.6	33.1	8	14	5.4	81
			1	26.6	33.0	8	14	5.5	83
7:00	P	11	10	26.6	33.6	27	21	5.3	79
			5	26.5	33.4	7	13	5.2	79
			1	26.4	33.1	5	9	5.0	75
9:05	P	12	11	26.7	33.1	15	20	4.4	66
			6	26.7	32.9	11	19	4.1	62
			1	26.7	32.8	8	16	3.8	57
10:51	P	10	9	26.7	32.7	11	28	4.0	59
			5	26.7	32.7	7	15	4.0	60
			1	26.6	32.8	6	12	4.0	60
13:14	P	11	10	26.6	33.1	15	11	5.2	77
			5	26.7	32.7	4	11	4.2	63
			1	26.7	32.8	4	10	4.2	63
15:04	P	11	10	26.6	33.5	6	9	5.6	84
			5	26.6	33.2	4	10	5.3	79
			1	26.6	33.1	4	8	5.1	77

North Tsing Yi - Marine Water Quality Survey

Time		Sea Bed Level	Depth	Temp	Salinity	Suspended Solids		Dissolved Oxygen	
		m	m	Deg C	ppt	NTU	mg/l	mg/l	% sat
20 October 1994									
15:06	Q	16	15	27.3	32.9	18	21	5.3	80
			8	27.2	32.3	5	11	5.4	81
			1	27.1	32.2	5	10	5.2	79
17:29	Q	16	15	27.3	32.8	16	28	6.0	91
			8	27.1	32.4	5	10	5.7	86
			1	27.0	31.9	4	10	4.7	70
19:11	Q	14	13	27.2	32.2	24	42	3.6	54
			7	27.1	32.2	15	21	3.5	53
			1	27.1	32.2	10	18	3.7	55
21:10	Q	14	13	27.1	32.4	11	17	3.6	54
			7	27.0	32.2	6	13	3.7	56
			1	27.0	32.2	5	12	3.8	57
23:07	Q	14	13	27.0	32.3	4	10	4.1	62
			7	27.0	32.3	4	12	3.4	51
			1	26.0	32.3	4	12	3.4	51
21 October 1994									
1:28	Q	17	16	27.1	33.6	17	22	5.8	89
			9	26.9	33.2	4	11	5.2	79
			1	26.6	32.6	4	9	4.3	64
3:09	Q	15	14	26.8	33.6	11	17	5.4	81
			8	26.7	33.4	8	15	5.3	81
			1	26.6	33.0	7	9	5.4	82
5:31	Q	10	9	26.7	33.1	7	13	5.3	80
			5	26.6	33.1	7	12	5.3	80
			1	26.5	33.0	6	10	5.1	77
7:11	Q	12	11	26.7	33.4	11	18	5.1	76
			6	26.3	33.0	4	8	4.7	70
			1	26.2	33.0	4	13	4.5	68
9:16	Q	14	13	26.7	32.9	14	19	4.0	59
			7	26.7	32.9	11	17	4.0	60
			1	26.7	32.9	8	18	4.0	60
11:00	Q	14	13	26.7	32.8	12	22	4.1	62
			7	26.7	32.8	8	19	4.2	62
			1	26.6	32.8	7	19	4.1	62
13:26	Q	17	16	26.7	32.8	9	13	4.0	61
			8	26.7	32.9	5	14	4.2	63
			1	26.7	32.9	5	11	4.2	63
15:13	Q	17	16	26.6	33.5	28	37	5.3	80
			8	26.6	33.0	5	9	4.9	74
			1	26.5	32.9	4	11	4.8	72

North Tsing Yi - Marine Water Quality Survey

Time		Sea Bed Level	Depth	Temp	Salinity	Suspended Solids		Dissolved Oxygen	
		m	m	Deg C	ppt	NTU	mg/l	mg/l	% sat
20 October 1994									
15:13	R	13	12	27.3	32.8	16	22	5.6	85
			7	27.3	32.4	6	12	5.3	79
			1	27.1	31.9	4	10	5.1	77
17:40	R	13	12	27.0	32.0	15	11	4.6	70
			7	27.1	32.0	4	10	4.5	67
			1	27.1	31.9	4	11	4.2	64
19:20	R	13	12	27.2	32.3	9	66	3.3	50
			7	27.1	32.0	7	16	3.8	57
			1	27.0	31.9	6	15	3.6	54
21:20	R	15	14	27.1	32.3	6	13	3.9	58
			8	27.1	32.0	5	12	4.0	60
			1	27.0	32.0	5	14	3.9	59
23:14	R	14	13	27.0	32.2	5	13	3.3	50
			7	27.0	32.2	4	12	3.3	50
			1	26.9	32.4	4	11	3.6	54
21 October 1994									
1:20	R	13	12	27.1	33.5	15	33	5.2	79
			7	27.0	33.1	5	13	4.7	71
			1	26.8	32.4	4	10	3.9	58
3:17	R	13	12	26.7	33.5	9	11	5.5	84
			7	26.7	33.4	5	16	5.3	81
			1	26.6	33.1	6	12	5.4	82
5:23	R	13	12	26.7	33.3	9	14	5.3	80
			7	26.6	33.0	7	11	5.3	80
			1	26.4	32.8	5	10	4.9	74
7:19	R	13	12	26.6	33.0	27	47	4.3	65
			7	26.7	32.8	16	29	4.0	61
			1	26.7	32.9	11	20	3.9	59
9:24	R	15	12	26.8	33.0	15	32	3.9	59
			7	26.7	32.9	17	25	4.0	60
			1	26.7	32.9	12	20	4.1	61
11:07	R	13	12	26.6	32.8	12	19	4.3	64
			7	26.6	32.8	9	19	4.4	66
			1	26.6	32.8	8	15	4.3	64
13:31	R	13	12	26.6	32.9	8	13	4.2	63
			6	26.7	32.3	5	11	4.2	63
			1	26.7	32.8	5	13	4.1	62
15:20	R	13	12	26.6	33.4	23	24	5.2	78
			6	26.6	32.9	4	9	4.7	70
			1	26.5	32.9	4	9	4.8	71

North Tsing Yi - Marine Water Quality Survey

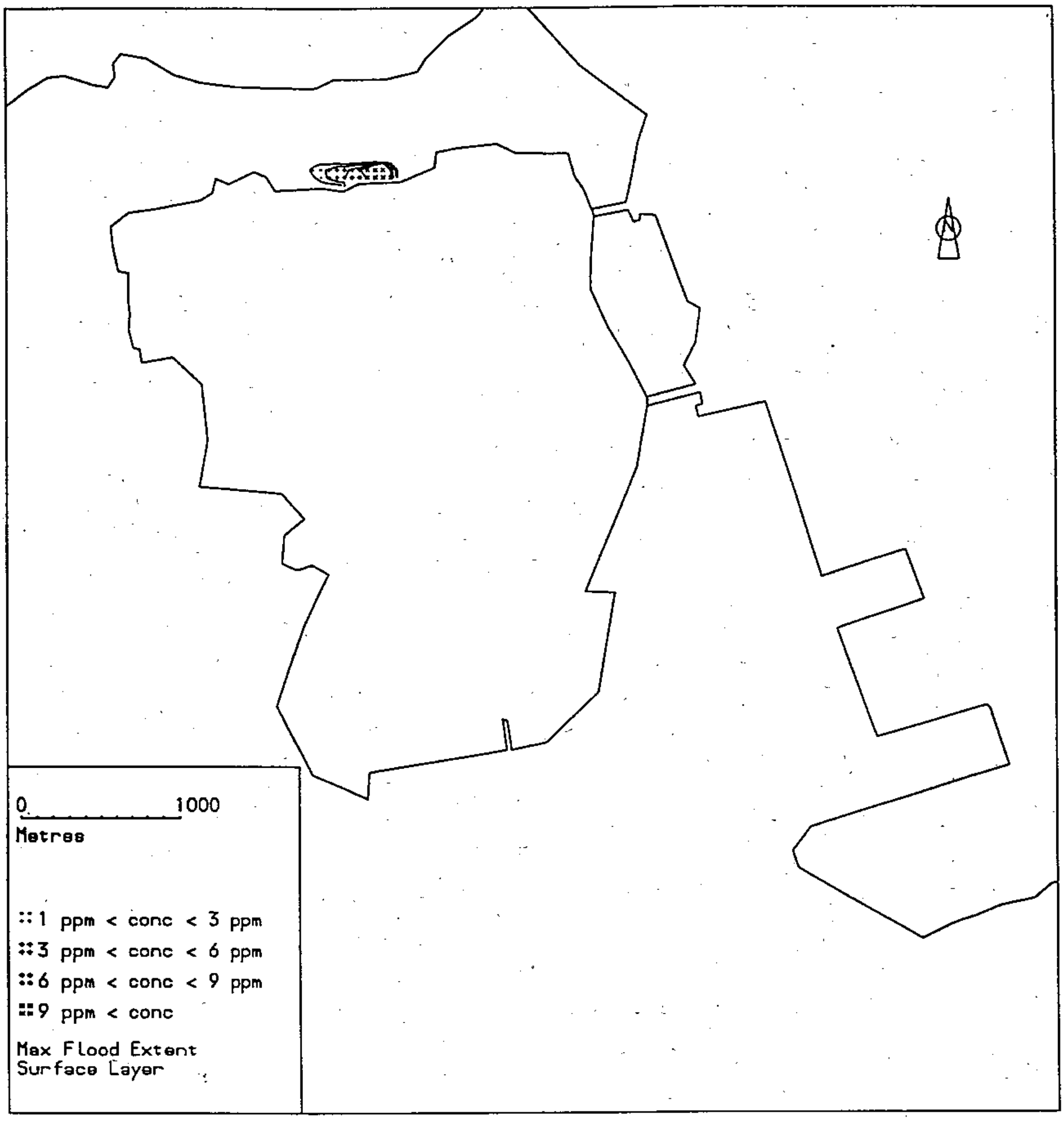
Time		Sea Bed Level	Depth	Temp	Salinity	Suspended Solids		Dissolved Oxygen	
		m	m	Deg C	ppt	NTU	mg/l	mg/l	% sat
20 October 1994									
15:26	S	12	11	27.2	32.0	14	23	4.3	65
			6	27.2	31.9	6	12	4.6	69
			1	27.1	31.8	4	11	4.3	65
17:52	S	12	11	27.2	31.9	8	16	3.7	56
			6	27.2	32.0	7	15	3.8	58
			1	27.1	31.9	6	15	3.8	57
19:33	S	12	11	27.1	32.2	8	15	3.4	51
			6	27.1	32.1	7	16	3.4	50
			1	27.1	32.0	7	17	3.4	51
21:30	S	13	12	27.1	32.5	4	12	3.7	56
			7	27.1	32.3	5	11	3.6	54
			1	27.0	32.2	4	11	3.6	54
23:24	S	13	12	27.0	32.3	5	18	3.5	53
			7	27.0	32.2	5	10	4.0	60
			1	27.0	32.2	4	14	4.0	60
21 October 1994									
1:11	S	13	12	27.1	32.5	6	12	3.3	49
			7	26.8	32.3	4	10	3.4	51
			1	26.7	32.3	3	10	3.3	50
3:28	S	12	11	26.8	33.4	14	21	5.2	78
			6	26.7	33.4	12	9	5.2	78
			1	26.5	32.7	4	8	4.2	63
5:13	S	12	11	26.7	33.5	9	9	5.2	79
			6	26.4	32.9	5	10	5.0	75
			1	26.1	32.7	4	7	4.2	63
7:30	S	12	11	26.8	32.9	9	20	3.7	56
			6	26.7	32.8	8	16	3.6	54
			1	26.7	32.7	7	14	3.6	54
9:34	S	12	11	26.7	32.9	9	20	3.8	57
			6	26.6	32.9	9	22	3.8	58
			1	26.6	32.8	8	14	4.0	59
11:17	S	12	11	26.7	32.9	7	14	3.9	59
			6	26.6	32.7	6	15	3.9	59
			1	26.6	32.9	6	12	4.0	59
13:40	S	12	11	26.6	32.9	8	15	3.9	58
			6	26.6	32.9	6	12	3.9	58
			1	26.6	32.7	4	8	3.8	58
15:30	S	11	10	26.6	32.8	6	13	4.0	61
			5	26.6	32.8	4	9	4.2	63
			1	26.6	32.7	4	9	4.0	61

North Tsing Yi - Marine Water Quality Survey

Time		Sea Bed Level	Depth	Temp	Salinity	Suspended Solids		Dissolved Oxygen	
		m	m	Deg C	ppt	NTU	mg/l	mg/l	% sat
20 October 1994									
15:35	T	16	15	27.2	31.8	7	5	4.7	70
			8	27.3	31.8	6	14	3.9	59
			1	27.2	31.7	5	12	4.0	60
18:02	T	16	15	27.3	32.4	10	29	3.6	55
			8	27.2	32.4	6	13	4.0	60
			1	27.2	32.3	6	17	3.6	55
19:43	T	13	12	27.2	32.7	7	13	3.9	59
			7	27.1	32.4	5	12	3.6	55
			1	27.1	32.3	4	10	3.6	55
21:40	T	13	12	27.2	32.9	5	13	4.7	71
			7	27.2	32.6	4	11	4.0	61
			1	27.2	32.3	4	10	3.5	53
23:33	T	13	12	27.1	32.4	4	10	3.5	52
			7	27.0	32.3	4	14	3.6	55
			1	26.0	32.1	4	11	3.5	53
21 October 1994									
1:00	T	15	14	27.0	32.5	5	32	3.3	50
			8	27.0	32.4	7	14	3.4	52
			1	26.8	32.2	6	16	3.4	51
3:38	T	13	12	26.9	33.3	11	19	4.8	72
			7	26.8	33.1	9	15	4.5	67
			1	26.8	33.0	6	11	4.2	63
5:02	T	14	12	26.8	33.5	7	12	5.0	75
			7	26.5	32.9	4	10	4.3	64
			1	26.6	32.8	4	9	3.8	57
7:43	T	12	11	26.8	33.0	8	15	3.7	56
			6	26.8	32.9	6	14	3.7	56
			1	26.7	32.7	6	12	3.6	54
9:43	T	13	12	26.7	33.0	13	21	4.0	60
			6	26.6	33.0	7	14	4.0	59
			1	26.6	33.0	5	14	4.0	59
11:22	T	14	13	26.7	33.1	8	15	4.2	63
			7	26.6	32.9	6	13	4.1	61
			1	26.6	32.9	4	11	4.0	60
13:49	T	15	14	26.6	32.9	7	15	4.0	59
			7	26.6	32.8	6	11	3.9	58
			1	26.7	32.7	4	11	3.9	58
15:39	T	16	15	26.7	32.8	6	13	4.1	62
			7	26.7	32.8	6	13	3.9	59
			1	26.7	32.7	6	11	3.9	59

Appendix F-5

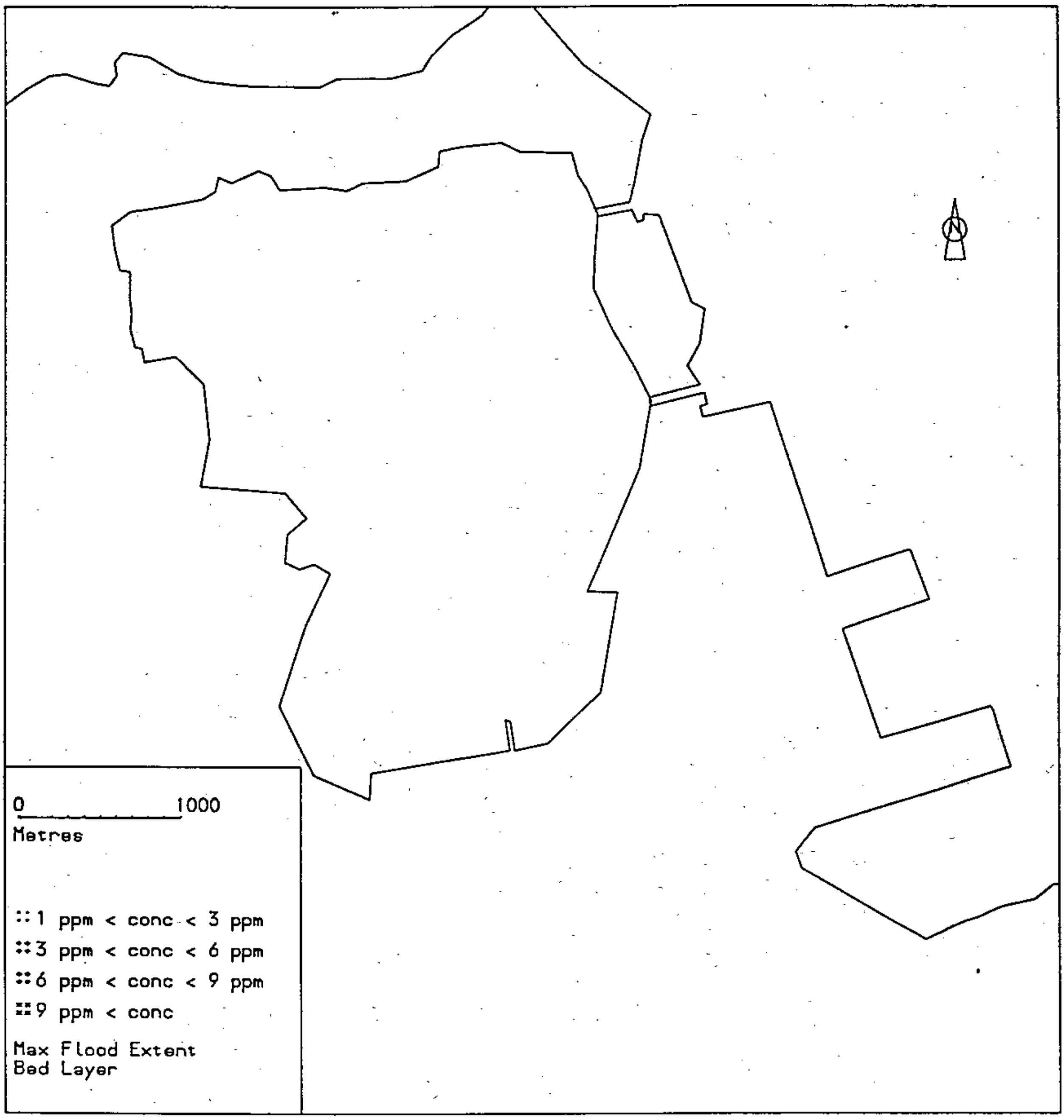
Suspended Solids Simulations



Dredging on Flood Phase of Tide Wet Season Spring Tide
Suspended Solids Concentrations

Mouchel

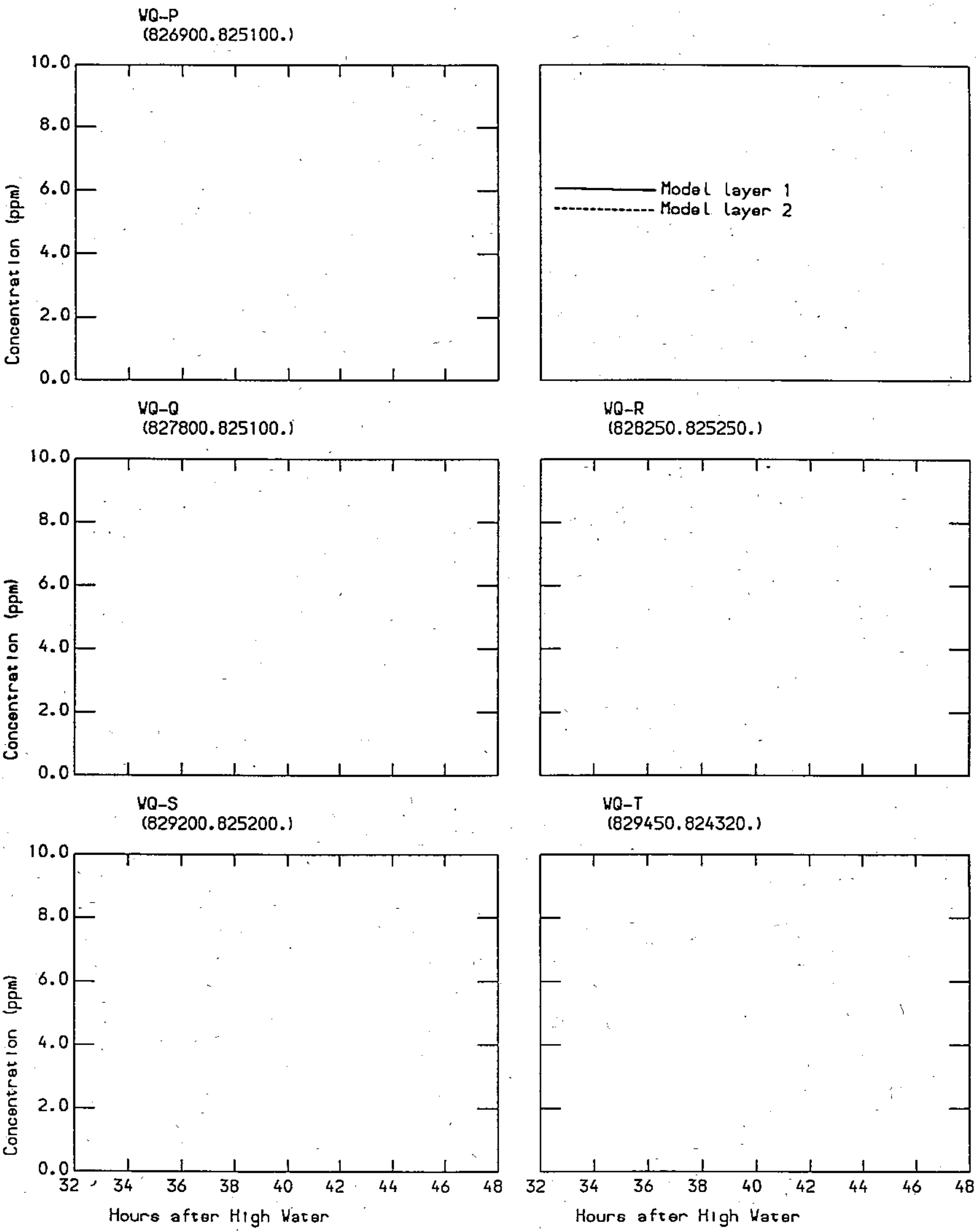
Figure No. F-5.1



Dredging on Flood Phase of Tide Wet Season Spring Tide
Suspended Solids Concentrations

Mouchel

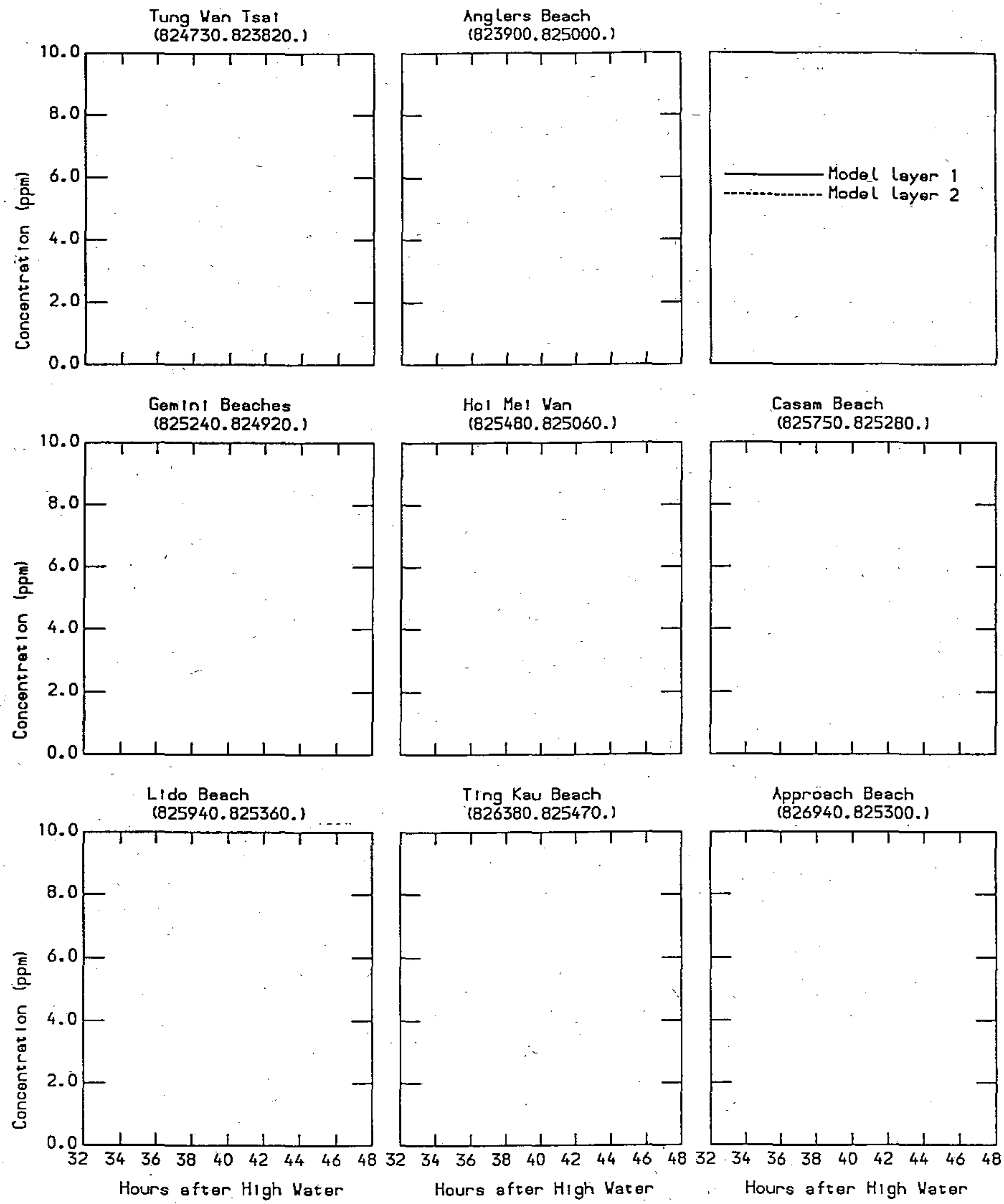
Figure No. F-5.2



Dredging on Flood Phase of Tide Wet Season Spring Tide Suspended Solids Concentrations

Mouchel

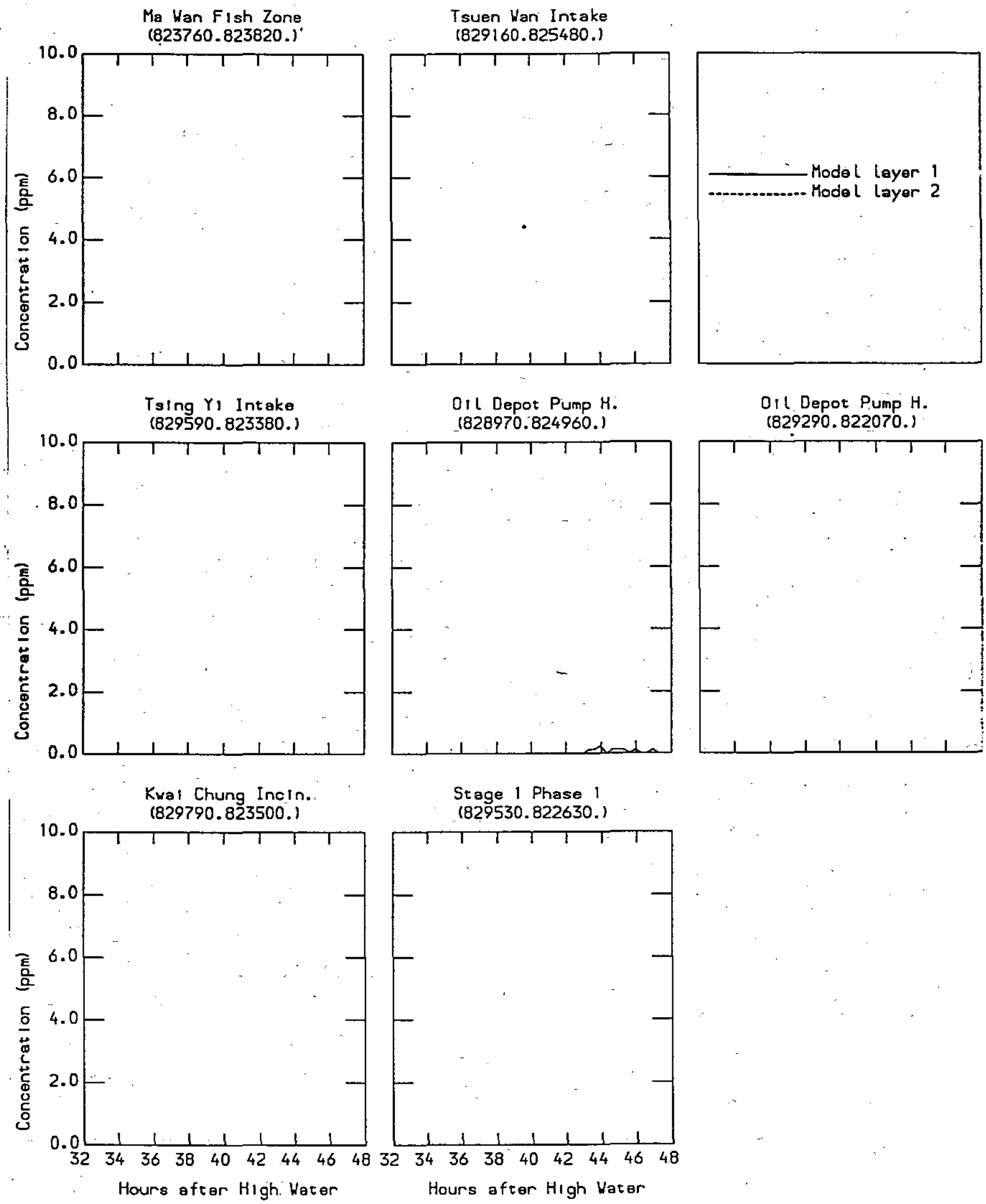
Figure No. **F-5.3**



Dredging on Flood Phase of Tide Wet Season Spring Tide
Suspended Solids Concentrations

Mouchel

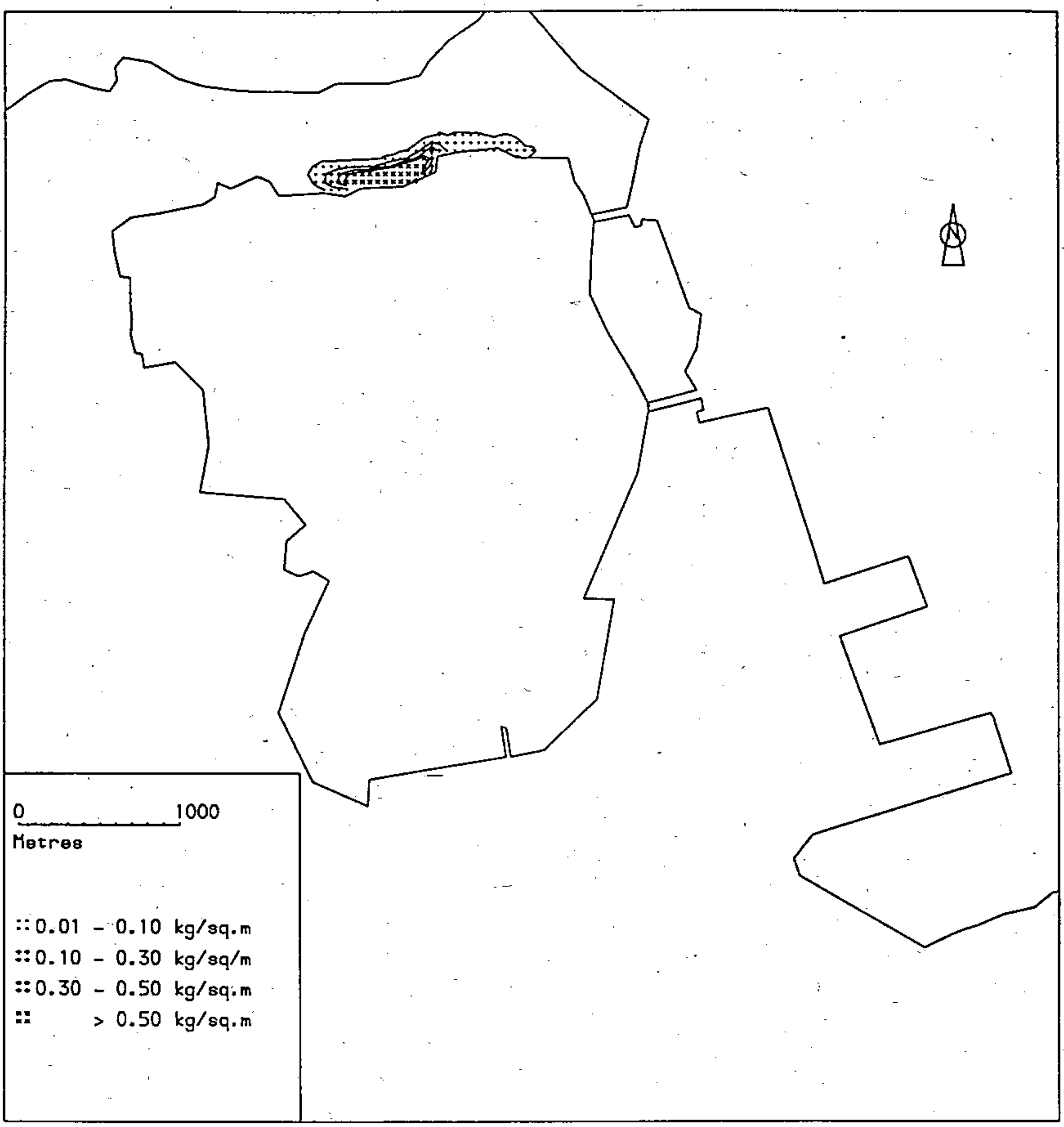
Figure No. F-5.4



Dredging on Flood Phase of Tide Wet Season Spring Tide Suspended Solids Concentrations

Mouchel

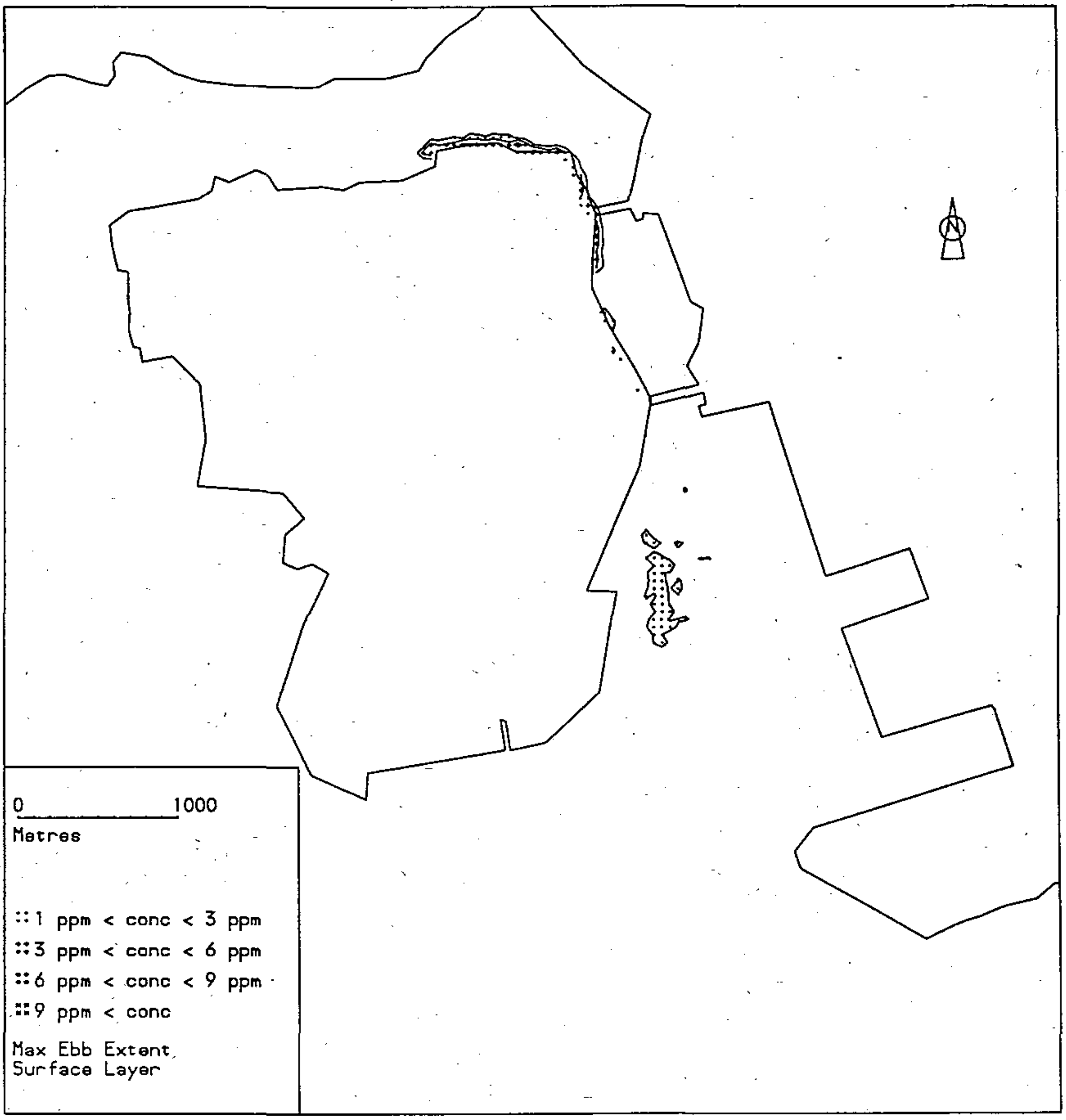
Figure No. **F-5.5**



Dredging on Flood Phase of Tide
Wet Season Spring Tide Bed Deposits

Mouchel

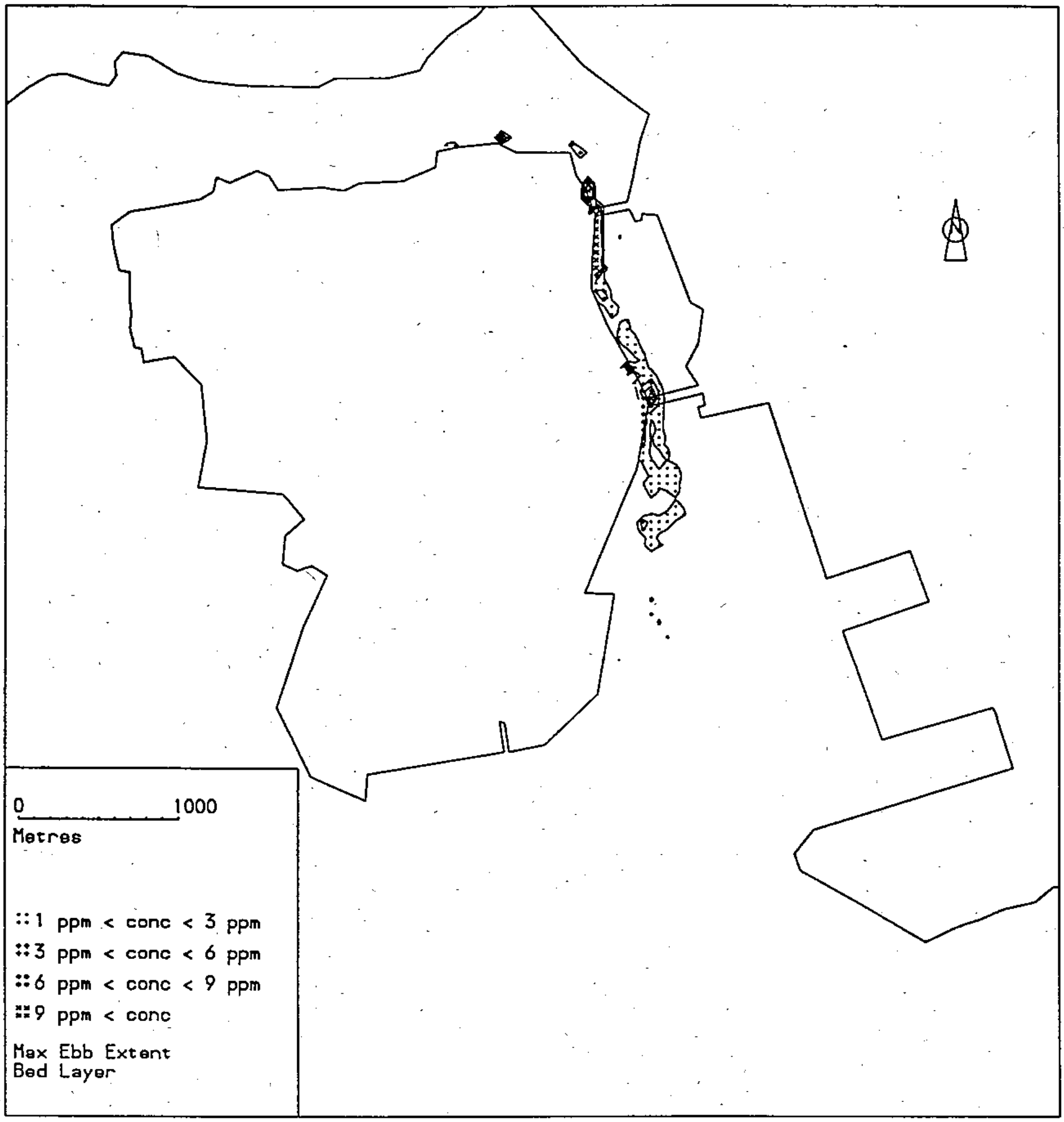
Figure No. F-5.6



Dredging on Ebb Phase of Tide Wet Season Spring Tide
Suspended Solids Concentrations

Mouchel

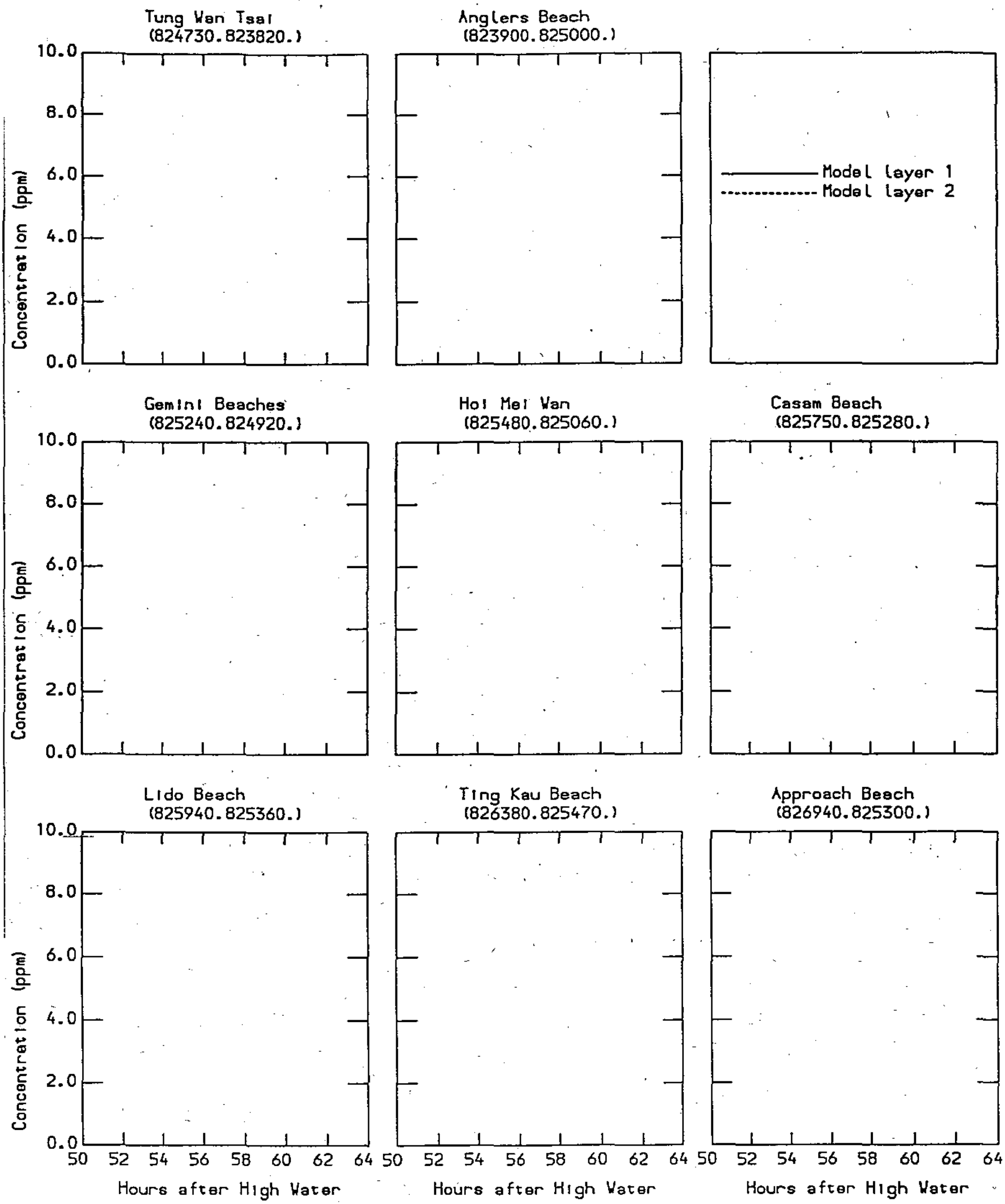
Figure No. F-5.7



Dredging on Ebb Phase of Tide Wet Season Spring Tide
Suspended Solids Concentrations

Mouchel

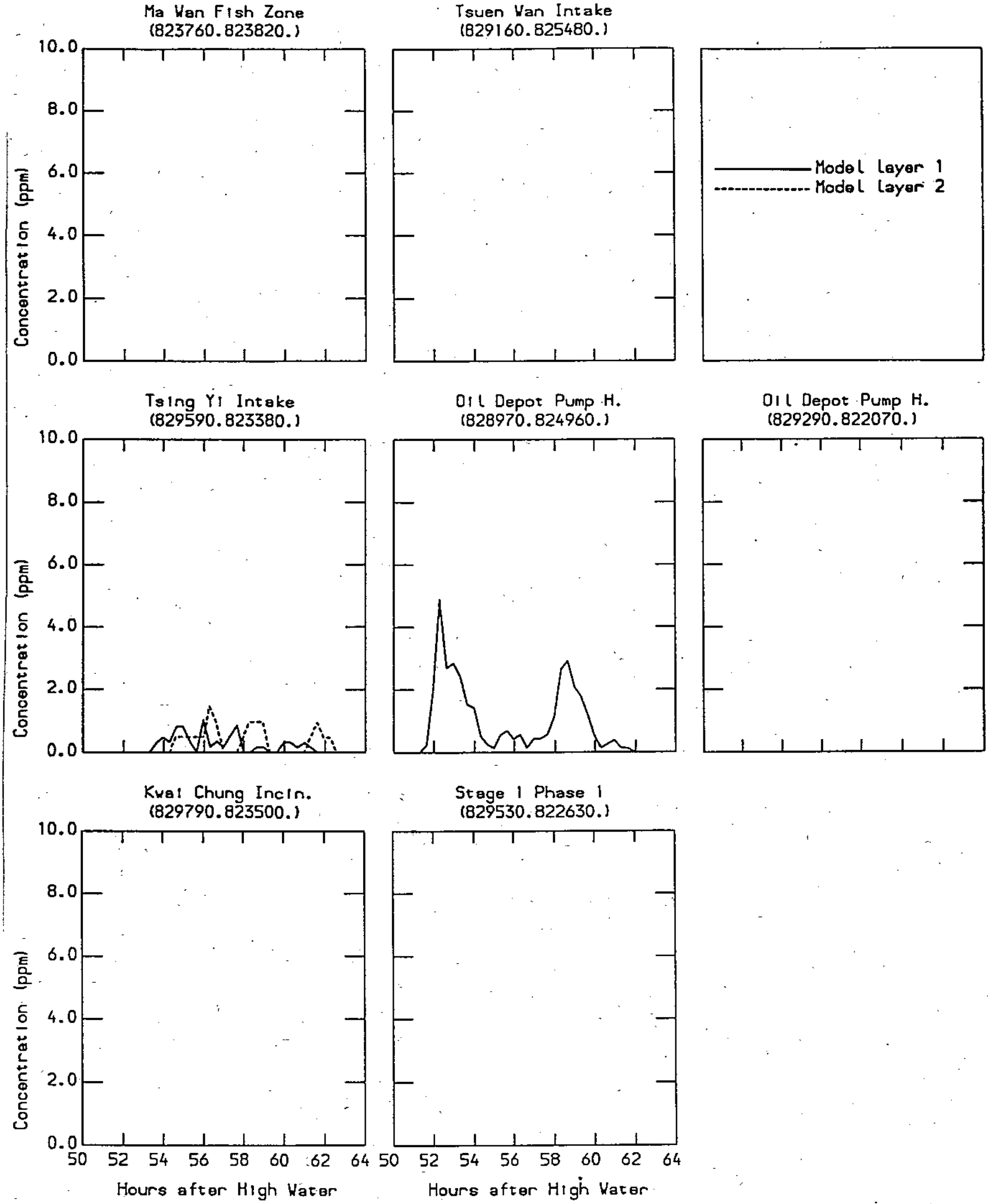
Figure No. F-5.8



Dredging on Ebb Phase of Tide Wet Season Spring Tide
Suspended Sediment Concentrations

Mouchel

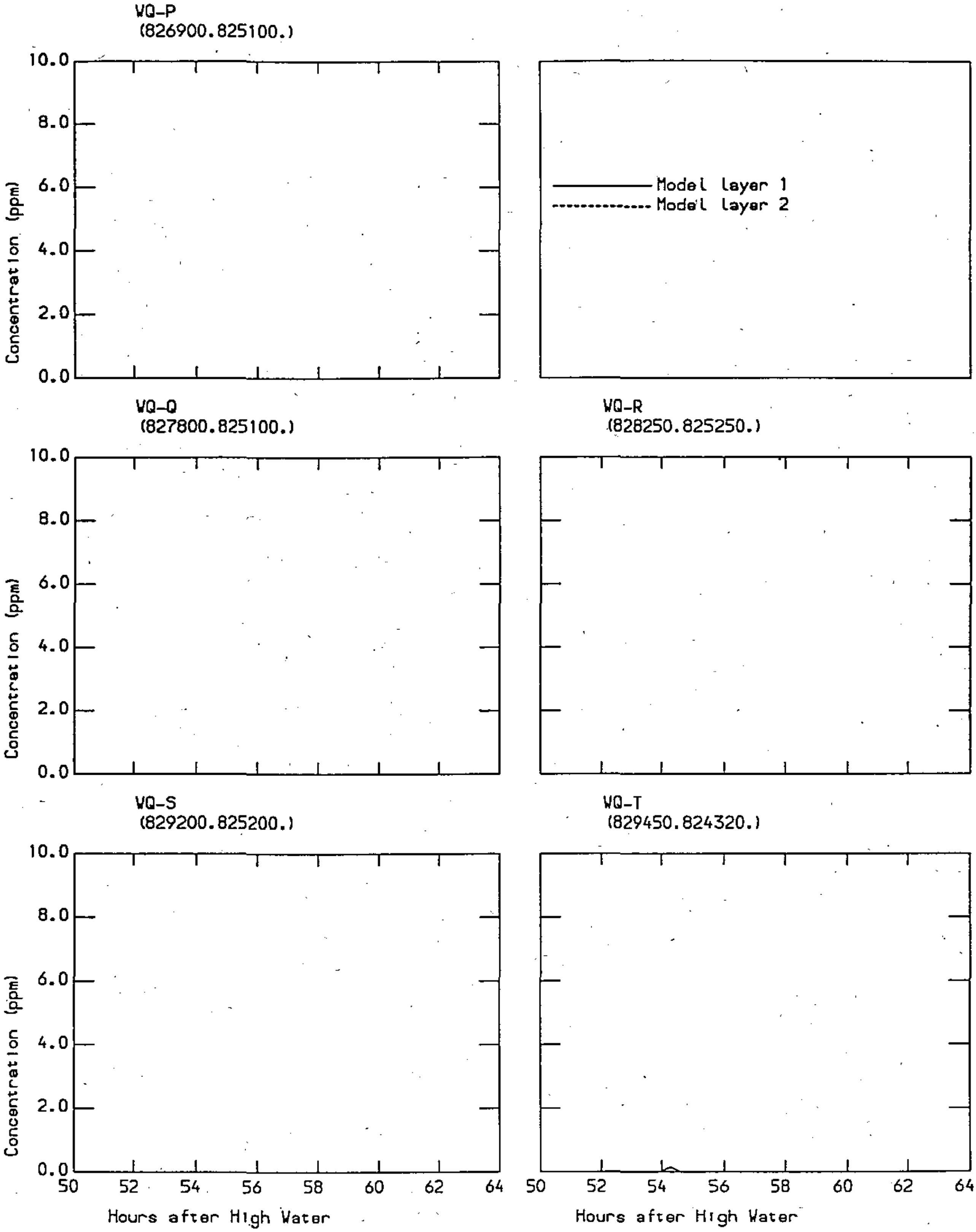
Figure No. **F-5.9**



Dredging on Ebb Phase of Tide Wet Season Spring Tide
Suspended Sediment Concentrations

Mouchel

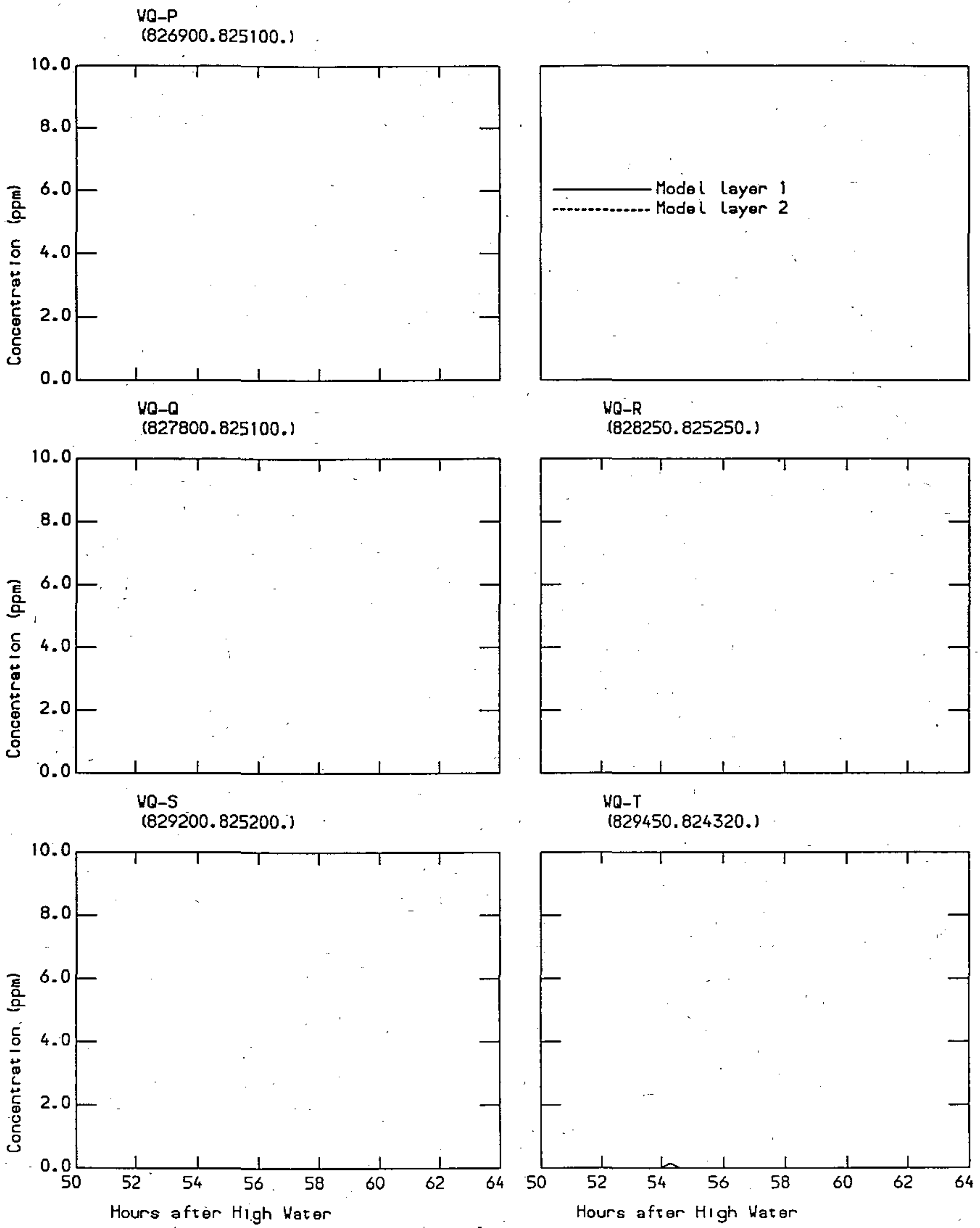
Figure No. F-5.10



Dredging on Ebb Phase of Tide Wet Season Spring Tide
Suspended Sediment Concentrations

Mouchel

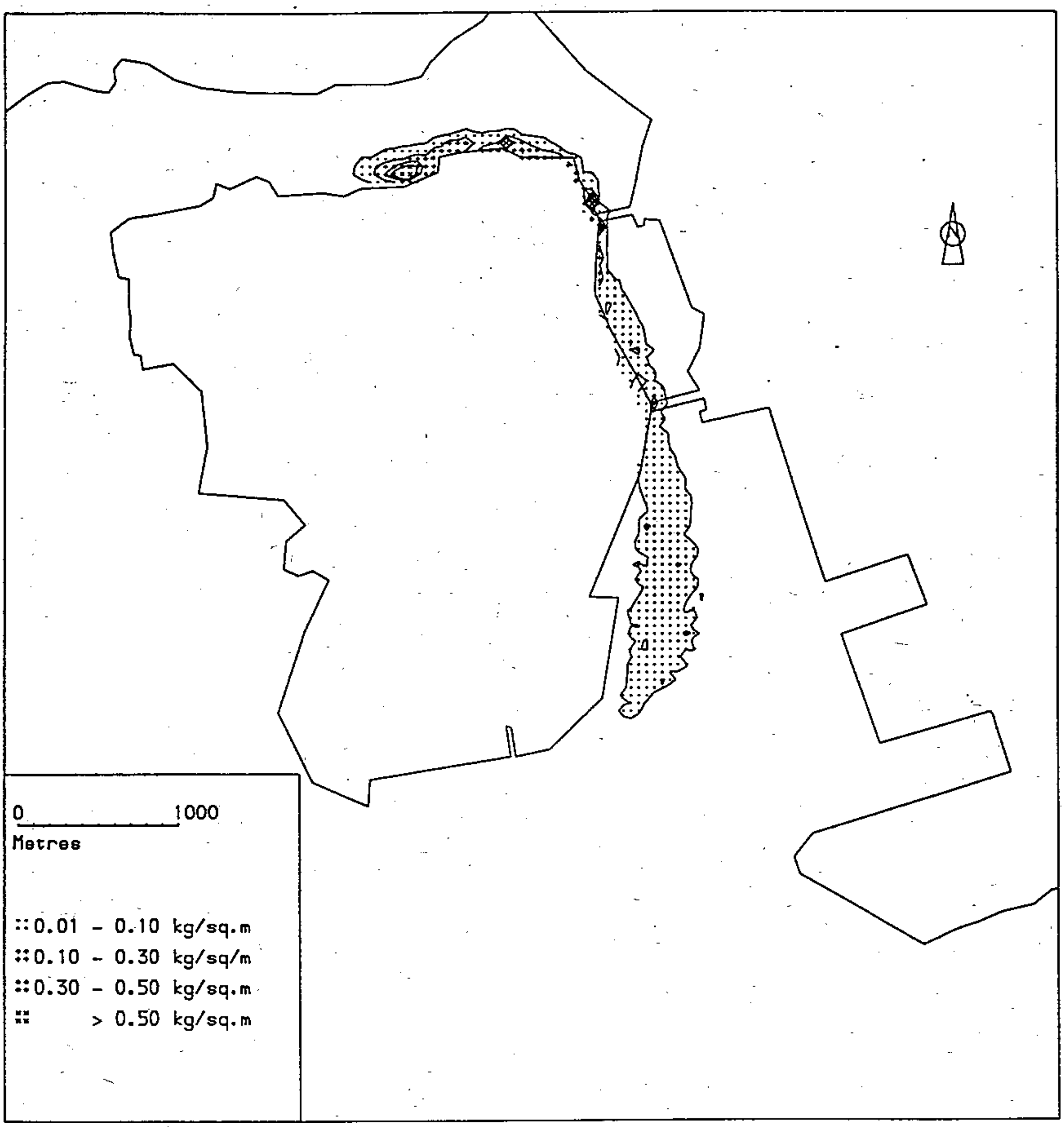
Figure No. F-5.11



Dredging on Ebb Phase of Tide Wet Season Spring Tide
Suspended Sediment Concentrations

Mouchel

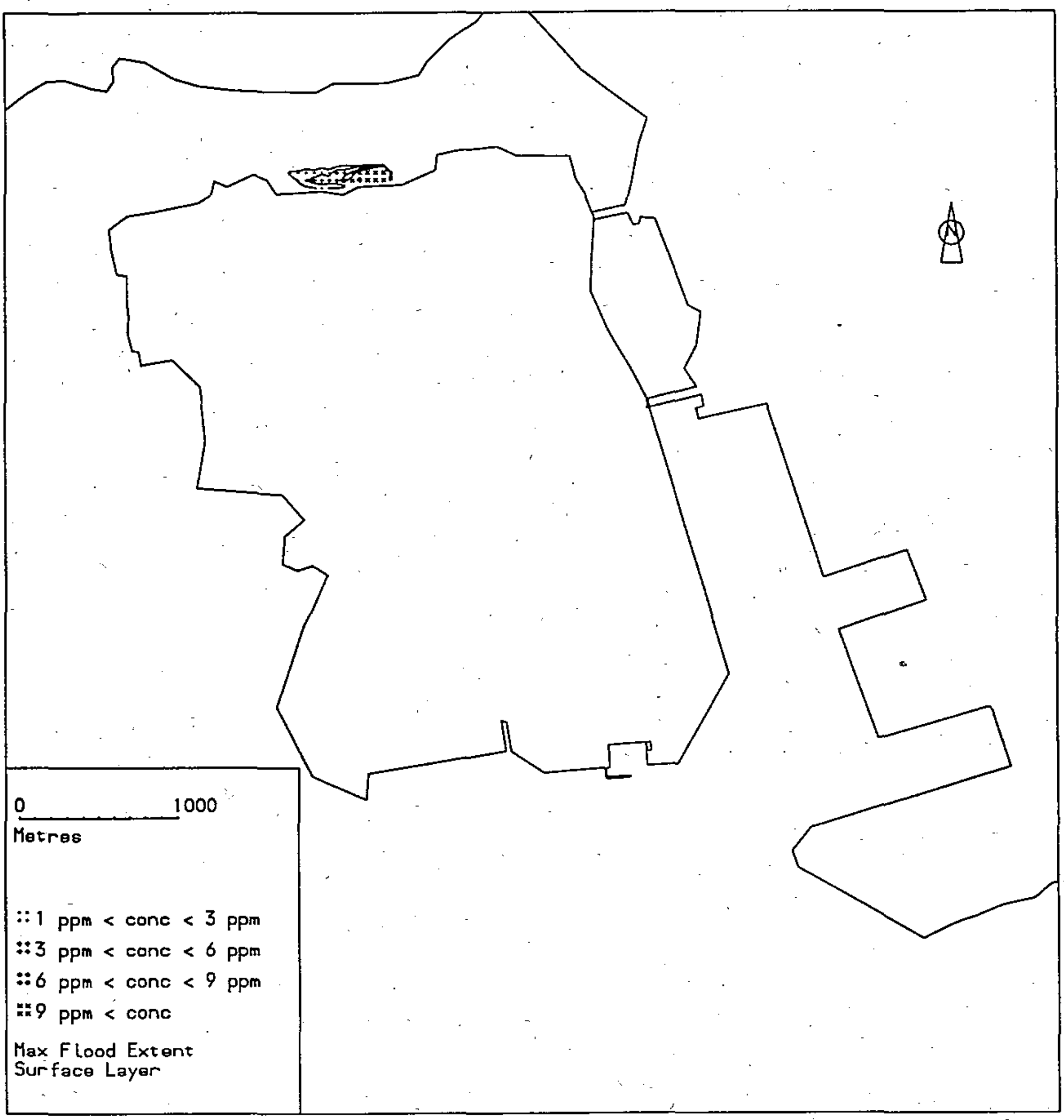
Figure No. **F-5.11**



Dredging on Ebb Phase of Tide
Wet Season Spring Tide Bed Deposits

Mouchel

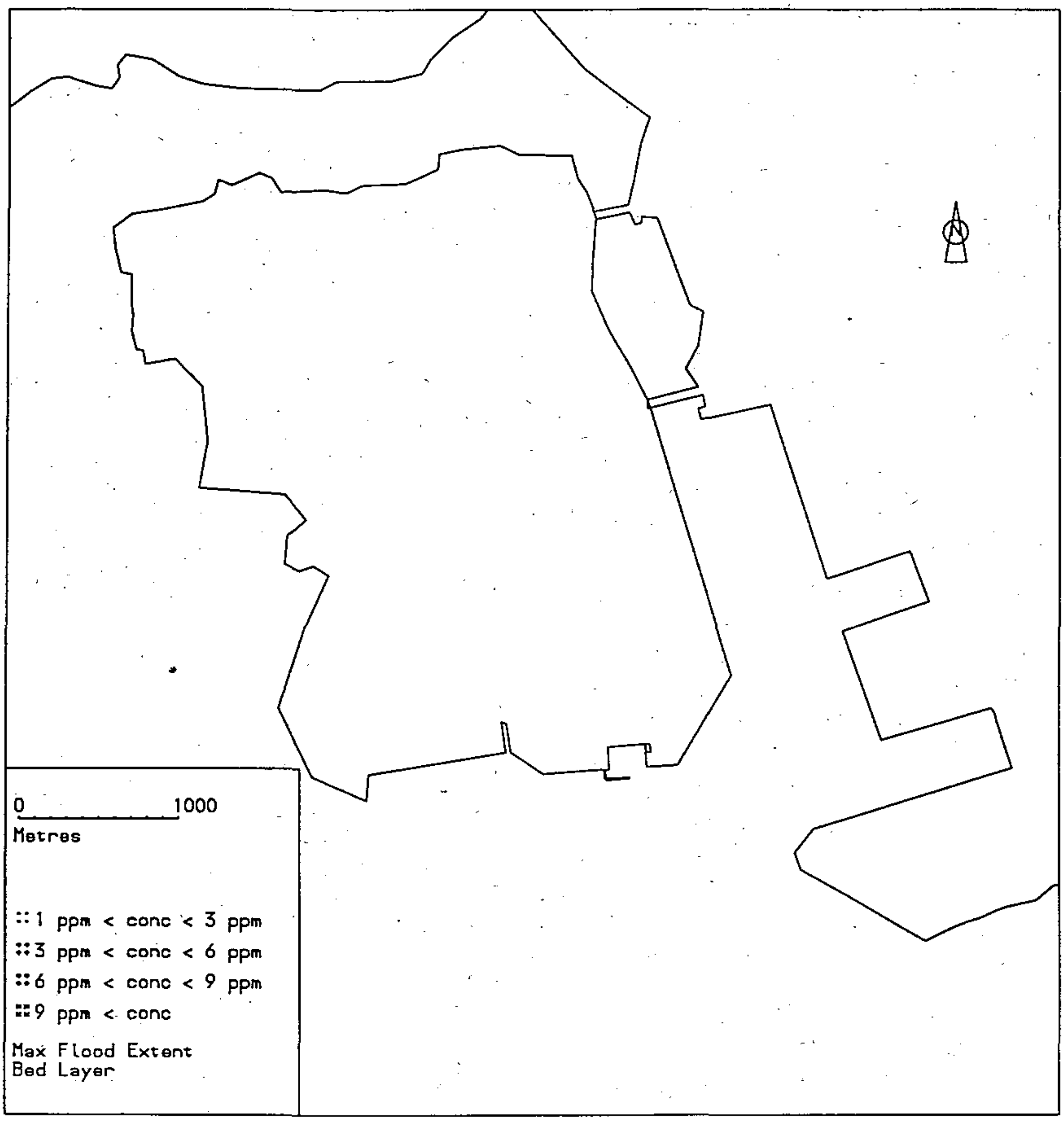
Figure No. **F-5.12**



Dredging on Flood Phase of Tide Dry Season Neap Tide Suspended Solids Concentrations

Mouchel

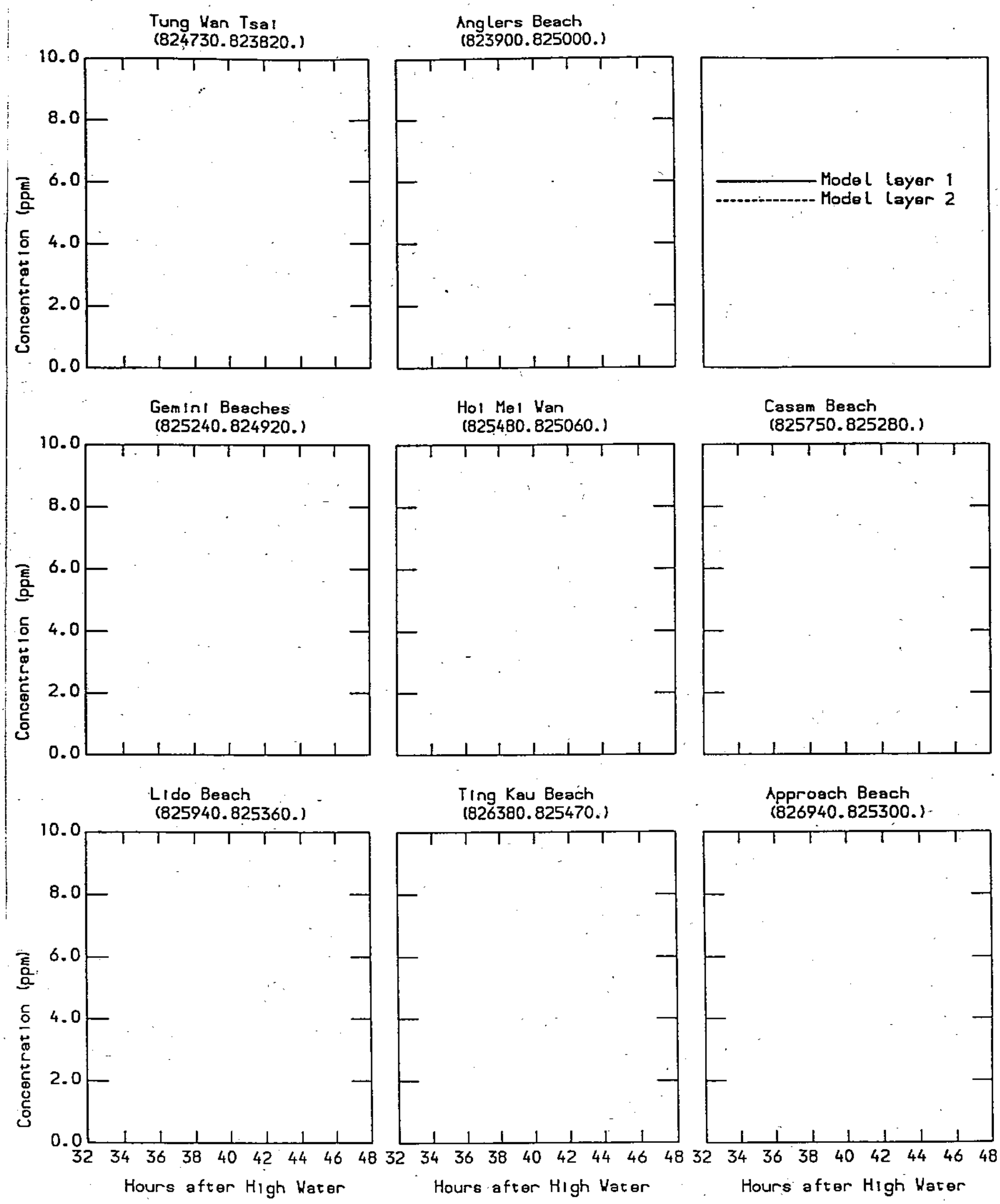
Figure No. F-5.13



Dredging on Flood Phase of Tide Dry Season Neap Tide
Suspended Solids Concentrations

Mouchel

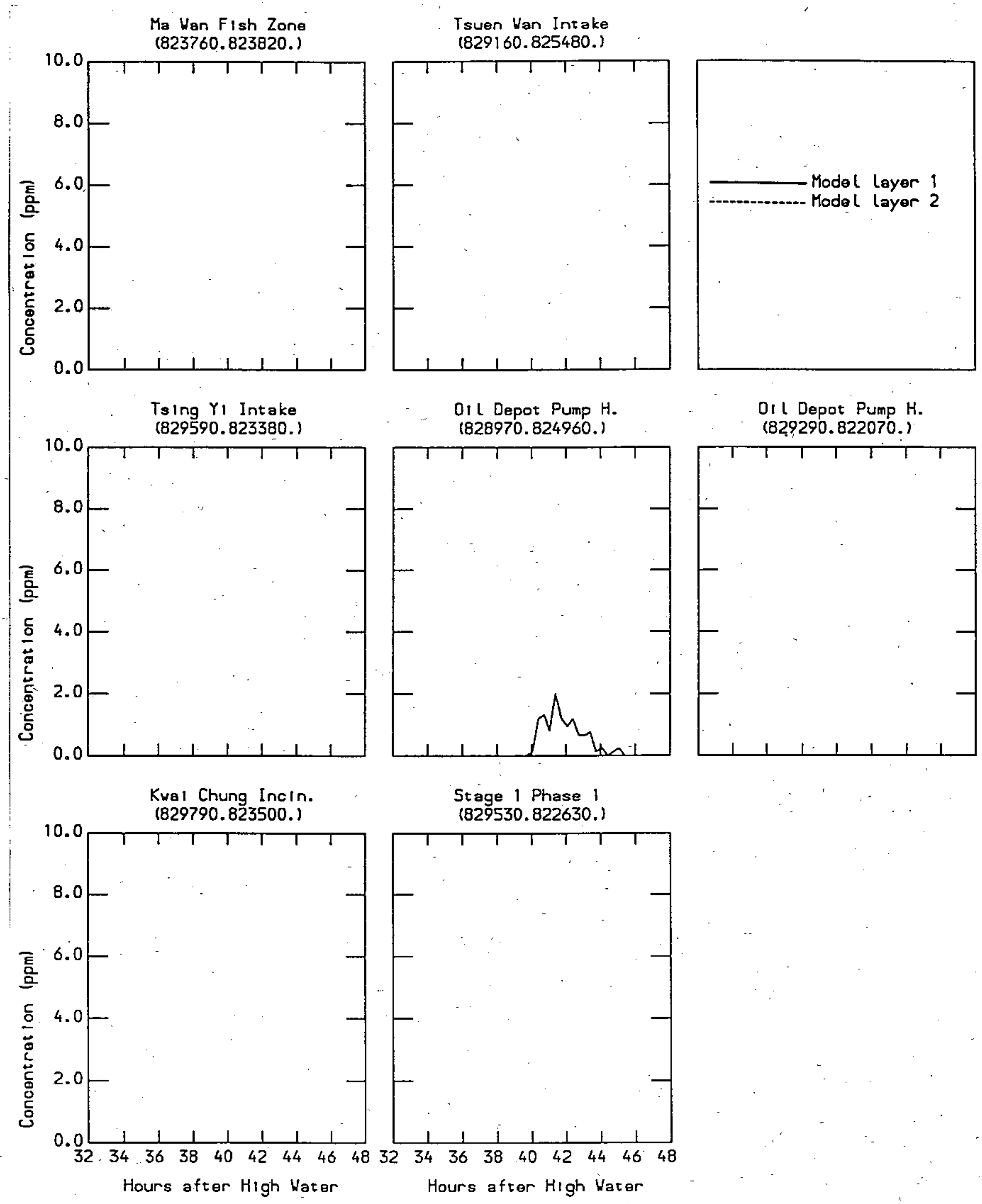
Figure No. F-5.14



Dredging on Flood Phase of Tide Dry Season Neap Tide
Suspended Sediment Concentrations

Mouchel

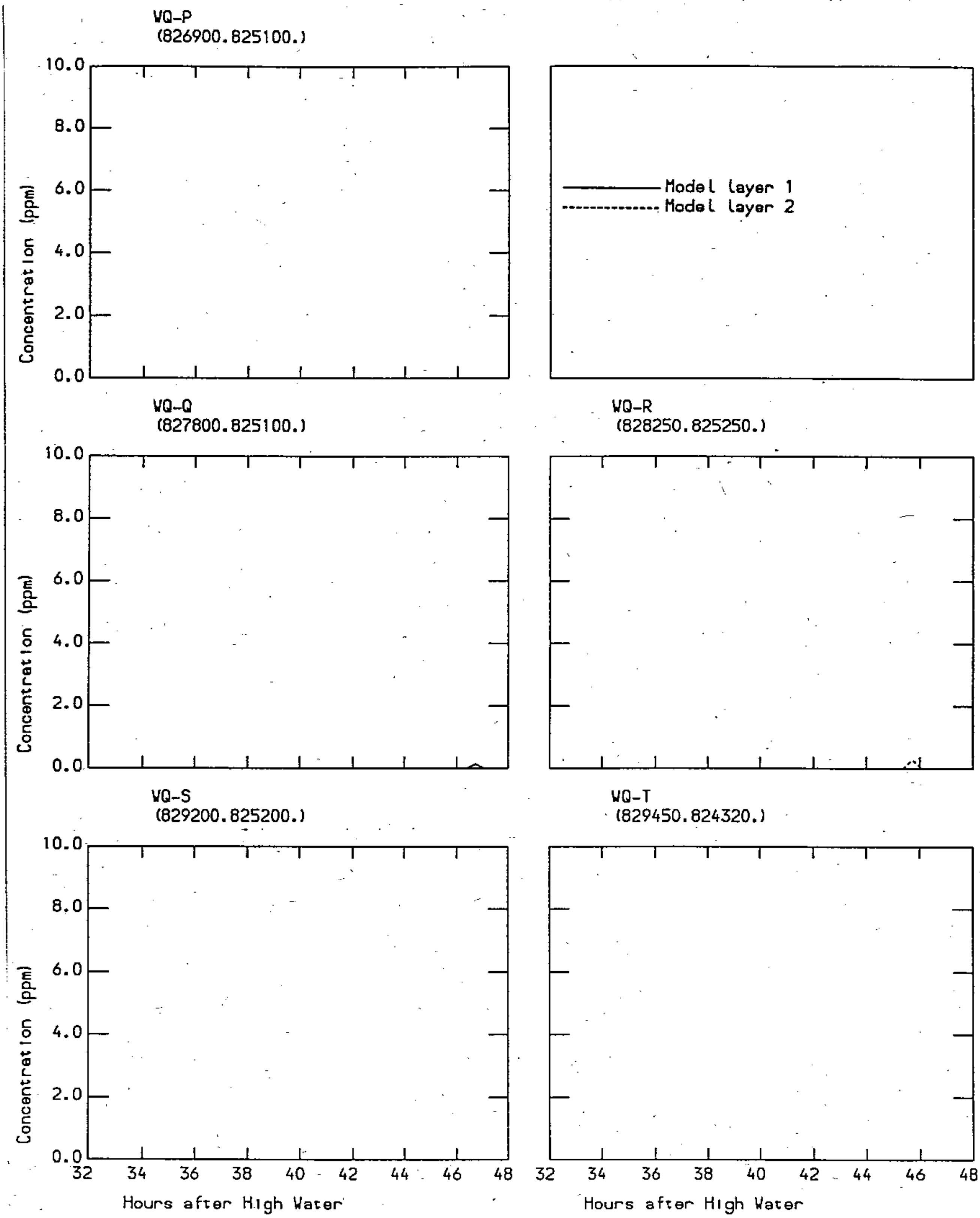
Figure No. F-5.15



Dredging on Flood Phase of Tide Dry Season Neap Tide
Suspended Sediment Concentrations

Mouchel

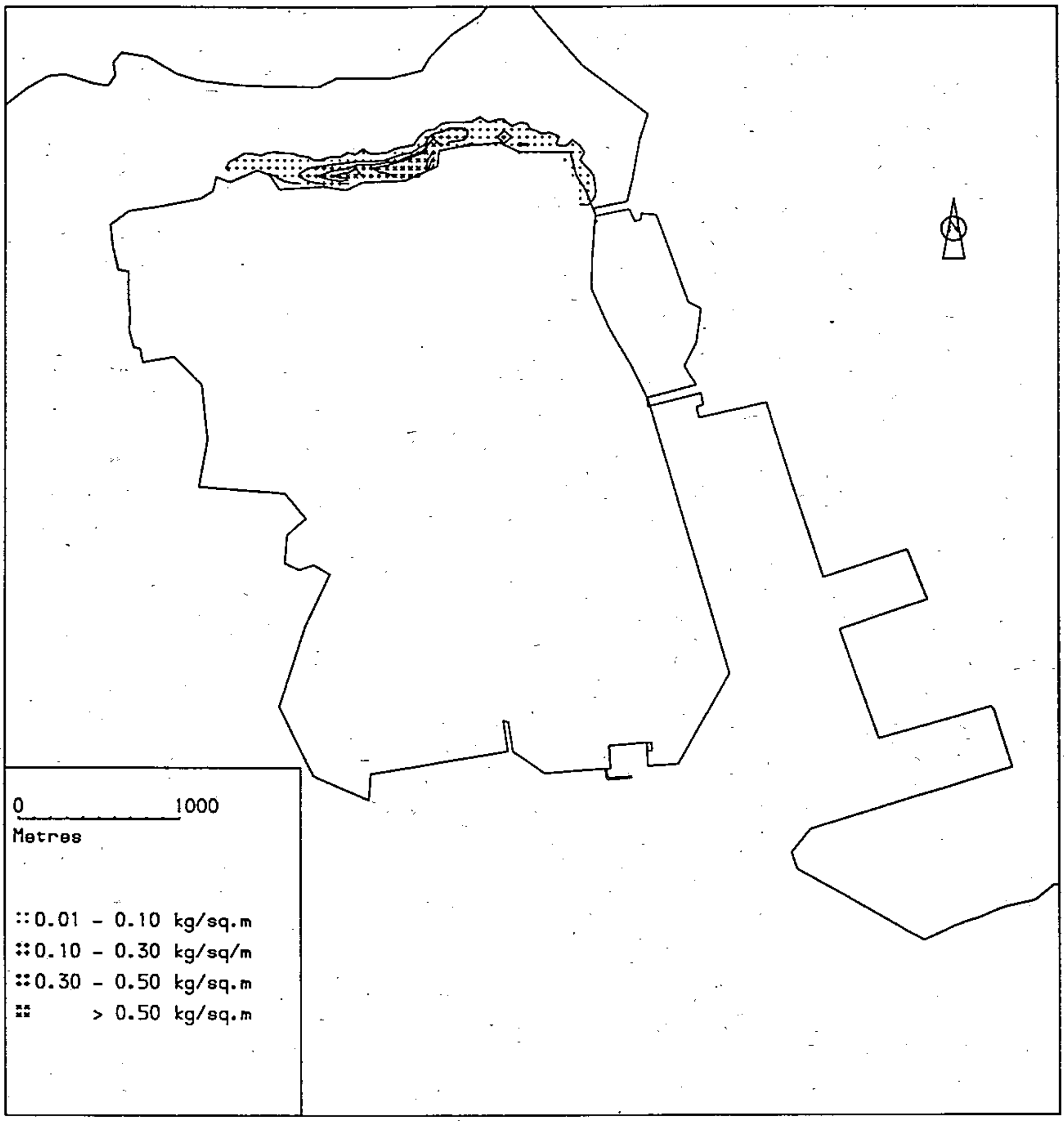
Figure No. F-5.16



Dredging on Flood Phase of Tide Dry Season Neap Tide
Suspended Sediment Concentrations

Mouchel

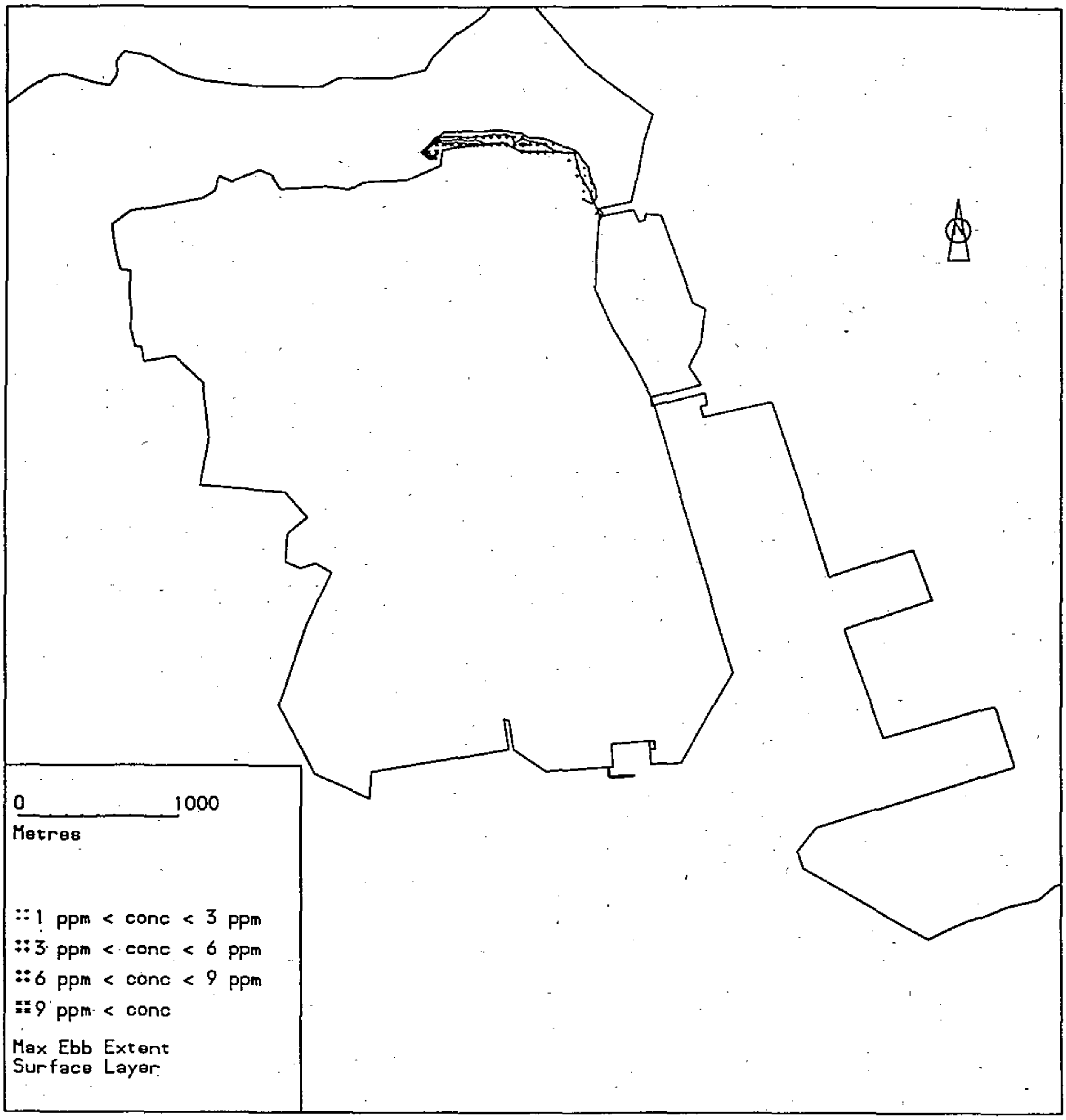
Figure No. F-5.17



Dredging on Flood Phase of Tide
Dry Season Neap Tide Bed Deposits

Mouchel

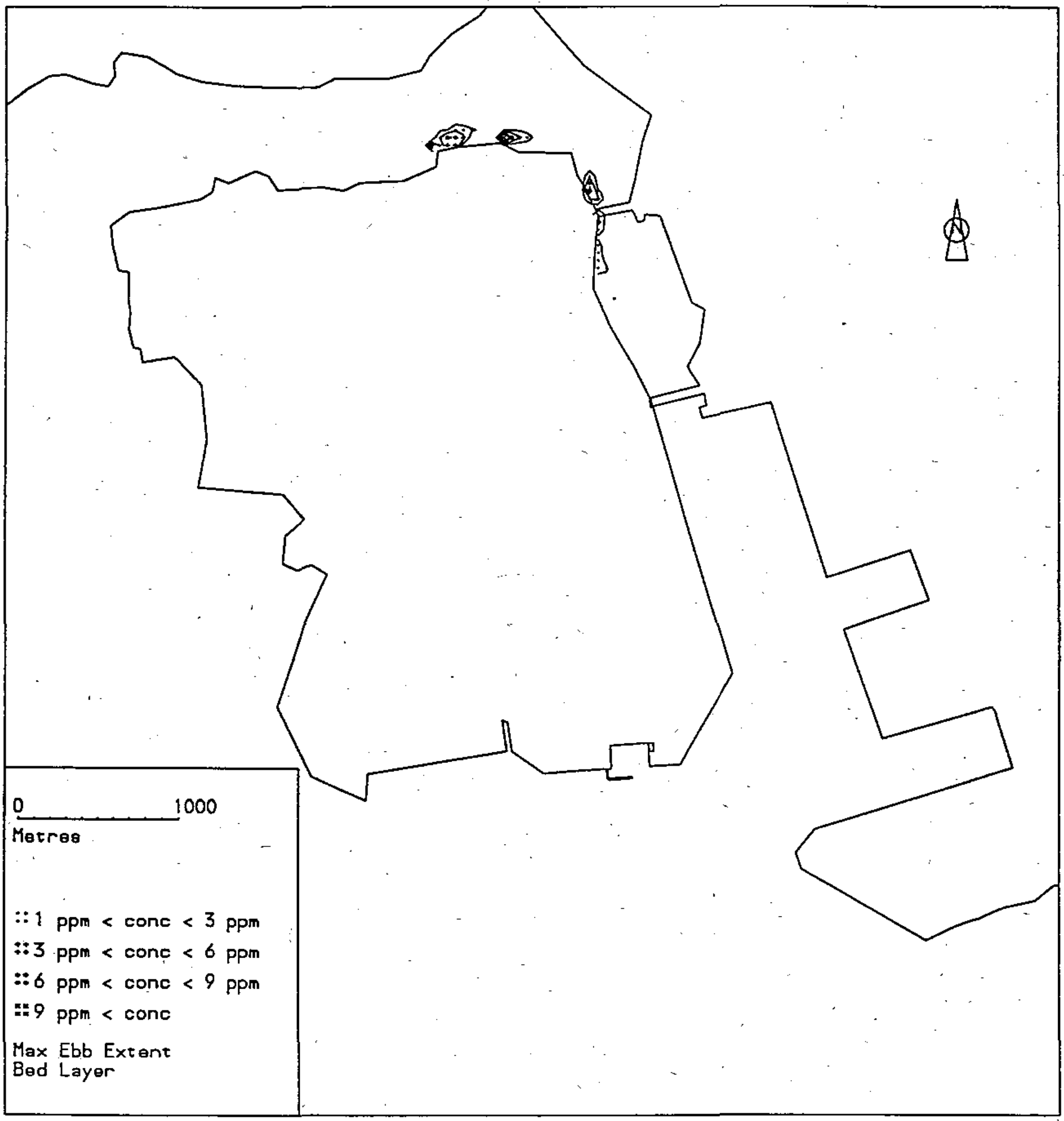
Figure No. F-5.18



Dredging on Ebb Phase of Tide Dry Season Neap Tide
Suspended Solids Concentrations

Mouchel

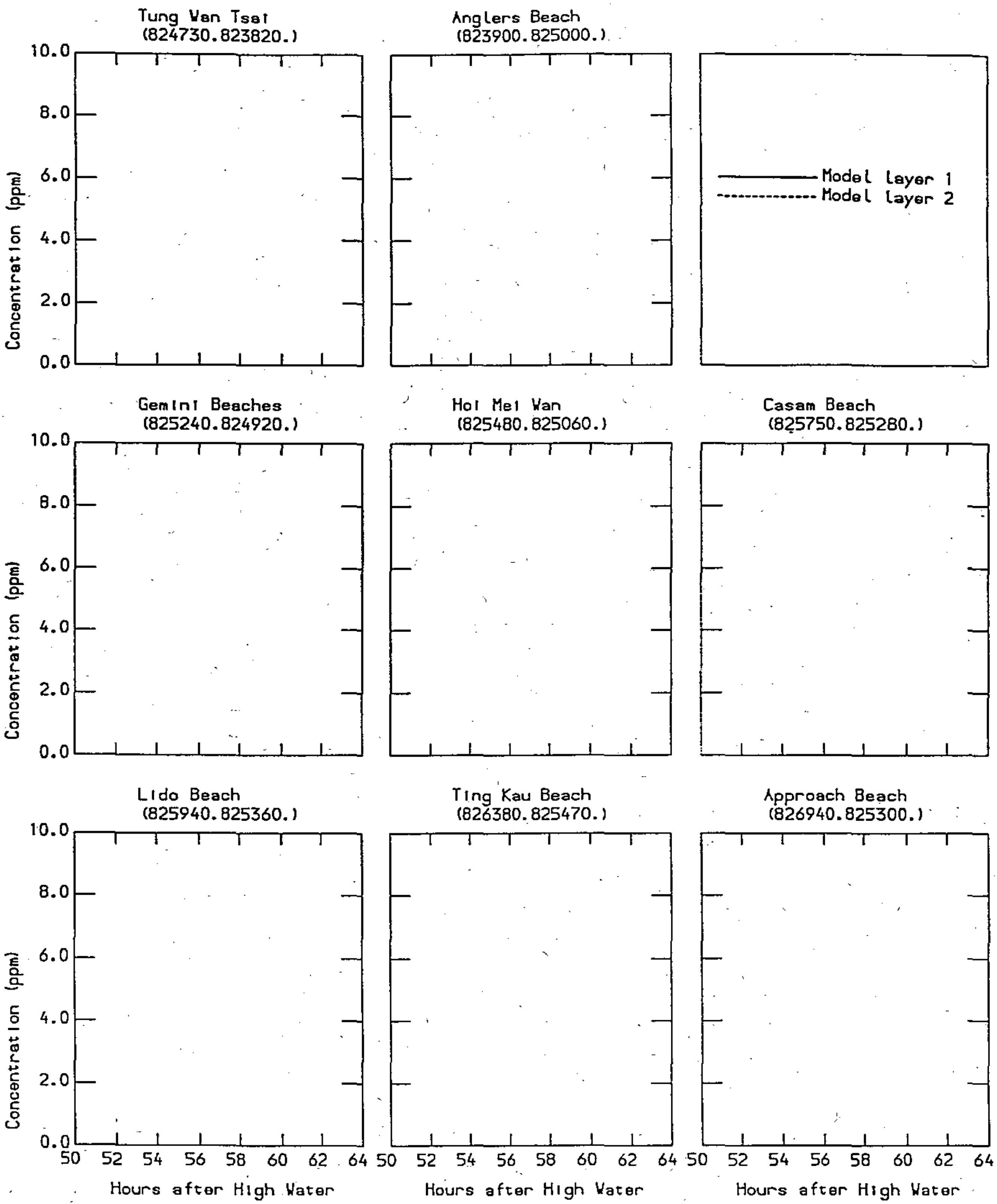
Figure No. F-5.19



Dredging on Ebb Phase of Tide Dry Season Neap Tide
Suspended Solids Concentrations

Mouchel

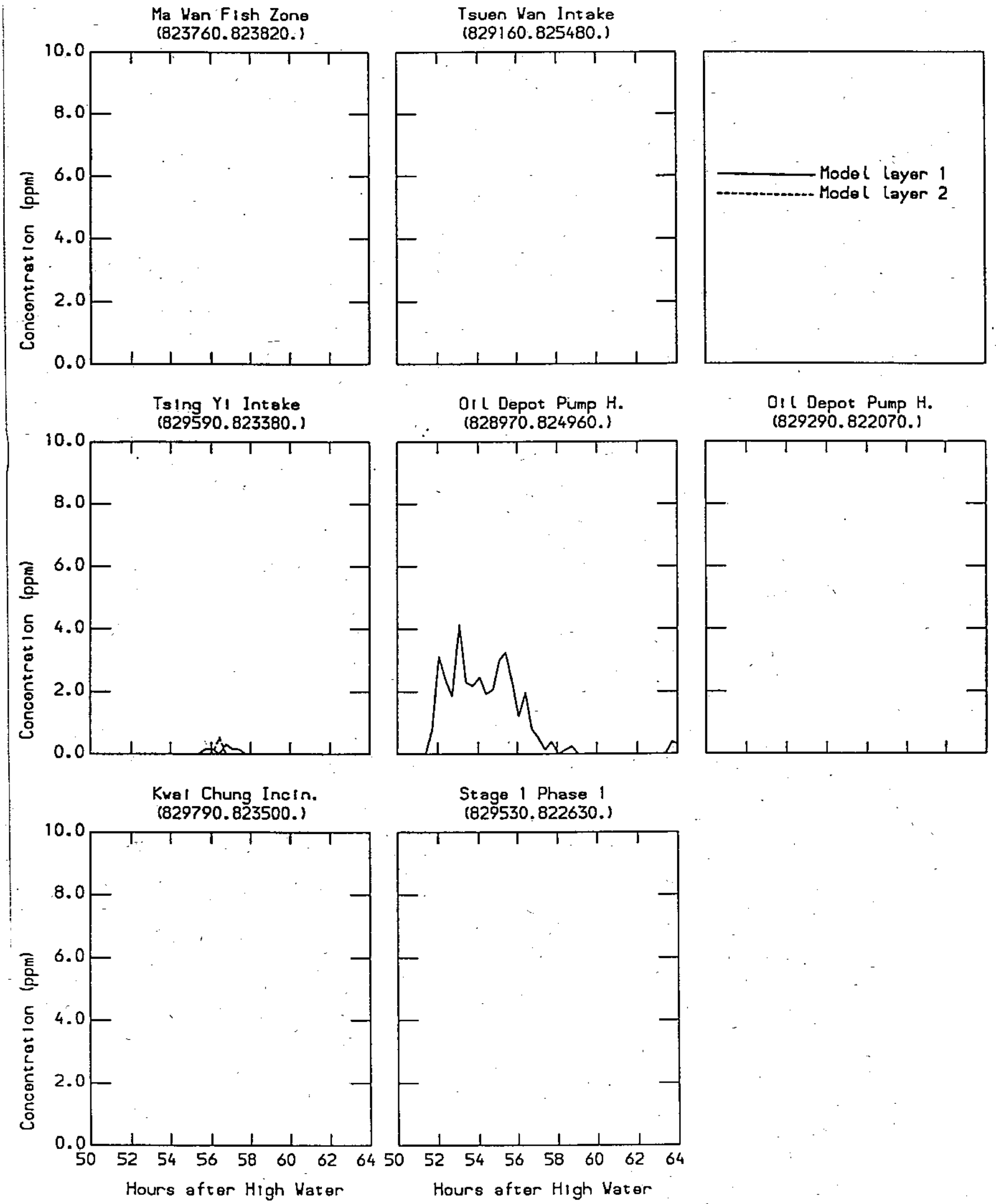
Figure No. F-5.20



Dredging on Ebb Phase of Tide Dry Season Neap Tide
Suspended Sediment Concentrations

Mouchel

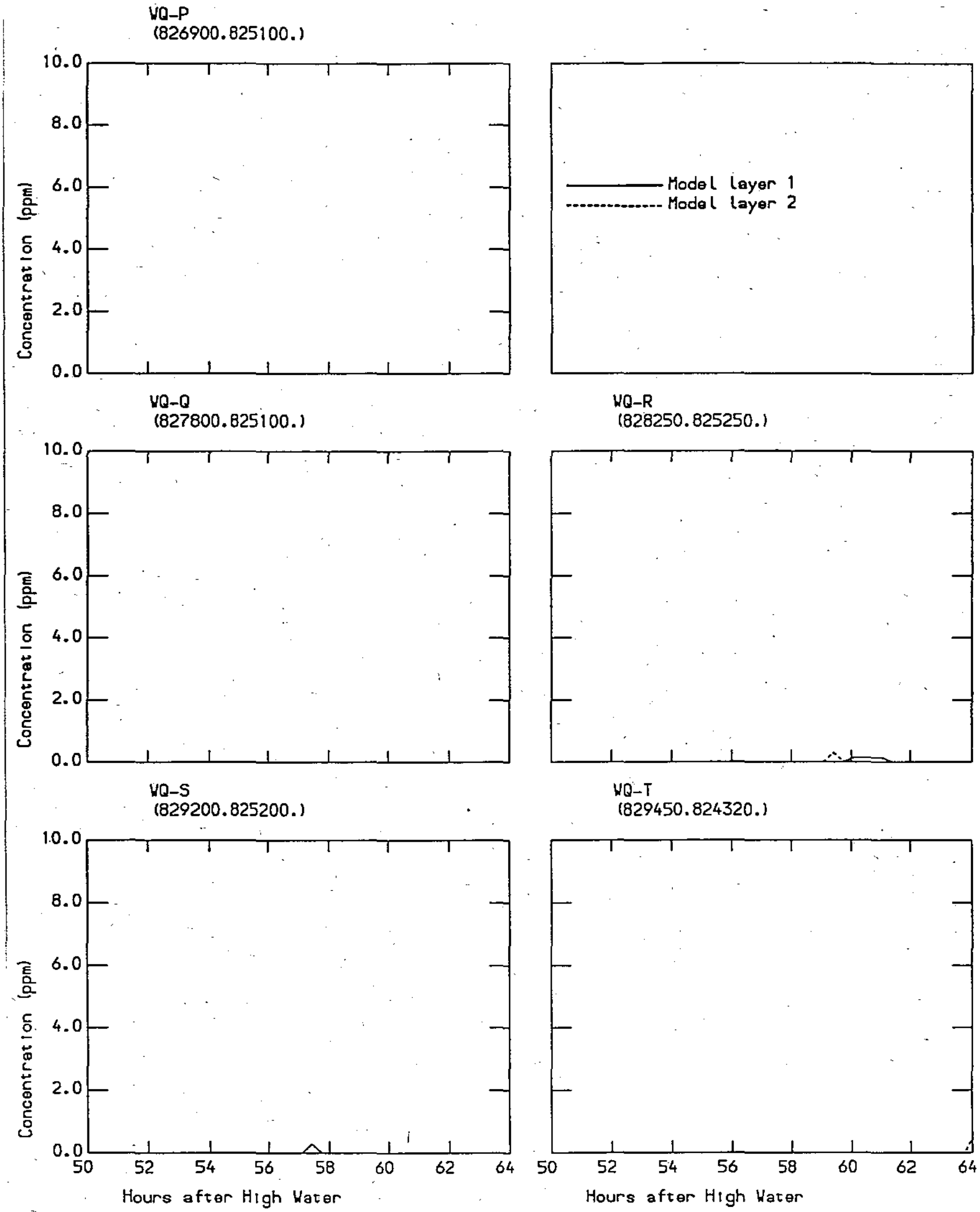
Figure No. F-5.21



Dredging on Ebb Phase of Tide Dry Season Neap Tide
Suspended Sediment Concentrations

Mouchel

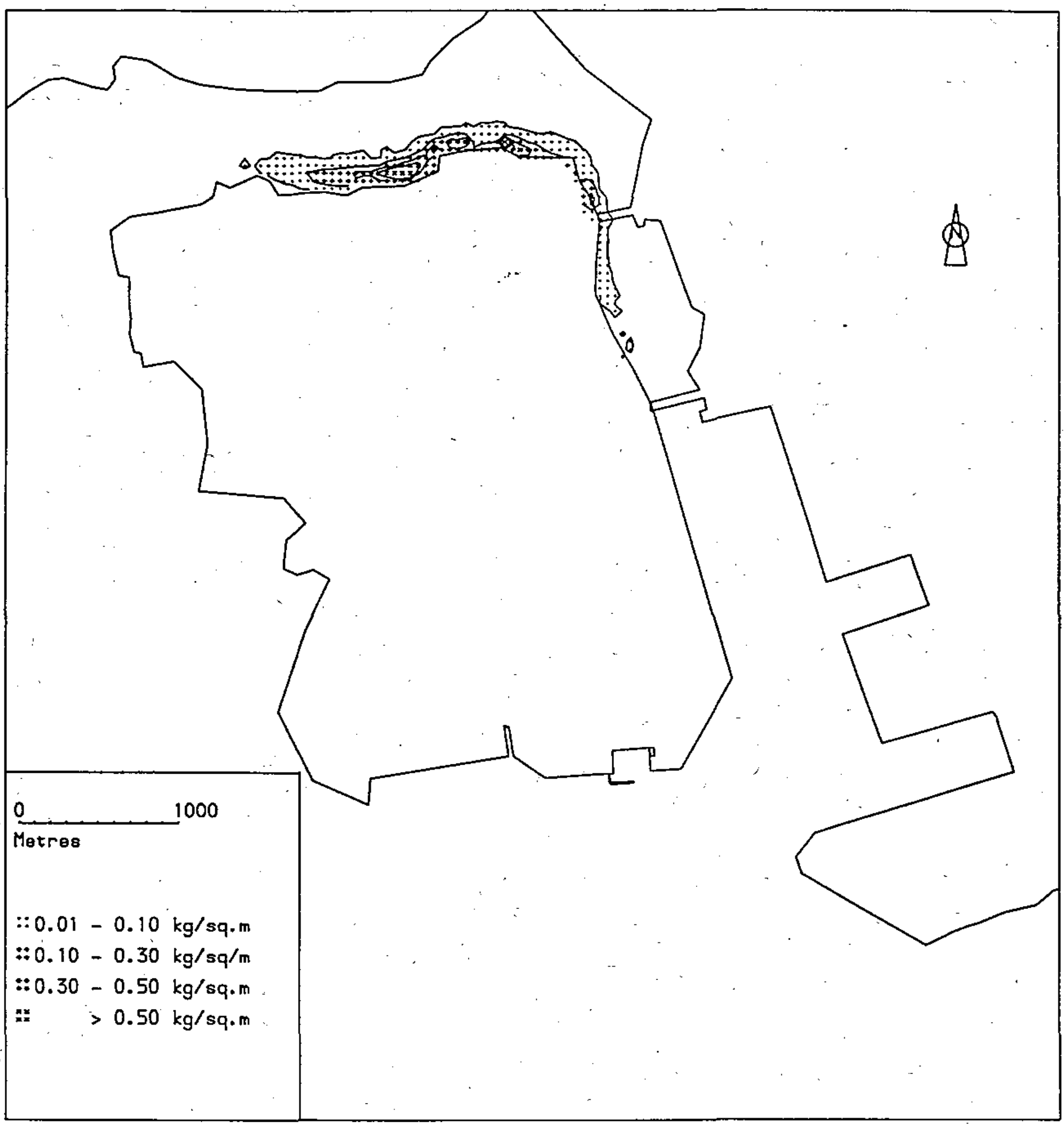
Figure No. F-5.22



Dredging on Ebb Phase of Tide Dry Season Neap Tide Suspended Sediment Concentrations

Mouchel

Figure No. F-5.23



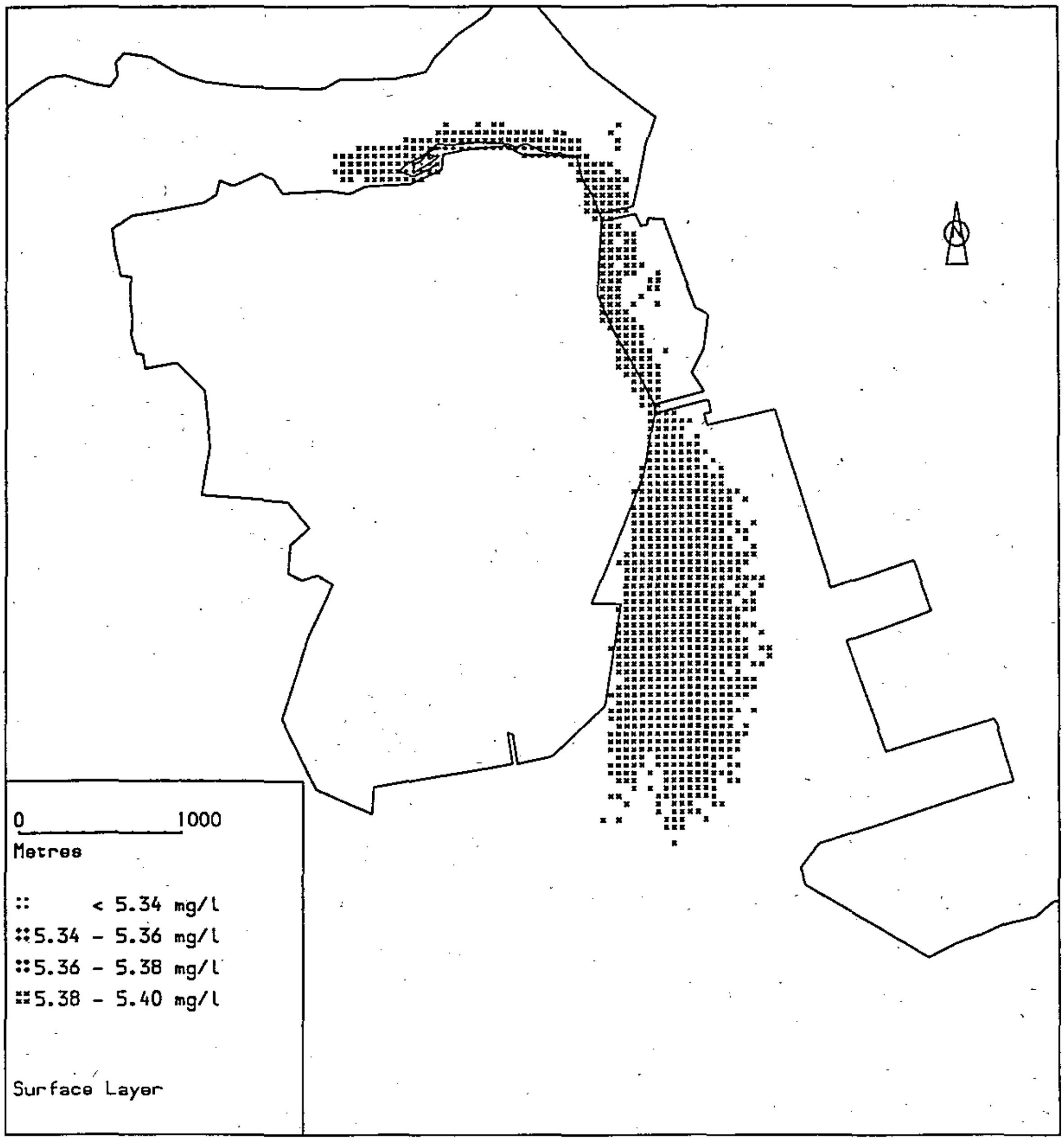
Dredging on Ebb Phase of Tide
Dry Season Neap Tide Bed Deposits

Mouchel

Figure No. F-5.24

Appendix F-6

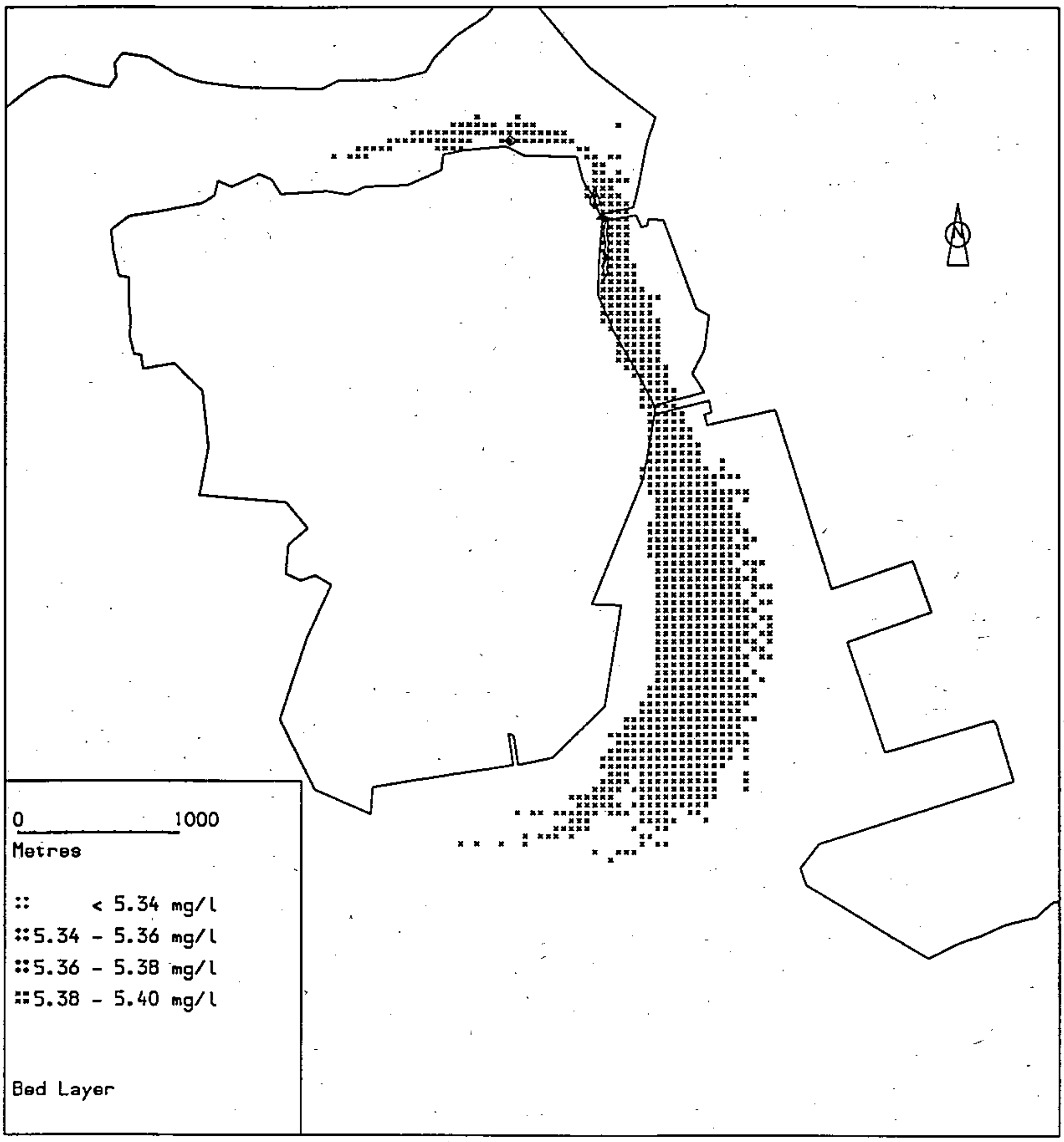
Dissolved Oxygen Simulations



Dredging on Ebb Phase of Tide Wet Season Spring Tide
Daily Dissolved Oxygen Levels

Mouchel

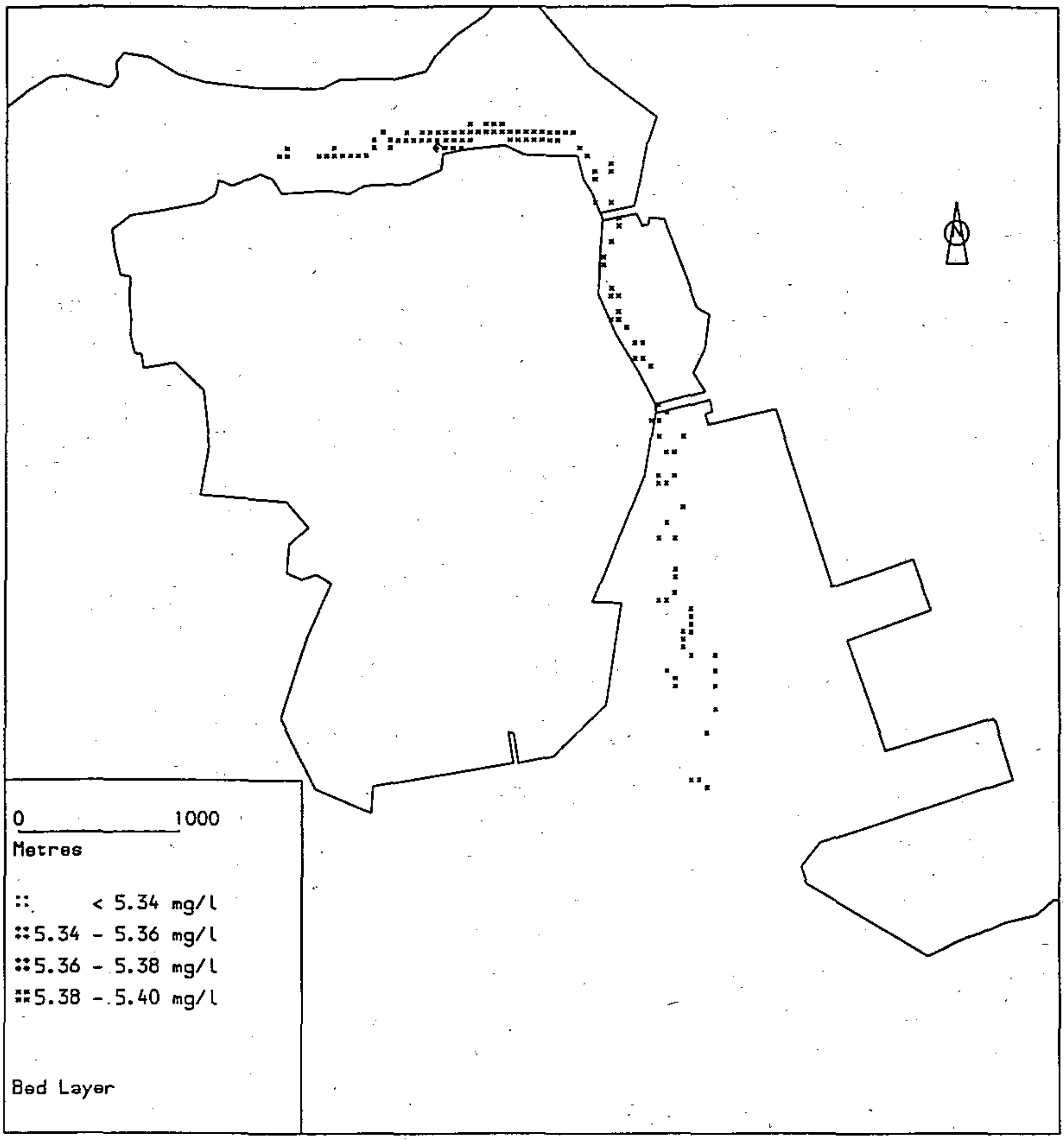
Figure No. F-6.1



Dredging on Ebb Phase of Tide Wet Season Spring Tide
Daily Dissolved Oxygen Levels

Mouchel

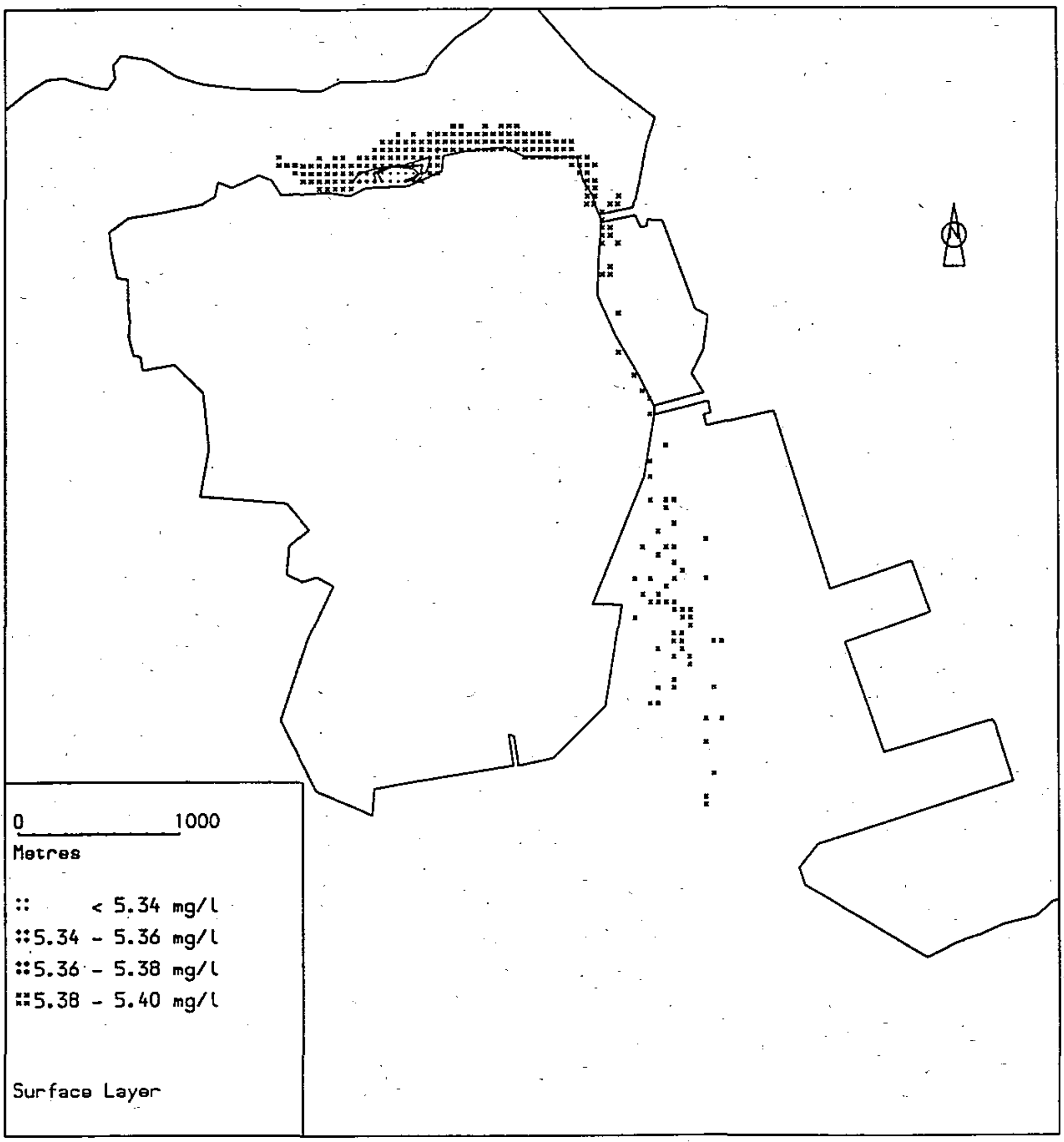
Figure No. F-6.2



Dredging on Flood Phase of Tide Wet Season Spring Tide
Daily Dissolved Oxygen Levels

Mouchel

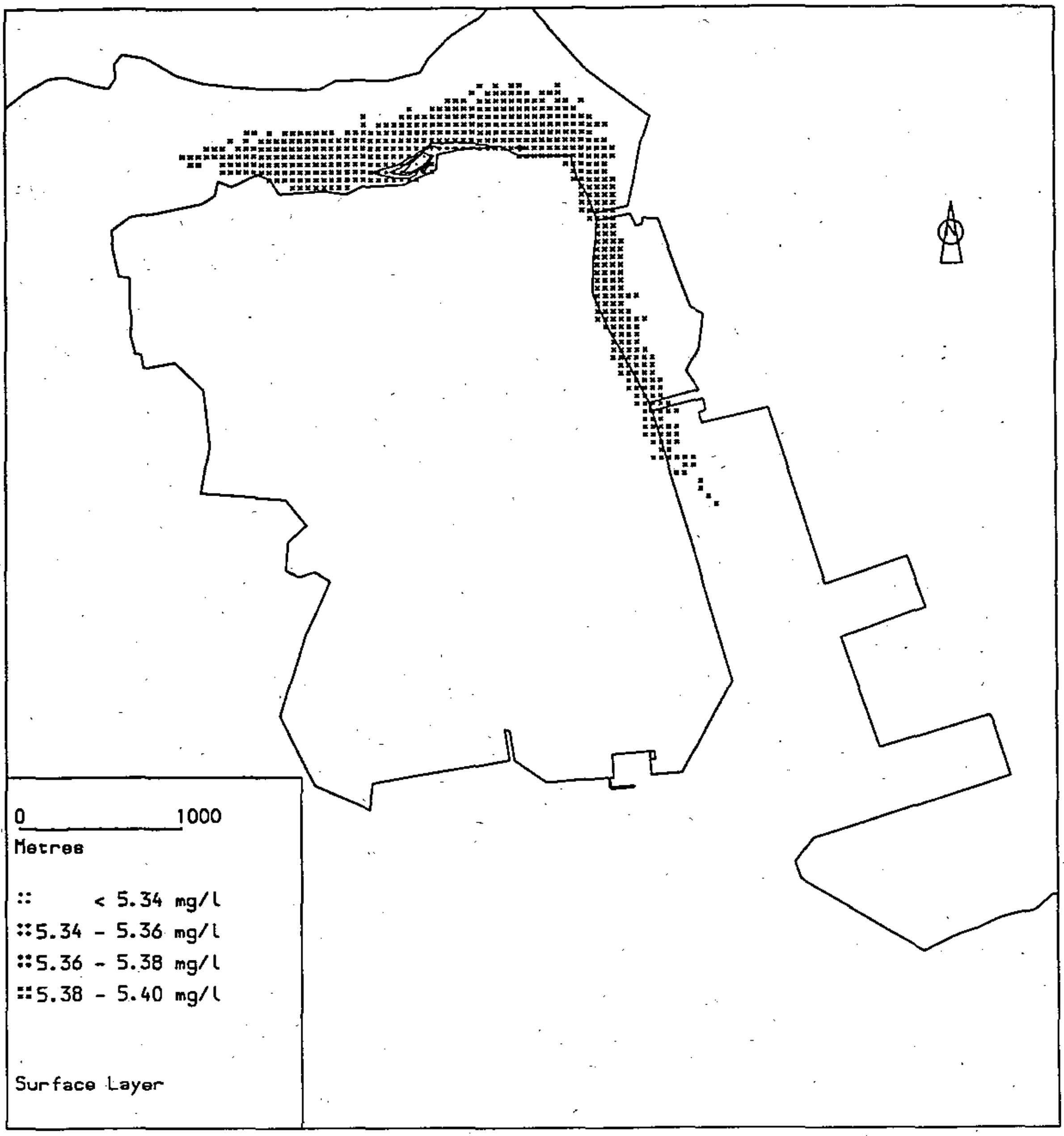
Figure No. F-6.3



Dredging on Flood Phase of Tide Wet Season Spring Tide
Daily Dissolved Oxygen Levels

Mouchel

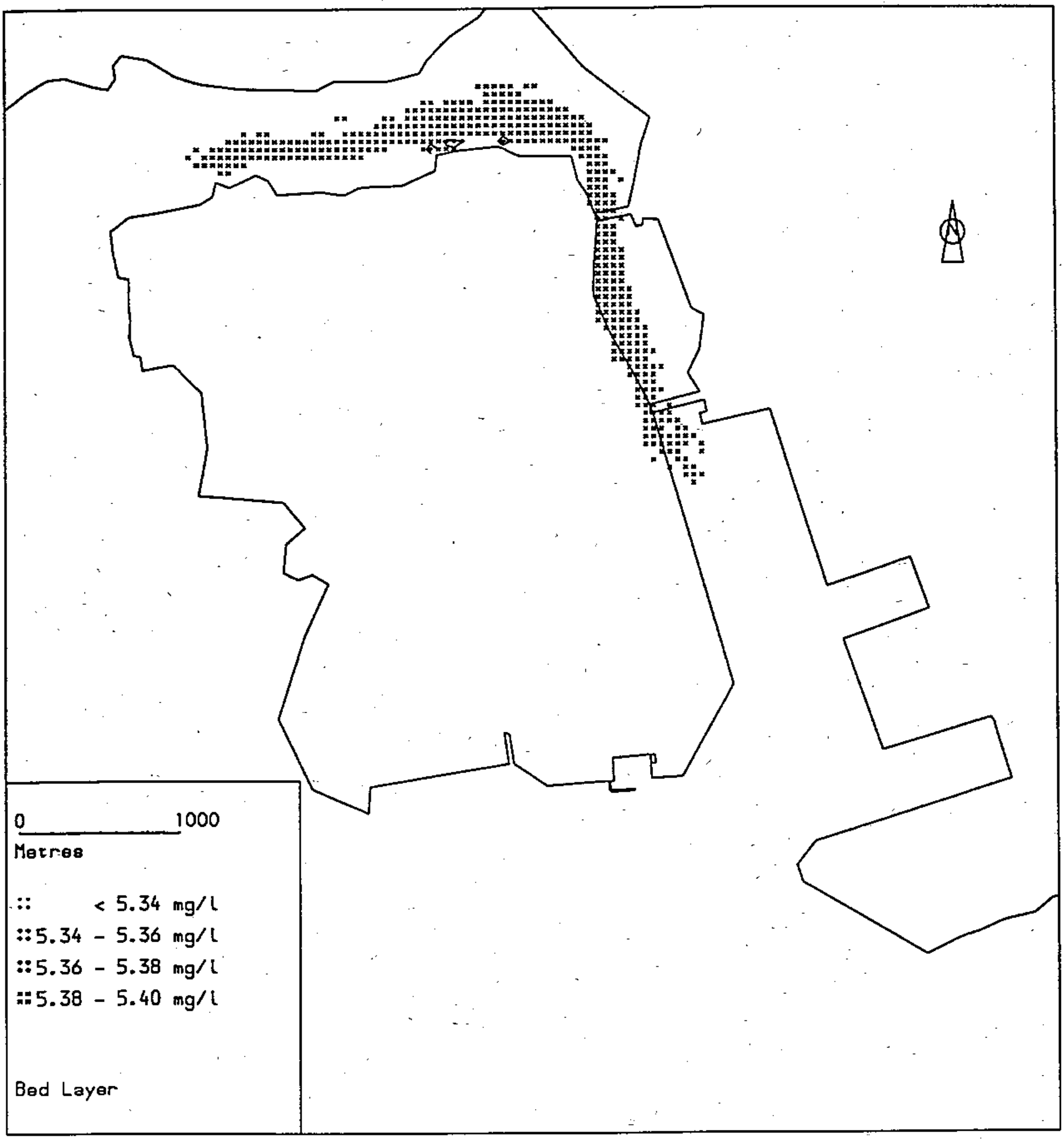
Figure No. F-6.4



Dredging on Ebb Phase of Tide Dry Season Neap Tide
Daily Dissolved Oxygen Levels

Mouchel

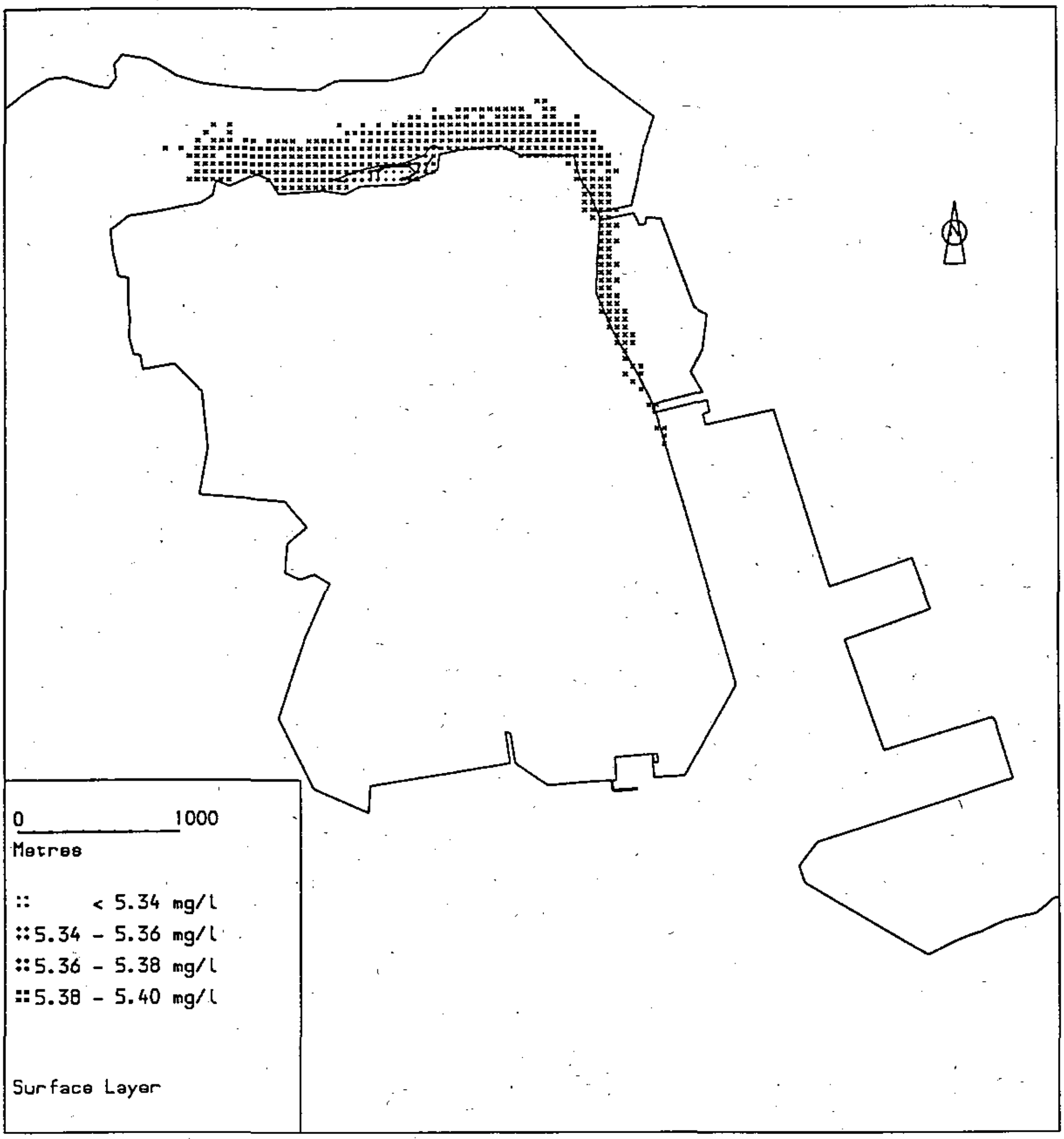
Figure No. F-6.5



Dredging on Ebb Phase of Tide Dry Season Neap Tide
Daily Dissolved Oxygen Levels

Mouchel

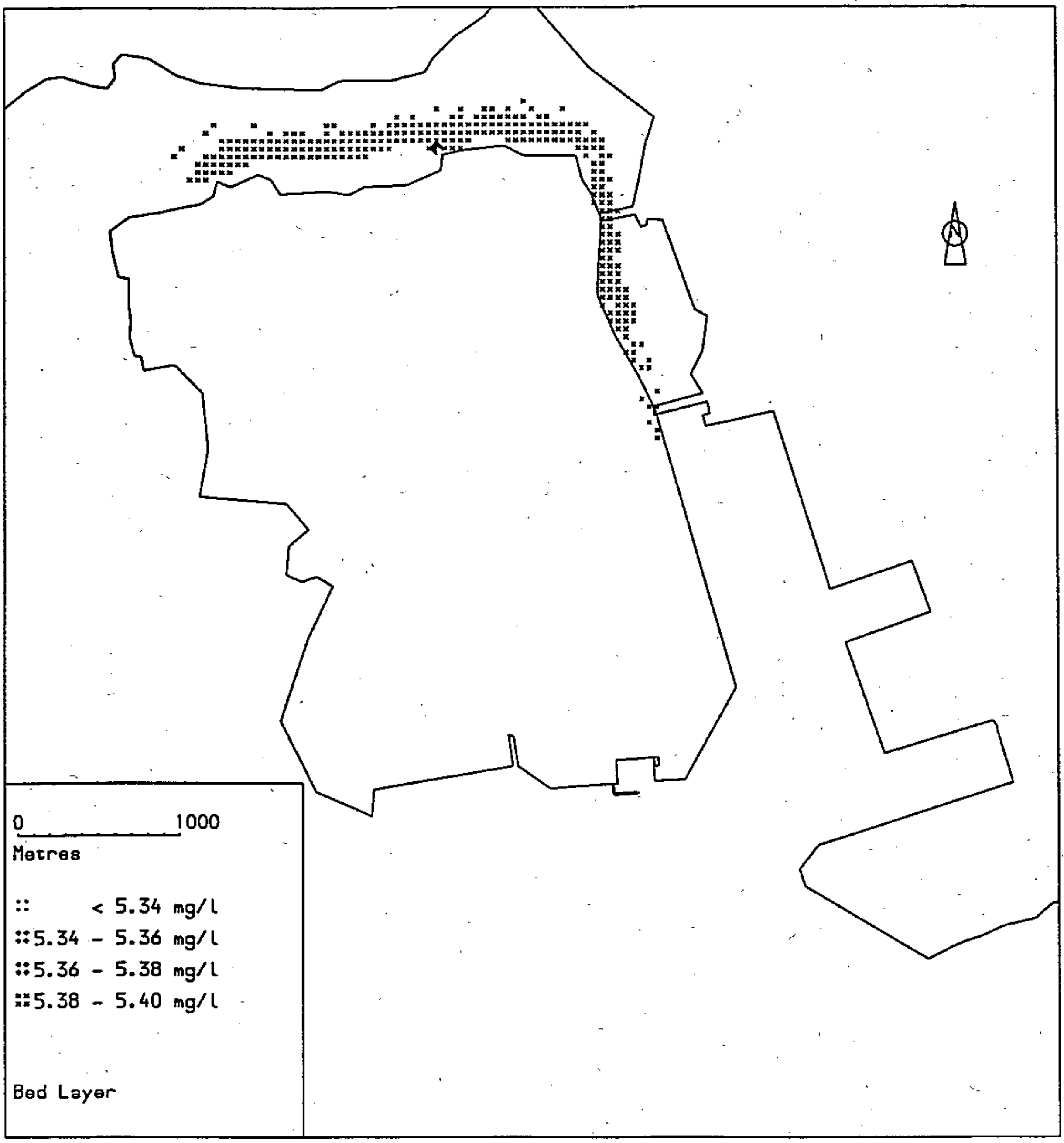
Figure No. F-6.6



Dredging on Flood Phase of Tide Dry Season Neap Tide
Daily Dissolved Oxygen Levels

Mouchel

Figure No. F-6.7



Dredging on Flood Phase of Tide Dry Season Neap Tide
Daily Dissolved Oxygen Levels

Mouchel

Figure No. F-6.8

APPENDIX G

Land Contamination

Appendix G-1

EPD Draft Land Contamination Assessment Standard Brief
and Guidelines on Sampling and Analysis

LAND CONTAMINATION ASSESSMENT STANDARD BRIEF

A contamination assessment is required to be carried out to examine the extent of the possible land contamination problem and to identify any remedial measures that are necessary for the site. The assessment should include, inter alia, the following:

a. provision of a clear and detailed account of the present use of the land (eg. description of the activities, inventory of chemicals and hazardous substances handled with clear indication of their storage and location by reference to a site map) and the relevant past land history in relation to possible land contamination (eg. accident records, change of land use and any other relevant information);

b. identification of potential contamination and associated impacts, risks or hazards;

c. submission of a plan for actual contamination assessment, which should include proposals on sampling and analyses required, for agreement in principle by EPD prior to its implementation;

d. evaluation of the likely impacts as a result of the findings of the analyses; and

e. formulation of necessary remedial measures for agreement by EPD and inclusion of the agreed measures into the relevant contract documents to ensure their implementation by the project proponent.

GUIDELINES ON SAMPLING AND ANALYSIS

SAMPLING

1. For contamination assessments, soil samples are usually collected for analysis to determine the degree of the possible contamination. For sites near to the seashore or water sources, groundwater samples should however be taken, in addition, downstream of potential "hot spots" or along the coast. This will be useful in giving information about the migration of the contamination and also the potential of spread of the contamination to the nearby water bodies.

2. For soil sampling, samples should be taken based on a regular grid pattern in line with most international practices. Additional samples should be taken in areas which are identified as potential "hot spots". For grid sampling, the intention is to locate an area of soil contamination which occupies 10% of a site with a 95% confidence limit. Examples of the grid sizes to achieve this for different site areas are:

Size of site	Grid size
1 ha.	18 m
3 ha.	31 m
9 ha.	56 m

Samples can be taken by means of trial pits, boreholes or similar. They should also be taken at various depths (eg. 0.5 m, 1.5 m, 3 m) so that the penetration profile of the contamination can be delineated.

3. Proper sample handling and storage are essential in a sampling exercise. Special precaution should be taken to avoid cross contamination. Samplers should be thoroughly cleaned in between sampling of individual samples. Samples taken should be

well contained, sealed and labelled. It is also a good practice to store the samples, especially those containing relatively volatile contaminants, immediately at ice temperature for proper sample preservation. Site staff and the sampling team should also pay attention to site safety of their own. They should wear proper protective clothing and observe good practice of hygiene. It is important to avoid direct or indirect contact with potentially contaminated materials.

ANALYSIS

4. Planning for sample analysis depends very much on the nature of the previous activities on the site, types of chemicals/hazardous substances stored or used, etc. Generally,

a. for petroleum contamination, TPH (Total Petroleum Hydrocarbon) is analysed; in specific cases, analysis of PAHs (Polyaromatic Hydrocarbons) and/or BTEX (Benzene, Toluene, Ethylbenzene & Xylene) will be required; and

b. for general inorganic contamination, heavy metals (eg. Cd, Cr, Cu, Hg, Ni, Pb, Zn,...), cyanide, sulphates, etc. should be targeted.

These contamination analyses should be conducted in accordance with international standard methods wherever available. Sometimes, it will also be acceptable for simple on-site screening tests to be conducted so that subsequent laboratory analyses can be focused on parameters of major concern.

INTERPRETATION OF RESULTS

5. There are a number of international references including those from U.K., U.S., Canada, the Netherlands and Australia on criteria for contaminated sites which can be used for interpretation of the assessment results. Since the Dutch Indicative Index is considered more comprehensive in terms of its coverage of parameters and is almost the mostly commonly used reference worldwide, EPD has basically adopted this as a general guideline for most of the cases. A full list of the Dutch Indicative Index is at Appendix IV.

TIMING FOR CONTAMINATION ASSESSMENT

6. Contamination assessment of this kind will usually take approximately 6 months to complete and any follow-up remediation, if necessary, will probably take another 6 months or more. Therefore, project proponents are advised to conduct the required assessment as soon as the site is available or accessible to avoid any delay to the subsequent construction programme. For cost effective arrangements, sampling for the purpose of contamination assessment can be conducted in parallel with the geo-technical survey of the site. However, the project proponent should ensure that competent and experienced professionals are employed for supervision of the sampling exercise and the subsequent interpretation of results which requires professional judgements.

Appendix G-2

Soil and Groundwater Criteria used in the Netherlands for Contaminated Land

Soil and ground water criteria used in The Netherlands for contaminated land ("Dutch List")

Component	Soil (mg/kg dry soil) A	Soil B	Soil C	Ground water (ug/L) A	Ground water B	Ground water C
1. Metals						
Cr	100	250	800	20	50	200
Co	20	50	300	20	50	200
Ni	50	100	500	20	50	200
Cu	50	100	500	20	50	200
Zn	200	500	3000	50	200	800
As	20	30	50	10	30	100
Mo	10	40	200	5	20	100
Cd	1	5	20	1	2.5	10
Sn	20	50	300	10	30	150
Ba	200	400	2000	50	100	500
Hg	0.5	2	10	0.2	0.5	2
Pb	50	150	600	20	50	200
2. Inorganics						
NH_4 (as N)	-	-	-	200	1000	3000
F (total)	200	400	2000	300	1200	4000
CN (tot.free)	1	10	100	5	30	100
(tot.comb.)	5	50	500	10	50	200
S (total)	2	20	200	10	100	300
Br (total)	20	50	300	100	500	2000
PO_4 (as P)	-	-	-	50	200	700
3. Aromatics Compounds						
Benzene	0.01	0.5	5	0.2	1	5
Ethylbenzene	0.05	5	50	0.5	20	60
Toluene	0.05	3	30	0.5	15	50
Xylenes	0.05	5	50	0.5	20	60
Phenols	0.02	1	10	0.5	15	50
Total	0.1	7	70	1	30	100
4. Polycyclic Hydrocarbons						
Naphthalene	0.1	5	50	0.2	7	30
Anthracene	0.1	10	100	0.1	2	10
Fenanthrene	0.1	10	100	0.1	2	10
Flouranthene	0.1	10	100	0.02	1	5
Pyrene	0.1	10	100	0.02	1	5
1,2 benzopyrene	0.05	1	10	0.01	0.2	1
Total	1	20	200	0.2	10	40
5. Chlorinated Hydrocarbons						
Aliphatics						
(Individual)	0.1	5	50	1	10	50
(Total)	0.1	7	70	1	15	70
Chlorobenzenes						
(Individual)	0.05	1	10	0.02	0.5	2
(Total)	0.05	2	20	0.02	1	5
Chlorophenols						
(Individual)	0.01	0.5	5	0.01	0.3	1.5
(Total)	0.01	1	10	0.01	0.5	2
Chlor. PAHs (Tot.)	0.05	1	10	0.01	0.2	1
PCB's (Tot.)	0.05	1	10	0.01	0.2	1
EOCL (Tot.)	0.1	8	80	1	15	70
6. Pesticides						
Chlorinated organics						
(Individual)	0.1	0.5	5	0.5	0.2	1
(Total)	0.1	1	10	0.1	0.5	2
Pesticides						
(Total)	0.1	2	20	0.1	1	5
7. Other Pollutants						
Tetrahydrofuran	0.1	4	40	0.5	20	60
Pyridine	0.1	2	20	0.5	10	30
Tetrahydrothiofene	0.1	5	50	0.5	20	60
Cyclohexanes	0.1	6	60	0.5	15	50
Styrene	0.1	5	50	0.5	20	60
gasoline	20	100	800	10	40	150
mineral oil	100	1000	5000	20	200	600

These values are not "standards" but rather guidelines for use in assessing the significance of contaminated land. A simplified explanation of the ABC levels : A-level implies unpolluted, B-level implies pollution present and further investigation required, C-level implies significant pollution present and cleanup (preferably back to the A-level)

Appendix G-3

Soil Contamination Assessment: International Committee on the Redevelopment of Contaminated Land

TABLE 3 TENTATIVE "TRIGGER CONCENTRATIONS" FOR SELECTED INORGANIC CONTAMINANTS

CONDITIONS

1. This Table is invalid if reproduced without the conditions and footnotes.

2. All values are for concentrations determined on "spot" samples based on an adequate site investigation carried out prior to development. They do not apply to analysis of averaged, bulked or composited samples, nor to sites which have already been developed. All proposed values are tentative.

3. The lower values in Group A are similar to the limits for metal content of sewage sludge applied to agricultural land. The values in Group B are those above which phytotoxicity is possible.

4. If all sample values are below the threshold concentrations then the site may be regarded as uncontaminated as far as the hazards from these contaminants are concerned and development may proceed. Above these concentrations, remedial action may be needed, especially if the contamination is still continuing. Above the action concentration, remedial action will be required or the form of development changed.

Contaminants		Planned Uses		Trigger Concentrations (mg/kg air-dried soil) Threshold	Action
Group A: Contaminants which may pose hazards to health					
Arsenic		Domestic gardens, allotments.		10	*
		Parks, playing fields, open space.		40	*
Cadmium		Domestic gardens, allotments.		3	*
		Parks, playing fields, open space.		15	*
Chromium (hexavalent)	(1)	Domestic Gardens, allotments.		25	*
		Parks, playing fields, open space.			
Chromium (total)		Domestic gardens, allotments.		600	*
		Parks, playing fields, open space.		1,000	*
Lead		Domestic gardens, allotments.		500	*
		Parks, playing fields, open space.		2,000	*
Mercury		Domestic gardens, allotments.		1	*
		Parks, playing fields, open space.		20	*
Selenium		Domestic gardens, allotments.		3	*
		Parks, playing fields, open space.		6	*
Group B: Contaminants which are phytotoxic but not normally hazards to health					
Boron (water-soluble)	(3)	Any uses where plants are to be grown	(2, 6)	3	*
Copper	(4, 5)	Any uses where plants are to be grown	(2, 6)	130	*
Nickel	(4, 5)	Any uses where plants are to be grown	(2, 6)	70	*
Zinc	(4, 5)	Any uses where plants are to be grown	(2, 6)	300	*

NOTES:

* Action concentrations will be specified in the next edition of ICRCL 59/83.

1. Soluble hexavalent chromium extracted by 0.1M HCl at 37°C; solution adjusted to pH 1.0 if alkaline substances present.

2. The soil pH value is assumed to be about 6.5 and should be maintained at this value. If the pH falls, the toxic effects and the uptake of these elements will be increased.

3. Determined by standard ADAS method (soluble in hot water).

4. Total concentration (extractable by $HNO_3/HClO_4$).

5. The phytotoxic effects of copper, nickel and zinc may be additive. The trigger values given here are those applicable to the 'worst-case': phytotoxic effects may occur at these concentrations in acid, sandy soils. In neutral or alkaline soils phytotoxic effects are unlikely at these concentrations.

6. Grass is more resistant to phytotoxic effects than are most other plants and its growth may not be adversely affected at these concentrations.

TABLE 4: TENTATIVE "TRIGGER CONCENTRATIONS" FOR CONTAMINANTS ASSOCIATED WITH FORMER COAL CARBONISATION SITES

CONDITIONS

1. This Table is invalid if reproduced without the conditions and footnotes.

2. All values are for concentrations determined on "spot" samples based on an adequate site investigation carried out prior to development. They do not apply to analysis of averaged, bulked or composited samples, nor to sites which have already been developed.

3. Many of these values are preliminary and will require regular updating. They should not be applied without reference to the current edition of the report "Problems Arising from the Redevelopment of Gas Works and Similar Sites". (1)

4. If all sample values are below the threshold concentrations then the site may be regarded as uncontaminated as far as the hazards from these contaminants are concerned, and development may proceed. Above these concentrations, remedial action may be needed, especially if the contamination is still continuing. Above the action concentrations, remedial action will be required or the form of development changed.

Contaminants	Proposed Uses	Trigger Concentrations (mg/kg air-dried soil) Threshold	Action
Polyaromatic hydrocarbons(1,2)	Domestic gardens, allotments, play areas.	50	500
	Landscaped areas, buildings, hard cover.	1000	10000
Phenols	Domestic gardens, allotments.	5	200
	Landscaped areas, buildings, hard cover.	5	1000
Free cyanide	Domestic gardens, allotments landscaped areas.	25	500
	Buildings, hard cover.	100	500
Complex cyanides	Domestic gardens, allotments.	250	1000
	Landscaped areas.	250	5000
	Buildings, hard cover.	250	NL
Thiocyanate(2)	All proposed uses.	50	NL
Sulphate	Domestic gardens, allotments, landscaped areas.	2000	10000
	Buildings(3).	2000(3)	50000(3)
	Hard cover.	2000	NL
Sulphide	All proposed uses.	250	1000
Sulphur	All proposed uses.	5000	20000
Acidity (pH less than)	Domestic gardens, allotments, landscaped areas.	pH5	pH3
	Buildings, hard cover.	NL	NL

NOTES

NL: No limit set as the contaminant does not pose a particular hazard for this use.
(1): Used here as a marker for coal tar, for analytical reasons. See "Problems Arising from the Redevelopment of Gas works and Similar Sites" Annex A1. (1).
(2): See "Problems Arising from the Redevelopment of Gas Works and Similar Sites" for details of analytical methods. (1).

(3): See also BRE Digest 250: Concrete in sulphate-bearing soils and groundwater. (4).

Appendix G-4

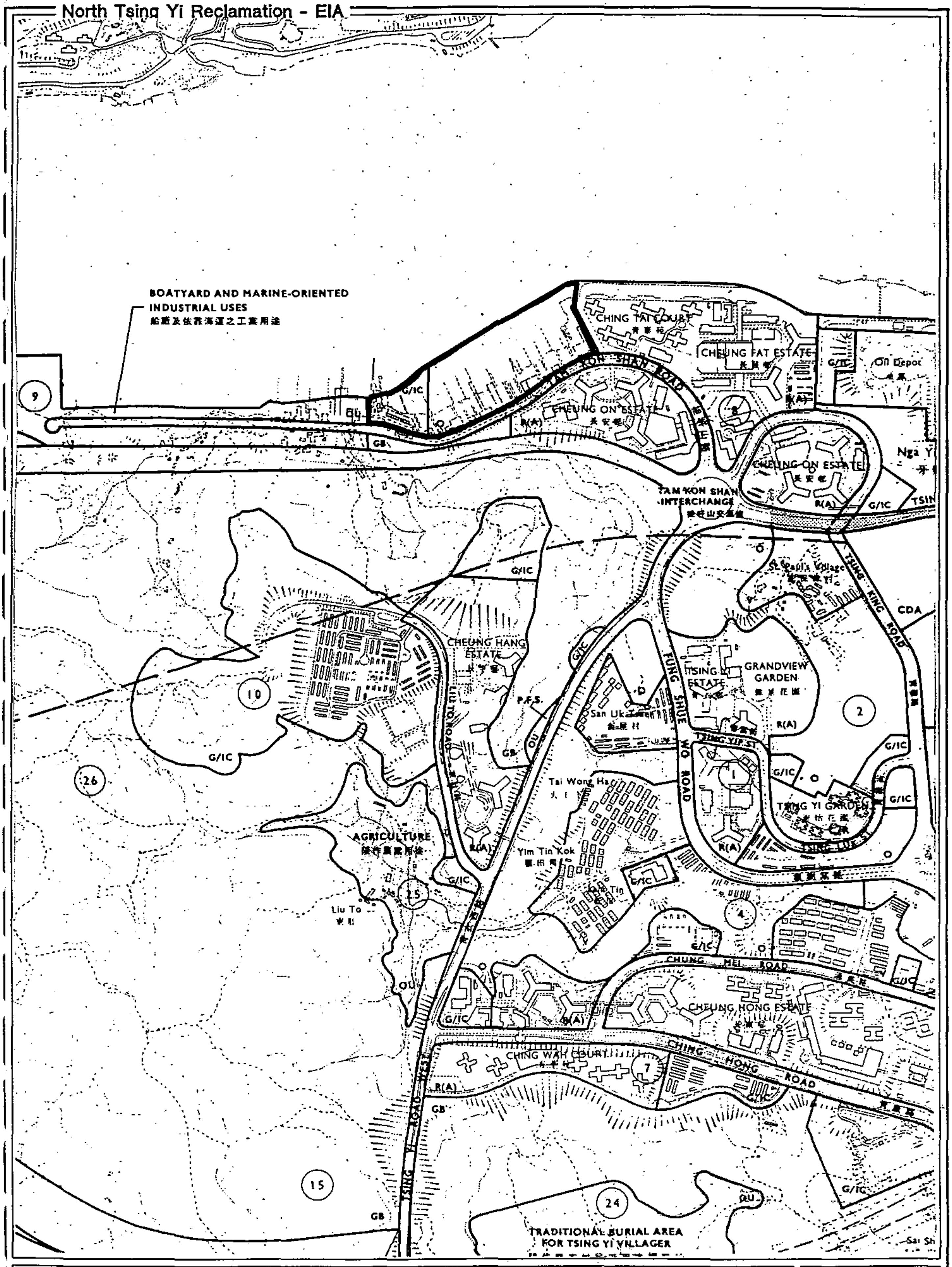
Draft Tsing Yi Outline Zoning Plan No. S/TY/8

OPEN SPACE

Column 1 Uses always permitted	Column 2 Uses that may be permitted with or without conditions on application to Town Planning Board
Ancillary Beach Use Ancillary Car Park Aviary Changing Room Park and Garden Plant Nursery Playground/Playing Field Public Convenience Refreshment Kiosk Zoo	Barbecue Spot Cable Car Route and Terminal Building Cooked Food Centre Exhibition or Convention Hall Fast Food Shop Government Refuse Collection Point Government Use (not elsewhere specified) Hawker Centre Market Mass Transit Vent Shaft or Other Structure above Ground Level Pier Place of Public Entertainment Place of Recreation, Sports or Culture Public Car Park Public Swimming Pool Public Transport Terminus or Station Public Utility Installation Religious Institution Restaurant Service Reservoir Utility Installation for Private Project

GOVERNMENT/INSTITUTION/COMMUNITY

Column 1 Uses always permitted	Column 2 Uses that may be permitted with or without conditions on application to Town Planning Board
Ambulance Depot	Abattoir
Ancillary Car/Lorry Park	Animal Pound
Broadcasting, Television and/or Film Studio	Aviary
Cable Car Route and Terminal Building	Bank
Canteen	Columbarium
Clinic/Polyclinic	Correctional Institution
Cooked Food Centre	Crematorium
Driving Test Centre	Dangerous Goods Godown
Educational Institution	Fast Food Shop
Exhibition or Convention Hall	Flat
Fire Station	Funeral Depot
Government Refuse Collection Point	Funeral Parlour
Government Staff Quarters	Funeral Service Centre
Government Use (not elsewhere specified)	Garden of Remembrance
Hawker Centre	Holiday Camp
Hospital	Hotel
Judicial Facility	House
Market	Marine Fuelling Station
Pier	Mass Transit Vent Shaft or Other Structure above Ground Level
Place of Recreation, Sports or Culture	Off-course Betting Centre
Plant Nursery	Office (other than Government Office)
Police Reporting Centre	Petrol Filling Station
Police Station	Photographic Studio
Post Office	Place of Public Entertainment
Private Swimming Pool	Private Club
Public Bathhouse	Quarantine Station and Quarantine Lairage for Animals
Public Car/Lorry Park	Radar, Telecommunication Electronic Microwave Repeater, Television and/or Radio Transmitter Installation
Public Convenience	Refuse Disposal Installation
Public Library	Restaurant
Public Swimming Pool	Retail Shop
Public Transport Terminus or Station	Sand Depot
Public Utility Installation	School (other than in free standing purpose-designed school building)
Religious Institution	Service Apartment
Residential Institution	Service Trades
School (in free standing purpose-designed school building only)	Showroom excluding Motro-vehicle Showroom
Service Reservoir	Staff Quarters
Sewage Treatment/Screening Plant	Utility Installation for Private Project
Social Welfare Facility	Warehouse/Godown
Vehicle Pound	Zoo
Wholesale Food Market	



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Draft Tsing Yi Outline Zoning Plan No. S/TY/8

Figure No. G-4.1

Appendix G-5

List of Products noted on Site by Product Name

Products Used on Site

Products noted on site	Main Constituents	Manufacturer
Acetone (Kowloon Shipyard)	Acetone	Unknown
Resin (Kowloon Shipyard)		Unknown
Paints:		
Zinc Chromite (Primer)	Zinc, Chromium	Camarine
Interspeed TBT-Free Antifouling Red (BWA500)	Cuprous Oxide	International
Sigmaphane hb Anti-fouling Paint Red-Brown 2106	Tributyltin (TBT)	Sigma
TCN 300 Coating	Xylene/Alkyl-arylpolyamine	Sigma
Interclene Regular TBT-Free Antifouling Red	Cuprous Oxide	International
Sigmarine Red Lead Alkyd Primer	Lead	Sigma
Marine Paint	Lead	Transocean
Intertuf Aluminium	Aluminium	International
Light Aluminium (Hemaptex Aluminium)	Aluminium, Aromatic Hydrocarbon (Ethylbenzene, Xylenes), White Spirit, Carbontetrachloride, Chloride Paraffin, Chlorinated Rubber, Quartz	Hempel-Seagull
Synthetic Enamel	Alkyl-base	Camlux
Anti-fouling Boottop 755 Red	Unknown	Woolsey
Hempalin Red Lead Primer	Lead Oxide, White Spirit, Alkyd	Hempel-Seagull
Hempalin Red 5000 Anti-fouling Classic 7611	Unknown	Hempel-Seagull
Hempalin B/T Coating (5118) Black 1999	Alkyd, Kerosene Resin, White Spirit	Hempel-Seagull
Bituminous Paint PF4	Bitumin	Torpedo Marine Coatings
B/T Coating 5118 Green	Alkyd, Kerosene Resin	Hempel-Seagull
Enamel 5214 Cream	Alkyd, White Spirit	Hempel-Seagull
B/T emamel red	Alkyd based	Hempel-Seagull
Platin primer 1000	Zinc, Aluminium, Alkyd, Bitumen, Petroleum, Resin, Xylenes, White Spirit	Hempel-Seagull
Hempel enamel white 5214	Alkyd, White Spirit	Hempel-Seagull
Wood stain (mahogany)	Unknown	Unknown
Peacock Blue	Unknown	Camlux
Red emamel 5214	Alkyd, White Spirit	Hempel - Seagull
Yellow enamel 2038	Alkyd, White Spirit	Hempel - Seagull
Other Materials:		
Thinners 9179	Xylene	Sigma
TCN Tiecoat (hardener)	Vinyl-epoxy	Sigma
Hydraulic Oil	Oil	Mobil DTM
Glassfibre primer	Unknown	International
Epiglass reaction lacquer	Unknown	Unknown
Epoxy primer	Unknown	Unknown
Fibre glass	Fibre Glass	Unknown
Super grease K2	Unknown	Unknown
Various thinners	Unknown	Unknown

APPENDIX H

Specification Clauses
for
Pollution Control

APPENDIX H

RECOMMENDED SPECIFICATION CLAUSES FOR POLLUTION CONTROL

1.0 SOLID WASTE

1.1 Conditions Prior to Site Clearance

1. An asbestos survey shall be undertaken by a Specialist Asbestos Contractor, approved by EPD, prior to commencement of site clearance works. All asbestos handling, transportation and disposal shall follow the "Code of Practice on Handling, Transportation and Disposal of Asbestos Waste" published under Section 35 of the Waste Disposal Ordinance (Cap. 345). Workers who carry out the site clearance shall wear protective clothing, face masks and other safety equipment approved under the "Factories and industrial Undertakings (Asbestos) Special Regulation 1986".

1.2 Conditions During Site Clearance

1. The Contractor shall ensure that all waste paints, oils and solvents found on site are handled, collected, treated and disposed of in accordance with the Waste Disposal Regulations (Chemical Waste and General). These materials shall be separated from non-chemical waste, stored in appropriate containers with proper labels and collected by a licensed collector for delivery to the Chemical Waste Treatment Centre for treatment or a designated landfill site for disposal as advised by EPD. Workers who are involved in the handling of chemical waste shall be suitably trained and wear appropriate protective masks and clothing when handling such materials.

2. The Contractor shall separate general wastes including steel, other metals and timber from other wastes, as far as practical, and arrange for a recycling company to collect these materials.

3. The Contractor shall stockpile on site all concrete from building structures found to be uncontaminated. This material shall be covered and used for fill material during reclamation construction.

4. Other residual uncontaminated demolition waste and debris, not suitable for the reclamation, shall be disposed of at a landfill site.

2.0 TRAFFIC

2.1 Conditions During Reclamation Construction

1. A requirement to use the northern bridge rather than the congested southern Tsing Yi Bridge shall be written into the Dumping License Agreement.

2. The Contractor shall locate the site entrance at the western end and the exit at the eastern end of the site. Vehicles shall travel along Tam Kon Shan Road to the western end to enter the site, and will leave via the exit at the eastern end. All queuing/waiting/parking shall be within the site boundary with no queuing outside on Tam Kon Shan Road.

(d) Idle equipment shall be turned off or throttled down. Noisy equipment shall be properly maintained and used no more often than is necessary.

(e) The power units of non-electric stationary plant and earth-moving plant shall be quietened by vibration isolation and partial or full acoustic enclosures for individual noise-generating components.

(f) Construction activities shall be planned so that parallel operations of several sets of equipment close to a given receiver is avoided.

(g) The numbers of operating items of powered mechanical equipment shall be kept to a minimum.

(h) Construction plant shall be properly maintained and operated.

(i) Temporary noise barriers or an earth embankment shall be used to screen specific receivers where required to meet the Acceptable Noise Levels. Enclosures for noisy activities such as concrete breaking shall be applied where the noise impact is potentially severe.

(j) Residents and school administrations shall be notified in advance of planned operations and informed of progress. A liaison body shall be established to bring together representatives of the affected communities, the government, and the contractors. In addition, residents and the school administrations shall be provided with a telephone number for the Representative Engineer's office, where they may register complaints concerning excessive noise. If justified, the Resident Engineer may authorise noisy operations to cease or to be conducted at more restricted hours.

3.5 Conditions for Noise Monitoring Equipment

1. The Contractor shall provide one approved integrating sound level meter to IEC 651 : 1979 (Type 1) and 804: 1985 (Type 1) Specification and a sound level calibrator recommended by the manufacturer. The equipment shall be for the exclusive use of the Engineer's Representative at all times. The Contractor shall maintain the equipment in proper working order and provide a substitute when the equipment is out of order or otherwise not available. A wind shield, suitable tripod and windspeed anemometer shall also be provided by the Contractor.

2. The sound level meter including the sound level calibrator shall be verified by the manufacturers every two years to ensure they perform the same levels of accuracies as stated in the manufacturer's specifications. That is to say at the time of measurements, the equipment shall have been verified within the last two years.

3. Immediately prior to and following each noise monitoring round, the accuracy of the sound level meter shall be checked using an acoustic calibrator generating a known pressure level at a known frequency.

4. The Contractor shall ensure that all measurements shall be carried out by suitably experienced staff, who have been approved by the Engineer's Representative and that all sound level readings are recorded on forms provided by the Contractor and approved by the Engineer's Representative.

7. Areas reaching the final level shall be progressively restored with hydroseeding and a surface water drainage system in order to control dust generation and surface water runoff.

4.3 Conditions for Air Quality Monitoring

1. The Contractor shall provide and operate one high volume air sampler and associated equipment and shelters in accordance with the USA standard *Title 40, Code of Federal Regulations, Chapter 1 (part 50), Appendix B* for the measurement of TSP. The Contractor shall maintain the equipment in proper working order and provide a replacement when the equipment is out of order or otherwise not available.

2. The Contractor shall provide all necessary protection fences and the like at each monitoring location. Testing and analysis of samples shall be carried out by a laboratory approved by the Engineer's Representative.

3. The Contractor shall install and operate equipment to measure wind speed and direction at a location to be agreed with the Engineer's Representative. The Contractor shall supply a data logger for collection of the wind speed data.

4. TSP monitoring for baseline and compliance monitoring shall be carried out at the locations, frequency and specification as defined in the EM&A manual. The exact location of the TSP monitoring is to be agreed with the Engineer's Representative and recorded for future compliance. The Contractor shall consult the Engineer's Representative for obtaining approval for any amendments to the EM&A Manual.

5. The Contractor shall submit to the Engineer's Representative, no later than the 10th day of the month following the monthly reporting period, three copies of a monthly monitoring report containing the contents specified in the EM&A manual.

5.0 WATER POLLUTION CONTROL

5.1 General Conditions

1. The Contractor shall carry out the works in such a manner as to minimise adverse impacts on the water quality. In particular the Contractor shall arrange the method of working to minimise the impact to water quality within the Site and adjacent to the Site. The Contractor shall ensure that the impact of the works on the water quality does not cause the target levels in Table 1 to be exceeded.

2. Before marine plant is used for the Project, it shall be inspected by the Engineer's Representative to ensure that the plant is suitable. The Contractor shall provide all necessary facilities to the Engineer's Representative for inspecting or checking such vessels and shall not use such vessels or plant for the Works without the agreement of the Engineer's Representative. The Engineer's Representative may require the Contractor to carry out trials of any plant or vessels to prove their suitability.

3. The Contractor shall design methods of working to minimise water pollution and shall provide experienced personnel with suitable training to ensure that these methods are implemented.

4. The Contractor shall submit the proposed methods of working to the Engineer's Representative before the commencement of the Works.

5.3 Conditions During Seawall Construction

1. During dredging activities, the Contractor shall use the following:

(a) Dredging of designated contaminated marine mud shall only be undertaken by a suitable grab dredger using a close grab within a silt curtain at all times to retain fine sediments released to the water column.

(b) Silt curtain shall be formed from tough, abrasion resistant, permeable membranes, suitable for the purpose, supported on floating booms in such a way as to ensure that the leakage of turbid waters is restricted.

(c) The bottom of the curtain should be formed and installed in such a way that tidal rise and fall are accommodated, and that the leakage of turbid waters is limited. The removal and reinstallation of such curtain during typhoon conditions shall be as agreed with the Director of Marine.

(d) The Contractor shall regularly inspect the silt curtain to ensure that it is adequately moored and marked to avoid danger to marine traffic.

(e) The Contractor shall design and implement working methods that:-

- Minimise disturbance to the seabed while dredging;
- Minimise leakage of dredged material during lifting;
- Minimise loss of material during transport of fill or dredged material;
- Prevent discharge of public dump material or dredged material except at approved locations;
- Prevent the unacceptable reduction of the dissolved oxygen content of the water adjacent to the Works

In the case that the Contractor fails to implement the necessary mitigation measures or the water quality deterioration persists despite the mitigation measures then the Engineer's Representative can instruct the Contractor to temporarily suspend the causative works until the Engineer is assured that proper mitigation measures have been implemented and the water quality has returned to acceptable levels.

2. EPD's Contaminated Sediment License Agreement contain requirements that shall be followed for the transport and disposal of contaminated sediments. The Contractor shall ensure that the following precautionary measures are also undertaken when transporting the contaminated sediment:

(a) Adequate load management shall be undertaken to ensure barges are not overloaded and to avoid spilled material being washed-off the decks and slopping.

(b) Purpose built bottom dumping barges shall be used which shall be fitted with water tight doors to prevent leakage.

(c) Transport of designated contaminated marine mud shall be by split barge well maintained and capable of rapid opening and discharge at the disposal site.

(d) Discharge from split barges shall take place within a radius of 100 metres of centre of the area allocated for the disposal of designated contaminated marine mud.

5.4 Conditions During Reclamation Construction

1. The Contractor shall provide a containment curtain with a suitably protected surface boom to be used for containing any floating material. The area contained by the boom should be cleared at least daily by scavenging sampans during periods when the site is being operated. The timber and other materials recovered should be disposed of appropriately at a landfill.

2. The Contractor shall enforce strict application of the dumping licences and monitor the material placed in the reclamation to control disposal of unauthorised material. Unauthorised material shall not be used in the reclamation.

3. The Contractor shall provide a recirculation system to be used to reduce the amount of discharge from the vehicle wash. The settled solids shall be disposed of to dry areas of the reclamation and arrangements made for treatment or off site disposal of oil contaminated wash water.

4. The Contractor shall ensure that fuel tanks on the site are housed within bunded containment areas which shall be regularly drained of rain water. Vehicle maintenance shall be carried out on paved areas and spillage, if it occurs, should be controlled by adsorbents. Waste oils shall also be collected in designated tanks prior to disposal off site.

5. The Contractor shall, if feasible, connect permanent site offices and facilities to the sewer in Tam Kon Shan Road. If this is not found feasible, chemical toilet facilities shall be provided and serviced daily.

6. The seawall shall be constructed progressively to ensure that it extends beyond a 150 m distance from the tipping face. When the seawall is within 150 m from total enclosure the vertical seawall shall be completed to facilitate final closure.

5.5 Conditions for Water Quality Monitoring

1. The Contractor shall provide the following equipment upon commencement of the Contract in accordance with the EM&A Manual:

   (a) Dissolved oxygen (DO) and temperature measuring equipment. The instrument shall be a portable, weatherproof dissolved oxygen measuring instrument complete with cable, sensor, comprehensive operation manuals, and be operable from a DC power source. It shall be capable of measuring a dissolved oxygen level in the range of 0-15 mg/l and 0-200% saturation and a temperature of 0-45 degree Celsius. (YSI model 58 meter, YSI 5739 probe, YSI 5795A submersible stirrer with reel and cable or similar approved by EPD). It shall have a membrane electrode with automatic temperature compensation complete with a cable of not less than 25 m in length. Sufficient stocks of spare electrodes and cable shall be maintained for replacement where necessary.

   (b) A Salinometer that is portable, weatherproof, complete with cable, sensor, comprehensive operation manuals and can be operated from a DC power source such as the YSI model 33.5.C.T. or other similar equipment approved by EPD.

   (c) Turbidity Measurement Instrument. The instrument shall be a portable, weatherproof turbidity-measuring instrument complete with sensor and comprehensive operation manuals. The equipment shall be operable from a DC power source. It shall have a

APPENDIX H

RECOMMENDED SPECIFICATION CLAUSES FOR POLLUTION CONTROL

1.0 SOLID WASTE

1.1 Conditions Prior to Site Clearance

1. An asbestos survey shall be undertaken by a Specialist Asbestos Contractor, approved by EPD, prior to commencement of site clearance works. All asbestos handling, transportation and disposal shall follow the "Code of Practice on Handling, Transportation and Disposal of Asbestos Waste" published under Section 35 of the Waste Disposal Ordinance (Cap. 345). Workers who carry out the site clearance shall wear protective clothing, face masks and other safety equipment approved under the "Factories and industrial Undertakings (Asbestos) Special Regulation 1986".

1.2 Conditions During Site Clearance

1. The Contractor shall ensure that all waste paints, oils and solvents found on site are handled, collected, treated and disposed of in accordance with the Waste Disposal Regulations (Chemical Waste and General). These materials shall be separated from non-chemical waste, stored in appropriate containers with proper labels and collected by a licensed collector for delivery to the Chemical Waste Treatment Centre for treatment or a designated landfill site for disposal as advised by EPD. Workers who are involved in the handling of chemical waste shall be suitably trained and wear appropriate protective masks and clothing when handling such materials.

2. The Contractor shall separate general wastes including steel, other metals and timber from other wastes, as far as practical, and arrange for a recycling company to collect these materials.

3. The Contractor shall stockpile on site all concrete from building structures found to be uncontaminated. This material shall be covered and used for fill material during reclamation construction.

4. Other residual uncontaminated demolition waste and debris, not suitable for the reclamation, shall be disposed of at a landfill site.

2.0 TRAFFIC

2.1 Conditions During Reclamation Construction

1. A requirement to use the northern bridge rather than the congested southern Tsing Yi Bridge shall be written into the Dumping License Agreement.

2. The Contractor shall locate the site entrance at the western end and the exit at the eastern end of the site. Vehicles shall travel along Tam Kon Shan Road to the western end to enter the site, and will leave via the exit at the eastern end. All queuing/waiting/parking shall be within the site boundary with no queuing outside on Tam Kon Shan Road.

3.0 NOISE POLLUTION CONTROL

3.1 General Conditions

1. The Contractor shall comply with and observe the Noise Control Ordinance and its subsidiary regulations.

2. In addition to the Acceptable Noise Levels specified in the Noise Control Ordinance, the noise levels at any sensitive receiver resulting from the Contrctor's activities shall not exceed 75dB(A) at any dwelling or 70dB(A) at any school (65dB(A) during examination periods) during any period not otherwise restricted under the Noise Control Ordinance.

3. No truck, bulldozer and dump truck with sound power levels higher than 109dB(A), 109dB(A) and 111dB(A), respectively, shall be used on site unless the Contractor can provide adequate measures such that the overall construction noise levels at the noise sensitive receivers are less than the recommended criteria stipulated in the Practice Note for Professional Persons (No. PNDECC PN 2/93).

3.2 Conditions During Site Clearance

The Contractor shall prepare an equipment list and schedule that meet the requirements of the noise level reduction as listed in the EIA. This shall be submitted to EPD for approval prior to the start of site clearance. The Contractor shall demonstrate that no noise impacts will occur to any noise sensitive receivers.

3.3 Conditions During Reclamation Construction

The Contractor shall prepare a list of equipment and schedule of activities together with a statement of noise impacts for approval by EPD prior to the start of reclamation construction. The Contractor shall be required to demonstrate that no noise impacts will occur to any noise sensitive receivers.

3.4 Conditions During all Stages of Project Construction

1. The following noise reduction measures to reduce noise levels from Project activities shall be implemented by the Contractor as part of general working practices:

   (a) Noisy equipment and activities shall be sited as far from sensitive receivers as is practical.

   (b) Noisy plant or processes shall be replaced by quieter alternatives where possible. For example, pneumatic concrete breakers shall be silenced with mufflers and bit dampers. Silenced diesel and gasoline generators and power units as well as silenced and super-silenced air compressors shall be used.

   (c) Noisy activities shall be scheduled to minimise exposure of nearby NSRs to high levels of construction noise. For example, noisy activities shall be scheduled for midday or at times coinciding with periods of high background noise (such as during peak traffic hours). Prolonged operation of noisy equipment close to dwellings or during school examination period shall be avoided.

(d) Idle equipment shall be turned off or throttled down. Noisy equipment shall be properly maintained and used no more often than is necessary.

(e) The power units of non-electric stationary plant and earth-moving plant shall be quietened by vibration isolation and partial or full acoustic enclosures for individual noise-generating components.

(f) Construction activities shall be planned so that parallel operations of several sets of equipment close to a given receiver is avoided.

(g) The numbers of operating items of powered mechanical equipment shall be kept to a minimum.

(h) Construction plant shall be properly maintained and operated.

(i) Temporary noise barriers or an earth embankment shall be used to screen specific receivers where required to meet the Acceptable Noise Levels. Enclosures for noisy activities such as concrete breaking shall be applied where the noise impact is potentially severe.

(j) Residents and school administrations shall be notified in advance of planned operations and informed of progress. A liaison body shall be established to bring together representatives of the affected communities, the government, and the contractors. In addition, residents and the school administrations shall be provided with a telephone number for the Representative Engineer's office, where they may register complaints concerning excessive noise. If justified, the Resident Engineer may authorise noisy operations to cease or to be conducted at more restricted hours.

3.5 Conditions for Noise Monitoring Equipment

1. The Contractor shall provide one approved integrating sound level meter to IEC 651 : 1979 (Type 1) and 804: 1985 (Type 1) Specification and a sound level calibrator recommended by the manufacturer. The equipment shall be for the exclusive use of the Engineer's Representative at all times. The Contractor shall maintain the equipment in proper working order and provide a substitute when the equipment is out of order or otherwise not available. A wind shield, suitable tripod and windspeed anemometer shall also be provided by the Contractor.

2. The sound level meter including the sound level calibrator shall be verified by the manufacturers every two years to ensure they perform the same levels of accuracies as stated in the manufacturer's specifications. That is to say at the time of measurements, the equipment shall have been verified within the last two years.

3. Immediately prior to and following each noise monitoring round, the accuracy of the sound level meter shall be checked using an acoustic calibrator generating a known pressure level at a known frequency.

4. The Contractor shall ensure that all measurements shall be carried out by suitably experienced staff, who have been approved by the Engineer's Representative and that all sound level readings are recorded on forms provided by the Contractor and approved by the Engineer's Representative.

5. Noise level monitoring shall be carried out at the locations, frequency and specification as defined in the Environmental Monitoring and Audit (EM&A) manual for baseline and compliance monitoring. The Contractor shall consult the Engineer's Representative for obtaining approval for any amendments to the EM&A Manual.

6. The Contractor shall submit to the Engineer's Representative, no later than the 10th day of the month following the monthly reporting period, three copies of a monthly monitoring report containing the contentents specified in the EM&A manual.

4.0 AIR POLLUTION CONTROL

4.1 General Conditions

The Contractor shall ensure that levels of Total Suspended Particulates (TSP) do not exceed 500μg/m^3 at the site boundary or 260μg/m^3 at the nearest sensitive receivers.

4.2 Conditions During Reclamation Construction

1. The Contractor shall restrict all vehicles to a maximum speed of 8 kph along the haul road and confine haulage and delivery vehicles to designated roadways inside the site. The 8 kph speed limit shall be posted on site in areas visable to incoming drivers. Other measures such as chicanes or speed bumps shall be implemented, if required, to ensure that vehicles do not exceed the speed limit.

2. The Contractor shall reduce dust emissions from the haul road by watering the haul road four times a day.

3. If it is found through the dust monitoring that watering and limiting vehicular speed are not effective, then paving of the haul road shall be required to reduce dust to an acceptable level.

4. The Contractor shall provide and maintain a comprehensive wheel washing facility at a location approved by the Engineer's Representative to remove dust and grit from the tires, undercarriage and body of vehicles leaving the site. The design of the wheel washing facility shall be approved by the Engineer's Representative before installation in order to ensure that it is suitable for the Project. All vehicles leaving the site shall be thoroughly cleaned. No earth, mud, debris, dust and the like shall be deposited on access and public roads. Water in the wheel cleaning facility shall be recirculated through a settling facility. Water shall be changed when the recirculated water becomes muddy. The wheel washing facility shall be constructed prior to the start of construction works for the seawall and reclamation. The Contractor shall also provide a hard-surfaced road between the washing facility and the public road.

5. Proper cleaning of the access road (e.g. flushing or vacuming) shall be conducted twice a week.

6. The Contractor shall water any stockpile of materials, access points and other areas during dust generating activities twice daily, if necessary using chemical treatment with a wetting agent (to more effectively wet fines and retain moisture) and provide windbreaks on three sides to prevent wind erosion at stock piles. During adverse weather conditions (e.g. windy and dry conditions) additional watering over the normal twice-daily watering shall be conducted.

7. Areas reaching the final level shall be progressively restored with hydroseeding and a surface water drainage system in order to control dust generation and surface water runoff.

4.3 Conditions for Air Quality Monitoring

1. The Contractor shall provide and operate one high volume air sampler and associated equipment and shelters in accordance with the USA standard *Title 40, Code of Federal Regulations, Chapter 1 (part 50), Appendix B* for the measurement of TSP. The Contractor shall maintain the equipment in proper working order and provide a replacement when the equipment is out of order or otherwise not available.

2. The Contractor shall provide all necessary protection fences and the like at each monitoring location. Testing and analysis of samples shall be carried out by a laboratory approved by the Engineer's Representative.

3. The Contractor shall install and operate equipment to measure wind speed and direction at a location to be agreed with the Engineer's Representative. The Contractor shall supply a data logger for collection of the wind speed data.

4. TSP monitoring for baseline and compliance monitoring shall be carried out at the locations, frequency and specification as defined in the EM&A manual. The exact location of the TSP monitoring is to be agreed with the Engineer's Representative and recorded for future compliance. The Contractor shall consult the Engineer's Representative for obtaining approval for any amendments to the EM&A Manual.

5. The Contractor shall submit to the Engineer's Representative, no later than the 10th day of the month following the monthly reporting period, three copies of a monthly monitoring report containing the contents specified in the EM&A manual.

5.0 WATER POLLUTION CONTROL

5.1 General Conditions

1. The Contractor shall carry out the works in such a manner as to minimise adverse impacts on the water quality. In particular the Contractor shall arrange the method of working to minimise the impact to water quality within the Site and adjacent to the Site. The Contractor shall ensure that the impact of the works on the water quality does not cause the target levels in Table 1 to be exceeded.

2. Before marine plant is used for the Project, it shall be inspected by the Engineer's Representative to ensure that the plant is suitable. The Contractor shall provide all necessary facilities to the Engineer's Representative for inspecting or checking such vessels and shall not use such vessels or plant for the Works without the agreement of the Engineer's Representative. The Engineer's Representative may require the Contractor to carry out trials of any plant or vessels to prove their suitability.

3. The Contractor shall design methods of working to minimise water pollution and shall provide experienced personnel with suitable training to ensure that these methods are implemented.

4. The Contractor shall submit the proposed methods of working to the Engineer's Representative before the commencement of the Works.

5. After commencement of construction, if the plant or work methods are believed by the Engineer's Representative to be causing unacceptable levels of pollution, the plant or work methods shall be inspected and remedial proposals drawn up, approved and implemented. Where such remedial measures include the use of additional or alternative plant such plant shall not be used on the works until agreed by the Engineer's Representative. Where remedial measures include maintenance or modification of previously approved plant such plant shall not be used on the Works until such maintenance or modification is completed and the adequacy of the maintenance or modification is demonstrated to the satisfaction of the Engineer's Representative.

Table 1 : Marine Water Quality Target Levels

Water Quality Parameter	Target Level
Offensive odours, tints and colours	The Contractor and Engineer's Representative should ensure that these are always absent at the site as a result of site activities
Visible foam, oil, grease, scum and litter	
Dissolved Oxygen within 2 m of the bottom	<u>Surface & Middle:</u> < 4 mg/L <u>Bottom:</u> < 2 mg/L (Requirements in WQOs)
Dissolved oxygen in the rest of the column	SS > 99% - ile of baseline data and SS > 130% upstream control station's SS at the same tide of the same day
Turbidity (NTU) Depth Average	Tby 99% - ile of baseline data and Tby > 130% upstream control station's Tby at the same tide of the same day
Suspended solids (mg/l) Depth Average	
Total Copper (μg/l) Depth Average	Determined from baseline monitoring
Total Lead (μg/l) Depth Average	
Total TBT (μg/l) Depth Average	

* "depth averaged" is calculated by taking the arithmetic means of reading of all three depths

5.2 Conditions During Site Clearance

1. The Contractor shall provide solid waste containers for waste paints and chemicals during site clearance activities. These containers shall be stored in a secure area at least 5 metres from the mean high tide level. Chemical storage containers shall be properly labelled to avoid mixing of chemicals.

2. The Contractor shall be required to remove slipway runners only at low tide during slack water.

5.3 Conditions During Seawall Construction

1. During dredging activities, the Contractor shall use the following:

   (a) Dredging of designated contaminated marine mud shall only be undertaken by a suitable grab dredger using a close grab within a silt curtain at all times to retain fine sediments released to the water column.

   (b) Silt curtain shall be formed from tough, abrasion resistant, permeable membranes, suitable for the purpose, supported on floating booms in such a way as to ensure that the leakage of turbid waters is restricted.

   (c) The bottom of the curtain should be formed and installed in such a way that tidal rise and fall are accommodated, and that the leakage of turbid waters is limited. The removal and reinstallation of such curtain during typhoon conditions shall be as agreed with the Director of Marine.

   (d) The Contractor shall regularly inspect the silt curtain to ensure that it is adequately moored and marked to avoid danger to marine traffic.

   (e) The Contractor shall design and implement working methods that:-

   - Minimise disturbance to the seabed while dredging;
   - Minimise leakage of dredged material during lifting;
   - Minimise loss of material during transport of fill or dredged material;
   - Prevent discharge of public dump material or dredged material except at approved locations;
   - Prevent the unacceptable reduction of the dissolved oxygen content of the water adjacent to the Works

   In the case that the Contractor fails to implement the necessary mitigation measures or the water quality deterioration persists despite the mitigation measures then the Engineer's Representative can instruct the Contractor to temporarily suspend the causative works until the Engineer is assured that proper mitigation measures have been implemented and the water quality has returned to acceptable levels.

2. EPD's Contaminated Sediment License Agreement contain requirements that shall be followed for the transport and disposal of contaminated sediments. The Contractor shall ensure that the following precautionary measures are also undertaken when transporting the contaminated sediment:

   (a) Adequate load management shall be undertaken to ensure barges are not overloaded and to avoid spilled material being washed-off the decks and slopping.

   (b) Purpose built bottom dumping barges shall be used which shall be fitted with water tight doors to prevent leakage.

   (c) Transport of designated contaminated marine mud shall be by split barge well maintained and capable of rapid opening and discharge at the disposal site.

   (d) Discharge from split barges shall take place within a radius of 100 metres of centre of the area allocated for the disposal of designated contaminated marine mud.

(e) Discharge shall be undertaken rapidly and the hoppers shall then immediately be closed; any material adhering to the sides of the shall not be washed out of the hopper and the hopper should remain closed until the barge next returns to the disposal site.

3. In addition to the above mitigation measures, the Contractor should also include the following procedures for the avoidance of water pollution during dredging, transporting and dumping of marine mud.

(a) Mechanical grabs shall be designed and maintained to avoid spillage and shall seal tightly while being lifted.

(b) All vessels shall be sized such that adequate clearance is maintained between vessels and the sea bed and under water pipelines at all states of the tide to ensure that undue turbidity is not generated by turbulence from vessel movement or propeller wash or pipelines damaged.

(c) The Works shall cause no visible foam, oil, grease, scum, litter or other objectionable matter to be present on the water within the Site or dumping grounds.

(d) All barges shall be fitted with tight fitting seals to their bottom openings to prevent leakage of material.

(e) Excess material shall be cleaned from the decks and exposed fittings of barges before the vessels are moved.

(f) Loading of barges shall be controlled to prevent splashing of dredged material to the surrounding water and barges shall not be filled to a level which will cause overflowing of material or polluted water during loading or transportation.

(g) The Engineer Representative may monitor any or all vessels transporting material to ensure that no dumping outside the approved location takes place. The Contractor shall provide all reasonable assistance to the Engineer's Representattive for this purpose.

(h) The Contractor shall ensure that all contaminated marine mud is disposed of at the approved locations. He will be required to ensure accurate positioning of vessels before discharge and will be required to submit and agree proposals with the Engineer for accurate position control at disposal sites before commencing dumping.

(i) The Engineer shall monitor any or all vessels transporting material to ensure that loss of material does not take place during transportation. The Contractor is to provide all reasonable assistance to the Engineer's Representative for this purpose.

(j) The Contractor shall ensure that all unsuitable material that is found during dredging is disposed of at the approved landfill or other designated location.

4. The Contractor shall ensure that no Contractor's vessel shall obstruct free marine access to the adjacent operational shipyards. Measures shall also be taken by the contractor to avoid any form of disturbance to normal operating conditions at the adjacent shipyards.

5.4 Conditions During Reclamation Construction

1. The Contractor shall provide a containment curtain with a suitably protected surface boom to be used for containing any floating material. The area contained by the boom should be cleared at least daily by scavenging sampans during periods when the site is being operated. The timber and other materials recovered should be disposed of appropriately at a landfill.

2. The Contractor shall enforce strict application of the dumping licences and monitor the material placed in the reclamation to control disposal of unauthorised material. Unauthorised material shall not be used in the reclamation.

3. The Contractor shall provide a recirculation system to be used to reduce the amount of discharge from the vehicle wash. The settled solids shall be disposed of to dry areas of the reclamation and arrangements made for treatment or off site disposal of oil contaminated wash water.

4. The Contractor shall ensure that fuel tanks on the site are housed within bunded containment areas which shall be regularly drained of rain water. Vehicle maintenance shall be carried out on paved areas and spillage, if it occurs, should be controlled by adsorbents. Waste oils shall also be collected in designated tanks prior to disposal off site.

5. The Contractor shall, if feasible, connect permanent site offices and facilities to the sewer in Tam Kon Shan Road. If this is not found feasible, chemical toilet facilities shall be provided and serviced daily.

6. The seawall shall be constructed progressively to ensure that it extends beyond a 150 m distance from the tipping face. When the seawall is within 150 m from total enclosure the vertical seawall shall be completed to facilitate final closure.

5.5 Conditions for Water Quality Monitoring

1. The Contractor shall provide the following equipment upon commencement of the Contract in accordance with the EM&A Manual:

   (a) Dissolved oxygen (DO) and temperature measuring equipment. The instrument shall be a portable, weatherproof dissolved oxygen measuring instrument complete with cable, sensor, comprehensive operation manuals, and be operable from a DC power source. It shall be capable of measuring a dissolved oxygen level in the range of 0-15 mg/l and 0-200% saturation and a temperature of 0-45 degree Celsius. (YSI model 58 meter, YSI 5739 probe, YSI 5795A submersible stirrer with reel and cable or similar approved by EPD). It shall have a membrane electrode with automatic temperature compensation complete with a cable of not less than 25 m in length. Sufficient stocks of spare electrodes and cable shall be maintained for replacement where necessary.

   (b) A Salinometer that is portable, weatherproof, complete with cable, sensor, comprehensive operation manuals and can be operated from a DC power source such as the YSI model 33.5.C.T. or other similar equipment approved by EPD.

   (c) Turbidity Measurement Instrument. The instrument shall be a portable, weatherproof turbidity-measuring instrument complete with sensor and comprehensive operation manuals. The equipment shall be operable from a DC power source. It shall have a photoelectric sensor capable of measuring turbidity between 0-200 NTU such as the Hach 2100P Turbidimeter or other similar equipment approved by EPD).

(d) A laboratory standard certified mercury thermometer with an accuracy of at least 0.5 degree Celsius.

(e) A portable, battery-operated Echo Sounder shall be used for the determination of water depth at each Designated Monitoring Station. This unit can either be handheld or affixed to the bottom of the work boat if the same vessel is to be used throughout the monitoring programme (Seafarer 701 or other similar equipment approved by EPD).

(f) Water sampling shall be taken by a water sampler consisting of a 3 litre PVC cylinder that can be effectively sealed with latex cups at both ends. The sampler shall have a positive latching system to prevent premature closure until released by a messenger at the selected water depth (Kalisco water sampler 135WB203 or other similar equipment approved by EPD).

(g) Equipment shall be lowered over the side of the boat using a weighted hydrowire calibrated at at least 0.5 m intervals.

2. All monitoring instruments shall be checked, calibrated and certified by an approved accredited laboratory before use and subsequently re-calibrated at 3-month intervals throughout all stages of the water quality monitoring. Responses of sensors and electrodes shall be checked with certified standard solutions before each use. The turbidity meter shall be calibrated to establish the relationship between turbidity readings (in NTU) and levels of suspended solids (in mg/l).

3. The Contractor shall provide approved qualified technicians, capable of operating the monitoring equipment, together with a suitable work boat for carrying out the monitoring.

4. Water quality monitoring for baseline, compliance and post project monitoring shall be carried out at the locations, defined in the EM&A manual. The Contractor shall consult the Engineer's Representative for amendments to the EM&A Manual requirements.

5. The Contractor shall submit to the Engineer's Representative, no later than the 10th day of the month, following the monthly reporting period, three copies of a monthly monitoring report containing the contents as specified in the EM&A manual.

6.0 LAND CONTAMINATION

1. A soil contamination survey shall be undertaken to determine the nature and extent of contamination across the Project site. The assessment shall follow the EPD Land Contamination Assessment Standard Brief. The sampling requirements and procedures shall be in accordance with EPD's Guidelines on Soil Contamination Sampling and Analysis. The assessment shall be carried out by suitably qualified and experienced professionals who will supervise the sampling exercise and interpret the results in accordance with international references. Laboratory analysis shall be carried out by a HOKLAS accredited laboratory or a laboratory accredited under similar approved scheme.

2. The Project proponent shall ensure that appropriate remediation measures, as agreed with the Director of Environmental Protection, for any land contamination identified within the site will be carried out and completed before infilling of the site commences.

APPENDIX I

Costs Associated with Environmental Mitigation Measures

APPENDIX I: COST ESTIMATE OF RECOMMENDED MITIGATION MEASURES (ESTIMATE MADE MAY 1995)

Item	Description	Quality	Rate (HK$)	Amount (HK$)
1.0	**SOLID WASTE MITIGATION MEASURES**			
1.1	Asbestos Survey	Item	-	$50,000
2.0	**TRAFFIC MITIGATION MEASURES - No costs associated with mitigation measures**	-	-	-
3.0	**NOISE MITIGATION MEASURES - No costs associated with mitigation measures**	-	-	-
4.0	**AIR QUALITY MITIGATION MEASURES**			
4.1	Wheel Washing Facility (including water recycling system)	Item	-	$250,000
4.2	Hydroseeding	76,200m^2	\$12/m^2	$914,400
4.3	Haul Road Paving (only if Mitigation Measures of watering and speed control are not effective) (150 rock base, base course 60)	3,500m^2	\$95/m^2	$332,500
4.4	Water Bowser	Item	-	$225,000
5.0	**MARINE WATER MITIGATION MEASURES**			
5.1	Silt Curtain	Item	-	$100,000
5.2	Containment curtain to contain floating solids during Reclamation Construction	50m	$400/m	$20,000
6.0	**LAND CONTAMINATION MITIGATION MEASURE**			
6.1	Soil Contamination Assessment			
	Assessment	Item	-	$200,000
	Materials, Sampling and Analysis	Item	-	$1,100,000
	TOTAL			$3,191,900

APPENDIX J

Comments and Responses to the Final Assessment Report

	Comments	Response to Comments
1.	**Traffic Engineering, NTW Division, Transport Department** **22 February 1995** **(Ms. F. F. Ying)**	
	Traffic Assessment, Section 4.0	
	(a) It is better to state clearly the date of traffic surveys, the year of reference in making statements outlined in section 4.3.3 and 4.3.4.	All surveys and observations were conducted on Thursday 18 August 1994. This is now included in Section 4.1 of the FAR.
	(b) The consultant is requested to clarify whether there will be adverse traffic impact on Tam Kon Shan Road by the project.	The traffic generated from this Project will be similar to the existing shipyards. Traffic associated with the reclamation will be off-set by the removal of traffic currently generated and attracted by shipyards. This has been described in the text along with potential impacts to Tam Kon Shan Road.
	(c) Arguments stated in Section 4.6 and 4.8 are somewhat inconsistent. Mitigation measures should also be suggested in case adverse traffic is forecasted.	Comment noted. Inconsistencies between Sections 4.6 and 4.8 were regarding the statement that the Tam Kon Shan Roundabout would be congested. The text has now been changed to indicate that local roads and intersections presently congested would remain congested with or without the project. No mitigation measures other than those listed would be required as part of this project.
2.	**CEIMS, DSD** **22 February 1995** **(Mr. C. K. Au)**	
	I have no comment on the captioned report enclosed with your above-quoted memo.	Noted.
3.	**CE/PD, CEO, CED** **23 February 1995** **(Mr. Wing-cheong Luk)**	
	I refer to your above quoted memo and have no comment on the Draft Final Assessment Report.	Noted.

Comments	Response to Comments
4. District Planning Office TW&KT 24 February 1995 (Mr. Alex Kiu)	
Table 9.1: Cumulative Project List	
(a) I notice that the some of the project commencement/completion dates listed in the table are out-dated. I therefore enclose an updated list for items 8-16 of the table for your information. PM/NTW and AC for T/NT will no doubt advise you on the remaining items. Please ask your consultants to update the report accordingly.	The cumulative list has been revised per the updated list.
(b) Please note also that there are no residential development in Area 6 as stated in item 12 of the table. Presumably, your consultant is referring to the cement plant site in Area 1 to the north of Cheung Wan Street, the plot ratio for which is 5.83 instead of 8.	Text has been revised per comment.
5. Director of Marine Department 24 February 1995 (Mr. K. K. Lau)	
I have no comment on the Draft Final Assessment Report.	Noted.
6. Chief Engineer, Port Works, CEO, CED 24 February 1995 (Mr. Kwok- cheong Leung)	
As far as Port Works aspects are concerned, I have no comment on the Draft Assessment Report attached to your above quoted memo.	Noted.

Comments	Response to Comments
7. Environmental Protection Department **3 March 1995** **Specialist Comment**	
7a. Marine Water Quality **(Mr. Arthur H. M. Lee)**	
Section 7.4.7	
(a) To avoid confusion, the report should mention the deterioration of bacteriological water quality of Angler's Beach was due to the sewage impacts arising from nearby squatters and development in unsewered the hinterland instead of due to a general deterioration in the water quality of the marine water.	The following text has been added to this Section:- "The particularly poor water quality at this beach is due to the impact from adjacent squatter and unsewered developments in the hinterland and is not symptomatic of a general deterioration in water quality. The programme for the interception of the sewage outfalls along that section of the coast and its subsequent treatment at Sham Tseng is expected to bring about significant improvements in the water quality at the beaches."
Section 7.4.9 last sentence	
(b) The consultant is reminded that the threshold SS concentration for cooling water is likely to be system dependent and the value "180 mg/L" is considered to be excessive.	This has been clarified for the final report. The data that have been reviewed indicate that at no time did the suspended solids concentrations approach the critical threshold established by the Mass Transport Railway Corporation (MTRC) for cooling water at 180 mg/l.
Section 7.17	
(c) It is advisable to shade or highlight the cell in case its concentration of particular metals fall into. "Class C - contaminated mud" range.	Comment incorporated into the tables.
Section 7.6.1 1st para.	
(d) The report should clarify whether it has attempted to explore the opportunity to minimize the amount of mud to be dredged such that the 105,000m^3 already represents the minimum amount of sediments to be removed to allow formation of the seawall foundation. The report should also mention a few words on whether the settlement problem will be a major concern to the subsequent land-use of the public dump.	The use of the no dredge techniques to minimise the need for contaminated mud disposal has not yet been implemented in Hong Kong and is still under evaluation. It is thought that the settlement will not be a major concern due to the relative thinness of the mud and the slow nature of construction of the public dump leading to slow settlement. Due allowance must be made for settlement in future developments when they are finally assigned.

Comments	**Response to Comments**
Section 7.6.5	
(e) We recognized that the information in Table 7.18 was extracted from relevant EC standards for the protection of saltwater life. The set of figures produced was correct but it was advisable to quote the reference.	Reference to the source document has been incorporated into the text.
Section 7.6.6	
(f) There were a total of 8 model runs for DO. The report shall clarify figures like the kind of dredging rate and what level of SS being mobilised into the water column for each case. We assume that they should have those figures derived from some previous model runs as in 7.6.3 - 7.6.4 from the sediment plume model.	The following input values were used for the model: • A COD value of 140,000 mg/kg was used, the maximum value measured in the sediment survey, and • The suspended solids concentration for each run was provided by the output from the previous runs of the sediment plume using the input parameters defined in Section 7.6.2.
(g) The consultant should consider if it was appropriate also to assume an ambient DO level of 5.4 mg/L when they tried to run their bed layer model. They should be expected to demonstrate through the model runs that whether there will be any significant deterioration in DO in bed layer due to construction and whether the bottom DO level can comply with the 2 mg/L WQO requirements.	The results of the modelling are shown in Appendix F-6. The spatial extent of the oxygen 'sag' is shown by the shaded area, unshaded areas do not fall below the background level. Decreases in the surface and bed layers of more the 0.02 mg/l below a depth averaged background of 5.4 mg/l are only found in the immediate vicinity of the dredging. Even in that region the levels do not fall below 5.3 mg/l at any time and consequently the WQO of 4 mg/l is maintained. A similar magnitude decrease, 0.1 mg/l, applied to the mean dissolved oxygen concentration in the bottom 2 m layer, 5.1 mg/l, would result in the concentration falling to 5 mg/l. Again the WQO is maintained above that for the bottom 2m of the water column.
Section 7.6.7 last sentence	
(h) The paragraph was somewhat incomplete. The consultant should say a few words concerning whether this amount of nutrient loading into the Rambler Channel will likely to have any significant effect on the water quality.	The following paragraph has been added:- "Mineralisation of the sediment bound nitrogen will occur while the sediment is suspended in the water column. The maximum concentrations occur in the region of the dredging and reach 9 mg/l above the existing background. Assuming that all of the nitrogen bound to those solids are mineralised and the inorganic nitrogen released to the water the increase in nitrogen available to stimulate algal growth is 7 μg/l. This represents a 2% increase in the annual average at WM4 which is 0.37 mg/l. This is unlikely to have any measurable effect on the trophic state of the local waters."

	Comments	Response to Comments
7b.	**Noise** **(Mr. K. K. Ng)**	
	Section 5.3 - Noise Sensitive Receivers	
	(a) There are some squatter areas along the Tam Kon Shan Road opposite to the proposed reclamation site. Although they may not have land titles, they are allowed to reside at these locations and should be counted as noise sensitive receivers. Due consideration should also be given to them in the noise impact study.	Potential impacts to the squatter houses have now been addressed in the FAR.
	Section 5.4 - Existing Noise Environment	
	(b) Appendix D - The distance of the station A from the existing boatyards is not correct. Please review.	The distance referenced in Appendix D has now been corrected for the FAR. The distance is from the centre of the site to the receiver.
	(c) The baseline noise levels obtained in this section would be on the high side and would not truly represent the background noise levels at the time when the proposed works are being carried out. As indicated that the existing noise environment in the area of interest is dominated by intermittent hammering noise from the boatyards. Of no doubt, the noise data obtained would certainly include this operational noise together with the others. However, when the proposed project starts the hammering noise will be substantially reduced as the boatyards concerned should have already been re-located to new sites.	Text has been added to the FAR indicating that noise levels will be reduced at the site once the shipyards are relocated.
	(d) According to the B.S. 5228 the sound power level (SWL) of the "truck with crane" is 116 dB(A) rather 109 dB(A) as listed in the Table 5.4. Thus, amendment to the Table 5.4 and hence 5.5 would be required.	The SWL used was obtained from a noise measurement conducted at Ma On Shan public dump site. The same value was used for the Pak Shek Kok Reclamation - EIA study. Per our discussion (Chui/Ng), we have added the noise study on the Ma On Shan noise readings into the Appendix D-4 and have required use of this type of equipment as part of the conditions of contract.

Comments	Response to Comments
Section 5.7.1 - General Assessment	
(e) The SWLs of the Bulldozer and Dump Truck would be on the low side. The SWL values stipulated on the "Technical Memorandum On Noise From Construction Work Other Than Percussive Piling" for relevant items should be used unless solid proofs and/or extensive noise survey data can be presented to substantiate the claim.	The response to this comment is the same as that listed above.
Section 5.9.1 - Demolition/Removal Noise Mitigation Measures	
(f) Although not clearly indicated in the text, the consultant seems to recommend a reduction of equipment and swopping the excavator mounted pneumatic breaker with a quieter hand-held pneumatic breaker as noise mitigation measures. I would like to advise that an air-compressor is generally required together with the hand-held pneumatic breaker, as such, the inputs in the Table 5.15 and 5.16 should be amended accordingly. The recommendation of the reduction of power mechanical equipment and the use of another quieter plant item as noise mitigation measures should be mentioned and explicitly explained in the text.	We would recommend using a quieter hand-held pneumatic breaker in conjunction with a super-quiet type air-compressor. Tables 5.15 and 5.16 have been amended accordingly.
Section 5.9.2 - Demolition and Operational Noise Mitigation Measures	
(g) This section merely contains general noise conscious guides to the contractor for the project. Specific noise alleviation measures and hence quantitative assessments on their effectiveness for the operation activities are missing from the report. An analysis and recommendation similar to the those given to the demolition and removal activities would be expected.	This is now provided in Sections 5.9.2 and 5.9.3 for site clearance and Reclamation Construction Mitigation Measures.
Section 5.9.3 - Traffic Noise	
(h) The presentation of the second last sentence is not clear, further elaboration required.	This means that if the number of dump trucks per hour is reduced, e.g. by increasing the infilling period to 12 months or more, the impact due to the trucks should be insignificant. This has now been clarified in the FAR.

Comments	Response to Comments
Section 5.10 - Residual Impacts	
(i) I suppose there is a typo error on the caption of the section, would it be "Conclusions" rather than "Residual Impacts"?	This Section is residual impacts which are project generated impacts after Mitigation Measures have been included in the project design.
Section 11.4 - Noise	
(j) The preceding paragraphs (7) to (9) are also applicable to relevant items of this section.	Amendments have been made to this Section in accordance with the amended noise Section.
Section 11.4.3 - Conclusions	
(k) This section is incapable to reflect all the findings of the noise issue. Noise mitigation for the operation activities has not yet been thoroughly discussed and no demonstration showing that the daytime construction noise criteria can be satisfied. Furthermore, the conclusion should also mention the finding that there is no practical noise mitigation measures to ameliorate the additional traffic noise brought about by the reclamation activities to the NSRs along the route leading to the site. The above comments also applicable to 5.10 if it is really a Conclusion section.	The Recommendation/Conclusion Section 11.0, has been expanded upon accordingly per your comment.
EM & A Manual and Action Plan	
(c) An EM & A manual and Action Plan should be recommended and included in the report.	The EM&A manual was included in Section 12 of the report. It has now been prepared as a stand alone document.

Comments	Response to Comments
7c. Disposal of Contaminated Mud - Marine Dumping (Mr. Jeffrey H. C. Chan)	
Section 7.4.16	
(a) The Waste and Water Management Group is still awaiting for a Formal Sediment Quality Report from the Mouchel Asia Ltd. This is a requirement under the WBTC No. 22/92 and the procedures outlined therein should be followed.	This has been supplied to CED as the formal field survey report.
Section 7.6.1	
(b) In this Section, the Consultants have briefly pointed out the pros and cons of various disposal options. However, there is no conclusion and substantiation on which disposal arrangement is the preferred one. We would expect a very detail analysis on the choice of disposal arrangement, its associated environmental impacts and the necessary mitigation measures.	A paragraph has been added at the end of this section to summarise recommendations for disposal of the dredged marine mud. As discussed in this section, retention of sediment within the confined areas of the Project site or disposal of the sediment to landfill is not technically appropriate. The dredged contaminated sediment has to be disposed of to designated contaminated mud pit. FMC should be consulted for the location of the specific contaminated mud pit available during the project period.
Section 7.9.2 & Table 12.1.5 - Disposal of Sediments	
(c) The two precautionary measures listed out in this Section are parts of our Licence Conditions only. In addition to requiring the disposal contractor to follow Conditions in the Marine Dumping Licence, which are statuary requirements under the Dumping at Sea Act, the Consultants should provide more expert advice on the mitigation measures on the dredging and handling of marine mud, and the Consultants should ensure that these advice and measures could be put into the Contract Document by the Design Engineer, and be practically executed by the Contractor on site.	The recommended mitigation measures have been proved in other dredging projects to be effective in controlling increase of suspended solids in the water column adjacent to dredging activities. Site experience indicates that close site supervision is necessary to ensure the dredging contractor follows the recommended mitigation measures. Other mitigation measures are mainly good housekeeping practices. Sediment dropped on the desk of the barge should be cleaned by shovels and disposed of to the hopper not to the sea. The gap between the dredger and the barge should be minimised as far as practical to prevent accidental dropped of sediment into sea.

Comments	Response to Comments
7d. Air Quality (Mr. K. W. Ng)	
Section 6.7.1, 2nd paragraph	
(a) Would the Consultant please clarify how the assumption of 25% of the total reclamation area will be in operation at any one time arrived.	This is based on activities at similar Public Dumps which is now stated in Section 6.7.1.
Section 6.7.1, 3rd paragraph	
(b) The Consultant is required to justify the use of emission factors (E_R) for heavy construction operations in AP-42 for the operations on the reclamation. According to AP-42, the emission factor was derived from field measurement at sites of relatively small construction area and activities like building apartments or shopping centres. The appropriateness of the factor being applied in this project is in doubt. The Consultant should consider any necessary change to emission factors for activities inside the site.	The heavy construction operations as described in the AP-42 involve land clearing, ground excavation, cut and fill operations, etc. which are close to the operation on the reclamation. As far as the Consultants are aware, there is no better emission factor for the operation. The same value was used for the Pak Shek Kok Reclamation - EIA Study.
Section 6.7.1, 4th paragraph	
(c) According to our calculation, the emission factor (E_S) for wind erosion of stockpile is in the order of 10^{-3} instead of 10^{-5}. Would the Consultant please check.	The emission factor for wind erosion has now been changed to $10^{(-3)}$ kg/day/m^2 per your request.
(d) There is no assessment of unpaved road within the reclamation site. It sounds unreasonable I would the Consultant please clarify.	An unpaved haul road has now been included in the assessment. The specifications for this haul road have verbally been agreed upon (Chui/Ng).
Appendix E-2, Section 6.7.2, Figures 6.2 to 6.4 and Table 6.7	
(e) According to Appendix E-2, the dust impact at some receivers would be over 1000 ug/m^3, but the predicted unmitigated TSP concentrations in Table 6.7 and Figures 6.2 to 6.4 are very low. Would the consultant please clarify.	The model has been rerun with corrected input parameters.

Comments	Response to Comments
Section 9.3.1	
(f) Would the Consultant please clarify what kinds of coordinated efforts should be made by the project proponent to ensure that the cumulative dust impacts would not exceed the AQOs.	The text has been revised as follows: "The Tsuen Wan Bay project is of sufficient distance from the North Tsing Yi Project that if the government standards for noise and air quality are complied with, then no individual or cumulative impacts would occur. Similarly, for Area 8, if the noise and air quality standards are complied with individually at these project sites and individual impacts do not occur at sensitive receivers then cumulative impacts would not likely occur."
Land Contamination Assessment (Dr. Cherie M. W. Lee)	
General	
(a) We have no further comments on the context of the contamination assessment plan which we had already commented in the submission of the Draft Initial Assessment Report by the Consultant in Sept 94. However, our agreement on the proposed plan is based on the understanding that this is just a preliminary assessment for the site as extensive sampling is not allowed before expiry of the land lease within the time frame of the EIA study. Therefore, only limited sampling near surface levels by hand held equipment will be conducted for preliminary indication of the potential contamination level. A detailed contamination investigation is to be followed when free access to the site is possible and the concerned department is aware of the time requirement (about 6 months or more) and resource requirement for such a detailed assessment to be conducted at that time.	

Comments	Response to Comments
Section 8.1	
(b) Nevertheless, I am a bit confused by the latest information revealed in this report regarding the timing for conduction of the preliminary assessment. Ref. section 8.1, para. 2, the Consultants stated that "the shipyard operators have refused to grant permission to the consultants for access to the shipyards for soil sampling ...... " and in section 8.10.5, it is stated that "the survey should be carried out as early as possible and preferably before the start of clearance and demolition of the existing buildings". Does it mean that even the "small scale surface sampling for this preliminary assessment could only be possible after termination of the present shipyard activities? Our previous understanding was the surface sampling could be conducted while the shipyards were still in operation. If this is the former case, a detailed assessment with comprehensive sampling should also be possible at that time. We would strongly recommended the conduction of a one-off exercise rather than splitting the assessments in two separate exercises.	As the shipyard operators have refused to grant permission to the Consultant for access to the shipyards for soil sampling, the proposed preliminary assessment cannot be carried out during this consultancy period. A one-off detailed assessment in accordance with EPD's contaminated assessment guidelines has been recommended to be carried out as early as possible after the shipyards have been relocated. Please see more recent comments by Dr. Lee.
8. Chief Engineer/Development & Airport, CED **3 March 1995** **(Mr. W. H. Lee)**	
(a) The DFAR should include cost estimates of the proposed mitigation measures. This is specified in the EIA Brief and was discussed / agreed in the Environmental Working Group Meeting No. 2.	Costs have been calculated for mitigation measures and are contained in Appendix I of the FAR.
(b) The EIA should also cover an assessment of the possible environmental impact the proposed reclamation project may have on its adjacent areas; such as the shipyard on the west side and the utility installations at the north-east corner of the project site. If adverse impacts are identified, mitigation measures should be proposed.	No impact to the adjacent shipyards or utility installation have been identified. This is now addressed in several sections of the FAR.

Comments	**Response to Comments**
(c) According to the EIA Brief, section 5.1 (iv) (c), the Final Assessment Report (and therefore the DFAR) should include a prescription of the specification for detailed design, construction and operation requirements of the proposed project. Although the DFAR contains a general description of works, equipment requirements and schedule of operations, it is desirable that the relevant specifications be summarized and listed out separately.	Applicable Specification Clauses for avoiding environmental impact are now provided in Appendix H of the FAR.
Section 7.7.1 - Impacts from Enclosure of Reclamation Area	
(d) The DFAR suggests to start the formation of the reclamation from the eastern end and to maintain a flushing opening in the seawall. It is possible that the contaminated mud on the seabed surface will be driven westwards and will leak through the flushing opening. This is environmentally undesirable. The consultant should expand on his proposal and how it will work.	Leaving an opening for flushing activity is less of an environmental concern than completing the seawall and leaving a large area of stagnant water. More details of how the seawall should be constructed to achieve this is contained in Section 7.7.1. Potential impacts that may occur from suspending contaminated mud have been calculated in this Section and have been found to be insignificant.
(e) Page 11-4, first sentence under "Demolition and Operational Noise Mitigation Measures" - The sentence is not well written and its meaning is unclear. Please clarify.	Noted, the text has been clarified.
(f) Page 11-6, the last paragraph under "Access Road" - The sentence, "The Contractor shall ...... that remaining from site.", needs clarification.	Noted, the text has been clarified accordingly.
(g) Section 2.1, 1st line of 2nd para. - Replace "18 shipyards" by "18 separate shipyard operators".	Noted, the text has been amended accordingly.
(h) The DFAR uses the term "operational activities" to refer to the public dumping on site. This is confusing; because the term "operational phase" is used in the Project Brief to mean the use of the site after the completion of the project and public dumping should be regarded as part of the construction.	The text has now been chanaged to describe the three stages of construction works: Site Clearance, Seawall Construction and Reclamation Construction.

Comments	Response to Comments
(i) Page 7-17, 4th para. - Please clarify the meaning of the word "putrescible".	Putrescible is degradable by biological processes. This has been clarified in the FAR.
(j) Section 11 should include a statement to conclude the overall acceptability of the environmental impacts identified as well as the acceptability of residual impacts after the proposed mitigation measures are implemented.	The Conclusion, Section 11 has been revised to include a statement on the general acceptability of the project and residual impacts.

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Reclamation Works for District Open Space
and GIC Facilities in North Tsing Yi - EIA
Subsequent Comments on the Final Assessment Report (Received between 10 March 1995 and 11 May) and Responses

Comments	Response to Comments
1. Mr. K. W. Ng Air Impact Assessment	
(a) These comments in fact have already been discussed in the 3rd WG meeting on 10.3.95 and the Consultants agreed to re-run the model with correct input parameters.	Please see response to Mr. Ng's comment in the minutes of the Working Group Meeting No. 3 and responses to comments prior to 10 March 1995.
(b) The Consultants also agreed in the meeting to review why there are some nodes of high TSP concentrations in the pollution contours in figures 6.2 a\to 6.4 of the Draft FAR.	The Figures have now been revised per the new air quality model runs. The nodes are no longer present in the contour plots.
(c) According to the fax from ENPAC to APG dated 27 Jan 1995, the emission factor (Es) for wind erosion of stockpile is in the order of 10^{-3} instead of 10^{-5}.	This has been changed per your request. The new section was provided for review 1 May 1995.
(d) In the meeting on 10 Mar 95, the Consultants agreed to make separate assessment on the dust impact from haulage on unpaved surface on the reclamation site.	This has been conducted per your request. Specification requirements for the haul road have been confirmed with Mr. Ng (Chui/Ng)
2. Dr. Cherie M. W. Lee Contamination Assessment	
Section 8.1	
We are pleased to learn that an one-off detailed assessment exercise rather than a 2 steps preliminary-detailed assessments be conducted after the shipyards are relocated. However, in view of the extent and context of the survey proposed in Section 8.10.5 which limited only to surface sampling (0.5 m to max. 1 m) and to only about 30 samples, we cannot accept this proposed assessment as a comprehensive and detailed contamination assessment, which should give a full delineation of the degree of contamination of a site. The assessment plan should be revised accordingly.	This section has been revised per Dr. Lee's comment. The amended section has been provided for Dr. Lee's review 12 May 1995.

Subsequent Comments on the Final Assessment Report (Received between 10 March 1995 and 11 May) and Responses

Comments	Response to Comments
3. Mr. K. K. Ng Noise Assessment	
Section 5.4	
(a) Queries on this item have not been answered. The Consultants should specify the follow-up actions.	The items that are referred to were included in the revised Noise Section that was circulated for review 9 May 1995. See response to comments prior to 10 March 1995.
(b) Not to mention the validity and the accuracy of the measurement, the SWL value obtained by a single measurement on a particular plant item under a set of specific conditions cannot represent a general SWL for that type of equipment. Furthermore, I wonder whether the exact plant item which has undergone through the noise measurement would be used in the subject project. On the contrary, the SWLs quoted in the relevant TM are established from the results of a series of noise measurements on a wide range of equipment of the same type I, therefore, opine that SWLs contained in the relevant TM should be used in the calculations.	This issue has been discussed verbally (Chui/Ng) with agreed upon revisions provided in the revised Noise Section.
Section 5.7.1	
With the same token in the preceding, the SWLs of the bulldozer and dump truck quoted in the report are not acceptable. SWLs of the relevant TM should be adhered to.	Please see comment above.
Section 5.9.2 and 11.4	
Queries raised in these sections have not been answered, the Consultants should clarify or suggest follow-up actions rather than just responded "Noted".	Action has been taken on these issues. As comments were received up to the day of the meeting there was no time to include a detailed response to your comment at that time.

Comments	Response to Comments
1. Mr. K. W. Ng Air Assessment	
Section 6.7.1 (p-6.6 2nd para.)	
The Consultants should state in the Report the dust control efficiency due to twice-daily watering the haul road.	The paragraph has been revised to read " ...... and twice-daily watering as a normal operation. According to US EPA's AP-42 publication, twice-daily watering can reduce dust emissions by up to 50 percent."
Section 6.7.2 (p.6-7 last para)	
The Consultants should further elaborate how comparable the environment of the Tsuen Wan Monitoring Station as compared with the North Tsing Yi Island and hence the annual average TSP concentration.	The paragraph has been revised to read "With regard to the annual average TSP concentration, the monitoring results for the year 1993 obtained from EPD's Tsuen Wan Monitoring Station has been used for the baseline data. Despite that North Tsing Yi and Tsuen Wan are neighbour coastal urban areas situated at hill sides, they have different development environments. Tsuen Wan is an industrial town with industrial sites heavily developed across the area. North Tsing Yi, on the other hand, is mainly a residential area with only a few industrial activities nearby (i.e. a number of shipyards to the west and an oil depot to the east). The major industrial sites are located largely along the coast at the southern half of Tsing Yi Island and are at least 2 km away from the area. As such, it is anticipated that the annual average TSP concentration level at North Tsing Yi would be lower than that obtained from Tsuen Wan (101 $\mu g/m^3$). This can further be substantiated by the baseline TSP concentration levels measured in the area. According to the baseline monitoring results, the mean daily averaged TSP concentration is 132 $\mu g/m^3$ (also see Section 6.7.1), which is approximately 50% of the AQO. Given that the predicted annual averaged TSP concentrations at the sensitive receivers due to the operation of the dumping site are only 1 to 11 $\mu g/m^3$, it is expected that the air quality impact would be minimal and the annual cumulative dust impact would be well within the AQO."
Table 6.8 (p.6-8)	
As identified in the assessment, movement of dump trucks on haul roads would cause significant dust impact. This should also be included in Table 6.8.	This table has been revised to include "Material filling (including movement of dump trucks on haul road) and stockpile of materials."

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Final Assessment Report - Comments and Responses (Received 11 May 1995)

Comments	Response to Comments
Section 6.9.1 (p.6-8)	
Would the Consultants please clarify what is the dust control efficiency by watering the haul road four times a day.	The 1st paragraph of this Section has been revised to read "The Contractor shall reduce dust emission from the haul road by watering the road four times a day to achieve a further reduction in dust emissions of 50 percent" .
Due consideration should be given to pave the haul road.	Consideration to pave the haul road has been provided as part of the dust mitigation measure as an action to be required in the event that watering of the haul road does not effectively reduce dust levels.

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Reclamation Works for District Open Space
and GIC Facilities in North Tsing Yi - EIA
Subsequent Comment on the Final Assessment Report (Received 12 May 1995) and Responses

Comments	Response to Comments
1. Dr. Cherie M. W. Lee Contamination Assessment	
Please be informed that we would accept the amended draft (4 May 95) section of the above EIA Report subject to the following conditions:	
(i) upon completion of the detailed contamination assessment, the results evaluation together with the proposed remediation measure would need to be agreed with this department before its implementation and all necessary remediation work would need to be completed before infilling of the site can commence; and	
(ii) to incorporate a clause stipulating that,	
"The project proponent shall ensure that appropriate remediation measures as agreed with the Director of Environmental Protection for any land contamination identified within the site will be carried out and completed before infilling of the site commences."	This clause has been incorporated into Appendix H of the FAR.
into Appendix H (Recommended Specification Clauses for Pollution Control) of the EIA report.	

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