

**The Hongkong Electric Co Ltd**  
香港電燈有限公司



**ENVIRONMENTAL IMPACT ASSESSMENT (EIA) ORDINANCE, CAP. 499**

**ENVIRONMENTAL PERMIT NO. EP-071/2000/B**

**LAMMA POWER STATION EXTENSION  
ENVIRONMENTAL MONITORING & AUDIT PROGRAMME  
AT CONSTRUCTION PHASE**

Report Title	Monthly EM&A Report (November 2001)
Date	13 December 2001
Certified by	 (Mr. IP Tat-Yan, Environmental Team Leader)
Verified by	 (ERM - Hong Kong Ltd, Independent Environmental Checker)

## TABLE OF CONTENT

### EXECUTIVE SUMMARY

<b>1.</b>	<b>INTRODUCTION.....</b>	<b>1</b>
1.1	Background	1
1.2	Project Organisation	1
1.3	Construction Works undertaken during the Reporting Month	2
1.4	Summary of EM&A Requirements	3
<b>2.</b>	<b>AIR QUALITY.....</b>	<b>6</b>
2.1	Monitoring Requirements	6
2.2	Monitoring Locations	6
2.3	Monitoring Equipment	6
2.4	Monitoring Parameters, Frequency and Duration	7
2.5	Monitoring Procedures and Calibration Details	8
2.6	Results and Observations	9
<b>3.</b>	<b>NOISE.....</b>	<b>11</b>
3.1	Monitoring Requirements	11
3.2	Monitoring Locations	11
3.3	Monitoring Equipment	11
3.4	Monitoring Parameters, Frequency and Duration	12
3.5	Monitoring Procedures and Calibration Details	12
3.6	Results and Observations	13
<b>4.</b>	<b>WATER QUALITY MONITORING.....</b>	<b>15</b>
4.1	Monitoring Requirements	15
4.2	Monitoring Locations	15
4.3	Monitoring Equipment	16
4.4	Monitoring Parameters, Frequency and Duration	16
4.5	Monitoring Procedures and Calibration Details	17
4.6	Results and Observations	20
<b>5.</b>	<b>ENVIRONMENTAL AUDIT.....</b>	<b>25</b>
5.1	Review of Environmental Monitoring Procedures	25
5.2	Assessment of Environmental Monitoring Results	25
5.3	Site Environmental Audit	26
5.4	Status of Environmental Licensing and Permitting	26
5.5	Implementation Status of Environmental Mitigation Measures	28
5.6	Implementation Status of Action/Limit Plans	28
5.7	Implementation Status of Environmental Complaint Handling Procedures	28
<b>6.</b>	<b>FUTURE KEY ISSUES.....</b>	<b>29</b>
6.1	Status of Natural Gas supply	29
6.2	Key Issues for the Coming Month	29
6.3	Monitoring Schedules for the Next 3 Months	29
6.4	Construction Program for the Next 3 Months	29
<b>7.</b>	<b>CONCLUSION.....</b>	<b>30</b>

## **LIST OF TABLES**

Table 1.1	Construction Activities and Their Corresponding Environmental Mitigation Measures
Table 2.1	Air Quality Monitoring Locations
Table 2.2	Air Quality Monitoring Equipment
Table 2.3	Air Quality Monitoring Parameter, Duration and Frequency
Table 3.1	Noise Monitoring Locations
Table 3.2	Noise Monitoring Equipment
Table 3.3	Noise Monitoring Duration and Parameter
Table 4.1	Water Quality Monitoring Locations
Table 4.2	Water Quality Monitoring Equipment
Table 4.3	Water Quality Monitoring Parameters and Frequency
Table 4.4	Laboratory Analysis Methodologies of Marine Water Samples
Table 5.1	Summary of AL Level Exceedances on Monitoring Parameters
Table 5.2	Estimated Amounts of Waste Generated in November 2001
Table 5.3	Summary of Environmental Licensing and Permit Status
Table 5.4	Environmental Complaints / Enquiries Received In November 2001
Table 5.5	Outstanding Environmental Complaints / Enquiries Received Before

## **LIST OF FIGURES**

Figure 1.1	Layout of Work Site
Figure 1.2	Location of Dumping Area (from 29 <sup>th</sup> October 2001)
Figure 2.1	Location of Air Quality Monitoring Stations
Figure 3.1	Location of Noise Monitoring Stations
Figure 4.1	Location of Water Quality Monitoring Stations

## **APPENDICES**

Appendix A	Organization Chart
Appendix B	Amount of Dredged and Dumped Marine Sediment
Appendix C	Action and Limit Levels for Air Quality, Noise, Water quality Monitoring
Appendix D	Environmental Monitoring Schedule
Appendix E	Air Quality Monitoring Results for November 2001
Appendix F	Noise Monitoring Results for November 2001
Appendix G	Water Quality Monitoring Results for November 2001
Appendix H	The QA/QC Procedures and Results
Appendix I	Event/Action Plans
Appendix J	Site Audit Summary
Appendix K	Summary of EMIS
Appendix L	Tentative Construction Programme

## **EXECUTIVE SUMMARY**

This is the eighth monthly Environmental Monitoring and Audit (EM&A) report for the Project "Construction of Lamma Power Station Extension" prepared by the Environmental Team (ET). This report presents the results of impact monitoring on air quality, noise and marine water quality for the said project in November 2001.

Air, noise and water quality monitoring were performed. The results were checked against the established Action/Limit (AL) levels. An on-site audit was conducted once per week. The implementation status of the environmental mitigation measures, Event/Action Plan and environmental complaint handling procedures were also checked.

### **Construction Activities Undertaken**

Construction activities undertaken during the reporting month were dredging, placing of drainage layer and seawall construction. Dredging work was completed on 3/11/2001. 7,650m<sup>3</sup> of marine mud was dredged from site and dumped at the allocated dumping area in Cheung Chau during the month. No sand filling activities were undertaken in the reporting month.

### **Environmental Monitoring Works**

All monitoring work at designated stations was performed as scheduled in the reporting period.

#### *Air Quality*

No exceedance of Action and Limit levels for air quality was recorded in the month.

#### *Noise*

Construction work was carried out during the restricted hours including evening-time, holidays and night-time under valid Construction Noise Permits. No exceedance of Action and Limit levels for noise was recorded in the month.

#### *Water Quality*

There were nine (9) cases of Action Level exceedance and three (3) cases of Limit Level exceedance for water quality in the reporting month. 9 out of 12 cases of action/limit level exceedance were contributed by SS while 3 cases by Turbidity. For these exceedances, comprehensive investigations have been carried out. It was found that no noticeable sediment plume migration from the direction of the site to the sampling location was observed. Hence, all of these exceedances were considered not related to site activities and have been explained to the satisfaction of EPD. No further action was required.

It was agreed by EPD that both NH<sub>3</sub>-N and TIN would be monitored throughout the dredging phase and for at least one month upon completion of dredging. As the dredging work was completed on 3<sup>rd</sup> November 2001, monitoring of NH<sub>3</sub>-N and TIN would be stopped from 4<sup>th</sup> December 2001 onward.

### Site Environmental Audit

Site audits were carried out on a weekly basis to monitor environmental issues on the construction site. The site conditions were generally satisfactory. All required mitigation measures were implemented.

### Environmental Licensing and Permitting

Description	Permit No.	Valid Period		Issued To	Date of Issuance
		From	To		
Varied Environmental Permit	EP-071/2000/B	13/07/01	-	HEC	13/07/01
Construction Noise Permit (cancelled on 23/11/2001)	GW-UW0256-01	29/06/01	07/12/01	Contractor	29/06/01
Construction Noise Permit	GW-UW0467-01	23/11/01	18/05/02	Contractor	23/11/01
Dumping Permit	EP/MD/02-073	07/10/01	06/04/02	Contractor	05/10/01

### Implementation Status of Environmental Mitigation Measures

Environmental mitigation measures for the dredging activities as recommended in the EM&A manual were implemented in the reporting month.

### Environmental Complaints

No complaint against the construction activities was received in the reporting month.

### Future Key Issues

The future key issues to be considered in the coming month are as follows:

- To estimate the noise level induced during the bored piling operation and to prepare the CNP application for the bored piling works in advance.
- to continue with the preventive measures for noise mitigation and keep monitoring the performance;
- to review the monitoring results and to take action, if necessary, to ensure acceptable sea water quality;
- to provide routine inspection and necessary maintenance for the silt curtains.

### Concluding Remarks

The environmental performance of the project was generally satisfactory.

## **1. INTRODUCTION**

### **1.1 Background**

The Environmental Team (hereinafter called the “ET”) was formed within the Hongkong Electric Co. Ltd (HEC) to undertake Environmental Monitoring and Audit for “Construction of Lamma Power Station Extension” (hereinafter called the “Project”). Under the requirements of Section 6 of Environmental Permit EP-071/2000/B, an EM&A programme for impact environmental monitoring set out in the EM&A Manual (Construction Phase) is required to be implemented. In accordance with the EM&A Manual, environmental monitoring of air quality, noise and water quality and regular environmental audits are required for the Project.

The Project involves the construction of a gas-fired power station employing combined cycled gas turbine technology, forming an extension to the existing Lamma Power Station. The key elements of the Project including the construction activities associated with the transmission system and submarine gas pipeline are outlined as follows.

- dredging and reclamation to form approximately 22 hectares of usable area;
- construction of six 300MW class gas-fired combined cycle units;
- construction of a gas receiving station;
- construction of a new transmission system linking the Lamma Extension to load centres on Hong Kong Island;
- laying of a gas pipeline for the supply of natural gas to the new power station

This report summarizes the environmental monitoring and audit work for the Project for the month of November 2001

### **1.2 Project Organisation**

An Environmental Management Committee (EMC) has been set up in HEC to oversee the Project. The management structure includes the following:

- Environmental Protection Department (The Authority);
- Environmental Manager (The Chairman of the Environmental Management Committee);
- Engineer;
- Independent Environmental Checker (IEC);
- Environmental Team (ET);
- Contractor.

The project organisation chart for the construction EM&A programme is shown in Appendix A.

### 1.3 Construction Works undertaken during the Reporting Month

Construction activities undertaken during the reporting month were dredging, placing of drainage layer and seawall construction. A Layout Plan showing the dredging locations for the Project is shown in Figure 1.1. Dredging work was completed on 3<sup>rd</sup> November 2001 and the total volume of dredged material from 1<sup>st</sup> to 3<sup>rd</sup> November 2001 was 7,650m<sup>3</sup>. No sand filling activities were undertaken in the month. Uncontaminated materials were dumped at the assigned location within the South Cheung Chau Spoil Disposal Area and the total dumped volume in November 2001 was 7,650m<sup>3</sup>. Figure 1.2 shows dumping location for this project in November 2001. Daily records of dredged / dumped volume are presented in Appendix B.

The main construction activities carried out during the reporting month and the corresponding environmental mitigation measures are summarized in Table 1.1. The implementation of major mitigation measures in the month is provided in Appendix K.

Table 1.1 Construction Activities and Their Corresponding Environmental Mitigation Measures

Item	Construction Activities	Environmental Mitigation Measures
1	Dredging, Placing of Drainage Layer & Seawall Construction	<p><b>Water Quality</b></p> <ul style="list-style-type: none"> <li>- The number of grab dredgers operating in the site and the total dredging rate are limited;</li> <li>- Silt curtain are installed on the eastern, southern and north western sides of the site;</li> <li>- Fully-enclosed watertight grabs are used and the descent speed are controlled;</li> <li>- All barges for transport of dredged materials are fitted with tight bottom seals.</li> </ul> <p><b>Noise</b></p> <ul style="list-style-type: none"> <li>- General noise mitigation measures are employed at all work sites throughout the construction phase.</li> </ul> <p><b>Waste Management</b></p> <ul style="list-style-type: none"> <li>- Waste Management Plan is submitted and implemented.</li> </ul> <p><b>Dredging Waste</b></p> <ul style="list-style-type: none"> <li>- All vessels for marine transportation of dredged sediment are fitted with tight fitting seals to their bottom openings to prevent leakage;</li> <li>- Dredged waste are disposed of at Licensed site – South Cheung Chau;</li> <li>- Records of the quantities of waste generated and</li> </ul>

		disposed off-site are taken.  <b>Marine Ecology</b> - All construction related vessels approach the site from the designated route/channel to avoid disturbance to the finless porpoise.
--	--	---

#### 1.4 Summary of EM&A Requirements

The EM&A program requires environmental monitoring for air, noise and water quality. Regular environmental site audits for air quality, noise, water quality and waste management were carried out. The detailed EM&A monitoring work for air quality, noise and water quality are described in Sections 2, 3 and 4 respectively.

The following environmental audits are summarized in Section 5 of this report:

- Environmental monitoring results;
- Waste Management Records;
- Weekly site audit results;
- The status of environmental licensing and permits for the Project;
- The implementation status of environmental protection and pollution control/mitigation measures.

Future key issues will be reported in Section 6 of this report.

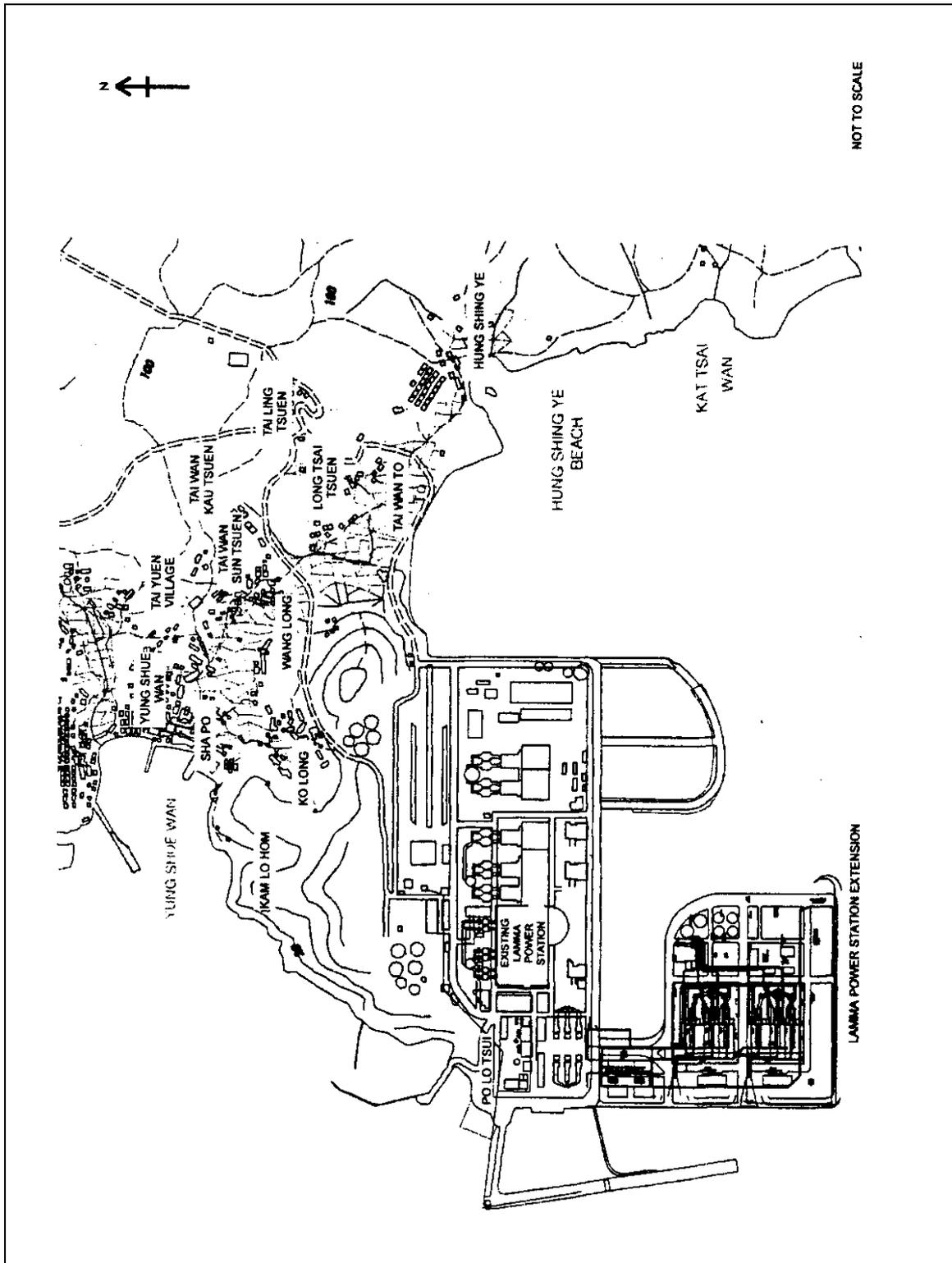


Figure 1.1 Layout of Work Site

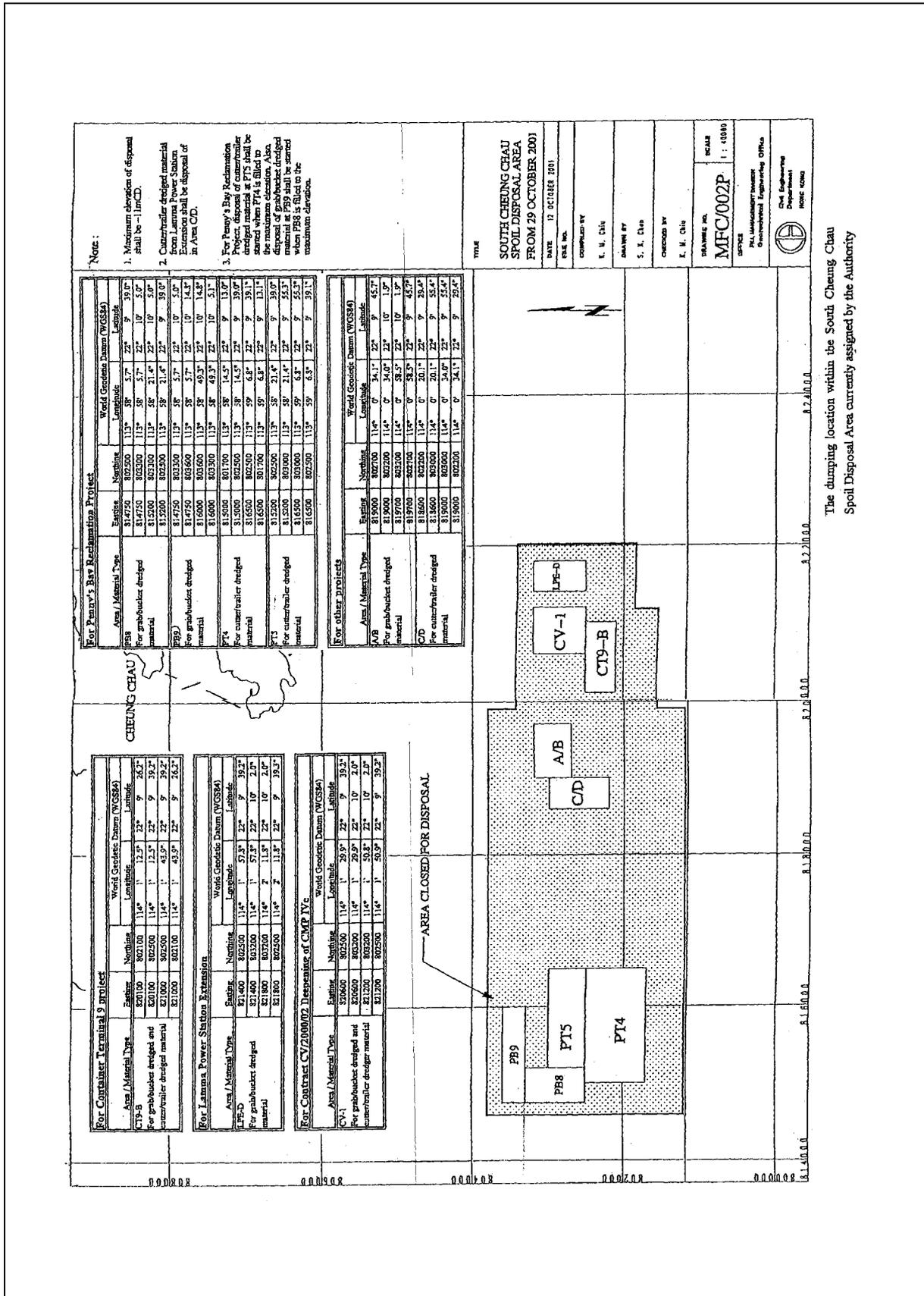


Figure 1.2 Location of Dumping Area (from 29<sup>th</sup> October 2001)

## 2. AIR QUALITY

### 2.1 Monitoring Requirements

1-hour and 24-hour TSP monitoring at agreed frequencies were conducted to monitor air quality. The impact monitoring data were checked against the Action/Limit Levels as determined in the Baseline Monitoring Report (Construction Phase). Appendix C shows the established Action/Limit Levels for Air Quality.

### 2.2 Monitoring Locations

Three dust monitoring locations were selected for 1-hour TSP sampling (AM1, AM2 & AM3) while four monitoring locations were selected for 24-hour TSP sampling (AM1, AM2, AM3 and AM4). Table 2.1 tabulates the monitoring stations. The locations of the monitoring stations are shown in Figure 2.1.

Table 2.1 Air Quality Monitoring Locations

<b>Location I.D.</b>	<b>Description</b>
AM1	Reservoir
AM2	East Gate
AM3	Ash Lagoon
AM4	Tai Yuen Village

### 2.3 Monitoring Equipment

Continuous 24-hour TSP air quality monitoring was performed using the GS2310 High Volume Air Samplers (HVAS), Partisol Model 2000 Sampler and the MINIVOL Portable Sampler at AM1&2, AM3 and AM4 respectively. TEOM Model 1400a continuous dust monitors were used to carry out 1-hour TSP monitoring at AM1, AM2 and AM3. Table 2.2 summarises the equipment used in dust monitoring.

Table 2.2 Air Quality Monitoring Equipment

<b>Equipment</b>	<b>Model and Make</b>
<i>24-hour sampling:</i> HVAS Sampler	Model GS2310 Anderson Instruments Inc.
Partisol Air Sampler	Partisol Model 2000 Rupprecht & Patashnick
MINIVOL Portable Sampler	AIRMETRICS
<i>1-hour sampling:</i> Continuous TSP Dust Meter	TEOM Model 1400a Rupprecht & Patashnick

## 2.4 Monitoring Parameters, Frequency and Duration

Table 2.3 summarises the monitoring parameters, duration and frequency of air quality monitoring. The monitoring schedule for the reporting month is shown in Appendix D.

Table 2.3 Air Quality Monitoring Parameter, Duration and Frequency

<b>Monitoring Stations</b>	<b>Parameter</b>	<b>Duration</b>	<b>Frequency</b>
AM1	1-hour TSP	1	3 hourly samples every 6 days
	24-hour TSP	24	Once every 6 days
AM2	1-hour TSP	1	3 hourly samples every 6 days
	24-hour TSP	24	Once every 6 days
AM3	1-hour TSP	1	3 hourly samples every 6 days
	24-hour TSP	24	Once every 6 days
AM4	24-hour TSP	24	Once every 6 days

## 2.5 Monitoring Procedures and Calibration Details

24- hour TSP Monitor:

### *Preparation of Filter Papers*

- Visual inspection of filter papers was carried out to ensure that there were no pinholes, tears and creases;
- The filter papers were then labelled before sampling.
- The filter papers were equilibrated at room temperature and relative humidity < 50% for at least 24 hours before weighing.

### *Field Monitoring*

- During collection of the sampled filter paper, the information on the elapse timer was logged. Site observations around the monitoring stations, which might have affected the monitoring results, were also recorded. Major pollution sources, if any, would be identified and reported. The flow record chart for the previous sampling was checked to see if there was any abnormality.
- The post-sampling filter papers were removed carefully from the filter holder and folded to avoid loss of fibres or dust particles from the filter papers;
- The filter holder and its surrounding were cleaned;
- A pre-weighed blank filter paper for the next sampling was put in place and aligned carefully. The filter holder was then tightened firmly to avoid leakage;
- A new flow record chart was loaded into the flow recorder;
- The programmable timer was set for the next 24 hrs sampling period,  $\pm 1/2$  hr;
- The post-sampling filter papers were equilibrated at room temperature and relative humidity < 50% for at least 24 hours before weighing.

1- hour TSP Monitor:

- The following parameters of the TEOM model dust meters are regularly checked to ensure proper functionality:
  - Mass concentration;
  - Total mass;
  - Frequency of the tapered element;
  - Electrical noise;
  - Main flow;
  - Auxiliary flow.

### *Maintenance & Calibration*

- The monitoring equipment and their accessories are maintained in good working conditions.

- Monitoring equipment is calibrated at monthly intervals. Calibration details are shown in Appendix H.

## **2.6 Results and Observations**

Dust monitoring was conducted as scheduled in the reporting month. All monitoring data and graphical presentation of the monitoring results are provided in Appendix E. Key findings and observations are provided below:

### *1-hour TSP*

No exceedance of 1-hour TSP Action/Limit Level was recorded in the month.

### *24-hour TSP*

No exceedance of 24-hour TSP Action/Limit Level was recorded in the month.

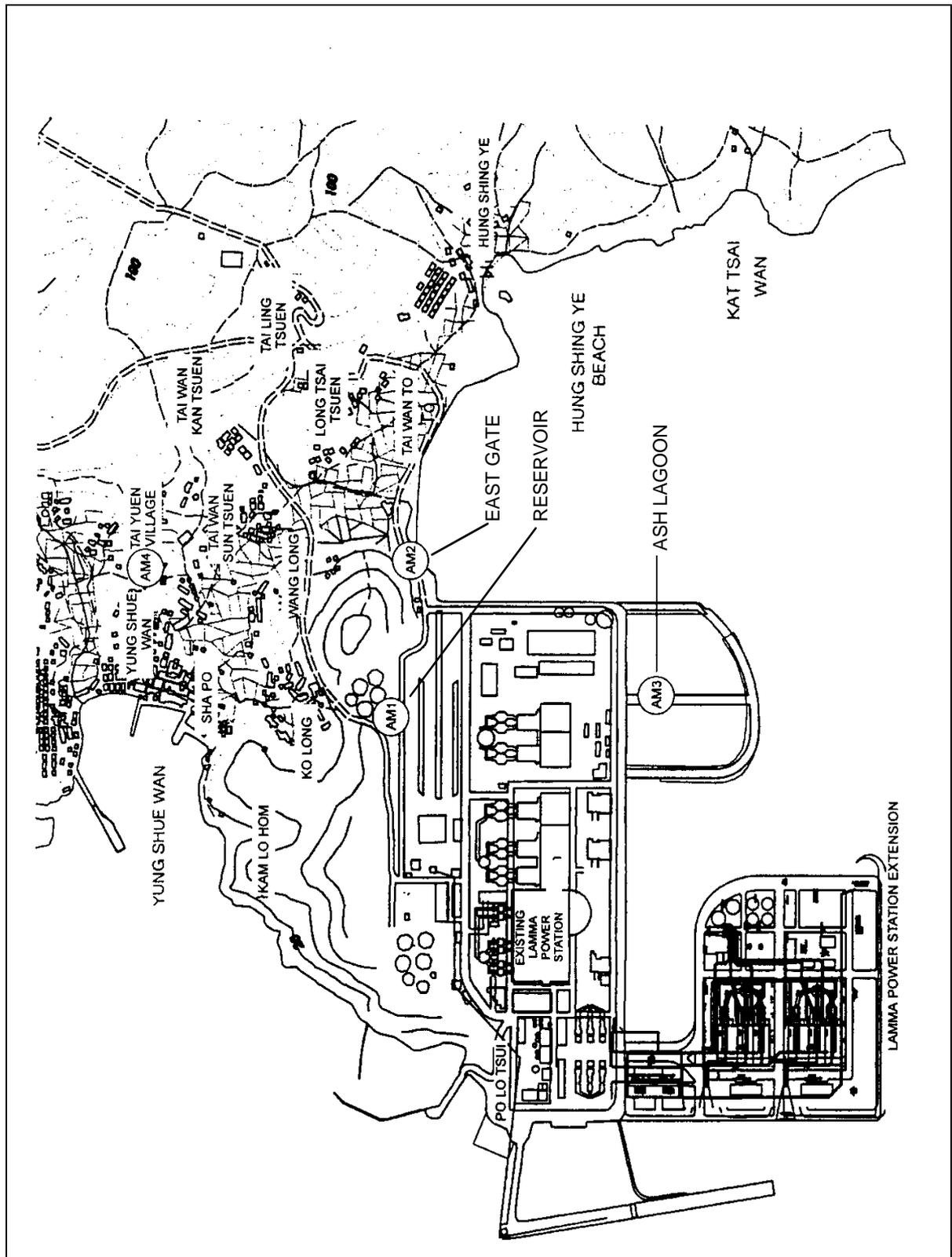


Figure 2.1 Location of Air Quality Monitoring Stations

### 3. NOISE

#### 3.1 Monitoring Requirements

Continuous noise alarm monitoring at Ash Lagoon/Ching Lam were carried out to calculate the noise contributed by the construction activities at the two critical NSR's, viz. Long Tsai Tsuen/Hung Shing Ye and the school within the village of Tai Wan San Tsuen. The impact monitoring data for construction noise other than percussive piling were checked against the limit levels specified in the EM&A Manual. With the availability of the construction noise permits, impact monitoring for the construction work during the restricted hours was also carried out. Section 5 presents the details of the construction noise permits.

As there were no activities for the construction of the transmission system, no manual noise measurement at the Pak Kok Tsui residences was carried out in the reporting month. Appendix C shows the established Action/Limit Levels for noise.

#### 3.2 Monitoring Locations

In accordance with the EM&A manual, the identified noise monitoring locations are listed in Table 3.1 and shown in Figure 3.1.

Table 3.1 Noise Monitoring Locations

<b>Purpose of noise monitoring</b>	<b>Monitoring Location</b>
Lamma Extension	Ash Lagoon
Lamma Extension	Ching Lam

#### 3.3 Monitoring Equipment

The sound level meters used for noise monitoring complied with International Electrotechnical Commission Publications 651:1979 (Type 1) and 804:1985 (Type 1). The noise monitoring equipment used is shown in Table 3.2.

Table 3.2 Noise Monitoring Equipment

<b>Equipment</b>	<b>Model</b>
Sound level meter	Rion NA-27
Calibrator (IEC 60942 Class 1)	Rion NC-74

### 3.4 Monitoring Parameters, Frequency and Duration

Continuous noise alarm monitoring of A-weighted Leq levels was carried out at Ash Lagoon and Ching Lam. The measurement duration and parameter of noise monitoring were presented in Table 3.3 as follows:

Table 3.3 Noise Monitoring Duration and Parameter

Location	Time Period	Frequency	Parameter
Ash Lagoon	Daytime: 0700-1900 hrs on normal weekdays	Daytime: 30 minutes	30-min $L_{Aeq}$
Ching Lam	Evening-time & holidays: 0700-2300 hrs on holidays; and 1900-2300 hrs on all other days	Evening-time & holidays: 5 minutes	5-min $L_{Aeq}$
	Night-time: 2300-0700 hrs of next day	Night-time: 5 minutes	5-min $L_{Aeq}$

### 3.5 Monitoring Procedures and Calibration Details

#### *Monitoring Procedures*

The measured noise levels (MNL's) were collected at the noise alarm monitoring stations at Ash Lagoon and Ching Lam. The notional background noise levels (viz. baseline noise data at Ash Lagoon and Ching Lam) were applied to correct the corresponding MNL's in 30-min/5-min  $L_{Aeq}$ .

A wind speed sensor was installed at Station Building Rooftop. The wind speed signal was used to determine whether the data from Ash Lagoon and Ching Lam noise alarm monitoring stations were affected. The instantaneous data was discarded in case the instantaneous wind speed exceeded 10 m/s. The 30-min/5-min  $L_{Aeq}$  was considered valid only if the amount of valid data was equal to or above 70%.

When calibrating the noise measuring equipment, all observations around the monitoring stations, which might have affected the monitoring results, were recorded.

#### *Equipment Calibration*

The sound level meters and calibrators were verified by the manufacturer. Monthly calibration of the noise measuring equipment was carried out. Calibration details are shown in Appendix H.

### **3.6 Results and Observations**

Continuous noise monitoring was conducted at the two monitoring stations at Ash Lagoon and Ching Lam. All monitoring results and their graphical presentations are provided in Appendix F.

No exceedance of noise Action/Limit Level was recorded in the month.

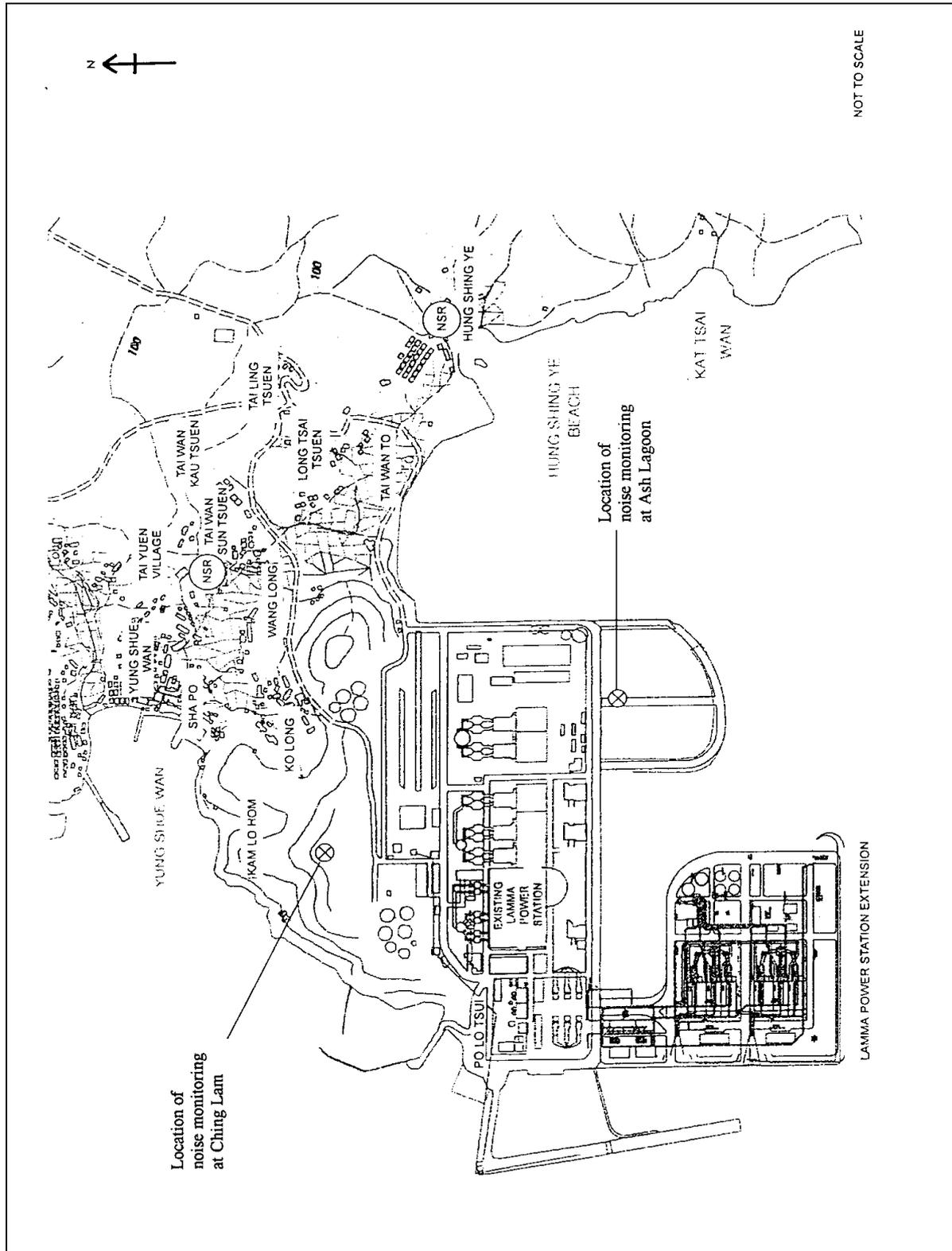


Figure 3.1 Location of Noise Monitoring Stations

## 4. WATER QUALITY MONITORING

### 4.1 Monitoring Requirements

Marine water quality monitoring at the monitoring locations adjacent to the dredging and filling operations for Lamma Extension was carried out by a monitoring consultant, HKPC. The purpose was to ensure that deterioration of water quality, if any, would be detected and that timely action could be taken to rectify the situation. The impact monitoring data were checked against the AL levels set out in the Baseline Monitoring Report (Construction Phase). As there were no activities for the laying of the gas pipeline in the reporting month, no water quality impact monitoring at the relevant stations was carried out.

### 4.2 Monitoring Locations

A total of 12 water quality monitoring locations were selected. 7 Sensitive Receiver (SR) stations were chosen on the basis of their proximity to the dredging and filling operations, 5 Marine Control stations (C) as recommended in the EIA were selected to facilitate comparison of the water quality of the SR stations with ambient water quality conditions. Table 4.1 describes the locations of these monitoring stations. Their locations are shown in Figure 4.1.

Table 4.1 Water Quality Monitoring Locations

Type	Monitoring Location	HK Metric Grid E	HK Metric Grid N
Sensitive Receiver Stations	SR1	830 224	811 528
	SR2	829 004	810 903
	SR3	829 194 (829 166) <sup>1</sup>	808 600 (808 592) <sup>1</sup>
	SR4	830 119	808 650
	SR5	830 386	807 189
	SR6	829 977	805 758
	SR7	829 566	804 545
Marine Control Stations	C1	830 542	813 492
	C2	828 608	813 492
	C3	826 776	809 978
	C4	826 776	806 464
	C5	830 440	802 186

*1. Due to the construction programme, the monitoring location SR3 was slightly shifted since the monitoring on 16<sup>th</sup> April 2001. EPD has verbally been informed of the shift of the monitoring location.*

### 4.3 Monitoring Equipment

Table 4.2 summarizes the equipment used in the water-quality monitoring programme.

Table 4.2 Water Quality Monitoring Equipment

Equipment	Detection Limit
YSI 6820 Water Quality Monitor	Temperature: -5 to 50 °C; +/- 0.15 °C Salinity: 0 to 70 ppt; +/- 0.2 ppt Dissolved Oxygen: 0 to 200%; +/- 0.5% 0 to 20 mg/L; +/- 0.2 mg/L Turbidity: 0 to 100 and 100 to 1000 NTU; +/- 5% of the range pH: 0 to 14 units; +/- 0.2 units
Trimble NT200 GPS	Accuracy better than 3m
Leica GS5	Accuracy better than 3m

### 4.4 Monitoring Parameters, Frequency and Duration

Table 4.3 summarizes the monitoring parameters, frequencies and total duration of water quality monitoring. The monitoring schedule for reporting month is shown in Appendix D.

Table 4.3 Water Quality Monitoring Parameters and Frequency

Monitoring Stations	Parameters	Frequency	No. of Depths	No. of Samples
Sensitive Receiver Stations SR1, SR2, SR4, SR5, SR6 & SR7  Marine Control Stations C1, C2, C3, C4 & C5	<ul style="list-style-type: none"> <li>• Depth, m</li> <li>• Temperature, °C</li> <li>• Salinity, ppt</li> <li>• DO, mg/L</li> <li>• DO Saturation, %</li> <li>• Turbidity, NTU</li> <li>• SS, mg/L</li> <li>• pH</li> <li>• Total inorganic nitrogen, mg/L</li> <li>• Un-ionised ammonia, mg/L</li> </ul>	Three times per week	3 Surface, Mid-Depth and Bottom	2 Mid-ebb and Mid-flood

For laboratory analysis of marine water samples collected at SR3, only SS parameter was measured.

## 4.5 Monitoring Procedures and Calibration Details

### *Monitoring Procedures*

- The monitoring stations were accessed using survey boat to within 3m, guided by Differential Global Positioning System (DGPS).
- The depth of the monitoring location was measured using depth meter in order to determine the sampling depths. Afterwards, the water sampler was lowered into the water to the required depths of sampling. Upon reaching the pre-determined depth, a messenger to activate the sampler was then released to travel down the wire. The water sample was sealed within the sampler before retrieving.
- All in-situ measurements at each monitoring stations were taken at 3 water depths, where appropriate, namely 1m below water surface, mid-depth, and 1 meter from seabed, except where the water depth was less than 6m, the mid-depth measurement was omitted. If the water depth was less than 3m, only the mid-depth position was monitored.
- At each measurement/sampling depth, two consecutive measurements were taken. The probes were retrieved out of the water after the first measurement and then redeployed for the second measurement. Where the difference in the value between the first and the second readings of each set was more than 25% of the value of the first reading, the reading was discarded and further samplings were taken.
- The duplicate water samples for physical and chemical analysis were stored into a pre-labelled high-density polyethylene (HDPE) bottle pre-rinsed with the same water samples. The sample bottles were then packed in a cool-box (cooled to 4°C without being frozen) and delivered to a HOKLAS Laboratory for analysis upon the completion of each round of sampling.
- In addition, field information such as the general meteorological conditions and any observations regarding any significant activities in the vicinity of each monitoring location were also recorded. Major water pollution sources, if any, were identified and recorded.

### *Equipment Calibration*

The equipment deployed for in-situ measurement of marine water quality was calibrated before use. The methodologies for the calibration follow the instruction manuals provided by the corresponding manufacturers. The calibration records are shown in Appendix H.

### *Laboratory Analysis & QA/QC*

The collected marine water samples were analyzed for Suspended Solids, Total Inorganic Nitrogen and Unionized Ammonia with methodologies as summarized in Table 4.4.

Table 4.4 Laboratory Analysis Methodologies of Marine Water Samples

<b>Parameter</b>	<b>Method</b>	<b>Limit of Reporting (mg/L)</b>
Suspended Solids	APHA 17 ed 2540 D	1.0
Total Inorganic Nitrogen	APHA 18 ed 4500 NO <sub>2</sub> B & NO <sub>3</sub> E + APHA 17ed 4500-NH <sub>3</sub> B, E	0.01
Ammoniacal Nitrogen (Un-ionized Ammonia)	APHA 17 ed 4500-NH <sub>3</sub> G	0.01 (Limit of Reporting for Ammoniacal Nitrogen) x degree of ionization

Note: The determination of unionized ammonia was based on the articles entitled "Aqueous Ammonia Equilibrium Calculation: Effect of pH and Temperature" and "Ionization of Ammonia in Seawater: Effects of Temperature, pH and Salinity" which was accepted by EPD.

In order to ensure that the laboratory analysis works were carried out properly, stringent QA/QC procedures (which includes the sample preparation as well as the subsequent instrumentation analysis) were followed. According to the requirements stipulated in the EM&A Manual, QA/QC requirements for laboratory testing include:

- 1) "Blind" duplicate samples analysis of 10% collected marine water samples; and
- 2) in-house QA/QC procedures of the testing laboratory (this includes the use of blank, batch duplicates, quality control samples and matrix spike recovery test).

#### Blind Duplicate:

In order to cross check the precision of the measurement results obtained from the laboratory analysis, "blind" duplicate samples of 10% of the collected marine water samples were analysed alongside the normal samples. The sample codes for the "blind" duplicates were determined by the sampling team and are not identifiable by the laboratory. The results of the "blind" duplicate samples are summarized in Appendix H.

In accordance with the QA/QC procedures of Environmental Management Laboratory of HKPC, QA/QC procedures were conducted for at least 5% of samples. A total of 858 sets of samples (for Total Inorganic Nitrogen and Unionized Ammonia) and 936 sets of samples (for Suspended Solids analysis) were received during the marine monitoring period including both ebb and flood tides. Therefore at least 5% laboratory blanks, batch duplicates, quality control samples and recovery tests for each parameter were conducted. The acceptance criteria are outlined in each type of Quality Control data.

#### Blank:

A laboratory blank is an analyte free matrix to which all reagents are added in the same volumes or proportions as used in the standard sample preparation to monitor contamination introduced in laboratory. The acceptance criterion for laboratory blank in Environmental Management Division (EMD) Laboratory of HKPC stipulated in EMD Quality Manual is less than the detection limit. All the laboratory blank values and acceptance criterion of the following testing parameter are summarized in Appendix H.

- Suspended Solids
- Unionized Ammonia
- Total Inorganic Nitrogen

#### Batch Duplicate:

Batch duplicate is an intra-laboratory split sample randomly selected from the sample batch to monitor the method precision in a given matrix. The acceptance limit of duplicate values of the following testing parameters and their duplicate results are summarized in Appendix H.

- Suspended Solids
- Unionized Ammonia
- Total Inorganic Nitrogen

#### Quality Control Sample:

The quality control sample is the analysis of a material with a known concentration of contaminants to determine the accuracy of results in a given matrix. The quality control samples are not applicable to all testing parameters due to the constraints of the testing parameters. The quality control samples results for the following testing parameters are shown in Appendix H.

- Unionized Ammonia
- Total Inorganic Nitrogen

Quality control sample testing is not applicable to the testing of Suspended Solids.

#### Matrix Spike:

Matrix spike is an intra-laboratory split of a digested sample spiked with target known concentration analyte to determine method bias in a given matrix. The matrix spike is applicable to the following tests:

- Unionized Ammonia

- Total Inorganic Nitrogen

Matrix spike testing is not applicable to testing of Suspended Solids. The matrix spike samples results are shown in Appendix H.

The QA/QC results in Appendix H indicated that the laboratory analysis works of the collected marine water samples were properly carried out and the measurement results obtained were valid in accordance with the Hong Kong Laboratory Accreditation Scheme (HOKLAS) requirements. On the other hand, the “blind” duplicate measurement results indicated that the precision of the measurements for Suspended Solids, Total Inorganic Nitrogen and Unionized Ammonia are in compliance with the HOKLAS requirements.

#### 4.6 Results and Observations

Marine water monitoring was conducted as scheduled in the reporting month. All monitoring data and graphical presentation of the monitoring results are provided in Appendix G. Key findings and observations are provided in the following tables:

Summary of Exceedances in Turbidity (Depth Average) in November 2001

Monitoring Dates	No. of Exceedances		Investigation Findings (if any)
	Action Level	Limit Level	
2 <sup>nd</sup> November	0	0	N. A.
5 <sup>th</sup> November	0	0	N. A.
7 <sup>th</sup> November	0	0	N. A.
9 <sup>th</sup> November	0	0	N. A.
12 <sup>th</sup> November	0	0	N. A.
14 <sup>th</sup> November	1 (SR7 during ebb tide)	0	Not related to site activities. Based on the observation made by the sampling team, no noticeable sediment plume migration from the direction of the site to the sampling location was observed. Moreover, there was no dredging or sand filling activity on-site during the said exceedance. Besides, the measurement result at SR5 and SR6 (which is located between the site and SR7) were lower than the said exceedance therefore the elevated result at SR7 was considered not relevant to the site activities. Furthermore, the measurement result at the same location during the following session (PM) of the same sampling day was below the action level.
16 <sup>th</sup> November	0	0	N. A.
20 <sup>th</sup> November	0	0	N. A.
22 <sup>nd</sup> November	0	0	N. A.
24 <sup>th</sup> November	0	0	N. A.

Monitoring Dates	No. of Exceedances		Investigation Findings (if any)
	Action Level	Limit Level	
26 <sup>th</sup> November	0	0	N. A.
28 <sup>th</sup> November	0	0	N. A.
30 <sup>th</sup> November	2 (SR1 and SR6 during flood tide)	0	Not related to site activities. Based on the observation made by the sampling team, no noticeable sediment plume migration from the direction of the site to the sampling locations were observed. Moreover, there was no dredging or sand filling activity on-site during the said exceedances. On the other hand, it was found that the measurement result at SR2 (which is located between SR1 and the site) was lower than the action level therefore it was considered that elevated measurement at SR1 during flood tide was not related to the site activities. Besides, SR6 was located at the upstream to the site during the course of sampling while the marine water flowing from South to North. Hence, the elevated measurement results might be due to the occasional background fluctuation rather than the site activities.

Summary of Exceedances in Suspended Solids (Depth Average) in November 2001

Monitoring Dates	Number of Exceedances		Investigation Findings (if any)
	Action Level	Limit Level	
2 <sup>nd</sup> November	1 (SR6 during ebb tide)	0	Not related to site activities. Based on the observation made by the sampling team, no sediment plume migration from the direction of site to the sampling location was observed. Moreover, the dredging volume was greatly reduced on that day and there was no sand filling activity on-site during the said exceedance. Furthermore, the measurement result at the same location during the PM session of the same sampling day was below the action level. Hence, the elevated result might be due to the occasional background fluctuation rather than the site activities.
5 <sup>th</sup> November	1 (SR6 during flood tide)	1 (SR4 during flood tide)	Not related to site activities. Based on the observation made by the sampling team, no sediment plume migration from the direction of site to the sampling location was observed. Moreover, there was no dredging or sand filling activity on-site during the said exceedances. For the exceedance at SR4 during flood tide, the measurement result during the PM session of the same sampling day was below the action level. In view of this, the said exceedance might be due to background fluctuation. Besides, SR6 was located at the upstream to the site during the course of sampling while the marine water flowing from South to North. Therefore, the elevated SS result at SR6 might be due to the occasional background fluctuation rather than the site activities.

Monitoring Dates	Number of Exceedances		Investigation Findings (if any)
	Action Level	Limit Level	
7 <sup>th</sup> November	0	1 (SR5 during flood tide)	Not related to site activities. Based on the observation made by the sampling team, no sediment plume migration from the direction of site to the sampling location was observed. Moreover, there was no dredging or sand filling activity on-site during the said exceedance. Besides, SR5 was located at the upstream to the site during the course of sampling while the marine water flowing from South to North. Therefore, the elevated SS result might be due to the occasional background fluctuation rather than the site activities.
9 <sup>th</sup> November	0	0	N. A.
12 <sup>th</sup> November	0	1 (SR6 during flood tide)	Not related to site activities. Based on the observation made by the sampling team, no sediment plume migration from the direction of site to the sampling location was observed. Moreover, there was no dredging or sand filling activity on-site during the said exceedance. Besides, SR6 was located at the upstream to the site during the course of sampling while the marine water flowing from South to North. Therefore, the elevated SS result might be due to the occasional background fluctuation rather than the site activities.
14 <sup>th</sup> November	2 (SR1 during flood tide & SR7 during ebb tide)	0	Not related to site activities. Based on the observation made by the sampling team, no noticeable sediment plume migration from the direction of the site to the sampling location was observed. Moreover, there was no dredging or sand filling activity on-site during the said exceedances. Besides, the measurement result at SR7 during the PM session of the same sampling day was below the action level. In view of this, the said exceedance might be due to background fluctuation. For the exceedance at SR1 during flood tide, since measurement result at SR2 (which is located between the site and SR1) was lower than the action level, therefore the elevated result at SR1 was also considered not relevant to the site activities
16 <sup>th</sup> November	0	0	N. A.
20 <sup>th</sup> November	0	0	N. A.
22 <sup>nd</sup> November	0	0	N. A.
24 <sup>th</sup> November	0	0	N. A.
26 <sup>th</sup> November	0	0	N. A.

Monitoring Dates	Number of Exceedances		Investigation Findings (if any)
	Action Level	Limit Level	
28 <sup>th</sup> November	1 (SR7 during ebb tide)	0	Not related to site activities. Based on the observation made by the sampling team, no noticeable sediment plume migration from the direction of the site to the sampling location was observed. Moreover, there was no dredging or sand filling activity on-site during the said exceedance. Besides, the measurement result at SR7 during the PM session of the same sampling day was below the action level. Therefore, the said exceedance might be due to background fluctuation.
30 <sup>th</sup> November	1 (SR6 during flood tide)	0	Not related to site activities. Based on the observation made by the sampling team, no sediment plume migration from the direction of site to the sampling location was observed. Moreover, there was no dredging or sand filling activity on-site during the said exceedance. Besides, SR6 was located at the upstream to the site during the course of sampling. Therefore, the elevated result might be due to the occasional background fluctuation rather than the site activities.

There were nine cases (9) of Action Level exceedance and three (3) cases of Limit Level exceedance for water quality in the reporting month. 9 out of 12 cases of action/limit level exceedance were contributed by SS while 3 cases by Turbidity. For these exceedances, comprehensive investigations have been carried out. It was found that no noticeable sediment plume migration from the direction of the site to the sampling location was observed. Hence, all of these exceedances were considered not related to site activities and have been explained to the satisfaction of EPD. No further action was required. Nevertheless, EPD, IEC and the construction contractor have been informed of the exceedances accordingly as per the requirements of the EM&A Manual.

There was no AL exceedance recorded for Dissolved Oxygen (Bottom) and and Dissolved Oxygen (Surface & Middle) for the monitoring month. Further, all measurement results of TIN and NH<sub>3</sub> were below the maximum level of TIN and NH<sub>3</sub> collected at EPD's monitoring stations in the vicinity during the past five years.

It was agreed by EPD that both NH<sub>3</sub>-N and TIN would be monitored throughout the dredging phase and for at least one month upon completion of dredging. As the dredging work was completed on 3<sup>rd</sup> November 2001, monitoring of NH<sub>3</sub>-N and TIN would be stopped from 4<sup>th</sup> December 2001 onward.

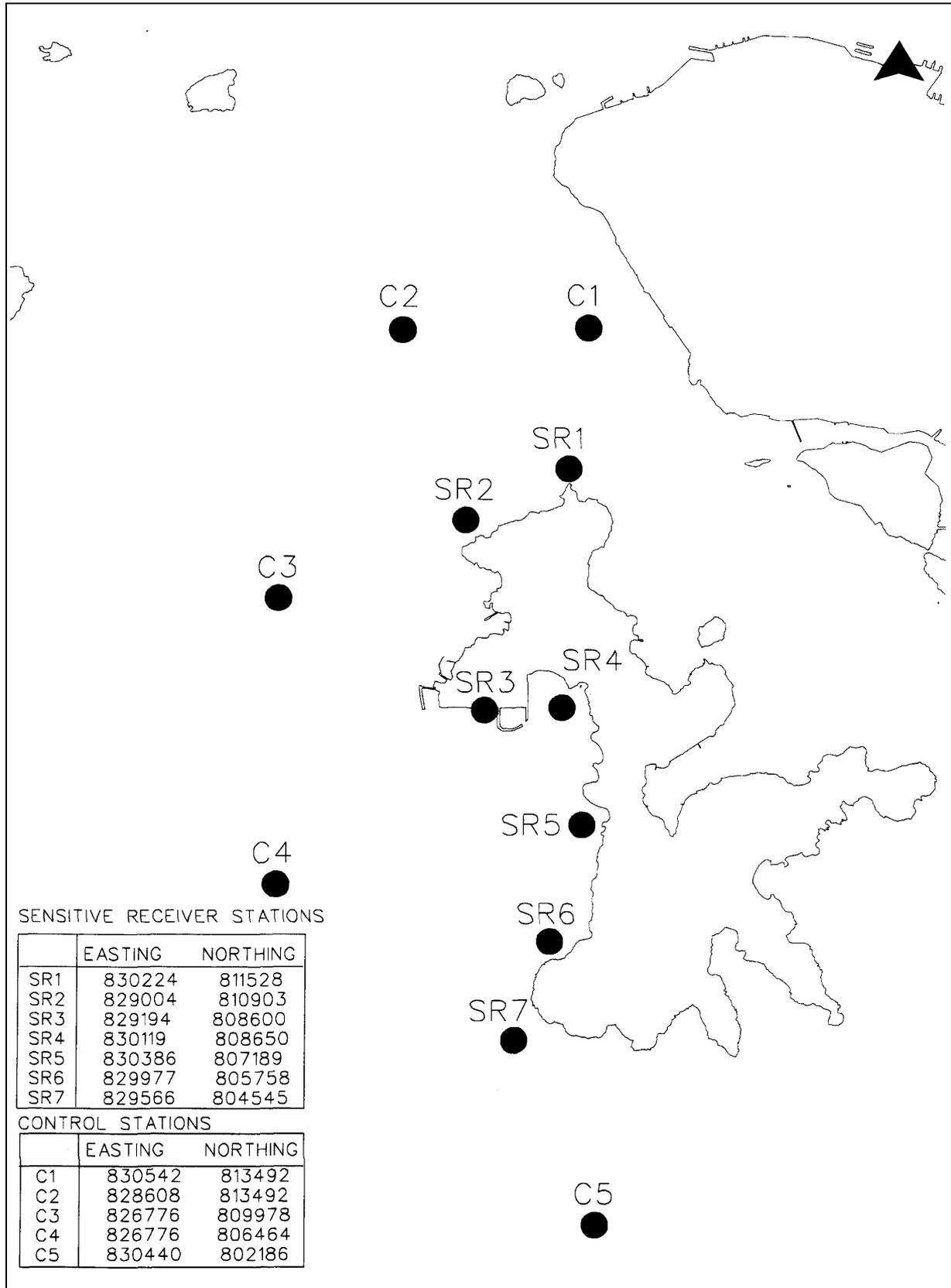


Figure 4.1 Location of Water Quality Monitoring Stations

## 5. ENVIRONMENTAL AUDIT

### 5.1 Review of Environmental Monitoring Procedures

The environmental monitoring procedures were regularly reviewed by the Environmental Team. No modification to the existing monitoring procedures was recommended.

### 5.2 Assessment of Environmental Monitoring Results

#### *Monitoring results for Air Quality, Noise and Water Quality*

The environmental monitoring results for Air Quality, Noise and Water Quality in November 2001 presented in sections 2,3 and 4 respectively are summarized in Table 5.1.

Table 5.1 Summary of AL Level Exceedances on Monitoring Parameters

Item	Parameter Monitored	Monitoring Period	No. of Exceedances In		Event/Action Plan Implementation Status and Results
			Action Level	Limit Level	
Air					
1	Ambient TSP (24-hour)	01/11/01-30/11/01	0	0	
2	Ambient TSP (1-hour)	01/11/01-30/11/01	0	0	
Noise					
1	Noise level at the critical NSR's predicted by the noise alarm monitoring system	01/11/01-30/11/01	0	0	
2	Manual noise monitoring at the Pak Kok Tsui residences	01/11/01-30/11/01	NA	NA	Construction of transmission system not yet commenced.
Water					
1	DO (Surface & Middle)	01/11/01-30/11/01	0	0	
2	DO (Bottom)	01/11/01-30/00/01	0	0	

Item	Parameter Monitored	Monitoring Period	No. of Exceedances In		Event/Action Plan Implementation Status and Results
			Action Level	Limit Level	
3	SS	01/11/01-30/11/01	6	3	The exceedances were considered not related to the construction activities. Please refer to section 4 of the report for details.
4	Turbidity	01/11/01-30/11/01	3	0	The exceedances were considered not related to the construction activities. Please refer to section 4 of the report for details.

### *Waste Management Records*

The estimated amounts of different types of waste generated in November 2001 are shown in Table 5.2.

Table 5.2 Estimated Amounts of Waste Generated in November 2001

Waste Type	Examples	Estimated Amount (m <sup>3</sup> )
Dredged Materials	Marine Mud	7,650
Construction Waste	Concrete Waste, Used formwork	0
Excavated Materials	Rock and soil	0
General Refuse	Domestic wastes collected on site	1

The total bulk volume of dredged material was 7,650m<sup>3</sup>. No sand filling took place.

### **5.3 Site Environmental Audit**

Site audits were carried out by ET on a weekly basis to monitor environmental issues at the construction sites to ensure that all mitigation measures were implemented timely and properly. The site conditions were generally satisfactory. All required mitigation measures were implemented. The weekly site inspection results are attached in Appendix J.

### **5.4 Status of Environmental Licensing and Permitting**

Construction Noise Permit (CNP) (GW-UW0256-01) was cancelled and another CNP (GW-UW-0467-01) was issued on 23<sup>rd</sup> November 2001. All permits/licenses obtained for the project are summarised in Table 5.3.

Table 5.3 Summary of Environmental Licensing and Permit Status

Description	Permit No.	Valid Period		highlights	Status
		From	To		
Varied Environmental Permit	EP-071/2000/B	13/07/01	-	The whole construction work site.	Valid
Construction Noise Permit	GW-UW0256-01	29/06/01	07/12/01	4 derrick barges, 5 dredger grabs and 6 tug boats before 2300  5 grab dredgers and 2 tug boats from 2300 to 0700 next day with a condition restricting the location of the grab dredger (CNP063)	Cancelled on 23/11/2001
Construction Noise Permit	GW-UW0467-01	23/11/01	18/05/02	4 groups of PME's, viz. (A) 6 derrick barges & 2 tug boats, (B) 3 derrick barges, 1 grab dredger & 1 tug boat, (C) 2 derrick barges & 3 tug boats, (D) 8 derrick barges, 1 grab dredger, 4 tug boats, 4 sand placing barges & 4 rotary type drill rigs (diesel).  Only one group can be used. Group D shall not be operated from 11:00pm to 7:00am on next day.	Valid. Issued on 23/11/2001
Dumping Permit	EP/MD/02-073	07/10/01	06/04/02	Dumping at South Cheung Chau Disposal Area (Relocation of the Spoil Disposal Areas with effective 29 <sup>th</sup> October 2001)	Valid

## 5.5 Implementation Status of Environmental Mitigation Measures

Mitigation measures detailed in the permits and the EM&A Manual (Construction Phase) are required to be implemented. An updated summary of the Environmental Mitigation Implementation Schedule (EMIS) is presented in Appendix K.

## 5.6 Implementation Status of Action/Limit Plans

The Action/Event Plans for air quality, noise and water quality extracted from the EM&A Manual (Construction Phase) and the review report on marine water quality monitoring are presented in Appendix I.

As all the action/limit level exceedances were not related to the construction work, no further action can be devised. Nevertheless, EPD, IEC and the construction contractor have been informed of the exceedances accordingly as per the requirements in the EM&A Manual.

## 5.7 Implementation Status of Environmental Complaint Handling Procedures

No environmental complaint against the construction activities was received in November 2001.

Table 5.4 Environmental Complaints / Enquiries Received in November 2001

Case Reference / Date, Time Received / Date, Time Concerned	Descriptions /Actions Taken	Conclusion / Status
Nil	N/A	N/A

Table 5.5 Outstanding Environmental Complaints / Enquiries Received Before

Case Reference / Date, Time Received / Date, Time Concerned	Descriptions /Actions Taken	Conclusion / Status
Nil	N/A	N/A

## **6. FUTURE KEY ISSUES**

### **6.1 Status of Natural Gas supply**

Based on current project schedule, HEC anticipates there is no delay in the supply of natural gas.

### **6.2 Key Issues for the Coming Month**

Key issues to be considered in the coming month include:

#### *Construction Noise Impact*

- To estimate the noise level induced during the bored piling operation and to prepare the CNP application for the bored piling works in advance.
- To continue the preventive measures for noise exceedance and keep monitoring/reviewing the performance.

#### *Construction Water Impact*

- To keep reviewing the monitoring results in order to take corresponding action to ensure the sea water quality;
- To provide routine inspection and necessary maintenance for the silt curtain.

### **6.3 Monitoring Schedules for the Next 3 Months**

The tentative environmental monitoring schedules for the next 3 months are shown in Appendix D.

### **6.4 Construction Program for the Next 3 Months**

The tentative construction program for the next 3 months is shown in Appendix L.

## 7. CONCLUSION

Environmental monitoring and site inspection were performed as scheduled in the reporting month. All monitoring results were checked and reviewed.

No Action/Limit level exceedance on 1-hour and 24-hour TSP level was recorded in the reporting month.

No Action/Limit level exceedance on noise was recorded in the reporting month.

A total of 12 cases of action/limit level exceedance on water quality parameters were recorded in the reporting month. As all the action/limit level exceedances were not related to construction activities, no further action is required.

Environmental mitigation measures recommended in the EM&A manual for the dredging activities were implemented in the reporting month. No environmental complaint against the construction activities was received in the reporting month. No prosecution was received for this Project in the reporting period.

The environmental performance of the Project was generally satisfactory.