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香港電燈有限公司



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ENVIRONMENTAL PERMIT NO. EP-071/2000A

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


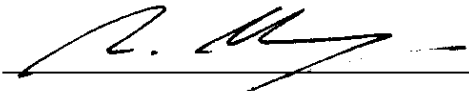
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EXECUTIVE SUMMARY

This is the second 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 May 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.

Environmental Monitoring Works

All monitoring work at designated stations was performed on schedule in the reporting period.

Air Quality

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

Noise

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

Water Quality

A total of one hundred cases of Action level exceedance and fifty cases of Limit Level exceedance for water quality were recorded in the reporting month. 99 out of 150 cases of action/limit level exceedances were contributed by TIN and NH₃-N while 48 cases by DO. For these exceedances, comprehensive investigations have been carried out. It is found that similar measurement results were also obtained at the control stations during the monitoring period, suggesting that the background DO levels were already low and TIN & NH₃-N levels were already high. Furthermore, when compared with EPD's published monitoring data at the monitoring locations adjacent to Lamma Island, all the measurement results exceeding Action/Limit Levels lay within the range of EPD's data. This indicated that the measured data only reflected the background fluctuation.

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, HEC would review with EPD the impact monitoring programme for water quality and would come up with a better criteria for establishing action and limit levels accordingly.

Site Environmental Audit

Some malpractices of the contractor contravening the marine dumping permit were spotted by EPD on 7th May 2001. The contractor has been warned by HEC to take necessary actions to prevent them from happening again. 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/A	22/12/00	-	HEC	22/12/00
Construction Noise Permit	GW-UW0109-01	02/04/01	01/10/01	Contractor	31/03/01
	GW-UW0163-01 (superseded by GW-UW0180-01)	24/04/01	08/10/01	Contractor	24/04/01
	GW-UW0180-01	08/05/01	18/10/01	Contractor	08/05/01
Dumping Permit	EP/MD/01-174	07/04/01	06/10/01	Contractor	27/03/01

Implementation Status of Environmental Mitigation Measures

Environmental mitigation measures for the dredging activities were implemented in the reporting month.

Environmental Complaints

No complaint was received in the reporting month.

Concluding Remarks

Except the malpractices of the contractor spotted by EPD on 7th May 2001, 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/A, 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 following outlines the key elements of the Project including the construction activities associated with the transmission system and submarine gas pipeline.

- 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 May 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 and dumping of dredged mud. A Layout Plan showing the dredging locations for the Project is shown in Figure 1.1. The total volume of dredged material from 1st to 31st May 2001 was 908,837m³. No 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 May 2001 was 908,837m³. The contractor was informed by EPD (via a letter ref: () in EP 60/G1/12-51 XI dated 3rd May 2001) of the relocation of the Spoil Disposal Area with effect from 14th May 2001. Another relocation of the Spoil Disposal Area effective from 24th May 2001 was notified to the contractor by EPD (viz a letter ref: (76) in EP 60/G1/12-51 XI dated 23rd May 2001). Figure 1.2, Figure 1.3 and Figure 1.4 show all dumping locations for this project in May 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	The following mitigation measures related to dredging have been implemented: a. Installation of silt curtains; b. Allowable equipment configuration and maximum rates of dredging; c. Appropriate procedures for preventing leakage/spillage of dredged materials during loading and transport; d. Dredging equipment equipped with silencers or mufflers.

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.

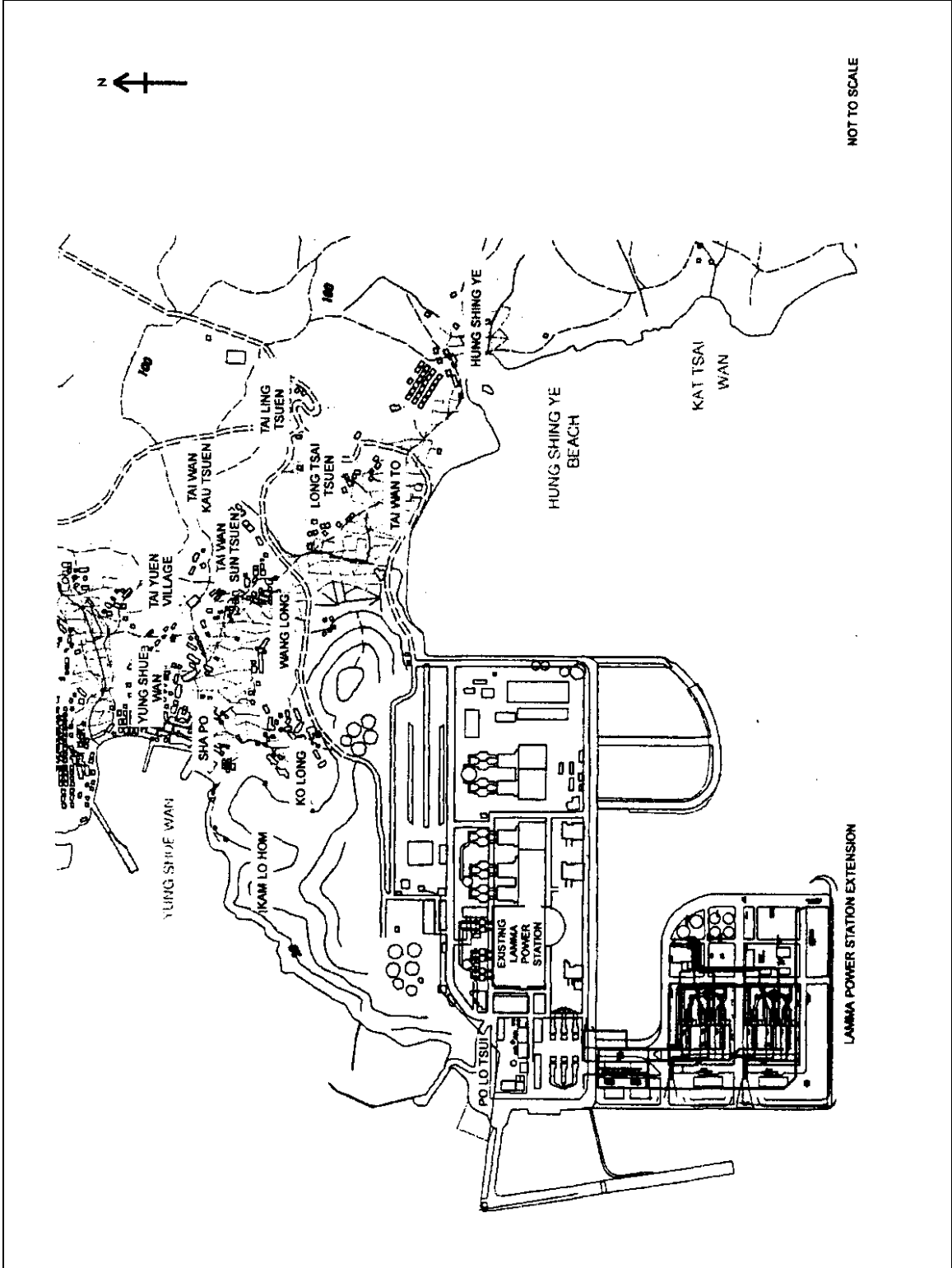


Figure 1.1 Layout of Work Site

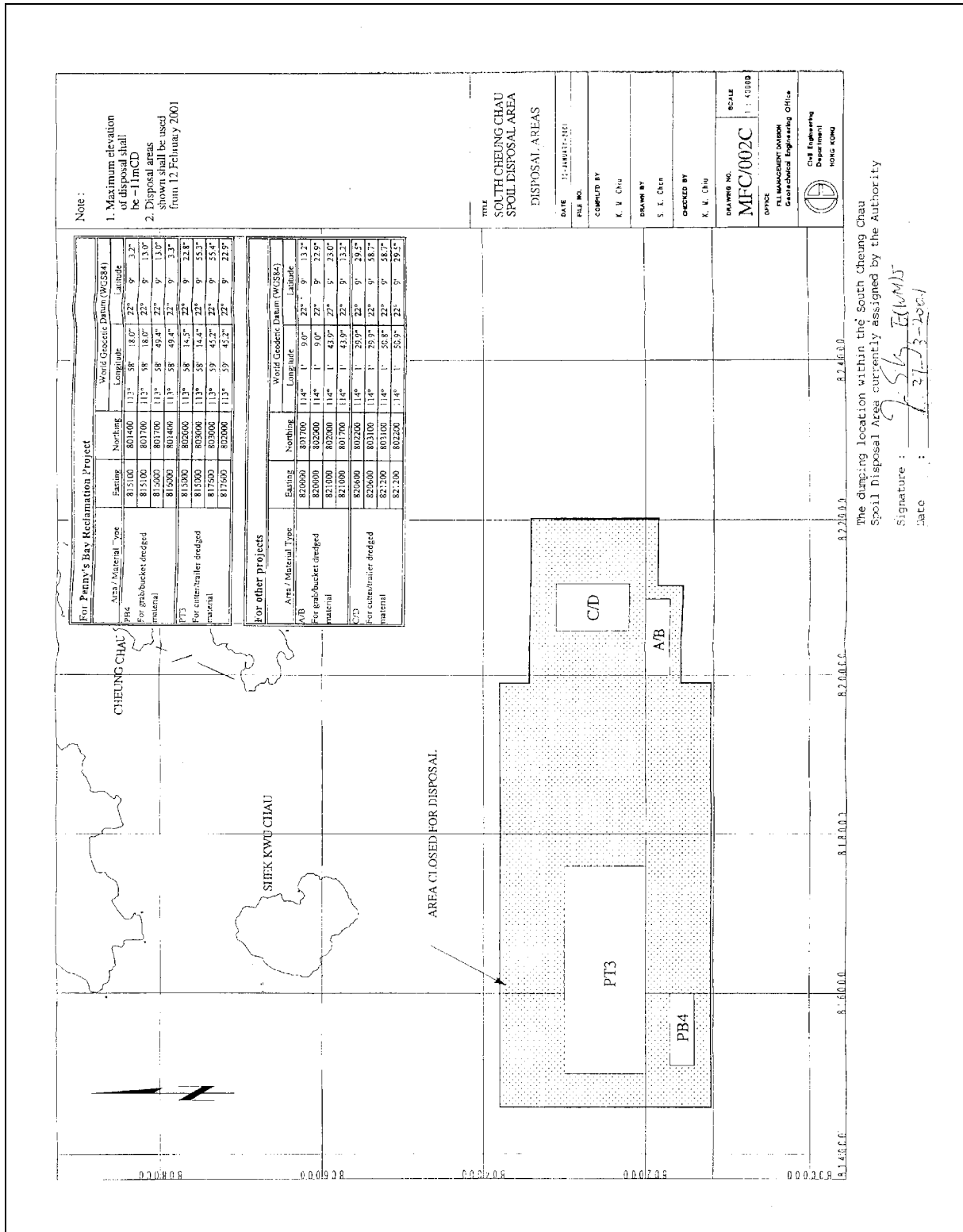


Figure 1.2 Location of Dumping Area (from 12th April 2001)

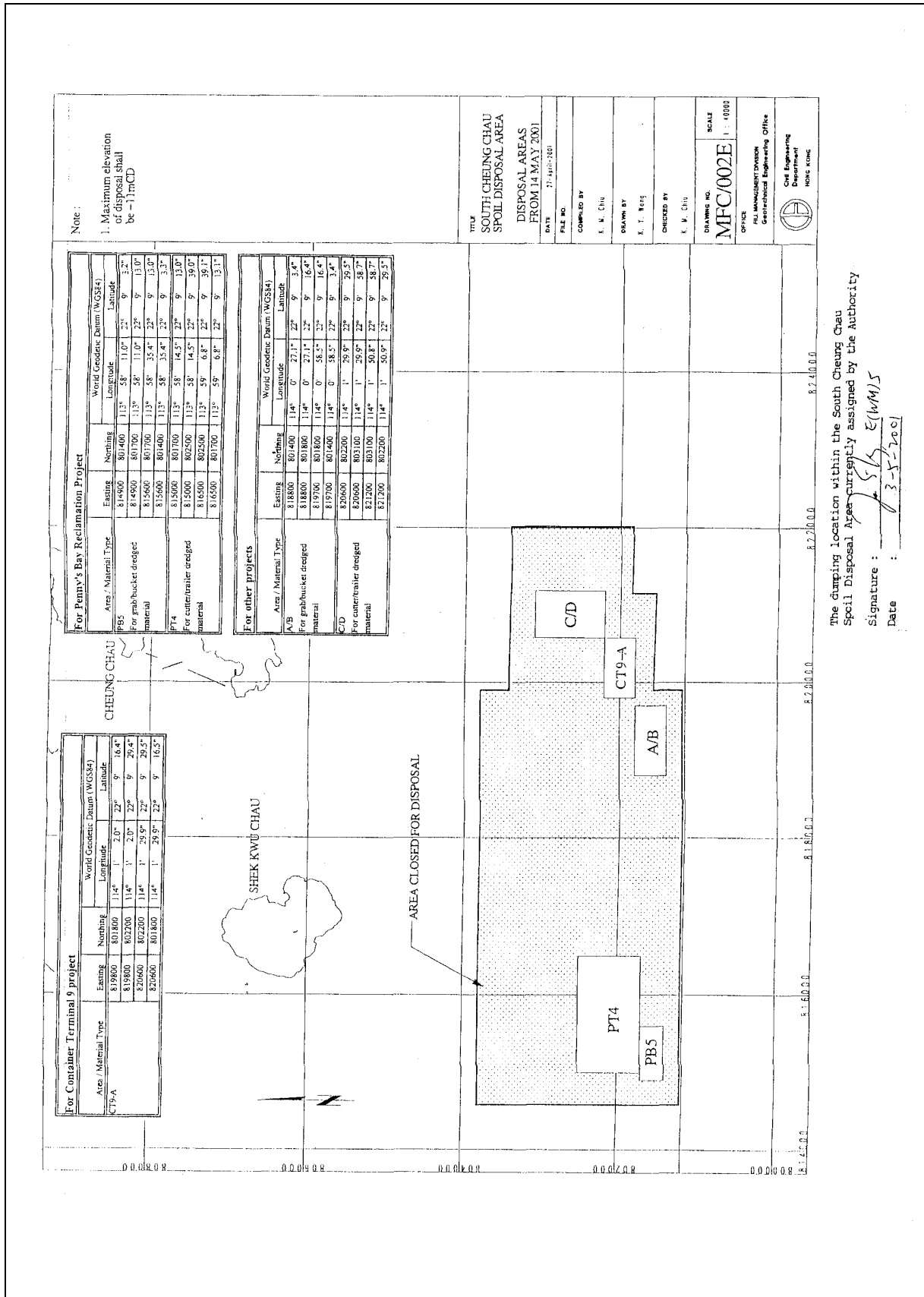


Figure 1.3 Location of Dumping Area (from 14th May 2001)

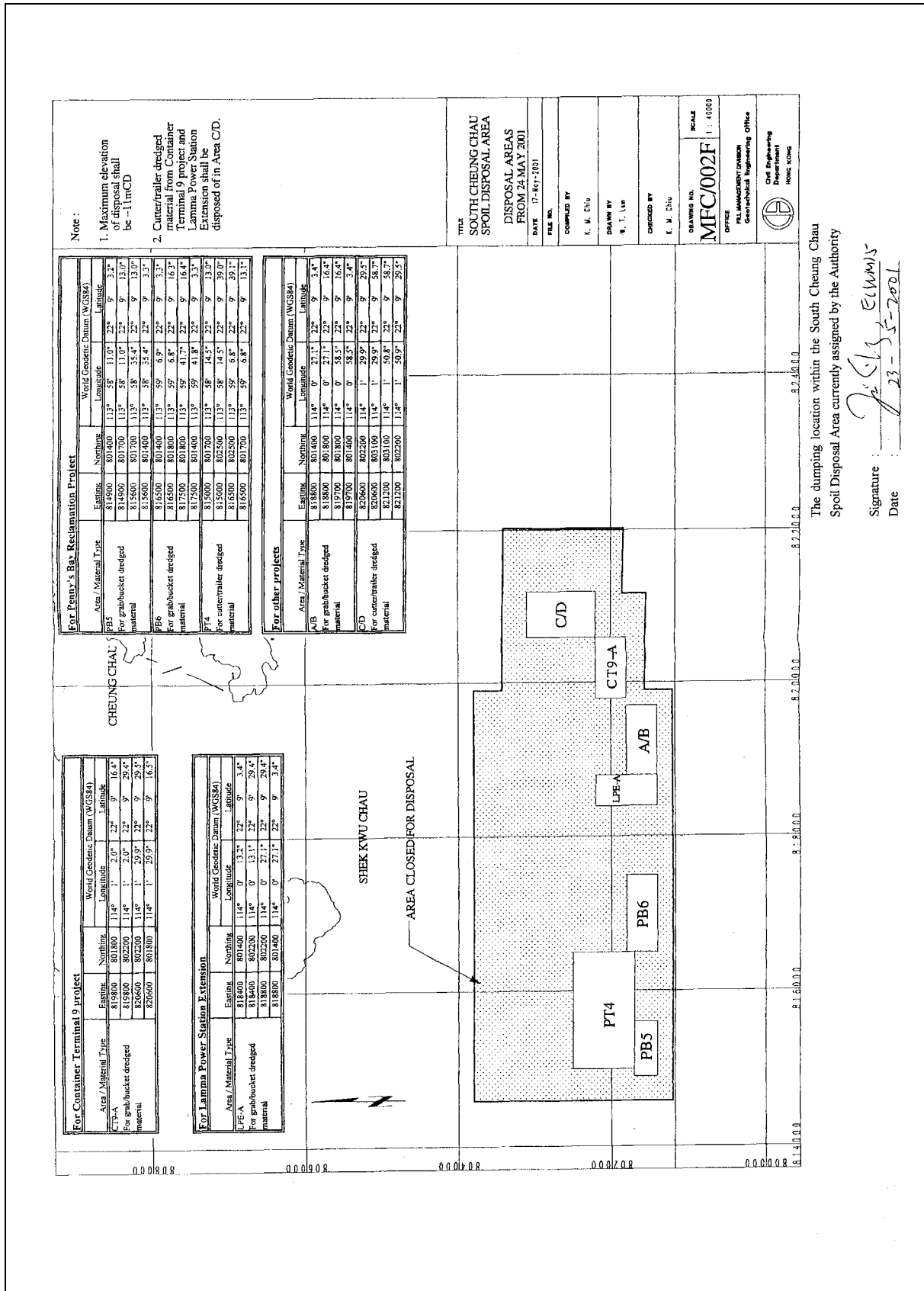


Figure 1.4 Location of Dumping Area (from 24th May 2001)

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

Location I.D.	Description
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

Equipment	Model and Make
<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

Monitoring Stations	Parameter	Duration	Frequency
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.

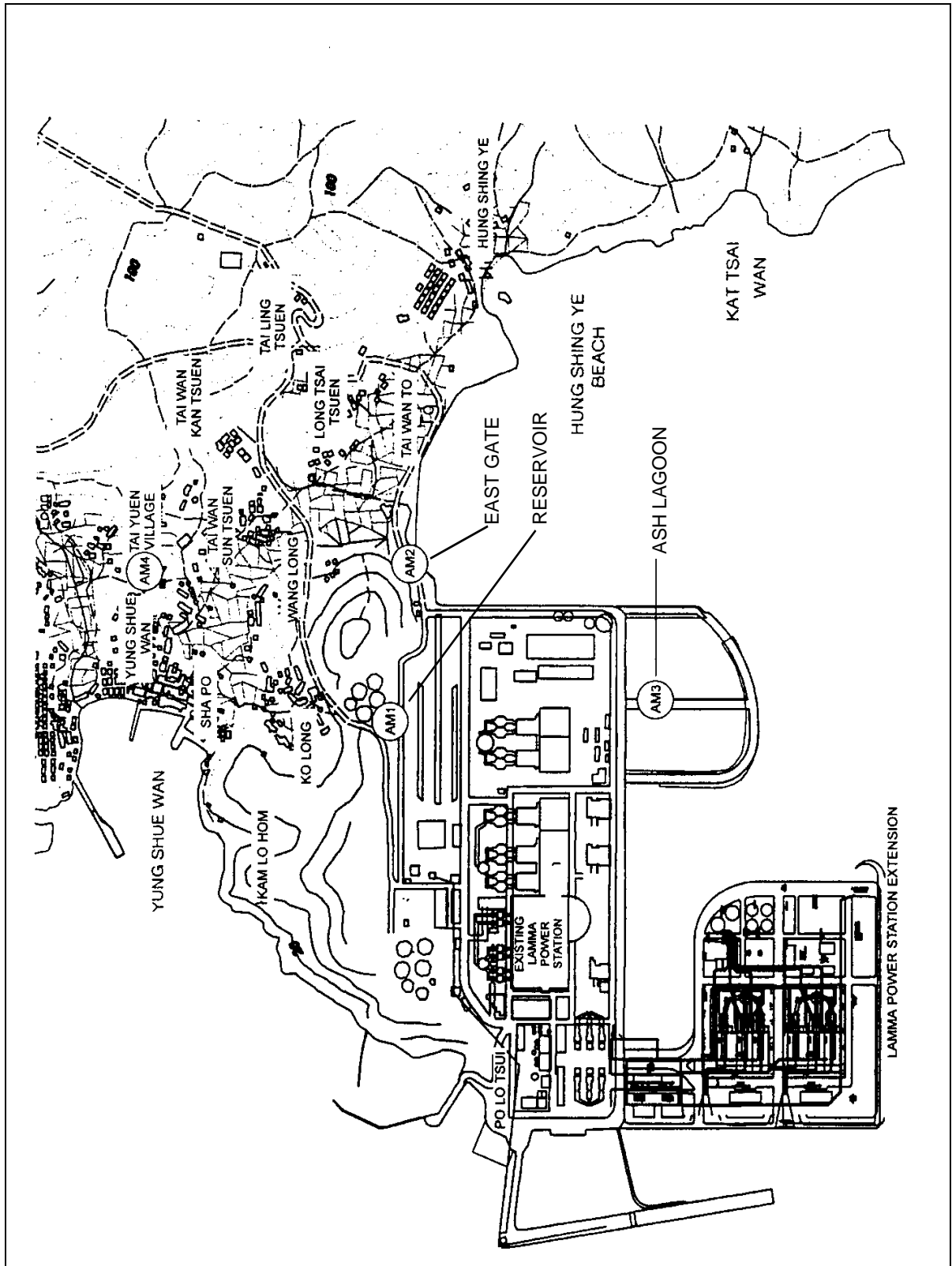


Figure 2.1 Location of Air Quality Monitoring Stations

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

Purpose of noise monitoring	Monitoring Location
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

Equipment	Model
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 Ching Lam	Daytime: 0700-1900 hrs on normal weekdays	Daytime: 30 minutes	30-min L_{Aeq}
	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.

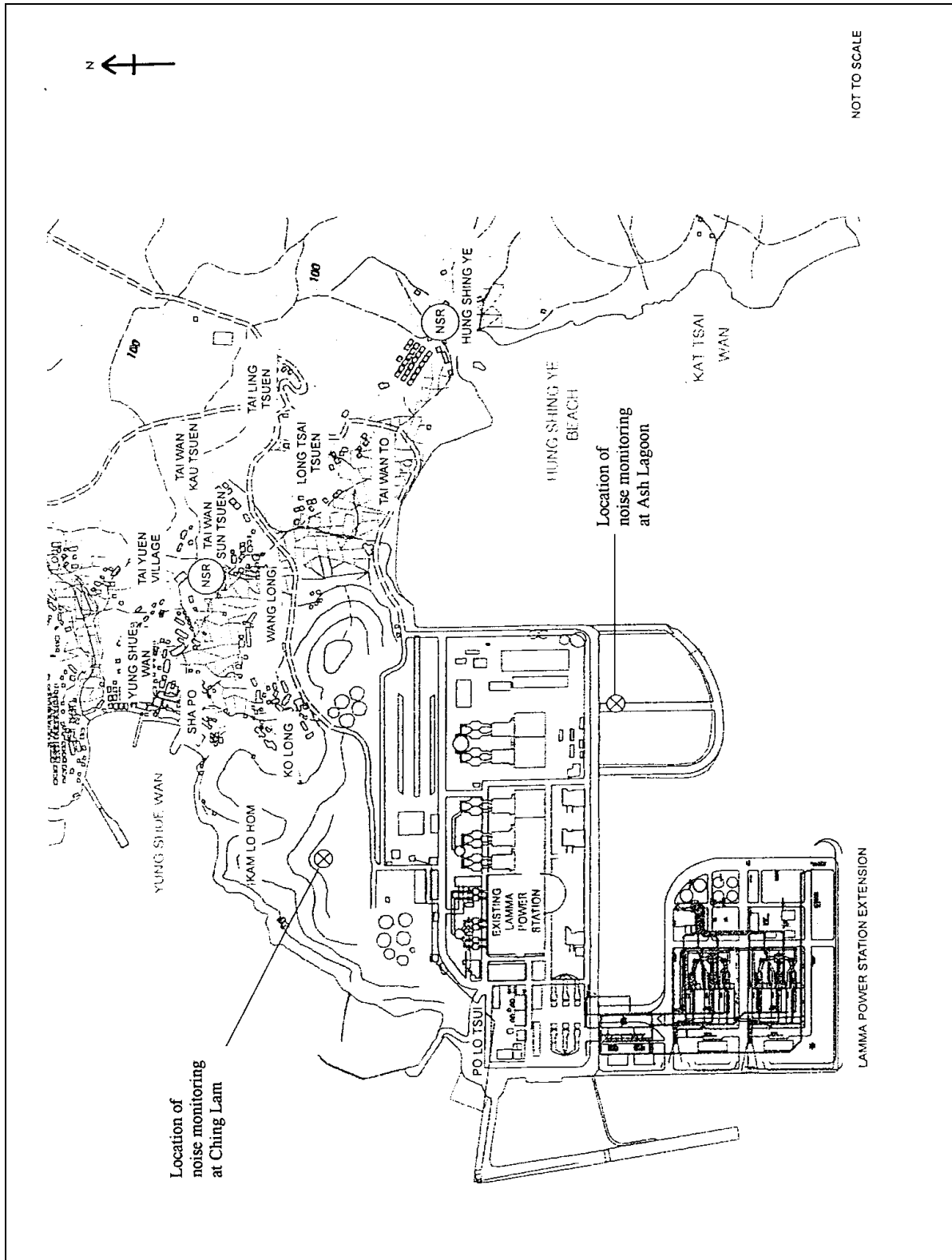


Figure 3.1 Location of Noise Monitoring Stations

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 any deterioration of water quality could be detected and that timely action would 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. Appendix C shows the established Action/Limit Levels for water quality.

4.2 Monitoring Locations

A total of twelve 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) ¹	808 600 (808 592) ¹
	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 16th 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 baseline 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

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"> • Depth, m • Temperature, oC • Salinity, ppt • DO, mg/L • DO Saturation, % • Turbidity, NTU • SS, mg/L • pH • Total inorganic nitrogen, mg/L • Un-ionised ammonia, mg/L 	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

Parameter	Method	Limit of Reporting (mg/L)
Suspended Solids	APHA 17 ed 2540 D	1.0
Total Inorganic Nitrogen	APHA 18 ed 4500 NO ₂ B & NO ₃ E + APHA 17ed 4500-NH ₃ B, E	0.01
Ammoniacal Nitrogen (Un-ionized Ammonia)	APHA 17 ed 4500-NH ₃ 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 sample digested 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 Dissolved Oxygen (Surface and Middle) in May 2001

Monitoring Dates	Number of Exceedances		Investigation Findings (if any)
	Action Level	Limit Level	
2nd May	0	0	N. A.
4th May	0	0	N. A.
7th May	0	0	N. A.
9th May	0	0	N. A.
11th May	0	0	N. A.
15th May	0	0	N. A.
17th May	0	0	N. A.
19th May	1 (SR1 at mid-flood)	0	Not related to site activities because by reviewing the literature data from EPD in 1999, the said measurement result lay within the ranges of measurement data collected by EPD, suggesting that the low DO measurement results at the said impact location might reflect the background fluctuation.
21st May	0	0	N. A.
23rd May	7 (SR1 at mid-ebb and SR1, SR2, SR4, SR5, SR6 and SR7 during mid-flood)	0	Not related to site activities since the measurement results at control stations were also low, suggesting that the background DO concentration was low.
25th May	0	0	N. A.

Monitoring Dates	Number of Exceedances		Investigation Findings (if any)
	Action Level	Limit Level	
28th May	4 (SR1 & SR2 during mid-ebb and mid-flood)	0	Not related to site activities since by reviewing the EPD's literature data of 1999 (WM1), the said measurement all lay in the measurement range, suggesting that the low DO measurement results at the said impact locations might reflect the background fluctuation
30th May	4 (SR1 & SR2 during mid-ebb and mid-flood)	0	Not related to site activities since by reviewing the literature data from EPD in 1999 (WM1), the measurement results lay within the measurement range, suggesting that the said exceedances might be due to the background fluctuation.

Summary of Exceedances in Dissolved Oxygen (Bottom) in May 2001

Monitoring Dates	Number of Exceedances		Investigation Findings (if any)
	Action Level	Limit Level	
2nd May	0	0	N. A.
4th May	0	0	N. A.
7th May	0	0	N. A.
9th May	0	0	N. A.
11th May	0	0	N. A.
15th May	0	0	N. A.
17th May	0	0	N. A.
19th May	2 (SR1 & SR7 during mid-flood)	0	Not related to the site activities as the results of the control stations were also low, suggesting that the marginal low measurement results might be due to the background fluctuation.
21st May	4 (SR1, SR2 & SR7 during mid-ebb and SR6 during mid-flood)	0	Not related to the site activities as by reviewing the literature data from EPD in 1999 (WM1 & SM5), the said measurement results were all within the ranges of measurement data collected by EPD, suggesting that the marginal low measurement results were due to the background fluctuation.
23rd May	12 (All stations except SR3 at mid-flood and mid-ebb)	0	Not related to the site activities as by reviewing the literature data of EPD in 1999 (WM1 & SM5), the said exceedances lay within the range of measurement, suggesting that low measurement results were due to the background fluctuation.
25th May	2 (SR1 and SR2 during mid-flood)	0	Not related to the site activities as by reviewing the literature data from EPD at the vicinity of the monitoring location (WM1) in 1999, the measurement results lay within the measurement range at WM1, suggesting that the low DO measurement might reflect the background fluctuation of the sampling location.
28th May	7 (SR1 & SR2 during mid-ebb and SR1, SR2, SR5, SR6 and SR7 during mid-flood)	0	Not related to the site activities as by reviewing the EPD's literature data of 1999 (SM5), the said measurement lay in the measurement range, suggesting that the low DO measurement results at the said impact locations might reflect the background fluctuation.

Monitoring Dates	Number of Exceedances		Investigation Findings (if any)
	Action Level	Limit Level	
30th May	5 (SR2 & SR7 during mid-ebb and SR1, SR2 & SR7 during mid-flood)	0	Not related to the site activities as by reviewing the literature data from EPD in 1999 (WM1), the measurement results lay within the measurement range, suggesting that the said exceedances might be due to background fluctuation.

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

Monitoring Dates	No. of Exceedances		Investigation Findings (if any)
	Action Level	Limit Level	
2nd May	0	0	N. A.
4th May	0	0	N. A.
7th May	0	0	N. A.
9th May	0	0	N. A.
11th May	0	0	N. A.
15th May	0	0	N. A.
17th May	0	0	N. A.
19th May	0	0	N. A.
21st May	0	0	N. A.
23rd May	0	0	N. A.
25th May	0	0	N. A.
28th May	0	0	N. A.
30th May	0	0	N. A.

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

Monitoring Dates	Number of Exceedances		Investigation Findings (if any)
	Action Level	Limit Level	
2nd May	0	0	N. A.
4th May	0	0	N. A.
7th May	0	1 (SR2 during flood tide)	Not related to the site activities. Based on the on-site observation made by the sampling team, no obvious dust plume migrated from the site area to the said monitoring station was observed during the course of sampling; and no particular activities were carried out at the vicinity of the sampling location. Further, the measurement result on the subsequent sampling was below the Action Level. Therefore, the said exceedance might be due to background fluctuation.
9th May	1 (SR1 during flood tide)	0	Not related to the site activities. This was because the measurement result at SR2 (which is located between SR1 and the construction site) was much less than the result at SR1.
11th May	0	0	N. A.
15th May	0	0	N. A.
17th May	0	0	N. A.
19th May	0	0	N. A.
21st May	0	0	N. A.
23rd May	0	0	N. A.
25th May	0	0	N. A.

Monitoring Dates	Number of Exceedances		Investigation Findings (if any)
	Action Level	Limit Level	
28th May	0	1 (SR1 during flood tide)	Not related to the site activities. Based on the on-site observation made by the environmental consultant, a fishing boat was just traveling in the vicinity of the sampling location, which resulted in the re-suspension of sediment from the bottom. A photograph showing the fishing boat is given in Appendix M.
30th May	0	0	N. A.

Summary of Exceedances in Unionized Ammonia (Depth Average) in May 2001

Monitoring Dates	Number of Exceedances		Investigation Findings (if any)
	Action Level	Limit Level	
2nd May	0	0	N. A.
4th May	6 (SR5, SR6 & SR7 during mid-flood and mid-ebb)	0	Not related to site activities since the measurement results at the upstream control stations were even higher than the impact monitoring results, suggesting that the background concentrations were already high.
7th May	6 (SR2 & SR7 during mid-ebb and SR2, SR5, SR6 & SR7 during mid-flood)	0	Not related to site activities since the measurement results at the upstream control stations were also high.
9th May	2 (SR2 during ebb tide and SR5 during flood tide)	0	Not related to site activities since the measurement results of the upstream control stations were much higher than the impact station's results.
11th May	7 (SR2, SR5, SR6 & SR7 during ebb tide and SR5, SR6 & SR7 during flood tide)	0	Not related to site activities since the measurement result of SR2 during ebb tide was the same as SR1, suggesting that the elevated measurement result might be due to the traveling of marine water from NE part of Lamma Island. The marginal exceedance at SR5, SR6 and & SR7 were not related to site activities since the measurement result at the upstream control stations were much higher.
15th May	0	0	N. A.
17th May	1 (SR6 during flood tide)	0	By reviewing the observation recorded during the course of sampling, no noticeable plume of sediment-loaded marine water dispersed from the project area to the monitoring station was observed. Further, the SS results and TIN results at the same location were well below the Action Level. Therefore it was considered that the elevated NH ₃ result might not be associated with the site activities.
19th May	6 (SR5, SR6 & SR7 during ebb tide and flood respectively)	0	Not related to site activities since the measurement results at the upstream control stations were much higher.

Monitoring Dates	Number of Exceedances		Investigation Findings (if any)
	Action Level	Limit Level	
21st May	4 (SR5, SR6 & SR7 during ebb tide and SR6 during flood tide)	0	Not related to site activities since the measurement results of the upstream control station were much higher, suggesting that the background concentrations at the study area were also high.
23rd May	5 (SR1, SR5 & SR6 during ebb tide and SR5 & SR 6 during flood tide)	0	Based on the on-site observation made by the sampling team, no noticeable activities were observed from the direction of construction site, which resulted in the elevated NH ₃ measurement results at SR1. Further, the NH ₃ result recorded in the subsequent measurement on 25 th May was below the Action Level. Therefore, the marginal exceedance at SR1 during ebb tide might not be related to site activities. The marginal exceedances at SR5 and SR6 during ebb tide were also not related to site activities since the measurement result at the upstream control stations were also high. The marginal exceedance at SR5 during flood tide was not related to site activities because the measurement result at the upstream control C4 was also high. For the exceedance at SR6 during flood tide, SR6 located upstream to the site area during the course of sampling and therefore the elevated measurement result might not be associated with the marine water flowing from the site area.
25th May	0	0	N. A.
28th May	0	0	N. A.
30th May	2 (SR5 & SR6 during ebb tide)	0	Not related to site activities since the measurement results at upstream control stations were much higher. Therefore, the elevated measurement results might be due to the background fluctuation instead of the site activities.

Summary of Exceedances in Total Inorganic Nitrogen (Depth Average) in May 2001

Monitoring Dates	Number of Exceedances		Investigation Findings (if any)
	Action Level	Limit Level	
2nd May	0	2 (SR2 during ebb tide and SR6 during flood tide)	Not related to site activities since the upstream control station measurement result at C3 was higher than the measurement result at SR2 during ebb tide. The measurement result at SR6 during flood tide was not related to site activities because the measurement result lay within the range of EPD literature data in 1999 (SM5), suggesting that the elevated TIN results at the said impact locations might reflect the background fluctuation.
4th May	0	0	N. A.
7th May	2 (SR1 during ebb tide and flood tide)	7 (SR2, SR4 & SR7 during ebb tide and SR2, SR5, SR6 & SR7 during flood tide)	Not related to site activities since the measurement results at upstream control stations were also high.

Monitoring Dates	Number of Exceedances		Investigation Findings (if any)
	Action Level	Limit Level	
9th May	2 (SR1 during ebb tide and SR4 during flood tide)	3 (SR2, SR4 & SR6 during ebb tide)	Not related to site activities since the measurement results of the corresponding upstream control stations were also high.
11th May	1 (SR1 during ebb tide)	2 (SR2 during ebb tide and SR3 during flood tide)	Not related to site activities since the measurement result at the upstream control stations were also high. Further, the measurement result lay within the range of EPD literature data in 1996 (SM5), suggesting that the elevated TIN results at the said impact locations might reflect the background fluctuation.
15th May	0	0	N. A.
17th May	0	0	N. A.
19th May	0	4 (SR2 during ebb tide and SR4, SR5 & SR6 during flood tide)	Not related to site activities since the measurement results at the upstream control stations were much higher.
21st May	2 (SR1 during ebb tide and flood tide)	10 (SR2, SR4, SR5, SR6 & SR7 during ebb tide and flood tide)	Not related to site activities since the measurement results of the upstream control stations were also high, suggesting the background concentrations at the study area were already high
23rd May	1 (SR1 during ebb tide)	10 (SR2, SR4, SR5, SR6 & SR7 during ebb tide and flood tide)	Not related to the site activities. The Limit Level exceedances at SR4, SR5 and SR7 were not related to site activities since the measurement result at Control Station C4 was also high. For the Action Level exceedance at SR1 and Limit Level exceedances at SR2 and SR6, the measurement results lay within the range of EPD literature data in 1999 (WM1 & SM5), suggesting that the elevated TIN results at the said impact locations might reflect the background fluctuation.
25th May	1 (SR1 during ebb tide)	0	Not related to the site activities since the measurement result of the upstream control station C1 was also high.
28th May	2 (SR1 during ebb tide and flood tide)	8 (SR2, SR4 & SR5 during ebb tide and SR2, SR4, SR5, SR6 & SR7 during flood tide)	Not related to site activities since the measurement results of the corresponding upstream control stations were much higher than the impact station's results.
30th May	1 (SR1 during ebb tide)	2 (SR2 during ebb tide and flood tide)	Not related to the site activities as the measurement results of the upstream control stations were even higher than that measured at the impact monitoring stations.

A total of one hundred cases of Action level exceedance and fifty cases of Limit Level exceedance for water quality were recorded in the reporting month. 99 out of 150 cases of action/limit level exceedances were contributed by TIN and NH₃-N while 48 cases by DO. For these exceedances, comprehensive investigations have been carried out. It is found that similar measurement results were also obtained at the control stations during

the monitoring period, suggesting that the background DO levels were already low and TIN & NH₃-N levels were already high. Furthermore, when compared with EPD's published monitoring data at the monitoring locations adjacent to Lamma Island, all the measurement results exceeding Action/Limit Levels lay within the range of EPD's data. This indicated that the measured data only reflected the background fluctuation.

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. IEC and the construction contractor have been informed of the exceedances accordingly as per the requirements of the EM&A Manual. Nevertheless, HEC would review with EPD the impact monitoring programme for water quality and would come up with a better criteria for establishing action and limit levels accordingly.

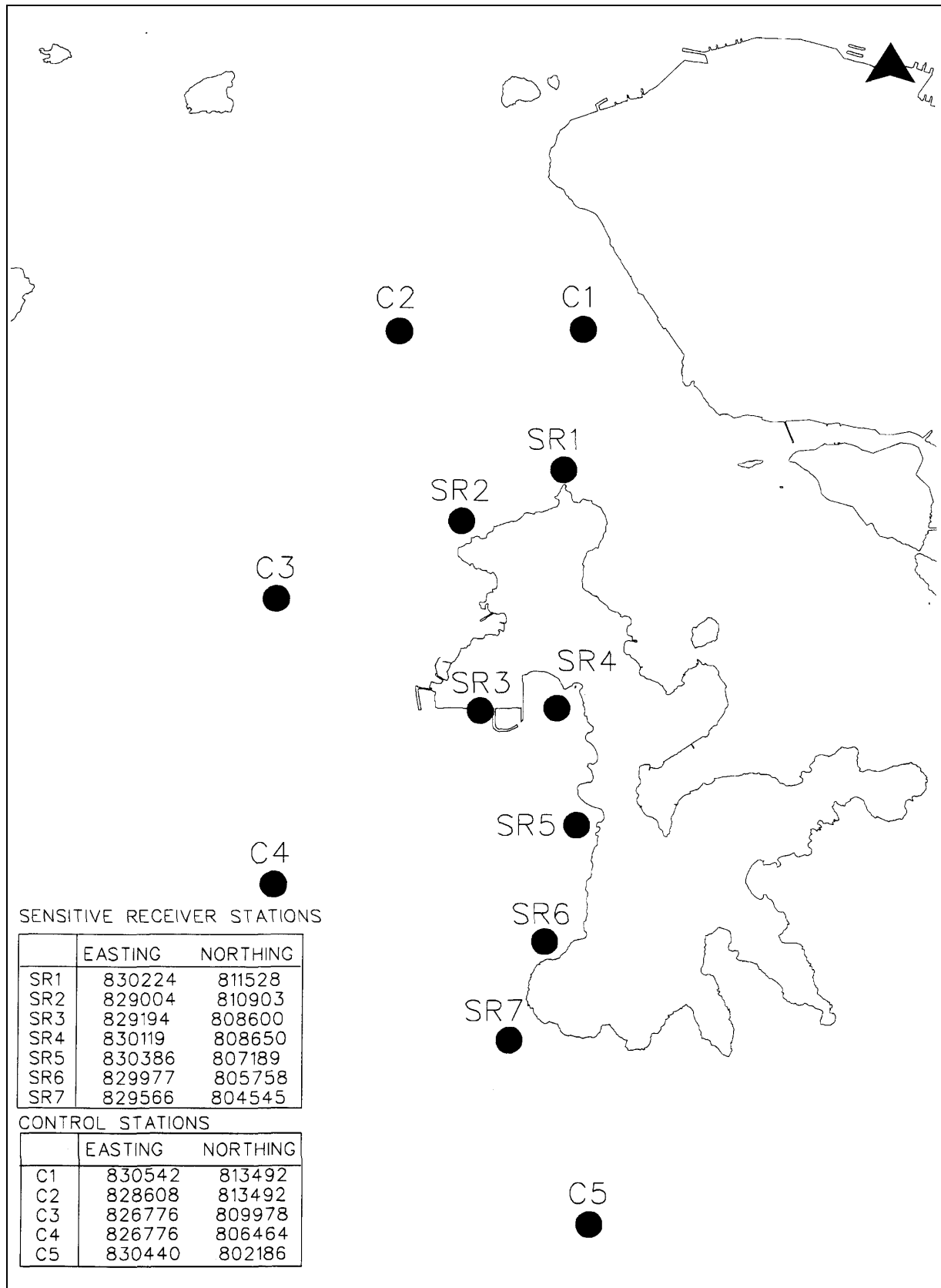


Figure 4.1 Location of Water Quality Monitoring Stations

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 May 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)	01/05/01-31/05/01	0	0	
2	Ambient TSP (1-hour)	01/05/01-31/05/01	0	0	
Noise					
1	Noise level at the critical NSR's predicted by the noise alarm monitoring system	01/05/01-31/05/01	0	0	
2	Manual noise monitoring at the Pak Kok Tsui residences	01/05/01-31/05/01	NA	NA	Construction of transmission system not yet commenced.
Water					
1	DO (Surface & Middle)	01/05/01-31/05/01	16	0	The exceedances were considered not related to the construction site. Please refer to section 4 of the report for details.

Item	Parameter Monitored	Monitoring Period	No. of Exceedances In		Event/Action Plan Implementation Status and Results
			Action Level	Limit Level	
2	DO (Bottom)	01/05/01-31/05/01	32	0	The exceedances were considered not related to the construction site. Please refer to section 4 of the report for details.
3	SS	01/05/01-31/05/01	1	2	The exceedances were considered not related to the construction site. Please refer to section 4 of the report for details.
4	Turbidity	01/05/01-31/05/01	0	0	
5	NH ₃ -N	01/05/01-31/05/01	39	0	The exceedances were considered not related to the construction site. Please refer to section 4 of the report for details.
6	TIN	01/05/01-31/05/01	12	48	The exceedances were considered not related to the construction site. Please refer to section 4 of the report for details.

Waste Management Records

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

Table 5.2 Estimated Amounts of Waste Generated in May 2001

Waste Type	Examples	Estimated Amount (m ³)
Dredged Materials	Marine Mud	908,837
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 908,837m³. No filling took place.

5.3 Site Environmental Audit

EPD officials have inspected the construction site on 7th May 2001. The following malpractices at one fully loaded dumping barge of the contractor, HB503S (Vessel No. 22111V) were found to have contravened the marine dumping conditions:

- Powering off the Automatic Self Monitoring Device;
- Failure to produce a copy of the marine dumping permit.

The contractor has been warned on the spot about the malpractices. HEC issued a warning letter to the contractor to remind them to take some necessary actions to avoid them from happening again.

Site audits were carried out by ET on a weekly basis to monitor environmental issues on 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

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/A	22/12/00	-	The whole construction work sites	Valid
Construction Noise Permit	GW-UW0109-01	02/04/01	01/10/01	4 derrick barges, 4 dredger grabs and 6 tug boats for 0700 to 2300 & holiday	Valid
	GW-UW0163-01	24/04/01	08/10/01	2 dredger barges and 1 tug boat for 2300 to 0700 next day	Superseded by GW-UW0180-01 on 18/05/01
	GW-UW0180-01	08/05/01	18/10/01	4 grab dredgers and 2 tug boats for 2300 to 0700 next day with conditions restricting the location of the grab dredgers and tug boats to various zones of the construction site	Valid
Dumping Permit	EP/MD/01-174	07/04/01	06/10/01	Dumping at South Cheung Chau Disposal Area (Relocation of the Spoil Disposal Area with effective from 14 th May 2001 and 24 th May 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) 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 requirements of the EM&A Manual. Investigation findings of the limit level exceedances in TIN recorded on 7th May 2001, 9th May 2001 and 11th May 2001 were submitted to EPD by letter on 29th May 2001 in response to the two letters from EPD ref: (4) in Ax(5) to EP2/N9/D/60 Pt.2 and (5) in Ax(5) to EP2/N9/D/60 Pt.2 dated 18th May 2001 and 22nd May 2001 respectively.

5.7 Implementation Status of Environmental Complaint Handling Procedures

There was no complaint / enquiry on environmental issues received in May 2001.

Table 5.4 Environmental Complaints / Enquiries Received in May 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 continue the preventive measures for noise exceedance and keep monitoring/reviewing the performance

Construction Water Impact

- To keep reviewing the monitoring results and to take corresponding action to ensure the sea water quality, if necessary
- 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 150 cases of action/limit level exceedance on water quality parameters were recorded in the reporting month. As the action/limit level exceedances were not related to construction activities, no further action can be devised.

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

Except the malpractices of the contractor spotted by EPD on 7th May 2001, the environmental performance of the Project was generally satisfactory.