

**Agreement No. CE 42/2005 (WS)  
Laying of Western Cross Harbour  
Main and Associated Land Mains  
from West Kowloon to Sai Ying  
Pun – Investigation**

**Environmental Monitoring & Audit  
Manual**

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## **1. INTRODUCTION**

### **1.1 Purpose of the Manual**

The purpose of this Environmental Monitoring and Audit (EM&A) Manual (hereafter referred to as the Manual) is to guide the setup of an EM&A programme to ensure compliance with the Environmental Impact Assessment (EIA) study recommendations, to assess the effectiveness of the recommended mitigation measures and to identify any further need for additional mitigation measures or remedial action. This Manual outlines the monitoring and audit programme proposed for the “Laying of Western Cross Harbour Main and Associated Land Mains from West Kowloon to Sai Ying Pun” (The Project).

For the purpose of this Manual, the "Engineer" shall refer to the Engineer as defined in the Contract and the Engineer's Representative (ER), in cases where the Engineer's powers have been delegated to the ER, in accordance with the Contract. The Environmental Team (ET) Leader, who shall be responsible for and in charge of the ET, shall refer to the person delegated the role of executing the environmental monitoring and audit requirements.

### **1.2 Review of the EM&A Manual**

It shall be noted that this EM&A Manual is subject to changes. The Manual shall be reviewed and updated later, where necessary, near the commencement of construction of the Project.

### **1.3 Background**

In February 2006, Mott Connell Ltd was commissioned by Water Supplies Department under Agreement No. CE 42/2005(WS) to carry out the investigation and preliminary design for the “Laying of Western Cross Harbour Main and Associated Land Mains from West Kowloon to Sai Ying Pun” (The Project).

The scope of the proposed Project comprises the following:

- approximately 2100-metre section of 1200mm nominal diameter of submarine watermain across Victoria Harbour from its connection at Lin Cheung Road in West Kowloon to the existing Sai Ying Pun Fresh Water Pumping Station in Sheung Wan (a designated project under EIA Ordinance); and
- approximately 2200-metre section of 1200mm nominal diameter of associated land watermain (Not a designated project under EIA Ordinance).

The submarine watermain component (referred in first bullet above) of the Project is a Designated Project under Schedule 2, Part 1(E3) of the Environmental Impact Assessment Ordinance (EIAO) (Cap. 499) and an Environmental Permit (EP) issued under the EIAO is required for the construction and operation of the designated project. An application (No. ESB-132/2005) for a EIA study brief under section 5(7)(a) of the EIAO was submitted by Water Supplies Department on 30 August 2005 with a project profile No. PP-258/2005 (the Project Profile). The EPD issued an EIA Study Brief No. ESB-132/2005 on 13 October 2005, detailing the requirements for carrying out and reporting the EIA study.

From the EIA, the recommendations for monitoring contained herein, are made.

## 1.4 Site Location

The proposed Project covers three main areas, namely: Victoria Harbour, West Kowloon and Sai Ying Pun.

The works for Victoria Harbour (a designated project under EIA Ordinance) is envisaged to comprise an approximately 50m wide corridor across Victoria Harbour linking West Kowloon with Sai Ying Pun.

The works in West Kowloon (Not a designated project under EIA Ordinance) generally comprise the West Kowloon Reclamation Area adjacent to the Western Harbour Tunnel Toll Plaza, and are bounded by Jordan Road to its north and Lin Cheung Road to its east. The land uses in this portion include the land reserved for the West Kowloon Cultural District, the Kowloon Station Development, the Wui Cheung Road Bus Terminus, the Yau Ma Tei Public Cargo Working Area, and the Western Harbour Tunnel Toll Plaza. The proposed 1200mm diameter fresh watermain will be laid in this portion for connection to the existing 1200mm diameter fresh watermain at the junction of Lin Cheung Road or Wui Cheung Road.

In Sai Ying Pun (Not a designated project under EIA Ordinance), the works comprise Sai Ying Pun area adjacent to Western Wholesale Food Market and is bounded by the approaches of Western Harbour Crossing Interchange. The proposed 1200mm diameter fresh watermain will be laid in this portion for connection to the existing Sai Ying Pun Fresh Water Pumping Station situated at the junction of Water Street/Fung Mat Road.

The route of the proposed watermains is illustrated in **Figure 1.1**.

## 1.5 Sensitive Receivers

Sensitive receivers have been identified in the EIA and are shown on **Figures 1.2a-d**. Representative Sensitive Receivers (SRs) for water quality, marine ecology, noise, air quality and fisheries are selected according to the criteria set out in the Technical Memorandum on Environmental Impact Assessment Ordinance (EIAO-TM) and listed as follows:

- New Yau Ma Tei Typhoon Shelter (WSR);
- Coral communities at Green Island (WSR, Marine Ecological Sensitive Receivers);
- 17 sea water intakes at the waterfront of Victoria Harbour (WSRs);
- Marine habitats in Victoria Harbour (Marine Ecological Sensitive Receivers);
- Residential buildings in West Kowloon including The Waterfront, Sorrento, The Arch, The Harbourside and the Union Square (NSRs);
- Residential buildings in Sai Ying Pun including Fung Shing Building, Viking Court, Cheong Ling Mansion, Kwan Yik Building Phase 2 & 3, Richwealth Mansion, Connaught Garden and General Building (ASRs and NSRs);
- Other buildings in Sai Ying Pun including Tianjin Building, China Merchants Group, the Westpoint, Island Pacific Hotel, Singaga Commercial Building, AFCD Market Office and Western Wholesale Food Market (ASRs).

## 1.6 Environmental Monitoring and Audit Requirements

The EIA study identified the likely environmental impacts during construction and operation phases. These impacts can be minimised to acceptable levels with the implementation of environmental mitigation measures and environmental monitoring and audit requirements. An Implementation Schedule of the Environmental Mitigation Measures recommended in the EIA Report is described in **Annex A**. To ensure the environmental acceptability of the proposed Project, monitoring and audit requirements have been identified and are described in detail in the subsequent sections. A summary of the EM&A requirements on different environmental aspects studied in the EIA is provided below:

### Water Quality

A marine water quality monitoring and audit programme is recommended during the dredging works to verify whether or not impact predictions are representative, and to ensure that the dredging works along the alignment of the proposed cross harbour main do not result in unacceptable impacts and the seawater quality at WSD's seawater intakes comply with the WSD's Water Quality Objectives (WQOs) of seawater for flushing supply. If monitoring shows unacceptable water quality impact, appropriate mitigation measures, such as changes in the operation of dredging works, should be introduced.

### Marine Ecology

The implementation of the ecological mitigation measures stated in *Section 4.8* and water quality mitigation measures in *Section 3* of the EIA report should be checked as part of the environmental monitoring and audit procedures during the construction period. No other marine ecology-specific measures are considered necessary.

### Noise

Full compliance with the noise criteria will be achieved at all NSRs with the implementation of mitigation measures. Environmental monitoring and audit is recommended to ensure that the noise levels do not exceed the criteria during the construction phase.

### Waste Management

Auditing of each waste stream is recommended to be carried out periodically to determine if wastes are being managed in accordance with approved procedures and the site waste management plan. The audits should look at all aspects of waste management including waste generation, storage, recycling, treatment, transport and disposal. An appropriate audit programme would be to undertake a first audit at the commencement of the construction works, and to audit weekly thereafter.

### Air Quality

Full compliance with the air quality criteria will be achieved at all ASRs with the implementation of mitigation measures. Dust monitoring is considered not necessary but weekly site audits are required to ensure that the dust control measures are properly implemented.

## **Cultural Heritage**

As discussed in *Section 8* of the EIA report, no indication of marine archaeological material was identified and no further investigation activities were recommended. As such, there would be no need for a cultural heritage monitoring programme during the construction phase of the submarine watermain.

## **Fisheries**

The implementation of the water quality mitigation measures stated in *Section 3* of the EIA report should be checked as part of the environmental monitoring and audit procedures during the construction period. No other fisheries-specific measures are considered necessary.

## **1.7 Project Organisation**

The proposed project organisation is shown in **Figure 1.3**. The responsibilities of respective parties are:

### The Contractor

- provide assistance to ET in carrying out monitoring;
- submit proposals on mitigation measures in case of exceedances of Action and Limit levels in accordance with the Event and Action Plans;
- implement measures to reduce impact where Action and Limit levels are exceeded;
- employ a ET to carryout the EM&A works; and
- adhere to the procedures for carrying out complaint investigation in accordance with *Section 9.3*.

### The Engineer or Engineer Representative (ER)

- supervise the Contractors activities and ensure that the requirements in the Manual are fully complied with;
- inform the Contractor when action is required to reduce impacts in accordance with the Event and Action Plans;
- employ an IEC to audit the results of the EM&A works carried out by the ET; and
- adhere to the procedures for carrying out complaint investigation in accordance with *Section 9.3*.

### The Environmental Team (ET)

- monitor the various environmental parameters as required in the Manual;
- analyse the EM&A data and review the success of EM&A programme to cost effectively confirm the adequacy of mitigation measures implemented and the validity of the EIA predictions and to identify any adverse environmental impacts arising;
- carry out site inspections to investigate and audit the Contractor's site practice, equipment and work methodologies with respect to pollution control and environmental mitigation, and anticipate environmental issues for proactive action before problems arise;



- audit and prepare audit reports on the environmental monitoring data and the site environmental conditions;
- report on the EM&A results to the IEC, Contractor, the ER, and the EPD;
- recommend suitable mitigation measures to the Contractor in the case of exceedance of Action and Limit levels in accordance with the Event and Action Plans; and
- adhere to the procedures for carrying out complaint investigation in accordance with *Section 9.3*.

The ET leader shall have relevant professional qualifications and at least 7 years of experience in environmental monitoring and audit (EM&A) or environmental management subject to approval of the ER and the Environmental Protection Department (EPD).

#### Independent Environmental Checker (IEC)

- check, review, verify the EM&A works performed by the ET;
- audit the monitoring activities and results;
- evaluate the EM&A reports submitted by the ET;
- review the proposals for mitigation measures submitted by the Contractor in accordance with the Event and Action Plans; and
- adhere to the procedures for carrying out complaint investigation in accordance with *Section 9.3*.

The IEC shall have relevant professional qualifications and at least 7 years of experience in environmental monitoring and audit (EM&A) or environmental management subject to approval of the ER and the EPD.

Sufficient and suitably qualified professional and technical staff shall be employed by the respective parties to ensure full compliance with their duties and responsibility, as required under the EM&A programme for the duration of the project. The ET shall not be in any way an associated body of the Contractor and the IEC. The IEC shall not be in any way an associated body of the Contractor or the ET.

## **1.8 Construction Programme**

The construction of the proposed Project is scheduled to commence in September 2008 for completion by May 2011. The tentative project programme is given in **Figure 1.4**.

## **2. WATER QUALITY**

### **2.1 Introduction**

As identified in the EIA Report, a key water quality issue of the construction phase would be dredging works for the pipeline trench. Marine water quality monitoring shall be carried out during the dredging works to ensure that any unacceptable increase in suspended solids/turbidity and decrease in dissolved oxygen due to dredging activities could be readily detected and timely action be taken to rectify the situation.

### **2.2 Water Quality Parameters**

Monitoring for Dissolved Oxygen (DO), Dissolved Oxygen Saturation (DO%), temperature, turbidity, salinity, suspended solid (SS) and water depth shall be undertaken at designated monitoring locations. All parameters should be measured *in-situ* whereas SS shall be determined by the laboratory. DO shall be presented in mg/L and in % saturation.

Other relevant data shall also be recorded, including monitoring location / position, time, tidal stages, weather conditions and any special phenomena or work underway at the construction site.

### **2.3 Sampling Procedures and Monitoring Equipment**

(N.B. Water samples for all monitoring parameters shall be collected, stored, preserved and analysis according to Standard Methods, APHA 19 ed. and/or methods agreed by the Director of Environmental Protection. *In-situ* measurements at monitoring locations including DO, temperature, turbidity, salinity and water depth shall be collected by equipment with the characteristics and functions listed in the following sections).

The following equipment and facilities shall be provided by the ET and used for the monitoring of water quality impacts:

#### **Dissolved Oxygen and Temperature Measuring Equipment**

DO and water temperature should be measured in-situ by a DO/ temperature meter. The instrument should be portable and weatherproof using a DC power source. It should have a membrane electrode with automatic temperature compensation complete with a cable. The equipment should be capable of measuring:

- a DO level in the range of 0-20 mg/l and 0-200% saturation; and
- a temperature of between 0 and 45 degree Celsius.

#### **Turbidity Measurement Instrument**

The instrument should be portable and weatherproof using a DC power source. It should have a photoelectric sensor capable of measuring turbidity between 0-1000 NTU, such as a Hach model 2100P or similar approved.

### **Salinity**

A portable salinometer with measuring range of 0-40 mg/L (YSI 30 Salinity meter or other approved instrument) should be used to determine the salinity of the water.

### **Water Depth Detector**

A portable, battery-operated echo sounder (Seafarer 700 or other approved instrument) would be used for the measurement of water depth at each designated monitoring station. The unit would be either handheld or affixed to the bottom of the work boat, if the same vessel is to be used throughout the monitoring programme.

### **Positioning Device**

A digital Global Positioning System (GPS) should be used during monitoring to ensure the monitoring vessel is at the correct location before taking measurements.

### **Calibration of In-Situ Instruments**

All in-situ monitoring instruments would be checked, calibrated and certified by a laboratory accredited under HOKLAS or any other international accreditation scheme before use, and subsequently re-calibrated at 3 monthly intervals throughout all stages of the water quality monitoring programme. Responses of sensors and electrodes should be checked with certified standard solutions before each use.

Wet bulb calibration for a DO probe should be carried out at least once per monitoring day. A zero check in distilled water should be performed with the turbidity probe at least once per monitoring day. The probe should then be calibrated with a solution of known NTU. In addition, the turbidity probe should be calibrated at least twice per month to establish the relationship between turbidity readings (in NTU) and levels of suspended solids (in  $\text{mgL}^{-1}$ ).

For the on-site calibration of field equipment, the BS 1427: 1993, *Guide to Field and On-Site Test Methods for the Analysis of Waters* should be observed. Sufficient stocks of spare parts should be maintained for replacements when necessary. Backup monitoring equipment should also be made available so that monitoring could proceed uninterrupted even when some equipment is under maintenance, calibration etc.

### **Water Sampling Equipment**

A water sampler comprises a transparent PVC cylinder, with a capacity of not less than 2 litres, and could be effectively sealed with latex cups at both ends should be used. The sampler should have a positive latching system to keep it open and prevent premature closure until released by a messenger when the sampler is at the selected water depth (Kahlsico Water Sampler or an approved similar instrument).

Water samples for suspended solids measurement should be collected in high density polythene bottles, packed in ice (cooled to 4°C without being frozen), and delivered to the laboratory as soon as possible after collection.

## Laboratory Measurement/Analysis

Analysis of suspended solids should be carried out in a HOKLAS or other international accredited laboratory. Water samples of about 1L should be collected at the monitoring stations for carrying out the laboratory suspended solids determination. The SS determination work should start within 24 hours after collection of the water samples. The SS analyses should follow the standard method APHA 2540D with a detection limit of 1mg/L as described in *APHA Standard Methods for the Examination of Water and Wastewater*, 19th Edition, unless otherwise specified.

If in-house or non-standard methods are proposed, details of the method verification should, if required, be submitted to EPD. In any circumstances, the sample testing should have comprehensive quality assurance and quality control programmes. The laboratory should be prepared to demonstrate the quality control programmes to EPD or their representative if and when required.

Additional duplicate samples may be required by EPD for inter laboratory calibration. Remaining samples after analysis should be kept by the laboratory for 3 months in case repeat analysis is required. If in-house or non-standard methods are proposed, details of the method verification may also be required to submit to EPD. In any circumstance, the sample testing should have comprehensive quality assurance and quality control programmes. The laboratory should prepare to demonstrate the programmes to EPD or his representatives when requested.

## 2.4 Monitoring Locations

The proposed water quality monitoring stations are shown in **Table 2-1** and **Figure 2.1**. The monitoring stations proposed in this section are indicative subject to further review before construction phase. The final locations and number of the monitoring points should be agreed with EPD at least 2 weeks before undertaking any works. The status and locations of water sensitive receivers and the marine activities may change after issuing this Manual. If such case exist, the ET Leader shall propose updated monitoring locations and seek approval from the IEC and EPD.

It is proposed to monitor the water quality in the vicinity of Green Island and at eight seawater intakes closest to the dredging area. Due to predicted potential water quality impact at the WSD Sea Water Intake at Kowloon South Pumping Station, implementation of the following mitigation measures is recommended:

- Dredging should be undertaken using one grab dredger only with a maximum production rate of 4,000m<sup>3</sup> per day;
- Deployment of frame type silt curtain to fully enclose the grab while dredging works are in progress;
- Deployment of silt screen at the sea water intake at Kowloon South Salt Water Pumping Station while dredging works are in progress.

It is recommended to conduct the monitoring at the appropriate vertical levels of the abstraction points of the seawater intakes to collect information on the mitigated water quality condition if practicable. Four Control Stations are proposed to represent the project site in its undisturbed condition and their respective positions are also shown in **Figure 2.1**.

**Table 2-1 Water Quality Monitoring Stations**

<b>ID</b>	<b>Description</b>	<b>Easting</b>	<b>Northing</b>
R5	Green Island	830 175.979	816 179.217
R6	Prince Philip Dental Hospital	833 437.625	816 747.640
R7	Tsan Yuk Hospital	833 461.092	816 744.773
R8	Macau Ferry Terminal	833 786.796	816 663.359
R15	Kowloon South Pumping Station	833 982.630	818 282.101
R16	Kowloon Government Offices Building	834 335.800	817 769.145
R17	Canton Road Government Offices Building	834 364.658	817 802.847
R28	WSD Kennedy Town Salt Water Pumping Station	830 707	815 983
R29	WSD Sheung Wan Salt Water Pumping Station	833 414	816 745
C1	Control Station	830 797.729	819 163.377
C2	Control Station	836 30.628	817 135.218
C3	Control Station	829 495.126	817 228.312
C4	Control Station	836 638.773	816 686.030

When alternative monitoring locations are proposed, they shall be chosen based on the following criteria:

- (a) at locations close to and preferably at the boundary of the mixing zone of the major site activities as indicated in the EIA report, which are likely to have water quality impacts;
- (b) close to the sensitive receptors which are directly or likely to be affected;
- (c) for monitoring locations located in the vicinity of the sensitive receptors, care shall be taken to cause minimal disturbance during monitoring;

Measurement shall be taken at 3 water depths, namely, 1m below water surface, mid-depth and 1m above sea bed, except where the water depth less than 6m, the mid-depth station may be omitted. Should the water depth be less than 3m, only the mid-depth station will be monitored. The ET Leader shall seek approval from the IEC and EPD on all the monitoring stations.

Replicates in-situ measurements and samples collected from each independent monitoring event are required for all parameters to ensure a robust statistically interpretable dataset.

## **2.5 Baseline Monitoring**

The purpose of the baseline monitoring is to establish ambient conditions prior to the commencement of marine construction works and to demonstrate the suitability of the proposed monitoring stations. The measurements should be taken at all designated

monitoring stations, 3-days per week, at mid-flood and mid-ebb tides, for at least 4 consecutive weeks prior to the commencement of marine construction works.

Two consecutive measurements of DO concentration ( $\text{mgL}^{-1}$ ), DO saturation (%) and turbidity (NTU) should be taken in-situ according to the stated sampling method. Where the difference in value between the first and second measurement of DO or turbidity parameters is more than 25% of the value of the first reading, the reading should be discarded and further readings should be taken. Water samples for SS ( $\text{mgL}^{-1}$ ) measurements should be collected at the same depths.

In addition to the above in-situ measurements, water temperature and salinity should be determined at all monitoring stations at the same depths, as specified above. Note that in addition to the water depth, monitoring location/position, time, weather conditions, sea conditions (where appropriate), tidal stage (where appropriate), and any special phenomena should be recorded.

The baseline monitoring campaign should be executed prior to commencement of marine construction works. In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET Leader should liaise with the IEC and EPD to agree on an appropriate set of data to be used as a baseline reference and submit to ER for approval.

Baseline monitoring schedule should be submitted to the Contractor, IEC, ER and EPD one week prior to the commencement of baseline monitoring. The interval between two sets of monitoring would not be less than 36 hours.

## 2.6 Impact Monitoring

During the course of the marine construction works, impact monitoring should be undertaken at all monitoring stations three working days per week, at mid-ebb and mid-flood tides, with sampling /measurement. The interval between two sets of monitoring should not be less than 36 hours except where the Action and/or Limit levels is/are exceeded, in which case the monitoring frequency should be increased.

Two consecutive measurements of DO concentration ( $\text{mgL}^{-1}$ ), DO saturation (%) and turbidity (NTU) should be taken in-situ according to the stated sampling method. Where the difference in value between the first and second measurement of DO or turbidity parameters is more than 25% of the value of the first reading, the reading should be discarded and further readings would be taken. Water samples for SS ( $\text{mgL}^{-1}$ ) measurements should be collected at the same depths. Duplicate water samples should be taken and analyzed.

In addition to the above in-situ measurements, water temperature and salinity should be determined at all monitoring stations at the same depths, as specified above. Note that in addition to the water depth, monitoring location/position, time, weather conditions, sea conditions (where appropriate), tidal stage (where appropriate), and any special phenomena should be recorded.

Proposed water quality monitoring schedule should be provided to the Contractor, IEC, ER and EPD on or before the first day of the monitoring month. The Contractor, IEC, ER and EPD should be notified immediately for any changes in schedule.

## 2.7 Post-Construction Monitoring

Upon completion of all marine construction activities, a post project water quality monitoring exercise should be carried out for four weeks upon completion of all marine activities, in the same manner as the impact monitoring during construction of the submarine watermain.

## 2.8 Event and Action Plan for Water Quality

The Action and Limit (AL) Levels for water quality are defined in **Table 2-2**. The actions in accordance with the Action Plan in **Table 2-3** shall be carried out if the water quality assessment criteria are exceeded at any designated monitoring points.

**Table 2-2 Typical Action and Limit Levels for Water Quality**

Parameters	Action Level	Limit Level
DO in mg/l (Surface, Middle & Bottom)	WSD Seawater Intakes 2 mg/L Other Impact Monitoring Stations 5 percentile of baseline data	<b>Surface and Middle</b> WSD Seawater Intakes 2 mg/L Other Impact Monitoring Stations 4 mg/L or 1 percentile of baseline data <b>Bottom</b> 2 mg/L or 1 percentile of baseline data
SS in mg/l (depth-averaged)	WSD Seawater Intakes 10 mg/L Other Impact Monitoring Stations 95 percentile of baseline data	WSD Seawater Intakes 10 mg/L Other Impact Monitoring Stations 99 percentile of baseline data
Turbidity (depth-averaged)	WSD Seawater Intakes 10 NTU Other Impact Monitoring Stations 95 percentile of baseline data	WSD Seawater Intakes 10 NTU Other Impact Monitoring Stations 99 percentile of baseline data

- Notes: 1. "Depth-averaged" is calculated by taking the arithmetic means of the readings of the three depths.  
 2. For DO measurement, non-compliance occurs when monitoring result is lower than the limits.  
 3. For SS and turbidity, non-compliance of water quality results when monitoring results is higher than the limits.  
 4. All the figures given in the table are used for reference only and the EPD may amend the figures whenever necessary.

**Table 2-3 Event and Action Plan for Water Quality for Construction Phase**

Event	Action			
	ET Leader	IEC	ER	Contractor
<b>Action Level</b>				
1. Exceedance for one sample	1. Repeat in-situ measurement to confirm finding; 2. Identify source(s) of impact; 3. Inform IEC and Contractor; 4. Check monitoring	1. Discuss with ET and Contractor on the mitigation measures; 2. Review proposals on mitigation	1. Discuss with IEC on the proposed mitigation measures; and 2. Make agreement on the mitigation	1. Inform the ER and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice;

Event	Action			
	ET Leader	IEC	ER	Contractor
	data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC and Contractor; and 6. Repeat measurement on next day of exceedance.	measures submitted by Contractor and advise the ER accordingly; and 3. Assess the effectiveness of the implemented mitigation measures.	measures to be implemented.	3. Check all plant and equipment; 4. Consider changes of working methods; 5. Discuss with ET and IEC and propose mitigation measures to IEC and ER; and 6. Implement the agreed mitigation measures.
2. Exceedance for two or more consecutive samples	1. Repeat in-situ measurement to confirm finding; 2. Identify source(s) of impact; 3. Inform IEC and Contractor; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC and Contractor; 6. Ensure mitigation measures are implemented; 7. Prepare to increase the monitoring frequency to daily; and 8. Repeat measurement on next day of exceedance.	1. Discuss with ET and Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly; and 3. Assess the effectiveness of the implemented mitigation measures.	1. Discuss with IEC on the proposed mitigation measures; 2. Make agreement on the mitigation measures to be implemented; and 3. Assess the effectiveness of the implemented mitigation measures.	1. Inform the Engineer and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Consider changes of working methods; 5. Discuss with ET and IEC and propose mitigation measures to IEC and ER within 3 working days; and 6. Implement the agreed mitigation measures.
<b>Limit Level</b>				
1. Exceedance for one sample	1. Repeat in-situ measurement to confirm finding; 2. Identify source(s) of impact; 3. Inform IEC, Contractor and EPD; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, ER and Contractor; 6. Ensure mitigation	1. Discuss with ET and Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly; and 3. Assess the effectiveness of the implemented	1. Discuss with IEC, ET and Contractor on the proposed mitigation measures; and 2. Request Contractor to critically review the working methods; 3. Make agreement on the mitigation measures to	1. Inform the Engineer and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Consider changes of working methods; 5. Discuss with ET and IEC and ER



Event	Action			
	ET Leader	IEC	ER	Contractor
	measures are implemented; and 7. Increase the monitoring frequency to daily until no exceedance of Limit level.	mitigation measures.	be implemented; and 4. Assess the effectiveness of the implemented mitigation measures.	and propose mitigation measures to IEC and ER within 3 working days; and 6. Implement the agreed mitigation measures.
2. Exceedance for two or more consecutive samples	1. Repeat in-situ measurement to confirm finding; 2. Identify source(s) of impact; 3. Inform IEC, Contractor and EPD; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, ER and Contractor; 6. Ensure mitigation measures are implemented; and 7. Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days.	1. Discuss with ET and Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly; and 3. Assess the effectiveness of the implemented mitigation measures.	1. Discuss with IEC, ET and Contractor on the proposed mitigation measures; and 2. Request Contractor to critically review the working methods; 3. Make agreement on the mitigation measures to be implemented; 4. Assess the effectiveness of the implemented mitigation measures; and 5. Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the marine work until no exceedance of Limit Level.	1. Inform the ER and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Consider changes of working methods; 5. Discuss with ET and IEC and ER and propose mitigation measures to IEC and ER within 3 working days; 6. Implement the agreed mitigation measures; and 7. As directed by the Engineer, to slow down or to stop all or part of the marine work or construction activities.

## 2.9 Mitigation Measures

The mitigation measures recommended for the construction phase of the submarine watermain are summarized below. The implementation schedule of the recommended water quality mitigation measures is presented in **Annex A**.

### Specific Mitigation Measures for dredging

- Dredging should be undertaken using one grab dredger only with a maximum production rate of 4,000m<sup>3</sup> per day;

- Deployment of frame type silt curtain to fully enclose the grab while dredging works are in progress;
- Deployment of silt screen at the sea water intake at Kowloon South Salt Water Pumping Station while dredging works are in progress.

The frame type silt curtain should be designed to enclose local pollution caused by the grab dredger and suspended by a steel frame mounted on the grab dredger and floating on water. This frame type silt curtain should be fabricated from permeable, durable, abrasion resistant membrane like geotextiles and be mounted on a floating boom structure. The frame type silt curtain should also extend to the seabed to cover the entire water column. Steel chain or ballast should be attached to the bottom of the silt curtain. Mid-ballast may be added as necessary. The structure of the silt curtain should be maintained by metal grids. The frame type silt curtain should be capable of reducing sediment loss to outside by a factor of 4 (or about 75%)<sup>(1)</sup>. Silt screen is recommended for dredging near the seawater intake at Kowloon South Salt Water Pumping Station. The implementation of silt screen at the intake could reduce the SS level by a factor of 2.5 (or about 60%)<sup>(1)</sup>. An illustration of a typical configuration of frame type silt curtain and silt screen at seawater intake is shown in **Figure 2.2**.

### **Other Mitigation Measures for dredging**

Good site practice that should be undertaken during dredging includes:

- Tight-closing grabs should be used to minimize the loss of sediment to suspension during dredging works. For dredging of any contaminated mud, closed watertight grabs must be used;
- all vessels should be sized so that adequate clearance is maintained between vessels and the seabed in all tide conditions, to ensure that undue turbidity is not generated by turbulence from vessel movement or propeller wash;
- the decks of all vessels should be kept tidy and free of oil or other substances that might be accidentally or otherwise washed overboard;
- adequate free board shall be maintained on barges to ensure that decks are not washed by wave action;
- all barges used for the transport of dredged materials should be fitted with tight bottom seals to prevent leakage of material during loading and transport;
- construction activities should not cause foam, oil, grease, scum, litter or other objectionable matter to be present in the water within the site or dumping grounds;
- loading of barges should be controlled to prevent splashing of material into the surrounding waters. Barges should not be filled to a level that would cause the overflow of materials or sediment laden water during loading or transportation;
- the speed of vessels should be controlled within the works area to prevent propeller wash from stirring up the seabed sediments; and
- before commencement of dredging works, the holder of the Environmental Permit should submit detailed proposal of the design and arrangement of the frame type silt curtain to EPD for approval.

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<sup>(1)</sup> Maunsell Consultants Asia Ltd (2001), *Agreement No. CE 74/98, Wan Chai Development Phase II Comprehensive Feasibility Study, Final Environmental Impact Assessment Report*, for Territory Development Department..

### **Effluent from Hydrostatic Tests of the Water Mains System**

To ensure compliance with the standards for effluent discharged into the inshore waters or marine waters of Victoria Harbour WCZ as shown in Tables 9a and 9b of the TM-DSS and Section 23.73 and 23.77 of the *General Specification for Civil Engineering Works Volume 3, 1992 Edition*, sedimentation tanks with sufficient capacity, constructed from pre-formed individual cells of approximately 6 to 8 m<sup>3</sup> capacities, are recommended as a general mitigation measure which can be used for settling the effluent prior to disposal. The system capacity should be flexible and suited to applications where the influent is pumped. Pre-treatment including dechlorination such as by physical process e.g. adsorption by activated carbon filter, or chemical process e.g. neutralisation by dechlorination agent dosing should be carried out to ensure compliance with the discharge requirements stipulated in TM-DSS.

### **Surface Runoff, Sewage and Wastewater from Construction Activities**

Appropriate measures should be implemented to control runoff and prevent high loads of SS from entering the marine environment. Proper site management is essential to minimise surface runoff and sewage effluents.

Construction site runoff should be prevented or minimised in accordance with the guidelines stipulated in the EPD's Practice Note for Professional Persons, Construction Site Drainage (ProPECC PN 1/94). All discharges from the construction site should be controlled to comply with the standards for effluents discharged into the Victoria Harbour WCZ under the TM-DSS. Good housekeeping and stormwater best management practices, as detailed below, should be implemented to ensure all construction runoff complies with WPCO standards and no unacceptable impact on the WSRs as a result of construction of the proposed submarine watermain.

Sedimentation tanks with sufficient capacity, constructed from pre-formed individual cells of approximately 6 to 8 m<sup>3</sup> capacities, are recommended as a general mitigation measure which can be used for settling surface runoff prior to disposal. The system capacity should be flexible and able to handle multiple inputs from a variety of sources and suited to applications where the influent is pumped.

Manholes (including newly constructed ones) should always be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris being washed into the storm runoff being directed into foul sewers.

All vehicles and plant should be cleaned before leaving a construction site to ensure no earth, mud, debris and the like is deposited by them on roads. An adequately designed and located wheel washing bay should be provided at every site exit, and wash-water should have sand and silt settled out and removed at least on a weekly basis to ensure the continued efficiency of the process. The section of access road leading to, and exiting from, the wheel-wash bay to the public road should be paved with sufficient backfill toward the wheel-wash bay to prevent vehicle tracking of soil and silty water to public roads and drains.

Precautions should be taken at any time of year when rainstorms are likely. Actions should be taken when a rainstorm is imminent or forecast. Actions to be taken during or after rainstorms are summarised in Appendix A2 of ProPECC PN 1/94. Particular attention

should be paid to the control of silty surface runoff during storm events, particularly for areas located near steep slopes.

Fuel tanks and storage areas should be provided with locks and be located on sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank, to prevent spilled fuel oils from reaching the coastal waters of the Victoria Harbour and Western Harbour WCZs.

Portable chemical toilets would be used to handle construction workforce sewage prior to discharge to the existing trunk sewer. Sufficient numbers of portable toilets shall be provided by a licensed contractor to serve the construction workers. The Contractor shall also be responsible for waste disposal and maintenance practices.

### **3. MARINE ECOLOGY**

A review of the existing information showed that the marine ecological resources within the dredging area consist of pollution tolerant soft benthos in low diversity and typical to benthos recorded in poor quality sediments. Inter-tidal species along Victoria shorelines are common fouling organisms recorded at artificial seawall. Both the species diversity and abundance recorded are lower than those recorded in semi-exposed shore in Hong Kong. The marine ecology in Green Island is of moderate ecological value, with soft coral assemblages and larger size inter-tidal species recorded. However, the results of water quality modelling showed that the elevation of SS concentration and sedimentation rate around the Green island waters is predicted to be less than  $0.1\text{mgL}^{-1}$  and  $0.001\text{kg m}^{-2}$  per day respectively, which is much lower than the tolerant level for coral communities. In addition, due to the remoteness from the works area, the impacts to the marine environment in vicinity to Green Island is anticipated to be negligible. The Study Area is not the distribution range of marine mammals and as low ecological value species are encountered in the region, the implementation of good site practices and mitigation measures for water quality impact are considered to be sufficient to minimize the impacts on the marine ecology. Thus, no special mitigation measures are necessary for ecological sensitive receivers.

The proposed dredging works would be confined in the works area within 25m at either side of the proposed alignment and the use of closed type grab dredger would reduce sediment and contaminants runoff to the water column. The trench would be backfilled with armour rock layer 4.5m thick with a 0.3m thick grade 75 bedding and gaps between the backfilled armour rock and the edge of the submarine pipeline trench would be filled by marine sediment within the sea volume from natural movement of the top soft soil of existing seabed to provide protection of the pipeline from damage by ship anchors. Benthic fauna is expected to be recolonized to the seabed after construction.

Mitigation measures for water quality impacts as detailed in *Section 2* of this EM&A Manual would apply to minimize the potential impact on marine ecology. No other ecology-specific measures or Environmental Monitoring and Audit Programme are considered necessary.

## 4. NOISE

### 4.1 Introduction

The monitoring programme shall be carried out by the ET to ensure that the noise level of construction works complies with the 75dB(A) criterion for domestic premises, with 70 dB(A) for schools and with a further reduction to 65dB(A) during examination periods.

### 4.2 Noise Parameters

The construction noise level shall be measured in terms of the A-weighted equivalent continuous sound pressure level ( $L_{eq}$ ).  $L_{eq(30\text{ min})}$  shall be used as the monitoring parameter for the time period between 0700-1900 hours on normal weekdays.

Supplementary information for data auditing, statistical results such as  $L_{10}$  and  $L_{90}$  shall also be obtained for reference. A sample data record sheet is shown in **Annex B** for reference.

### 4.3 Monitoring Equipment

As refer to the Technical Memorandum (TM) issued under the Noise Control Ordinance (NCO), sound level metres in compliance with the International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1) specifications shall be used for carrying out the noise monitoring. The calibration of the sound level meters and their respective calibrators shall be carried out in accordance with the manufacturer's requirements.

Noise measurements shall not be made in the presence of fog, rain, wind with a steady speed exceeding 5 ms<sup>-1</sup> or wind with gusts exceeding 10 ms<sup>-1</sup>.

The ET Leader is responsible for the provision and maintenance of the monitoring equipment. He shall ensure that sufficient noise measuring equipment and associated instrumentation are available for carrying out the baseline monitoring, regular impact monitoring and ad hoc monitoring. All the equipment and associated instrumentation shall be clearly labelled. The location of equipment installation should be proposed by the ET Leader and agreed with the ER and EPD in consultation with the IEC.

### 4.4 Monitoring Locations

The noise monitoring locations (Refer to **Figure 4.1 and 4.2**) are summarised in **Table 4-1**. The status and locations of noise sensitive receivers may change after issuing this manual. If such cases exist, the ET Leader shall propose updated monitoring locations and seek agreement from ER, IEC and EPD.

**Table 4-1 Noise Monitoring Stations**

<b>ID</b>	<b>Area</b>	<b>Description</b>
KS4	West Kowloon	The Harbourside
KS6	West Kowloon	Union Square
CG	Sai Ying Pun	Connaught Garden
RWM	Sai Ying Pun	Richwealth Mansion
KY3	Sai Ying Pun	Kwan Yik Building Phase 3

When alternative monitoring locations are proposed, the monitoring locations shall be chosen based on the following criteria:

- a) at locations close to the major site activities which are likely to have noise impacts;
- b) close to the noise sensitive receivers (any domestic premises, temporary housing accommodation, educational institution, place of public worship, shall be considered as a noise sensitive receiver); and
- c) for monitoring locations located in the vicinity of the sensitive receivers, care shall be taken to cause minimal disturbance to the occupants during monitoring.

The monitoring station shall normally be at a point 1m from the exterior of the sensitive receivers building facade and be at a position 1.2m above the ground. If there is a problem with access to the normal monitoring position, an alternative position may be chosen, and a correction to the measurements shall be made. For reference, a correction of +3dB(A) shall be made to the free field measurements. The ET Leader shall agree with the IEC on the monitoring positions and the correction adopted. Once the positions for the monitoring stations are chosen, the baseline monitoring and the impact monitoring shall be carried out at the same positions.

#### **4.5 Baseline Monitoring**

The ET shall carry out baseline noise monitoring prior to the commencement of the construction works. There shall not be any construction activities in the vicinity of the stations during the baseline monitoring. Continuous baseline noise monitoring for the A-weighted levels  $L_{Aeq}$ ,  $L_{A10}$  and  $L_{A90}$  shall be carried out daily for a period of at least two weeks in a sample period of 30 minutes between 0700 and 1900. Baseline monitoring schedule should be submitted to the Contractor, IEC, ER and EPD one week prior to the commencement of the baseline monitoring.

In exceptional case, when insufficient baseline monitoring data or questionable results are obtained, the ET Leader shall liaise with IEC and EPD to agree on an appropriate set of data to be used as a baseline reference and submit to ER for approval.

#### 4.6 Impact Monitoring

During normal construction working hour (0700-1900 Monday to Saturday), monitoring of  $L_{Aeq, 30min}$  noise levels (or as six consecutive  $L_{Aeq, 5min}$  readings) shall be carried out at the agreed monitoring locations once every week in accordance with the methodology in the TM.

Other noise sources such as road traffic may make a significant contribution to the overall noise environment. Therefore, the results of noise monitoring activities will take into account such influencing factors, which may not be presented during the baseline monitoring period.

In case of non-compliance with the construction noise criteria, more frequent monitoring as specified in the Event and Action Plan in *Section 4.7* shall be carried out. This additional monitoring shall be continued until the recorded noise levels are rectified or proved to be irrelevant to the construction activities.

Proposed noise monitoring schedule should be provided to the Contractor, IEC, ER and EPD on or before the first day of the monitoring month. The Contractor, IEC, ER and EPD should be notified immediately for any changes in schedule.

#### 4.7 Event and Action Plan for Noise

The Action and Limit (AL) Levels for construction noise are defined in **Table 4-2**. Should non-compliance of the criteria occurs, action in accordance with the Event and Action Plan in **Table 4-3**, shall be carried out.

**Table 4-2 Action and Limit Levels for Construction Noise**

Time Period	Action	Limit
0700-1900 hrs on normal weekdays	When one documented complaint is received.	75* dB(A)
1900-2300 hrs on normal weekdays	When one documented complaint is received.	70 dB(A)
Restricted hours (2300-0700 hrs)	When one documented complaint is received.	55 dB(A)

Note:

\* 70 dB(A) for schools and 65 dB(A) during school examination periods.

**Table 4-3 Event and Action Plan for Construction Noise**

Event	Action			
	ET Leader	IEC	ER	Contractor
<b>Action Level</b>	1. Notify IEC and the Contractor. 2. Carry out investigation. 3. Report the results of investigation to IEC and the Contractor. 4. Discuss with the Contractor and	1. Review with analysed results submitted by ET. 2. Review the proposed remedial measures by the Contractor and advise ER	1. Confirm receipt of notification of exceedance in writing. 2. Notify the Contractor. 3. Require the Contractor to	1. Submit noise mitigation proposals to IEC. 2. Implement noise mitigation proposals.

Event	Action			
	ET Leader	IEC	ER	Contractor
	formulate remedial measures. 5. Increase monitoring frequency to check mitigation measures.	accordingly. 3. Supervise the implement of remedial measures.	propose remedial measures for the analysed noise problem. 4. Ensure remedial measures are properly implemented.	
<b>Limit Level</b>	1. Identify the source. 2. Notify IEC, ER, EPD and the Contractor. 3. Repeat measurement to confirm findings. 4. Increase monitoring frequency. 5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented. 6. Inform IEC, ER, and EPD the causes & actions taken for the exceedances. 7. Assess effectiveness of the Contractor's remedial actions and keep IEC, EPD and ER informed of the results. 8. If exceedance stops, cease additional monitoring.	1. Discuss amongst ER, ET Leader and the Contractor on the potential remedial actions. 2. Review the Contractor's remedial actions whenever necessary to assure their effectiveness and advise ER accordingly. 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of exceedance in writing. 2. Notify the Contractor. 3. Require the Contractor to propose remedial measures for the analysed noise problem. 4. Ensure remedial measures are properly implemented. 5. If exceedance continues, consider what activity of the work is responsible and instruct the Contractor to stop that activity of work until the exceedance is abated.	1. Take immediate action to avoid further exceedance. 2. Submit proposals for remedial actions to IEC within 3 working days of notification. 3. Implement the agreed proposals. 4. Resubmit proposals if problem still not under control. 5. Stop the relevant activity of works as determined by the ER until the exceedance is abated.

#### 4.8 Mitigation Measures

The mitigation measures recommended for the construction phase of the submarine watermain are summarised below. The implementation schedule of the recommended noise mitigation measures is presented in **Annex A**.

##### Work Schedule Rearrangement

Concurrent works should be such that necessary noisy works should be carried out at different time slots or spread around the construction sites. This will help to reduce the cumulative noise effect produced in the construction process.

If night-time (2300 to 0700 hours) dredging is required, the work shall be scheduled to carry out at a distance as far as possible to the NSRs. It is determined that the dredging work should be carried out at a location 750m away from the Sai Ying Pun landfall site and 450m from the West Kowloon landfall site along the trench as shown in **Figure 4.3**. Under such condition, the separation distances to the NSRs (e.g. Richwealth Mansion and Union Square)



are increased to more than 900m. The Contractor will be required to adhere to the restricted locations of dredging work at night-time to comply with relevant noise standard.

### **Using Quality PME**

The use of Quality PME recognized by the Noise Control Authority for the purpose of CNP application can effectively reduce the noise generated from the construction plants. Quality PME are construction plants and equipments that are notably quieter, more environmental friendly and efficiently. The noise level reduction ranges from 5 – 10 dB(A) depending on the type of equipment used. The Contractor shall note the required procedures involved in application of the QPME.

### **Using Noise Barriers**

Mobile or movable noise barriers to be erected near to the construction plants would reduce the noise levels for commonly 5 – 10 dB(A) depending on the types of items of PME and materials of the barriers. It is recommended that the Contractor shall screen noisy works and noise from stationary items of PME whenever practicable.

### **Good Site Practice**

Good site practice and noise management can significantly reduce the impact of construction site activities on nearby NSRs. The following package of measures should be followed during construction:

- only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction works;
- machines and plant that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum;
- plant known to emit noise strongly in one direction, should, where possible, be orientated to direct noise away from the NSRs;
- mobile plant should be sited as far away from NSRs as possible; and
- material stockpiles and other structures should be effectively utilised, where practicable, to screen noise from on-site construction activities.

## **5. WASTE MANAGEMENT**

### **5.1 Introduction**

The Contractor shall have a plan in controlling the waste generated from the construction activities. Besides removal of waste material produced and implementation of recommended mitigation measures to minimise waste problems arising, a site waste inventory record should be maintained. The Contractor shall mention good site practice to ensure that the waste impacts are minimised and shall make sure that relevant disposal permits are obtained.

For the waste to be disposed appropriately, it is recommended that, if practical, the waste should be separated by category on-site by the Contractor. The following categories shall be adopted:

- Construction and Demolition (C&D) waste;
- General refuse;
- Chemical waste; and
- Marine Dredged Sediment

### **5.2 Audit Requirements**

It is recommended that auditing of each waste stream should be carried out periodically by the Contractor to determine if wastes are being managed in accordance with approved procedures and the site waste management plan. The audits should look at all aspects of waste management including waste generation, storage, recycling, treatment, transport and disposal. An appropriate audit programme would be to undertake the first audit at the commencement of the construction works, and then to audit weekly thereafter.

### **5.3 Mitigation Measures**

#### **Good Site Practices**

Adverse impacts related to waste management are not expected to arise, provided that good site practices are strictly followed. Recommendations for good site practices during the construction activities include:

- Nomination of an approved person, such as a site manager, to be responsible for good site practices, arrangements for collection and effective disposal to an appropriate facility, of all wastes generated at the site
- Training of site personnel in proper waste management and chemical handling procedures
- Provision of sufficient waste disposal points and regular collection of waste
- Appropriate measures to minimise windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers

### **Waste Reduction Measures**

Good management and control can prevent the generation of a significant amount of waste. Waste reduction is best achieved at the planning and design stage, as well as by ensuring the implementation of good site practices. Recommendations to achieve waste reduction include:

- Sort C&D material from demolition and decommissioning of the existing facilities to recover recyclable portions such as metals
- Segregation and storage of different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal
- Encourage collection of aluminium cans by providing separate labelled bins to enable this waste to be segregated from other general refuse generated by the work force
- Proper storage and site practices to minimise the potential for damage or contamination of construction materials
- Plan and stock construction materials carefully to minimise amount of waste generated and avoid unnecessary generation of waste.

### **Construction & Demolition Material**

In order to minimise impacts resulting from collection and transportation of C&D material for off-site disposal, the excavated materials should be reused on-site as backfilling material for landscaping works for the associated land mains as far as practicable. In addition, C&D material generated from the excavation works should be disposed of at public fill reception facilities for other beneficial uses. Other mitigation requirements are listed below:

- A Waste Management Plan should be prepared.
- A recording system for the amount of wastes generated, recycled and disposed (including the disposal sites) should be proposed.
- In order to monitor the disposal of C&D material and solid wastes at public filling facilities and landfills, and to control fly-tipping, a trip-ticket system (e.g. ETWB TCW No. 31/2004) should be included.

### **General Refuse**

General refuse should be stored in enclosed bins or compaction units separate from C&D material. A reputable waste collector should be employed by the Contractor to remove general refuse from the site, separately from C&D material. Preferably an enclosed and covered area should be provided to reduce the occurrence of 'wind blown' light material.

### **Chemical Waste**

If chemical wastes are produced at the construction site, the Contractor would be required to register with the EPD as a chemical waste producer and to follow the guidelines stated in the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes*. Good quality containers compatible with the chemical wastes should be used, and incompatible chemicals should be stored separately. Appropriate labels should be securely attached on each chemical waste container indicating the corresponding chemical characteristics of the chemical waste, such as explosive, flammable, oxidizing, irritant, toxic, harmful, corrosive, etc. The Contractor shall use a licensed collector to transport and dispose of the chemical

wastes, to either the approved Chemical Waste Treatment Centre, or another licensed facility, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.

### **Marine Dredged Sediment**

The basic requirements and procedures for dredged mud disposal are specified under the ETWB TCW No. 34/2002. The management of the dredging, use and disposal of marine mud is monitored by the MFC, while the licensing of marine dumping is the responsibility of the Director of Environmental Protection (DEP).

The dredged marine sediments would be loaded onto barges and transported to designated disposal sites depending on their level of contamination. Based on the chemical and biological screening results and subsequently the corresponding types of disposal required as evaluated in the EIA report, it was estimated that some 326,000m<sup>3</sup> of sediments would be suitable for open sea disposal (Type 1), some 5,000 m<sup>3</sup> of sediments would be suitable for open sea disposal (dedicated sites) (Type 1) and 212,000m<sup>3</sup> of sediments would require confined marine disposal (Type 2). In accordance with the ETWB TCW No. 34/2002, the contaminated material must be dredged and transported with great care, and the mitigation measures recommended in Section 3 of the EIA report should be strictly followed. Furthermore, the dredged contaminated sediment must be effectively isolated from the environment upon final disposal and shall be disposed of at the East Sha Chau Contaminated Mud Pits that is designated for the disposal of contaminated mud in Hong Kong.

During transportation and disposal of the dredged marine sediments, the following measures should be taken to minimise potential impacts on water quality:

- Bottom opening of barges shall be fitted with tight fitting seals to prevent leakage of material. Excess material shall be cleaned from the decks and exposed fittings of barges and dredgers before the vessel is moved.
- Monitoring of the barge loading shall be conducted to ensure that loss of material does not take place during transportation. Transport barges or vessels shall be equipped with automatic self-monitoring devices as specified by the EPD.
- Barges or hopper barges shall not be filled to a level that would cause the overflow of materials or sediment laden water during loading or transportation.

## **6. AIR QUALITY**

### **6.1 Introduction**

Potential air quality impacts arising from the construction and operation of the Project have been evaluated. As the number of construction plants involved in the cross harbour main laying activities at anytime on site would be limited, exceedance of Air Quality Objectives (AQOs) emissions of gaseous pollutants from these construction plants is not anticipated. Dust impact and SO<sub>2</sub> and NO<sub>2</sub> emissions from plants and site vehicles would be minimal. With the implementation of appropriate dust suppression measures stipulated in the Air Pollution Control (Construction Dust) Regulation, adverse air quality impact is not anticipated.

Dust monitoring during the construction of the Project is therefore considered not necessary but weekly site audits are required to ensure that the dust control measures are properly implemented. Monitoring during operation phase is not required.

### **6.2 Audit Requirement**

It is recommended that audits shall be carried out by the Environmental Team on a weekly basis to ensure that the recommended mitigation measures are carried out by the Contractor. Special attention shall be paid to the enforcement of dust control measures during construction process. The ET should consider the programme and site for construction works in determining the location to carry out the auditing.

### **6.3 Mitigation Measures**

Effective control measures and good site practices should be implemented to meet the requirements of the *Air Pollution Control (Construction Dust) Regulation* and minimize construction dust impact.

During construction phase, the Contractor shall make reference, but not limit himself, to the following measures:

- any excavated dusty materials or stockpile of dusty materials should be covered entirely by impervious sheeting or sprayed with water so as to maintain the entire surface wet, and recovered or backfilled or reinstated within 24 hours of the excavation or unloading;
- the working area of excavation should be sprayed with water immediately before, during and immediately after the operations so as to maintain the entire surface wet;
- the load of dusty materials carried by vehicle leaving a construction site should be covered entirely by clean impervious sheeting to ensure that the dusty materials do not leak from the vehicle;
- where a site boundary adjoins a road, streets or other area accessible to the public, hoarding of not less than 2.4m high from ground level should be provided along the entire length except for a site entrance or exit;

- the area where vehicle washing takes place and the section of the road between the washing facilities and the exit point should be paved with concrete, bituminous materials or hardcores;
- every main haul road should be sealed with concrete and kept clear of dusty materials or sprayed with water so as to maintain the entire road surface wet;
- the portion of road leading only to a construction site that is within 30m of a designated vehicle entrance or exit should be kept clear of dusty materials;
- all dusty materials should be sprayed with water prior to any loading, unloading or transfer operation so as to maintain the dusty material wet;
- vehicle speed should be limited to 10 kph except on completed access roads; and
- every vehicle should be washed to remove any dusty materials from its body and wheels before leaving the construction sites.

## 7. CULTURAL HERITAGE

A comprehensive baseline review identified no land based or submerged cultural heritage resources within the Study Area. A Geophysical Survey which covered a 200m submarine watermain corridor was conducted and no indication of marine archaeological material was identified.

No cultural heritage resources are identified within the Study Area and therefore, no environmental monitoring and audit programme and mitigation measures are required.

## 8. FISHERIES

Impacts to fisheries resources and fishing operations have largely been avoided during construction through constraints on the works operations for installation of the cross harbour main. Good construction practice and associated measures recommended in *Section 2* to control water quality impacts to within acceptable levels are also expected to control impacts to fisheries resources.

The implementation of the water quality mitigation measures stated in the *Section 2* (Water Quality) should be checked as part of the environmental monitoring and audit procedures during the construction phase. No fisheries-specific mitigation measures during construction of the proposed submarine watermain are considered necessary.

## **9. SITE ENVIRONMENTAL AUDIT**

### **9.1 Introduction**

Site Inspections provide a direct means to trigger and enforce the specified environmental protection and pollution control measures. They shall be undertaken routinely by the ET Leader to inspect the construction activities in order to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented. With well defined pollution control and mitigation specifications and a well established site inspection, deficiency and action reporting system, the site inspection is one of the most effective tools to enforce the environmental protection requirements on the construction site.

The ET Leader is responsible for formulation of the environmental site inspection, deficiency and action reporting system, and for carrying out the site inspection works. He shall submit a proposal on the site inspection, deficiency and action reporting procedures within 21 days of the construction contract commencement to the Contractor for agreement and to the ER for approval.

Regular site inspections shall be carried out at least once per week. The areas of inspection shall not be limited to the pollution control and mitigation measures within the site; the environmental situation outside the site area which is likely to be affected, directly or indirectly, by the site activities shall be reviewed. The ET Leader shall make reference to the following information when conducting the inspection:

- a) the EIA recommendations on environmental protection and pollution control mitigation measures;
- b) works progress and programme;
- c) individual works methodology proposals (which shall include proposal on associated pollution control measures);
- d) the contract specifications on environmental protection;
- e) the relevant environmental protection and pollution control laws; and
- f) previous site inspection results.

The Contractor shall update the ET Leader with all relevant information of the construction contract for him to carry out the site inspections. The inspection results and its associated recommendations on improvements to the environmental protection and pollution control works shall be submitted to the IEC and the Contractor within 24 hours, for reference and for taking immediate action. The Contractor shall follow the procedures and time-frame as stipulated in the environmental site inspection, deficiency and action reporting system formulated by the ET Leader to report on any remedial measures subsequent to the site inspections.

Ad hoc site inspections shall also be carried out if significant environmental problems are identified. Inspections may also be required subsequent to receipt of an environmental complaint, or as part of the investigation work, as specified in the Action Plan for environmental monitoring and audit.

## 9.2 Compliance with Legal and Contractual Requirements

There are contractual environmental protection and pollution control requirements as well as environmental protection and pollution control laws in Hong Kong which the construction activities shall comply with.

In order that the works are in compliance with the contractual requirements, all the works method statements submitted by the Contractor to the ER for approval shall also be sent to the ET Leader for vetting to see whether sufficient environmental protection and pollution control measures have been included. The implementation schedule of mitigation measures is summarised in **Annex A**.

The ET Leader shall also review the progress and programme of the works to check that relevant environmental laws have not been violated, and that any foreseeable potential for violating the laws can be prevented.

The Contractor shall regularly copy relevant documents to the ET Leader so that the checking work can be carried out. The document shall at least include the updated Work Progress Reports, the updated Works Programme, application letters for different license/permits under the environmental protection laws, and all the valid license/permit. The site diary shall also be available for the ET Leader's inspection upon his request.

After reviewing the document, the ET Leader shall advise the ER and the Contractor of any non-compliance with the contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the ET Leader's review concludes that the current status on license/permit application and any environmental protection and pollution control preparation works may not cope with the works programme or may result in potential violation of environmental protection and pollution control requirements by the works in due course, he shall advise the Contractor and the ER accordingly.

Upon receipt of the advice, the Contractor shall undertake immediate action to remedy the situation. The ER shall follow up to ensure that appropriate action has been taken by the Contractor in order that the environmental protection and pollution control requirements are fulfilled.

## 9.3 Environmental Complaints

Handling of environmental complaints should follow the environmental complaint flow diagram and reporting channel as presented in **Figure 9.1**.

During the complaint investigation work, the Contractor and ER shall cooperate with the IEC and ET Leader in providing all necessary information and assistance for completion of the investigation. If mitigation measures are identified in the investigation, the Contractor



shall promptly carry out the mitigation works. The ER shall ensure that the measures have been carried out by the Contractor. Sample of the complaint log is shown in **Annex C**.

## **10. REPORTING**

### **10.1 General**

The reporting requirements of EM&A information are based upon a paper-documented approach. However, the same information can be provided in an electronic medium upon agreeing the format with the ER and EPD. This will enable a transition from a paper / historic and reactive approach to an electronic / real time proactive approach.

Types of reports that the ET Leader shall prepare and submit include baseline monitoring report, monthly EM&A report, quarterly EM&A summary report and final EM&A review report. In accordance with Annex 21 of the EIAO-TM, a copy of the monthly, quarterly summary and final review EM&A reports shall be made available to the Director of Environmental Protection. The exact details of the frequency, distribution and time frame for submission shall be agreed with EPD prior to commencement of works.

### **10.2 Electronic Reporting**

To facilitate the public inspection of the Baseline Monitoring Report and monthly EM&A Reports, via the EIAO Internet Website and at the EIAO Register Office, electronic copies of these Reports shall be prepared in Hyper Text Markup Language (HTML) (version 4.0 or later) and in Portable Document Format (PDF version 4.0 or later), unless otherwise agreed by EPD and shall be submitted at the same time as the hard copies. For the HTML version, a content page capable of providing hyperlink to each section and sub-section of the EM&A Reports shall be included in the beginning of the document. Hyperlinks to all figures, drawings and tables in the EM&A Reports shall be provided in the main text from where the respective references are made. All graphics in the report shall be in interlaced GIF format unless otherwise agreed by the EPD. The content of the electronic copies of the EM&A Reports must be the same as the hard copies.

### **10.3 Baseline Monitoring Report**

The ET Leader shall prepare and submit a Baseline Environmental Monitoring Report within 10 working days of completion of the baseline monitoring. Copies of the Baseline Environmental Monitoring Report shall be submitted to all parties: the Contractor, the IEC, the ER and the EPD. The ET Leader shall liaise with the relevant parties on the exact number of copies they want. The format and content of the report, and the representation of the baseline monitoring data shall be in a format to the satisfaction of EPD and include, but not be limited to the following:

- a) up to half a page executive summary;
- b) brief project background information;
- c) drawings showing locations of the baseline monitoring stations;

- d) monitoring results (in both hard and diskette copies) together with the following information:
- monitoring methodology;
  - name of laboratory and types of equipment used and calibration details;
  - parameters monitored;
  - monitoring locations;
  - monitoring date, time, frequency and duration;
  - QA/QC results and detection limits;
- e) details on influencing factors, including
- major activities, if any, being carried out on the Site during the period;
  - weather conditions during the period;
  - other factors which might affect the results.
- f) determination of the Action and Limit Levels (AL Levels) for each monitoring parameter and statistical analysis of the baseline data; the analysis shall conclude if there is any significant difference between control and impact stations for the parameters monitored, and the following information shall be recorded:
- graphical plots of monitored parameters in the month annotated against;
  - the major activities being carried out on site during the period;
- g) revisions for inclusion in the EM&A Manual; and
- h) comments and conclusions.

#### **10.4 EM&A Reports**

The results and findings of all EM&A work required in the Manual shall be recorded in the monthly EM&A reports prepared by the ET Leader. The EM&A report shall be prepared by the ER, endorsed by IEC and submitted within 10 working days of the end of each reporting month, with the first report due in the month after construction commences. Before submission of the first EM&A report, the ET Leader shall liaise with the parties on the exact number of copies and format of the monthly reports in both hard copy and electronic medium requirement. The ET Leader shall review the number and location of monitoring stations and parameters to monitor every 6 months or on as needed basis in order to cater for the changes in surrounding environment and nature of works in progress.

##### **i. First Monthly EM&A Report**

The First Monthly EM&A Report shall include at least the following:

- a) 1-2 pages executive summary;
- Breaches of AL levels;
  - Complaints Log;
  - Notifications of any summons and successful prosecutions;
  - Reporting Changes; and

- Future key issues.
- b) Basic Project Information
- Project organisations including key personnel contact names and telephone numbers;
  - Programme;
  - Management structure; and
  - Works undertaken during the month.
- c) Environmental Status
- Work undertaken during the month with illustrations (such as location of works daily dredging/filling rates percentage fines in the fill material used); and
  - Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.
- d) Summary of EM&A requirements
- All monitoring parameters;
  - AL Levels;
  - Event-Action Plans;
  - Environmental mitigation measures, as recommended in the project EIA Report; and
  - Environmental requirements in contract documents.
- e) Implementation Status
- Advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA Report, summarised in the updated implementation schedule (in **Annex A**).
- f) Monitoring Results
- To provide monitoring results (in both hard and diskette copies) together with the following information:
- Monitoring methodology;
  - Name of laboratory and types of equipment used and calibration details;
  - Parameters monitored;
  - Monitoring locations;
  - Monitoring date, time, frequency, and duration;
  - Weather conditions during the period;
  - Any other factors which might affect the monitoring results; and
  - QA/QC results and detection limits.
- g) Report on Non-compliance, Complaints, Notifications of Summons and Successful Prosecutions
- Record of all non-compliance (exceedances) of the environmental quality performance limits (AL Levels);
  - Record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken,

actions and follow-up procedures taken, results and summary;

- Record of all notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
- Review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
- Description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.

h) Others

- An account of the future key issues as reviewed from the works programme and work method statements; and
- Advice on the solid and liquid waste management status.

ii. Subsequent Monthly EM&A Reports

The subsequent Monthly EM&A Reports shall include the following:

a) Executive Summary (1-2 pages)

- Breaches of AL levels;
- Complaint Log;
- Notifications of any summons and successful prosecutions;
- Future key issues.

b) Environmental Status

- Works undertaken during the month with illustrations including key personnel contact names and telephone number; and
- Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.

c) Implementation Status

Advice on the implementation status of environmental protection and pollution control/mitigation measures including measures for air, noise, water quality and ecological impacts etc, as recommended in the EIA Report, summarised in the updated implementation schedule (see **Annex A**).

d) Monitoring Results

To provide monitoring results (in both hard and diskette copies) together with the following information:

- Monitoring methodology;
- Name of laboratory and types of equipment used and calibration details;
- Parameters monitored;

- Monitoring locations;
  - Monitoring date, time, frequency, and duration;
  - Weather conditions during the period;
  - Any other factors which might affect the monitoring results; and
  - QA/QC results and detection limits.
- e) Report on Non-compliance, Complaints, Notifications of Summons and Successful Prosecutions
- Record of all non-compliance (exceedances) of the environmental quality performance limits (AL Levels);
  - Record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
  - Record of all notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
  - Review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
  - A description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.
- f) Others
- An account of the future key issues as reviewed from the works programme and work method statements; and
  - Advice on the solid and liquid waste management status.
- g) Appendix
- AL levels
  - Graphical plots of trends of monitored parameters at key stations over the past four reporting periods for representative monitoring stations annotated against the following:
    - i) major activities being carried out on site during the period;
    - ii) weather conditions during the period; and
    - iii) any other factors which might affect the monitoring results
  - Monitoring schedule for the present and next reporting period
  - Cumulative statistics
  - On complaints, notifications of summons and successful prosecutions
  - Outstanding issues and deficiencies
- iii. Quarterly EM&A Summary Reports
- The Quarterly EM&A Summary Report which shall generally be around 5 pages (including about 3 of text and tables and 2 of figures) shall contain at least the following information:
- a) up to half a page executive summary;

- b) basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of work undertaken during the quarter;
- c) a brief summary of EM&A requirements including:
  - monitoring parameters;
  - environmental quality performance limits (AL Levels); and
  - environmental mitigation measures, as recommended in the EIA Report;
- d) advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA study report, summarised in the updated implementation schedule;
- e) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- f) graphical plots of the trends of monitored parameters over the past 4 months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:
  - the major activities being carried out on site during the period;
  - weather conditions during the period; and
  - any other factors which might affect the monitoring results;
- g) advice on the solid and liquid waste management status;
- h) a summary of non-compliance (exceedances) of the environmental quality performance limits (AL Levels);
- i) an quarterly assessment of constructional impacts on water quality at the project site including but not limited to comparison of the difference between the quarterly mean and 1.3 times of the ambient which is defined as 30% increase of the baseline data or EPD data of the related parameters by using appropriate statistical procedures. Suggestion of appropriate mitigation measures if the quarterly assessment analytical results demonstrate that the quarterly mean is significantly higher than the liaison water quality times of the ambient mean ( $p < 0.05$ );
- j) a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;
- k) a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;
- l) a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- m) comments (e.g. effectiveness and efficiency of the mitigation measures), recommendations (e.g. any improvement in the EM&A programme) and conclusions for the quarter; and
- n) proponents' contacts and any hotline telephone number for the public to make enquiries.

#### iv. Final EM&A Review Reports

The Final EM&A Report shall contain at least the following information:

- a) Executive Summary (1-2 pages);
- b) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- c) basic project information including a synopsis of the project organisation contacts of key management, and a synopsis of work undertaken during the course of the project or past twelve months;
- d) a brief summary of EM&A requirements including:
  - (i) environmental mitigation measures, as recommended in the project EIA Report;
  - (ii) environmental impact hypotheses tested;
  - (iii) AL Levels;
  - (iv) all monitoring parameters; and
  - (v) Event-Action Plans;
- e) a summary of the implementation status of environmental protection and pollution control/mitigation measures as recommended in the project EIA study report summarized in the updated implementation schedule;
- f) graphical plots and the statistical analysis of the trends of monitored parameters over the course of the project, including the post project monitoring (for the past twelve months for annual report) for all monitoring stations against:
  - the major activities being carried out on site during the period;
  - weather conditions during the period; and
  - any other factors which might affect the monitoring results;
- g) a summary of non-compliance (exceedances) of the environmental quality performance limits (AL Levels);
- h) a review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate;
- i) a description of the actions taken in the event of non-compliance;
- j) a summary record of all complaints received (written or verbal) for each media liaison and consultation undertaken, action and follow-up procedures taken;
- k) a summary record of notifications of summons and successful prosecutions for breaches of the current environmental protection pollution control legislations locations and nature of the breaches, investigation, follow-up actions taken and results;
- l) a review of the validity of EIA Report predictions and identification of shortcomings in EIA Report recommendations;
- m) a review of the effectiveness and efficiency of the mitigation measures; and

- n) a review of success of the EM&A programme to cost effectively identify deterioration and to initiate prompt effective mitigatory action when necessary.

## **10.5 Data Keeping**

The site document such as the monitoring field records, laboratory analysis records, site inspection forms, etc. are not required to be included in the monthly EM&A reports for submission. However, the document shall be well kept by the ET Leader and be ready for inspection upon request. All relevant information shall be clearly and systematically recorded in the document. The monitoring data shall also be recorded in magnetic media form, and the software copy can be available upon request. The water quality data software format shall be agreed with EPD. All the documents and data shall be kept for at least one year after completion of the construction contract.

## **10.6 Interim Notifications of Environmental Quality Limit Exceedances**

With reference to Event/Action Plans in **Tables 2-3** and **4-3**, when the environmental quality limits are exceeded, the ET Leader shall immediately notify the ER and EPD, as appropriate. The notification shall be followed up with advice to EPD on the results of the investigation, proposed action and success of the action taken, with any necessary follow-up proposals. A sample template for the interim notifications is shown in **Annex D**.



## **FIGURES**



**LEGEND:**  
 - - - - - FV - - - - - PROPOSED DN1200 SUBMARINE WATER MAIN  
 \_\_\_\_\_ PROPOSED DN1200 LAND WATER MAIN  
 (NOTE: THE ALIGNMENT IS SHOWN FOR REFERENCE ONLY AND IT IS NOT PART OF THE DESIGNATED PROJECT COVERED UNDER THIS EIA STUDY)

P3	05/06	LYK	PRELIMINARY	CMH	RH
P2	04/06	LYK	PRELIMINARY	CMH	RH
P1	04/06	LYK	PRELIMINARY	CMH	RH
Rev	Date	Drawn	Description	Chk'd	App'd

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**THE GOVERNMENT OF THE HONG KONG  
 SPECIAL ADMINISTRATIVE REGION  
 WATER SUPPLIES DEPARTMENT**

Contract No. CE42/2005(W5)

Project  
 LAYING OF WESTERN CROSS HARBOUR MAIN  
 AND ASSOCIATED LAND MAINS FROM WEST  
 KOWLOON TO SAI YING PUN – INVESTIGATION

Title  
 LOCATION PLAN

Designed	RH	Eng.Chk.	CMH
Drawn	LYK	Coordination	---
Drg.Chk.	---	Approved	---
Scale	Project	226133	Status
1 : 5000@A1	CAD File	226133	
Drawing No.	FIGURE 1.1		Rev
			P3

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J:\2013\REPORT\DWG\MANUAL\070331\FIGURE 1.1\2013-10-16-11.dwg / 20/03/2007 12:26 / 443808


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LOCATION	Type	Assessment Point
New You Ma Tei Typhoon Shelter	Typhoon Shelter	R1
Green Island	Sensitive Receiver of Marine Ecology	R2
Green Island	Sensitive Receiver of Marine Ecology	R3
Green Island	Sensitive Receiver of Marine Ecology	R4
Green Island	Sensitive Receiver of Marine Ecology	R5
Prince Philip Dental Hospital	Seawater Intake	R6
Tsao Yuk Hospital	Seawater Intake	R7
Macau Ferry Hospital	Seawater Intake	R8
Munsey Hospital	Seawater Intake	R9
Harbour Building	Seawater Intake	R10
Princes Building Group	Seawater Intake	R11
Hong Kong Shanghai Bank	Seawater Intake	R12
Queensway Government Offices	Seawater Intake	R13
WSD Cheung Sha Wan Salt Water Pumping Station	Seawater Intake	R14
WSD Kowloon South Salt Water Pumping Station	Seawater Intake	R15
Kowloon Government Offices Building	Seawater Intake	R16
Canton Road Government Offices Building	Seawater Intake	R17
MIRC Cooling Mains	Seawater Intake	R18
China Ferry Terminal	Seawater Intake	R19
Hong Kong Cultural Centre	Seawater Intake	R20
Western Harbour Crossing West Kowloon Outfall	Existing Stormwater Outfall	R21
Western Harbour Crossing West Kowloon Outfall	Existing Stormwater Outfall	R22
Sai Ying Pun Outfall	Existing Stormwater Outfall	R23
Sai Ying Pun Outfall	Existing Stormwater Outfall	R24
Sai Ying Pun Outfall	Existing Stormwater Outfall	R25
Sai Ying Pun Outfall	Existing Stormwater Outfall	R26
Shek Tong Tsui	Existing Stormwater Outfall	R27
WSD Kennedy Town Salt Water Pumping Station	Sea Water Intake	R28
WSD Sheung Wan Salt Water Pumping Station	Sea Water Intake	R29

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**THE GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION WATER SUPPLIES DEPARTMENT**

Contract No. **CE42/2005(W5)**

Project  
**LAYING OF WESTERN CROSS HARBOUR MAIN AND ASSOCIATED LAND MAINS FROM WEST KOWLOON TO SAI YING PUN – INVESTIGATION**

Title  
**LOCATIONS OF WATER SENSITIVE RECEIVERS AND STORMWATER OUTFALLS AT WESTERN HARBOUR**

Designed		Eng.Chk.	
Drawn	LYK	Coordination	-
Dwg.Chk.	-	Approved	
Scale	Project	226133	Status
<b>1 : 25000@A1</b>	CAD File		
Drawing No.			Rev
	<b>FIGURE 1.2a</b>		<b>A</b>

J:\2013\REPORT\ENV\MANUAL\070331\FIGURE 1.2a\_WC\_226133-FIGURE-1.2a.dwg / 28/02/2007 12:29 / a00000

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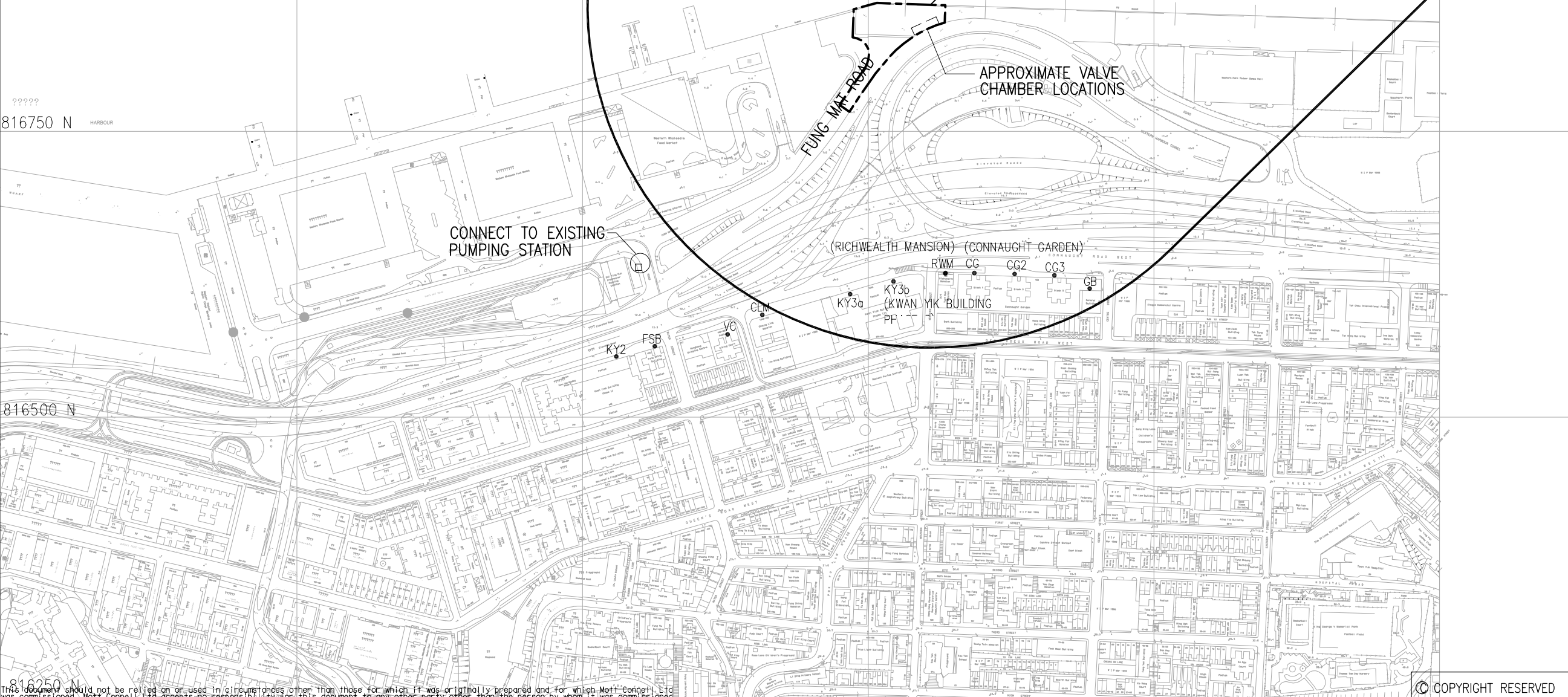
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LEGEND:

- PROPOSED ROUTE OF 1200# FRESH WATER MAIN
- NOISE SENSITIVE RECEIVERS
- 300m NOISE ASSESSMENT BOUNDARY
- WORKS AREA BOUNDARY



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Client  
**THE GOVERNMENT OF THE HONG KONG  
 SPECIAL ADMINISTRATIVE REGION  
 WATER SUPPLIES DEPARTMENT**

Contract No. **CE42/2005(W5)**

Project  
**LAYING OF WESTERN CROSS HARBOUR MAIN  
 AND ASSOCIATED LAND MAINS FROM WEST  
 KOWLOON TO SAI YING PUN – INVESTIGATION**

Title  
**LOCATIONS OF NOISE SENSITIVE  
 RECEIVERS IN SAI YING PUN**

Designed		Eng.Chk.	
Drawn	LYK	Coordination	
Drg.Chk.		Approved	

Scale	Project	Status
<b>1 : 2000@A1</b>	CAD File	

Drawing No.	Rev
	<b>A</b>

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FIGURE 1.2b

J:\2005\REPORT\DRAWING\MANUAL\070331\FIGURE 1.2b.MXD - 28/07/2007 12:34 / 1048908

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J:\26133\REPORT\ENV\ENHA-MANUAL\070331\FIGURE 1.2c\DWG-226133-FIGURE-1.2c.dwg, Layout1, 28/05/2007 11:23:55, H489898, C:\MPF\Wintor, A3, 0.03937012



**LEGEND:**

- PROPOSED ROUTE OF 1200 $\phi$  FRESH WATER MAIN
- NOISE SENSITIVE RECEIVERS
- TEMPORARY PLATFORM
- 300m NOISE ASSESSMENT BOUNDARY
- WORKS AREA BOUNDARY

Rev	Date	Drawn	Description	Ch'k'd	App'd
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**Contract No.** CE42/2005(W5)

**Project**  
 LAYING OF WESTERN CROSS HARBOUR MAIN  
 AND ASSOCIATED LAND MAINS FROM WEST  
 KOWLOON TO SAI YING PUN – INVESTIGATION

**Title**  
 LOCATION OF NOISE SENSITIVE  
 RECEIVERS IN WEST KOWLOON

Designated	Drawn	Dwg Chk.	Project	Eng Chk.	Status
	LYK			Coordination	
				Approved	

**Scale**  
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**Drawing No.** FIGURE 1.2c  
**Rev** A

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**LEGEND:**

- PROPOSED ROUTE OF 1200mm FRESH WATER MAIN
- AIR SENSITIVE RECEIVERS
- 500m AIR QUALITY ASSESSMENT BOUNDARY

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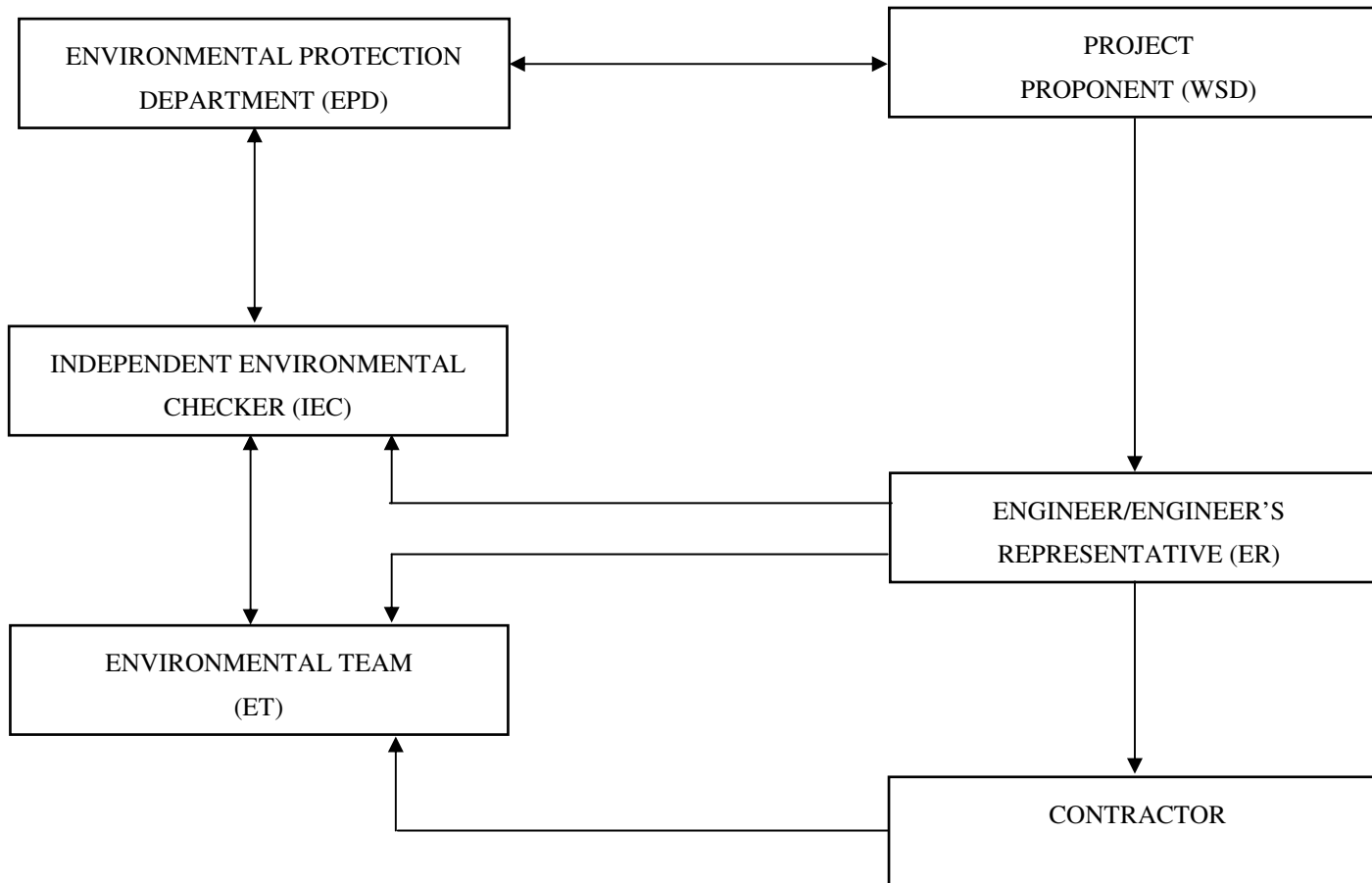
**Contract No.** CE42/2005(W5)


**Project**  
 LAYING OF WESTERN CROSS HARBOUR MAIN  
 AND ASSOCIATED LAND MAINS FROM WEST  
 KOWLOON TO SAI YING PUN – INVESTIGATION

**Title**  
 LOCATIONS OF AIR SENSITIVE  
 RECEIVERS IN SAI YING PUN

Designed		Eng.Chk.	
Drawn	LYK	Coordination	
Dwg.Chk.		Approved	
Scale	Project	226133	Status
1 : 2000@A1	CAD File		
Drawing No.	J:\226133\REPORT\DWG\EM&A-MANUAL\070333\FIGURE 1.2d WS-226133-FIGURE 1.2d		Rev

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Project	Laying of Western Cross Harbour Main and Associated Land Mains From West Kowloon to Sai Ying Pun - Investigation	
Title	Project Organisation and Lines of Communication	
Date	Feb 2007	







LOCATION	Type	MONITORING STATION
Green Island	Sensitive Receiver of Marine Ecology	R5
Prince Philip Dental Hospital	Seawater Intake	R6
Tsui Yuk Hospital	Seawater Intake	R7
Macau Ferry Hospital	Seawater Intake	R8
WSD Kowloon Salt Water Pumping Station	Seawater Intake	R15
Kowloon Government Offices Building	Seawater Intake	R16
Canton Road Government Offices Building	Seawater Intake	R17
WSD Kennedy Town Salt Water Pumping Station	Seawater Intake	R28
WSD Sheung Wan Salt Water Pumping Station	Seawater Intake	R29

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**THE GOVERNMENT OF THE HONG KONG  
 SPECIAL ADMINISTRATIVE REGION  
 WATER SUPPLIES DEPARTMENT**

Contract No. **CE42/2005(W5)**

Project  
**LAYING OF WESTERN CROSS HARBOUR MAIN  
 AND ASSOCIATED LAND MAINS FROM WEST  
 KOWLOON TO SAI YING PUN – INVESTIGATION**

Title  
**PROPOSED LOCATION OF WATER QUALITY  
 MONITORING STATIONS**

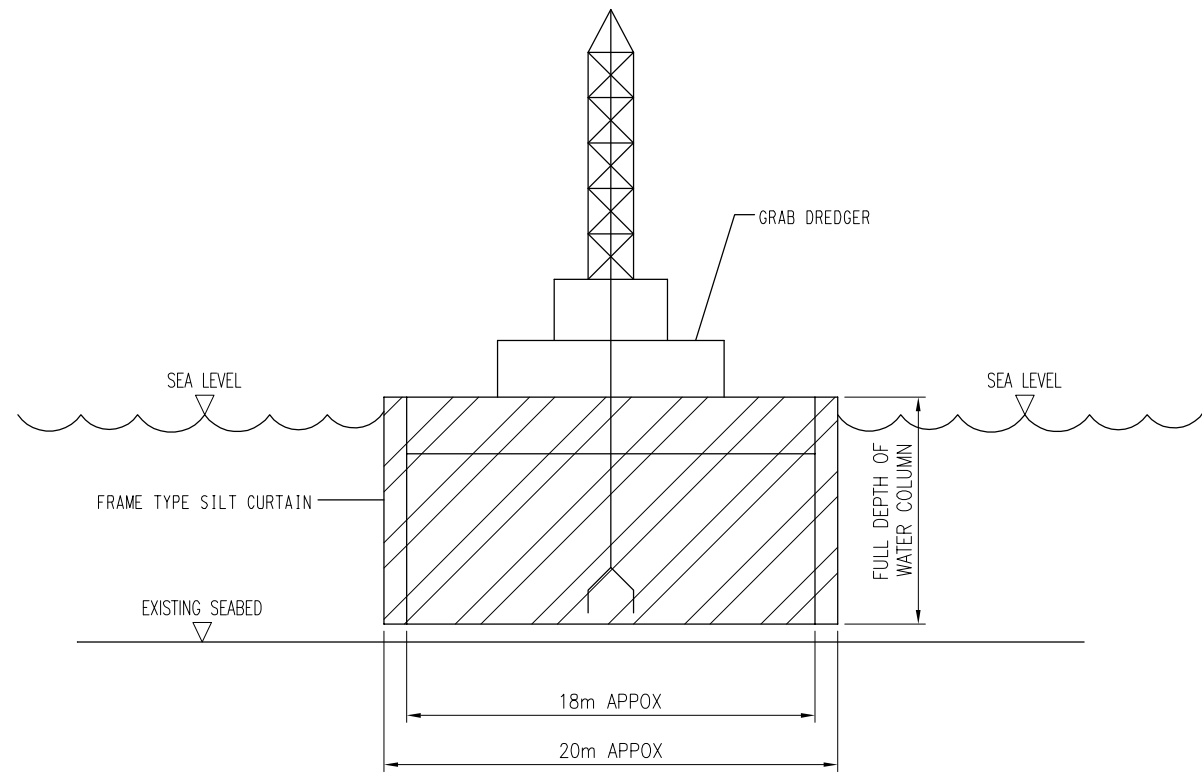
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Dwg.Chk.	—	Approved	
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Drawing No.			Rev
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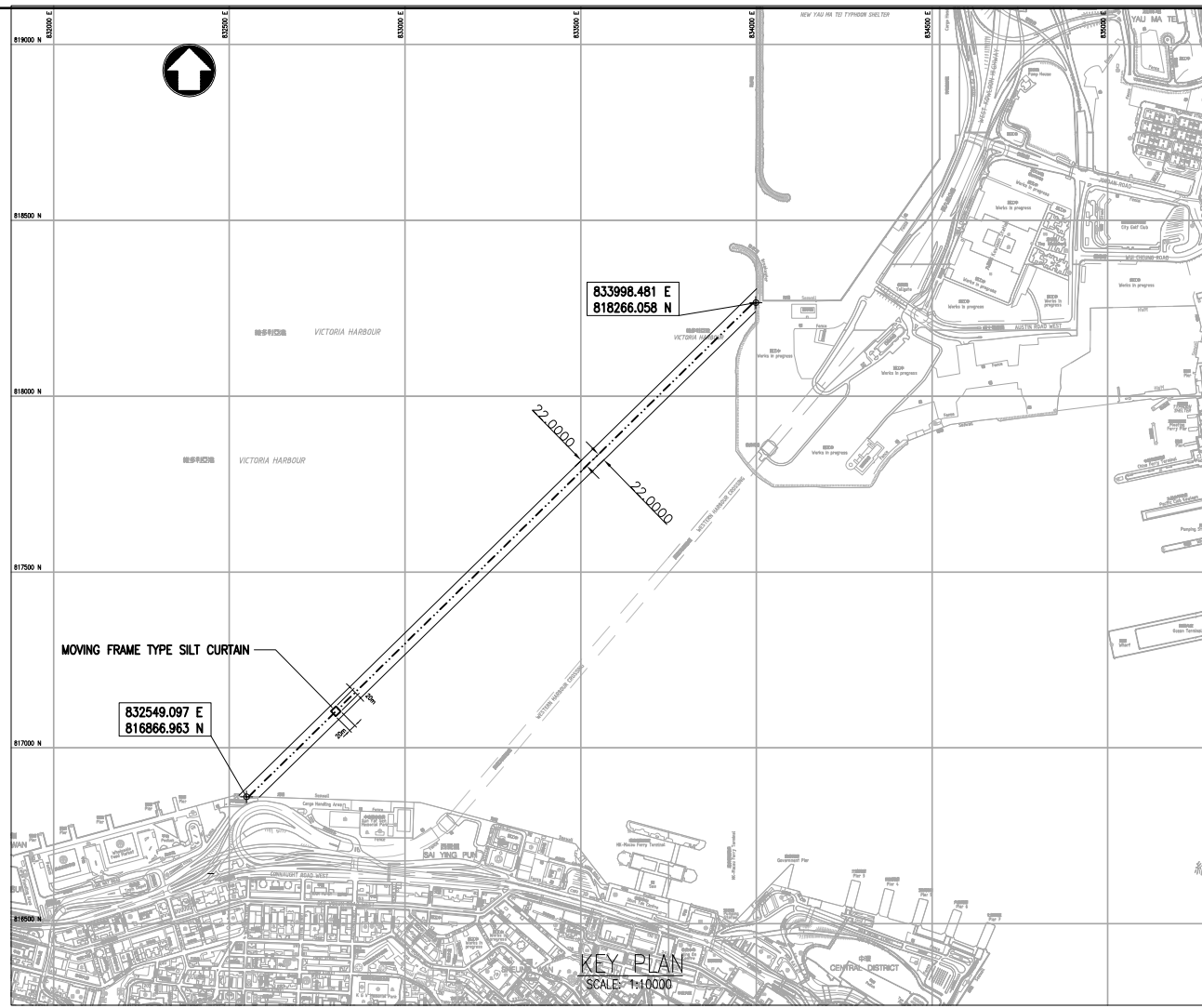
FIGURE 2.1

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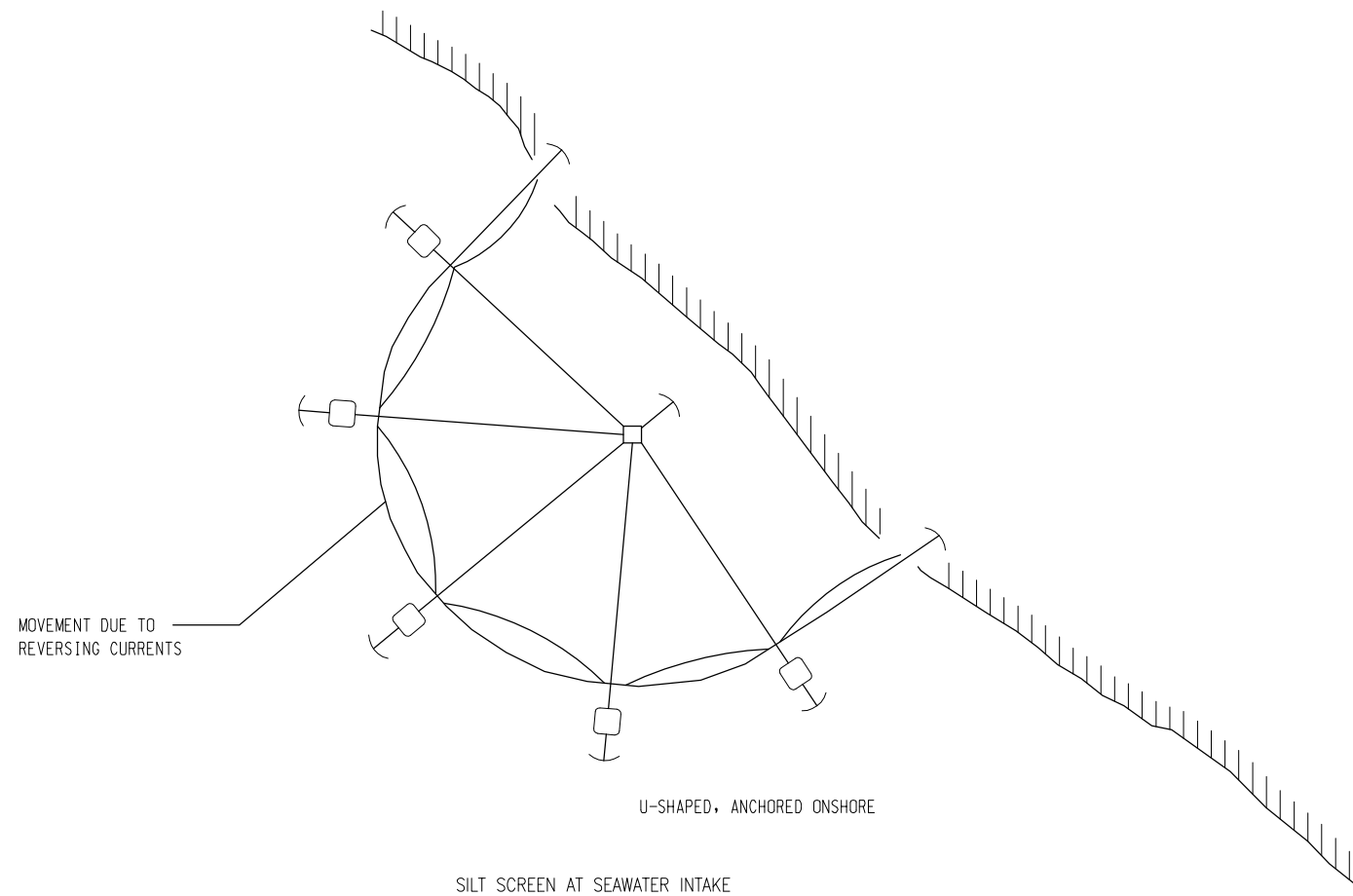
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SILT CURTAIN ENCLOSING THE GRAB DREDGER SECTION



LEGEND:  
 PROPOSED DN1200 SUBMARINE WATER MAIN  
 MOVING FRAME TYPE SILT CURTAIN



TYPICAL CONFIGURATION OF SILT CURTAINS AND SCREENS

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Contract No. CE42/2005(W5)

Project  
 LAYING OF WESTERN CROSS HARBOUR MAIN  
 AND ASSOCIATED LAND MAINS FROM WEST  
 KOWLOON TO SAI YING PUN – INVESTIGATION

Title  
 TYPICAL CONFIGURATION OF  
 SILT CURTAIN AND SILT SCREEN

Designed	RH	Eng.Chk.	CMH
Drawn	LYK	Coordination	---
Dwg.Chk.	---	Approved	---

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 Project 226133  
 CAD File  
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Drawing No.	Rev
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FIGURE 2.2

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832000 E

832250 E

832500 E

832750 E

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816250 N

**LEGEND:**

---FW--- PROPOSED ROUTE OF 1200# FRESH WATER MAIN

• NOISE MONITORING STATIONS



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WATER SUPPLIES DEPARTMENT**

Contract No. CE42/2005(W5)

Project

LAYING OF WESTERN CROSS HARBOUR MAIN AND ASSOCIATED LAND MAINS FROM WEST KOWLOON TO SAI YING PUN - INVESTIGATION

Title

PROPOSED LOCATIONS OF NOISE MONITORING STATIONS IN SAI YING PUN

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Dwg.Chk.		Approved	
Scale	Project	226133	Status
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FIGURE 4.1

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25\226133\REPORT\DWG\EMBA-MANUAL(107033)\FIGURE 4.1\W5-226133-FIGURE 1.dwg / 28/03/2007 14:42 / A08008

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833500 E

834000 E

834500 E

835000 E

835500 E

818500 N

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LEGEND:

- PROPOSED ROUTE OF 1200mm FRESH WATER MAIN
- NOISE MONITORING STATIONS
- TEMPORARY PLATFORM

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Contract No. CE42/2005(W5)

Project  
 LAYING OF WESTERN CROSS HARBOUR MAIN  
 AND ASSOCIATED LAND MAINS FROM WEST  
 KOWLOON TO SAI YING PUN – INVESTIGATION

Title  
 PROPOSED LOCATION OF NOISE MONITORING  
 STATIONS IN WEST KOWLOON

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Drawn	LYK	Coordination	-
Dwg.Chk.		Approved	

Scale	Project	Status
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Drawing No.	CAD File	Rev
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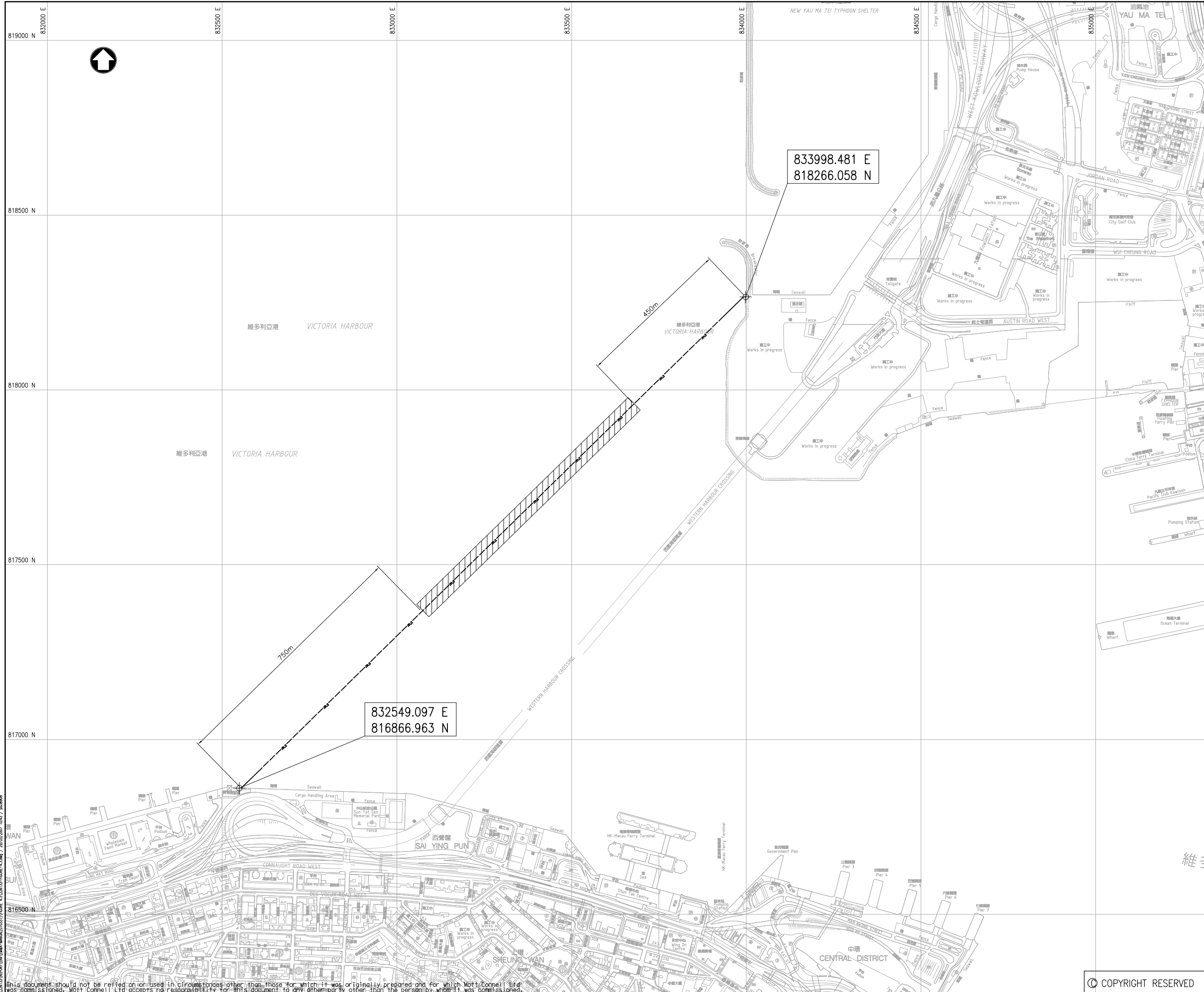
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FIGURE 4.2


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J:\226133\REPORT\ENV\EM&A-MANUAL\070331\FIGURE 4.2\W03-226133-FIGURE 4.2.dwg, Layout1, 28/05/2007 11:17:30, M389068, C:\gd\PDF Writer, A3, 0.02937012

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LEGEND:  
 PROPOSED DN1200 SUBMARINE WATER MAIN  
 NIGHT-TIME DREDGING ZONE

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 WATER SUPPLIES DEPARTMENT**

Contract No. CE42/2005(W5)  
 Project  
**LAYING OF WESTERN CROSS HARBOUR MAIN  
 AND ASSOCIATED LAND MAINS FROM WEST  
 KOWLOON TO SAI YING PUN – INVESTIGATION**

Title  
**LOCATION OF NIGHT-TIME DREDGING  
 ZONE**

Designed	RH	Eng.Chk.	CMH
Drawn	LYK	Coordination	---
Drg.Chk.	---	Approved	---
Scale	Project	226133	Status
1 : 5000@A1	CAD File	226133	
Drawing No.	FIGURE 4.3		Rev

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J:\2005\33\REPORT\ENR\ENR-MANUAL\070331\FIGURE 4.3\2005-33-FIGURE-4.3.dwg / 20/03/2007 10:43 / 443898

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## **ANNEXES**

## **ANNEX A**

# **Environmental Mitigation Implementation Schedule**



## ANNEX A ENVIRONMENTAL MITIGATION IMPLEMENTATION SCHEDULE

**Agreement No. CE 42/2005 (WS)**  
**Laying of Western Cross Harbour Main and Associated Land Mains**  
**From West Kowloon to Sai Ying Pun -Investigation**

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
<b>Water Quality</b>						
3.8.1	2.9	<p><b>Specific Mitigation Measures for Dredging</b></p> <p>Exceedances of WSD Seawater Intake criterion (10 mg L<sup>-1</sup>) at Kowloon South Salt Water Pumping Station was predicted during both dry and wet seasons if dredging was undertaken near West Kowloon. To minimise the potential SS impact, implementation of the following mitigation measures is recommended:</p> <ul style="list-style-type: none"> <li>- Dredging should be undertaken using one grab dredger only with a maximum production rate of 4,000m<sup>3</sup> per day;</li> <li>- Deployment of frame type silt curtain to fully enclose the grab while dredging work are in progress.</li> <li>- Deployment of silt screen at the sea water intake at Kowloon South Salt Water Pumping Station while dredging works are in progress.</li> </ul> <p>The frame type silt curtain should be designed to enclose local pollution caused by the grab dredger and suspended by a steel frame mounted on the grab dredger and floating on water. This frame type silt curtain should be fabricated from permeable, durable, abrasion resistant membrane like geotextiles and be mounted on a floating boom structure. The frame type silt curtain should also extend to the seabed to cover the entire water column. Steel chain or ballast should be attached to the bottom of the silt curtain. Mid-ballast may be added as necessary. The structure of the silt curtain should be maintained by metal grids. The frame type silt curtain should be capable of reducing sediment loss to outside by a factor of 4 (or about 75%). Silt screen is recommended for dredging near the seawater intake at Kowloon South Salt Water Pumping Station. The implementation of silt screen at the intake could reduce the SS level by a factor of 2.5 (or about 60%). These SS reduction factors have been adopted in the Wan Chai Development Phase II Environmental Impact Assessment Study in 2001. An illustration of a typical configuration of frame type silt curtain and silt screen at seawater intake is shown in Figure 3.9.</p>	WSD's Contractor	Construction Work Sites (Along the alignment of dredging)	During Marine Construction works	Practice Note for Professional Persons with regard to site drainage (ProPECC PN 1/94) and WQO

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
3.8.1	2.9	<p><b>Other Mitigation Measures for Dredging</b></p> <p>Good Site Practices are recommended to further reduce the potential water quality impacts from the construction works, especially during dredging.</p> <ul style="list-style-type: none"> <li>• Tight-closing grabs should be used to minimize the loss of sediment to suspension during dredging works. For dredging of any contaminated mud, closed watertight grabs must be used;</li> <li>• all vessels should be sized so that adequate clearance is maintained between vessels and the seabed in all tide conditions, to ensure that undue turbidity is not generated by turbulence from vessel movement or propeller wash;</li> <li>• the decks of all vessels should be kept tidy and free of oil or other substances that might be accidentally or otherwise washed overboard;</li> <li>• adequate free board shall be maintained on barges to ensure that decks are not washed by wave action;</li> <li>• all barges used for the transport of dredged materials should be fitted with tight bottom seals to prevent leakage of material during loading and transport;</li> <li>• construction activities should not cause foam, oil, grease, scum, litter or other objectionable matter to be present in the water within the site or dumping grounds;</li> <li>• loading of barges should be controlled to prevent splashing of material into the surrounding waters. Barges should not be filled to a level that would cause the overflow of materials or sediment laden water during loading or transportation;</li> </ul>				
		<ul style="list-style-type: none"> <li>• the speed of vessels should be controlled within the works area to prevent propeller wash from stirring up the seabed sediments; and</li> <li>• before commencement of dredging works, the holder of the Environmental Permit should submit detailed proposal of the design and arrangement of the frame type silt curtain to EPD for approval.</li> </ul>				

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
3.8.1	2.9	<p><b>Effluent from Hydrostatic Tests of the Water Mains System</b></p> <p>To ensure compliance with the standards for effluent discharged into the inshore waters or marine waters of Victoria Harbour WCZ as shown in Tables 9a and 9b of the TM-DSS and Section 23.73 and 23.77 of the General Specification for Civil Engineering Works Volume 3, 1992 Edition, sedimentation tanks with sufficient capacity, constructed from pre-formed individual cells of approximately 6 to 8 m<sup>3</sup> capacities, are recommended as a general mitigation measure which can be used for settling surface runoff prior to disposal. The system capacity should be flexible and suited to applications where the influent is pumped. Pre-treatment including dechlorination such as by physical process e.g. adsorption by activated carbon filter, or chemical process e.g. neutralisation by dechlorination agent dosing should be carried out to ensure compliance with the discharge requirements stipulated in TM-DSS.</p>	WSD's Contractor	Construction Work Sites (General)	During Hydrostatic Tests	Practice Note for Professional Persons with regard to site drainage (ProPECC PN 1/94) and WQO
3.8.1	2.9	<p><b>Surface Runoff, Sewage and Wastewater from Construction Activities</b></p> <p>Appropriate measures should be implemented to control runoff and prevent high loads of SS from entering the marine environment. Proper site management is essential to minimise surface runoff and sewage effluents.</p> <ul style="list-style-type: none"> <li>Construction site runoff should be prevented or minimised in accordance with the guidelines stipulated in the EPD's Practice Note for Professional Persons, Construction Site Drainage (ProPECC PN 1/94). All discharges from the construction site should be controlled to comply with the standards for effluents discharged into the Victoria Harbour WCZ under the TM-DSS. Good housekeeping and stormwater best management practices, as detailed below, should be implemented to ensure all construction runoff complies with WPCO standards and no unacceptable impact on the WSRs as a result of construction of the proposed submarine watermain;</li> <li>Sedimentation tanks with sufficient capacity, constructed from pre-formed individual cells of approximately 6 to 8 m<sup>3</sup> capacities, are recommended as a general mitigation measure which can be used for settling surface runoff prior to disposal. The system capacity should be flexible and able to handle multiple inputs from a variety of sources and suited to applications where the influent is pumped;</li> <li>Manholes (including newly constructed ones) should always be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris being washed into the storm runoff being directed into foul sewers;</li> </ul>	WSD's Contractor	Construction Work Sites (General)	During Construction works	Practice Note for Professional Persons with regard to site drainage (ProPECC PN 1/94) and WQO

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		<ul style="list-style-type: none"> <li>All vehicles and plant should be cleaned before leaving a construction site to ensure no earth, mud, debris and the like is deposited by them on roads. An adequately designed and located wheel washing bay should be provided at every site exit, and wash-water should have sand and silt settled out and removed at least on a weekly basis to ensure the continued efficiency of the process. The section of access road leading to, and exiting from, the wheel-wash bay to the public road should be paved with sufficient backfill toward the wheel-wash bay to prevent vehicle tracking of soil and silty water to public roads and drains;</li> <li>Precautions should be taken at any time of year when rainstorms are likely. Actions should be taken when a rainstorm is imminent or forecast. Actions to be taken during or after rainstorms are summarised in Appendix A2 of ProPECC PN 1/94. Particular attention should be paid to the control of silty surface runoff during storm events, particularly for areas located near steep slopes;</li> <li>Fuel tanks and storage areas should be provided with locks and be located on sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank, to prevent spilled fuel oils from reaching the coastal waters of the Victoria Harbour and Western Harbour WCZs;</li> <li>Portable chemical toilets should be used to handle construction workforce sewage prior to discharge to the existing trunk sewer. Sufficient numbers of portable toilets shall be provided by a licensed contractor to serve the construction workers. The Contractor shall also be responsible for waste disposal and maintenance practices.</li> </ul>				
<b>Ecology</b>						
4.8	3	Other mitigation measures suggested in the water quality impacts assessment such as the use of one grab dredger only with a maximum production rate of 4,000m <sup>3</sup> per day for dredging, deployment of frame type silt curtain to fully enclose the grab while dredging works are in progress, deployment of silt screen at the sea water intake at Kowloon South Salt Water Pumping Station while dredging works are in progress and good site practices to avoid silt runoff from construction works associated with the construction of the submarine watermain should be implemented to further reduce the impact on the marine ecology.	WSD's Contractor	Construction Work Sites (Along the alignment of dredging)	During Marine Construction works	EIAO
<b>Noise</b>						

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
5.6.1	4.8	<p><b>Work Schedule Rearrangement</b></p> <p>Concurrent works should be such that necessary noisy works should be carried out at different time slots or spread around the construction sites. This will help to reduce the cumulative noise effect produced in the construction process.</p> <p>If night-time (2300 to 0700 hours) dredging is required, the work shall be scheduled to carry out at a distance as far as possible to the NSRs. It is determined that the dredging work should be carried out at a location 750m away from the Sai Ying Pun landfall site and 450m from the West Kowloon landfall site along the trench as shown in the Figure 5.5 of the EIA Report. The Contractor shall adhere to the restricted locations of dredging work at night-time to comply with relevant noise standard.</p>	WSD's Contractor	Construction Work Sites (Along the alignment of dredging)	During Marine Construction works	PN 2/93 Noise from Construction Activities & EIAO
5.6.2	4.8	<p><b>Using Quality PME</b></p> <p>The use of Quality PME recognized by the Noise Control Authority for the purpose of CNP application can effectively reduce the noise generated from the construction plants. Quality PME are construction plants and equipments that are notably quieter, more environmental friendly and efficiently. The noise level reduction ranges from 5 – 10 dB(A) depending on the type of equipment used. The Contractor shall note the required procedures involved in application of the QPME.</p>				
5.6.3	4.8	<p><b>Using Noise Barriers</b></p> <p>Mobile or movable noise barriers to be erected near to the construction plants would reduce the noise levels for commonly 5 – 10 dB(A) depending on the types of items of PME and materials of the barriers. It is recommended that the Contractor shall screen noisy works and noise from stationary items of PME whenever practicable.</p>				
5.6.4	4.8	<p><b>Good Site Practices</b></p> <p>Good site practice and noise management can significantly reduce the impact of construction site activities on nearby NSRs. The following package of measures should be followed during construction:</p> <ul style="list-style-type: none"> <li>only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction works;</li> </ul>				

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		<ul style="list-style-type: none"> <li>machines and plant that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum;</li> <li>plant known to emit noise strongly in one direction, should, where possible, be orientated to direct noise away from the NSRs;</li> <li>mobile plant should be sited as far away from NSRs as possible; and</li> <li>material stockpiles and other structures should be effectively utilised, where practicable, to screen noise from on-site construction activities.</li> </ul>				
<b>Waste Management</b>						
6.6.1	5.3	<p><b>Good Site Practices</b></p> <p>Adverse impacts related to waste management are not expected to arise, provided that good site practices are strictly followed. Recommendations for good site practices during the construction activities include:</p> <ul style="list-style-type: none"> <li>Nomination of an approved person, such as a site manager, to be responsible for good site practices, arrangements for collection and effective disposal to an appropriate facility, of all wastes generated at the site;</li> <li>Training of site personnel in proper waste management and chemical handling procedures;</li> <li>Provision of sufficient waste disposal points and regular collection of waste;</li> <li>Appropriate measures to minimise windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers.</li> </ul>	WSD's Contractor	Construction Work Sites (General)	During Construction works	Waste Disposal Ordinance (Cap.354); Waste Disposal (Chemical Wastes) (General) Regulation (Cap 354) and ETWBTC No. 15/2003, Waste Management on Construction Site
6.6.2	5.3	<p><b>Waste Reduction Measures</b></p> <p>Good management and control can prevent the generation of a significant amount of waste. Waste reduction is best achieved at the planning and design stage, as well as by ensuring the implementation of good site practices. Recommendations to achieve waste reduction include:</p> <ul style="list-style-type: none"> <li>Sort C&amp;D material from demolition and decommissioning of the existing facilities to recover recyclable portions such as metals;</li> <li>Segregation and storage of different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal;</li> <li>Encourage collection of aluminium cans by providing separate labelled bins to enable this waste to be segregated from other general refuse generated by the work force;</li> <li>Proper storage and site practices to minimise the potential for damage or contamination of construction materials; and</li> </ul>	WSD's Contractor	Construction Work Sites (General)	During Construction works	

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		<ul style="list-style-type: none"> <li>Plan and stock construction materials carefully to minimise amount of waste generated and avoid unnecessary generation of waste.</li> </ul>				
6.6.3	5.3	<p><b>C&amp;D Material</b></p> <p>In order to minimise impacts resulting from collection and transportation of C&amp;D material for off-site disposal, the excavated materials should be reused on-site as backfilling material and for landscaping works as far as practicable. In addition, C&amp;D material generated from excavation works should be disposed of at public fill reception facilities for other beneficial uses. Other mitigation requirements are listed below:</p> <ul style="list-style-type: none"> <li>A Waste Management Plan should be prepared;</li> <li>A recording system for the amount of wastes generated, recycled and disposed (including the disposal sites) should be proposed; and</li> <li>In order to monitor the disposal of C&amp;D material and solid wastes at public filling facilities and landfills, and to control fly-tipping, a trip-ticket system (e.g. ETWB TCW No. 31/2004) should be included.</li> </ul>	WSD's Contractor	Construction Work Sites (General)	During Construction works	ETWB TCW No. 31/2004
6.6.4	5.3	<p><b>General Refuse</b></p> <p>General refuse should be stored in enclosed bins or compaction units separate from C&amp;D material. A reputable waste collector should be employed by the contractor to remove general refuse from the site, separately from C&amp;D material. Preferably an enclosed and covered area should be provided to reduce the occurrence of 'wind blown' light material.</p>	WSD's Contractor	Construction Work Sites (General)	During Construction works	
6.6.5	5.3	<p><b>Chemical Waste</b></p> <p>Good quality containers compatible with the chemical wastes should be used, and incompatible chemicals should be stored separately. Appropriate labels should be securely attached on each chemical waste container indicating the corresponding chemical characteristics of the chemical waste, such as explosive, flammable, oxidizing, irritant, toxic, harmful, corrosive, etc. The Contractor shall use a licensed collector to transport and dispose of the chemical wastes, to either the approved Chemical Waste Treatment Centre, or another licensed facility.</p>	WSD's Contractor	Construction Work Sites (General)	During Construction works	Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes, Waste Disposal (Chemical Waste) (General) Regulation

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
6.6.6	5.3	<p><b>Marine Dredged Sediment</b></p> <p>During transportation and disposal of the dredged marine sediments, the following measures should be taken to minimise potential impacts on water quality:</p> <ul style="list-style-type: none"> <li>• Bottom opening of barges shall be fitted with tight fitting seals to prevent leakage of material. Excess material shall be cleaned from the decks and exposed fittings of barges and dredgers before the vessel is moved;</li> <li>• Monitoring of the barge loading shall be conducted to ensure that loss of material does not take place during transportation. Transport barges or vessels shall be equipped with automatic self-monitoring devices as specified by the EPD; and</li> <li>• Barges or hopper barges shall not be filled to a level that would cause the overflow of materials or sediment laden water during loading or transportation.</li> </ul>	WSD's Contractor	Construction Work Sites (Along the alignment of dredging)	During Marine Construction works	ETWB TCW No. 34/2002
<b>Air Quality</b>						
7.5.1	6.30	<p><b>Dust Control</b></p> <p>Construction dust impacts should be controlled within the 1-hour TSP criterion of 500 g/m<sup>3</sup> and 24-hour TSP AQO of 260 g/m<sup>3</sup>. Therefore, effective control measures and good site practices should be implemented :</p> <ul style="list-style-type: none"> <li>• Any excavated dusty materials or stockpile of dusty materials should be covered entirely by impervious sheeting or sprayed with water so as to maintain the entire surface wet, and recovered or backfilled or reinstated within 24 hours of the excavation or unloading;</li> <li>• The working area of excavation should be sprayed with water immediately before, during and immediately after the operations so as to maintain the entire surface wet;</li> <li>• The load of dusty materials carried by vehicle leaving a construction site should be covered entirely by clean impervious sheeting to ensure that the dusty materials do not leak from the vehicle;</li> <li>• Where a site boundary adjoins a road, streets or other area accessible to the public, hoarding of not less than 2.4m high from ground level should be provided along the entire length except for a site entrance or exit;</li> <li>• The area where vehicle washing takes place and the section of the road between the washing facilities and the exit point should be paved with concrete, bituminous materials or hardcores;</li> <li>• Every main haul road should be sealed with concrete and kept clear of dusty materials or sprayed with water so as to maintain the entire road surface wet;</li> </ul>	WSD's Contractor	Construction Work Sites (General)	During Construction works	EIAO-TM and Air Pollution Control (Construction Dust) Regulation



<b>EIA Ref.</b>	<b>EM&amp;A Ref.</b>	<b>Recommended Mitigation Measures</b>	<b>Who to implement the measure?</b>	<b>Location of the measure</b>	<b>When to implement the measure?</b>	<b>What requirements or standards for the measure to achieve?</b>
		<ul style="list-style-type: none"> <li>• The portion of road leading only to a construction site that is within 30m of a designated vehicle entrance or exit should be kept clear of dusty materials;</li> <li>• All dusty materials should be sprayed with water prior to any loading, unloading or transfer operation so as to maintain the dusty material wet;</li> <li>• Vehicle speed should be limited to 10 kph except on completed access roads; and</li> <li>• Every vehicle should be washed to remove any dusty materials from its body and wheels before leaving the construction sites.</li> </ul>				
<b>Cultural Heritage</b>						
8.7	7	No cultural heritage resources are identified within the Study Area and therefore, no mitigation measures are considered necessary.				
<b>Fisheries</b>						
9.7	8	Impacts to fisheries resources and fishing operations have largely been avoided during construction through constraints on the works operations for installation of the submarine watermain. Good construction practice and associated measures recommended for Water Quality to control water quality impacts to within acceptable levels and are also expected to control impacts to fisheries resources.	WSD's Contractor	Construction Work Sites (General)	During Marine Construction works	EIAO-TM

## **ANNEX B**

# **Sample Environmental Monitoring Data Recording Sheets**

**ANNEX B SAMPLE ENVIRONMENTAL MONITORING DATA RECORDING SHEETS**

**Noise Monitoring Field Record Sheet**

Monitoring Location							
Details of Location							
Date of Monitoring							
Measurement Start Time (hh:mm)							
Measurement Time Length (min.)							
Weather Conditions	Fine / Sunny / Cloudy / Rainy						
Wind Speed (m/s)							
Noise Meter Model/Identification							
Calibrator Model/Identification							
Calibration Before Measurement (dB(A))							
Calibration After Measurement (dB(A))							
Measurement Result	5min	5min	5min	5min	5min	5min	30min
L <sub>90</sub> (dB(A))							
L <sub>10</sub> (dB(A))							
L <sub>eq</sub> (dB(A))							
Major Construction Noise Source(s) During Monitoring							
Other Noise Source(s) During Monitoring							
Remarks							

Name & Designation

Signature

Date

Record by:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Checked by:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

### Water Quality Monitoring Data Record Sheet

Location				
Date				
Start Time (hh:mm)				
Weather				
Sea Conditions				
Tidal Mode				
Water Depth (m)				
Monitoring Depth		Surface	Middle	Bottom
Salinity				
Temperature				
DO Saturation				
DO				
Turbidity				
SS Sample Identification				
SS	(mg/l)			
	<100m from location			
	>100m from location			
Other Observations				

Name & Designation

Signature

Date

Recorded by :

\_\_\_\_\_

Checked by:

\_\_\_\_\_

Note: The SS results are to be filled up once they are available from the laboratory.

## **ANNEX C**

### **Complaint Log**

**ANNEX C COMPLAINT LOG**

**COMPLAINT LOG**

<b>Log Ref.</b>	<b>Date / Location</b>	<b>Complainant / Date of Contract</b>	<b>Details of Complaint</b>	<b>Investigation / Mitigation Action</b>	<b>File Closed</b>

Signed by Environmental Team Leader : \_\_\_\_\_ Date : \_\_\_\_\_

## **ANNEX D**

### **Sample Interim Notification of Environmental Quality Limit Exceedances**

**ANNEX D SAMPLE INTERIM NOTIFICATION OF ENVIRONMENTAL QUALITY LIMIT  
EXCEEDANCES**

**Interim Notifications of  
Environmental Quality Limits Exceedances**

**Incident Report on Action Level or Limit Level Non-compliance**

Project	
Date	
Time	
Monitoring Location	
Parameter	
Action & Limit Levels	
Measured Level	
Possible reason for Action or Limit Level Non-compliance	
Actions taken / to be taken	
Remarks	

Location Plan

Prepared by:

Designation:

Signature:

Date:

