

AGREEMENT NO. CE 92/96

Formation and Servicing in Area 36, Fanling -
Environmental, Traffic and Drainage Impact Assessment

Environmental Monitoring and Audit Manual

Maunsell

EIA/131.3/BC

MAUNSELL CONSULTANTS ASIA LTD

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Formation and Servicing in Area 36, Fanling -
Environmental, Traffic and Drainage Impact Assessments

Environmental Monitoring and Audit Manual

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1. INTRODUCTION

1.1 Background

- 1.1.1 Area 36, Fanling (hereafter referred to as "the Project Site") is situated at the south-western edge of the Fanling/ Sheung Shui New Town and covers an approximate area of some 22 hectares. It is bounded by the existing Po Kin Road to the North and Pak Wo Road to the north-east. Figure 1-1 shows the location of the project site and its environs.
- 1.1.2 As part of the Environmental Impact Assessment (EIA) study, a Manual for guiding the setup of an Environmental Monitoring and Audit (EM&A) programme to ensure compliance with the EIA study recommendations is required. The establishment of an EM&A programme is also useful in terms of providing a mean to assess the effectiveness and adequacy of the mitigation measures recommended in the EIA, such that additional mitigation measures or remedial action can be formulated where necessary.
- 1.1.3 The Manual outlines the EM&A programme to be undertaken during the construction phase of the Project : "Formation and Servicing in Area 36, Fanling" (hereafter referred to as "the Project"). The environmental aspects that require monitoring include air quality, noise and water quality. The monitoring of the effectiveness of ecological, visual and construction waste mitigation measures are not considered necessary but should be covered within the environmental audit process. The manual aims at providing systematic procedures for monitoring and auditing, thus minimising the environmental impacts associated with the construction works of the Project.
- 1.1.4 Environmental regulations of Hong Kong pertaining to air quality, water quality, noise, waste and ecology, the Hong Kong Planning Standards and Guidelines (HKPSG), and recommendations in the EIA study final report on the Project have served as environmental standards and guidelines in the preparation of this Manual.
- 1.1.5 Based on the EIA findings, the setting up of an EM&A programme during the operational phase of the Project is not deemed necessary.

1.2 Scope of Works

- 1.2.1 This Manual contains the following :

- a) duties of the Environmental Team (ET) with respect to the environmental monitoring and audit requirements during construction;
- b) information on project organisation, construction schedule and activities;
- c) requirements with respect to the construction schedule and the necessary environmental monitoring and audit programme to track the varying environmental impacts;
- d) definition of Action and Limit levels, and establishment of event and action plans;
- e) requirements of reviewing pollution sources and working procedures required in the event of non-compliance of the environmental criteria;
- f) requirements of presentation of environmental monitoring and audit data and appropriate reporting procedures;
- g) An Environmental Mitigation Implementation Schedule (Appendix I) of the recommended environmental mitigation measures to be undertaken by the Contractor;
- h) Record forms (Appendix II) to be adopted where applicable during the construction phase of the Project.

1.3 Project Description

The Project Site

1.3.1 The project site is primarily rural with a large portion of the site currently used for agriculture. Existing residential premises on the site mainly consist of one to two storey domestic structures. The site is bisected by the Shek Sheung River which runs from the south-west to the north-east of the site. Apart from the knoll located to the south of Ng Uk Tsuen, the site has a gentle terrain of about +8 to +13 mPD.

Proposed Site Formation and Servicing

1.3.2 In order to prepare for the planned future land uses in Area 36, it is necessary to undertake the proposed Formation and Servicing Works in Area 36. The scope of the Project comprises the following :

- (i) formation of land for future developments in Area 36;
- (ii) construction of about 900m of road carriageways (Roads D1 and D2);
- (iii) construction of associated sewerage, stormwater drains and watermains;
- (iv) diversion of Shek Sheung River to an open channel along the southern and eastern perimeter of Area 36;
- (v) village expansion works for Ng Uk Tsuen;
- (vi) construction of subways;
- (vii) improvement of road junctions;
- (viii) provision of associated landscaping works.

1.4 Construction Programme

1.4.1 The Project can be broadly classified into two phases. The land covered in each phase are shown in Figures 1-2a and 1-2b, respectively. Phase 1 construction works involve formation of the "RS" Site, drainage works and diversion of the Shek Sheung River. Phase 2 construction works involve the formation of land (Phase II Land), roadworks and associated sewerage and drainage works. Landscaping works for both phases will be implemented near the end of the Project.

1.4.2 Figure 1-3 is the tentative construction programme assumed in the EIA study. Based on the preliminary work programme, it is intended to start Phases 1 and 2 construction works in February 1999 and January 2000, respectively. Both phases were planned to be completed in July 2001. This programme is for information of the ET to get an initial idea of the projection of the works. The ET shall make reference to the actual works progress and programme during the construction stage to schedule the EM&A works, and the Contractor shall provide the respective up-to-date information to the ET for reviewing and refining the EM&A schedule.

Sensitive Receivers

- 1.4.3 Existing sensitive receivers within Area 36 that would be potentially affected by the construction works of the Project include village houses in Ng Uk Tsuen and those scattered around the site. In the vicinity of Area 36, existing sensitive receivers include a secondary school, the new North District Hospital, residential premises such as Tai Ping Estate, Venice Garden, Kai Leng Village, Glamour Garden, Vena Garden, Cheerful Park, and scattered village houses. Ecological sensitive receivers mainly consist of the Green Belt Woodland and downstream aquatic systems of Shek Sheung River.

1.5 Environmental Monitoring and Audit Requirements

- 1.5.1 Mitigation measures pertaining to construction dust, water quality, noise, waste, ecological and visual impacts during the construction phase of the Project have been recommended in the EIA study final report.
- 1.5.2 In order to check the implementation and for checking of the effectiveness and adequacy of the recommended construction phase mitigation measures, it is necessary to design and specify the EM&A requirements. EM&A works can ensure that any deterioration in air quality or water quality, exceedance of noise limits, inappropriate waste management, and ecological or visual impacts be readily recognised and timely rectification measures taken to protect the health and well-being of the public.

1.6 Project Organisation

- 1.6.1 The key parties in an EM&A programme include the Contractor, the Engineer¹ or the Engineer's representative (ER)¹, the Environmental Team (ET), and the Environmental Protection Department (EPD).

The Contractor

- 1.6.2 The Contractor is responsible to provide requested information to the ET in the event of any exceedances in the environmental criteria specified in this Manual or other current environmental standards, and to rectify unacceptable practices. The Contractor shall also discuss any additional mitigation measures with the Engineer, ER, or ET and implement the agreed measures. The Contractor shall report to the ET on the actions taken targeting at environmental protection for inclusion in the monthly report to be prepared by the ET.

The Engineer or the Engineer's Representative

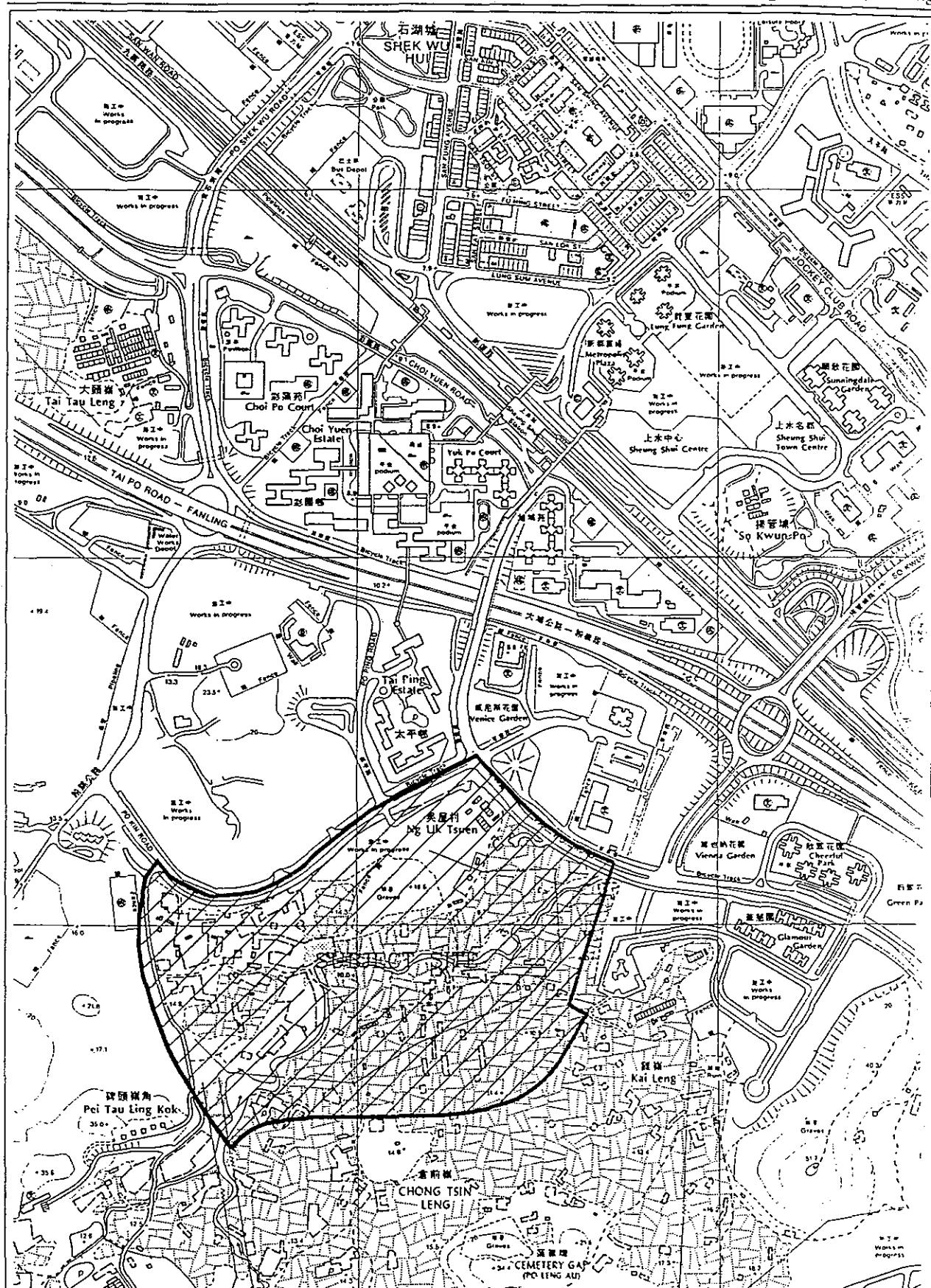
- 1.6.3 The Engineer, or the ER shall be responsible for overseeing the operations of the Contractor and the ET. He shall agree with the Contractor and ET for implementation of any required additional environmental mitigation measures.

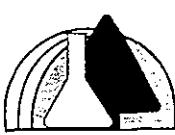
¹ For the purpose of this manual, the "Engineer" shall refer to the Engineer as defined in the Contract and the Engineer's Representative (ER), in cases where the Engineer's powers have been delegated to the ER, in accordance with the Contract.

Environmental Team

- 1.6.4 An independent Environmental Team (ET) shall be established to carry out the EM&A works of the Project. The ET leader² shall have relevant professional qualifications, or have sufficient relevant EM&A experience subject to approval of the ER.
- 1.6.5 Appropriate staff shall be included in the ET under the supervision of the ET Leader, to fulfill the EM&A duties specified in this Manual. The board categories of works of the ET comprise the followings :
- (i) To monitor the various environmental parameters as required in EIA study final report;
 - (ii) To investigate and audit the Contractor's equipment and work methodologies with respect to pollution control and environmental mitigation, and anticipate environmental issues for proactive action before problems arise;
 - (iii) To audit and prepare audit reports on the environmental monitoring data and the site environmental conditions;
 - (iv) To report on the environmental monitoring and audits results to the Contractor, the ER, and the EPD or its delegate.
- 1.6.6 In the event of an exceedance in action/ limit levels, the ET shall immediately inform the Contractor and Engineer/ ER so that appropriate remedial action can be undertaken by the Contractor promptly. The ET is also responsible for the preparation of the monthly EM&A reports for submission to the Contractor and the Engineer/ ER, and through the Engineer/ ER to EPD and TDD. The ET shall assist the Contractor and the Engineer/ ER in formulating any needed corrective actions and/ or additional mitigation measures, and liaising with Government Departments where necessary.

² The Environmental Team (ET) leader, who shall be responsible for and in charge of the ET, refers to the person delegated the role of executing the environmental monitoring and audit requirements.



TITLE : Location of the Project Site and its Environs		
PROJECT : Formation and Servicing in Area 36, Fanling - Environmental Monitoring and Audit Manual		
Figure :	1-1	Scale : NTS
		EHS Consultants Limited

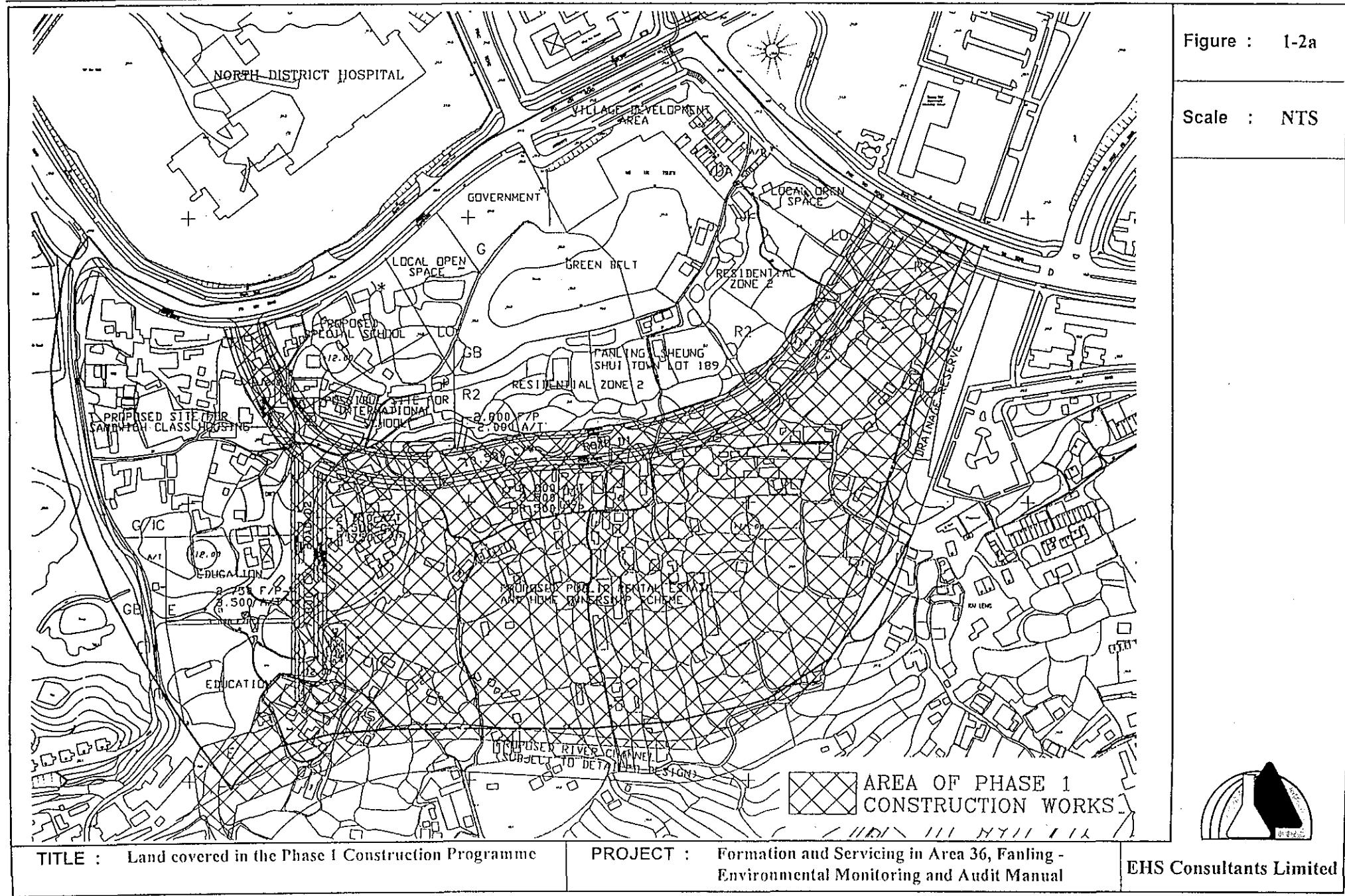
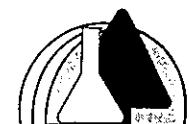
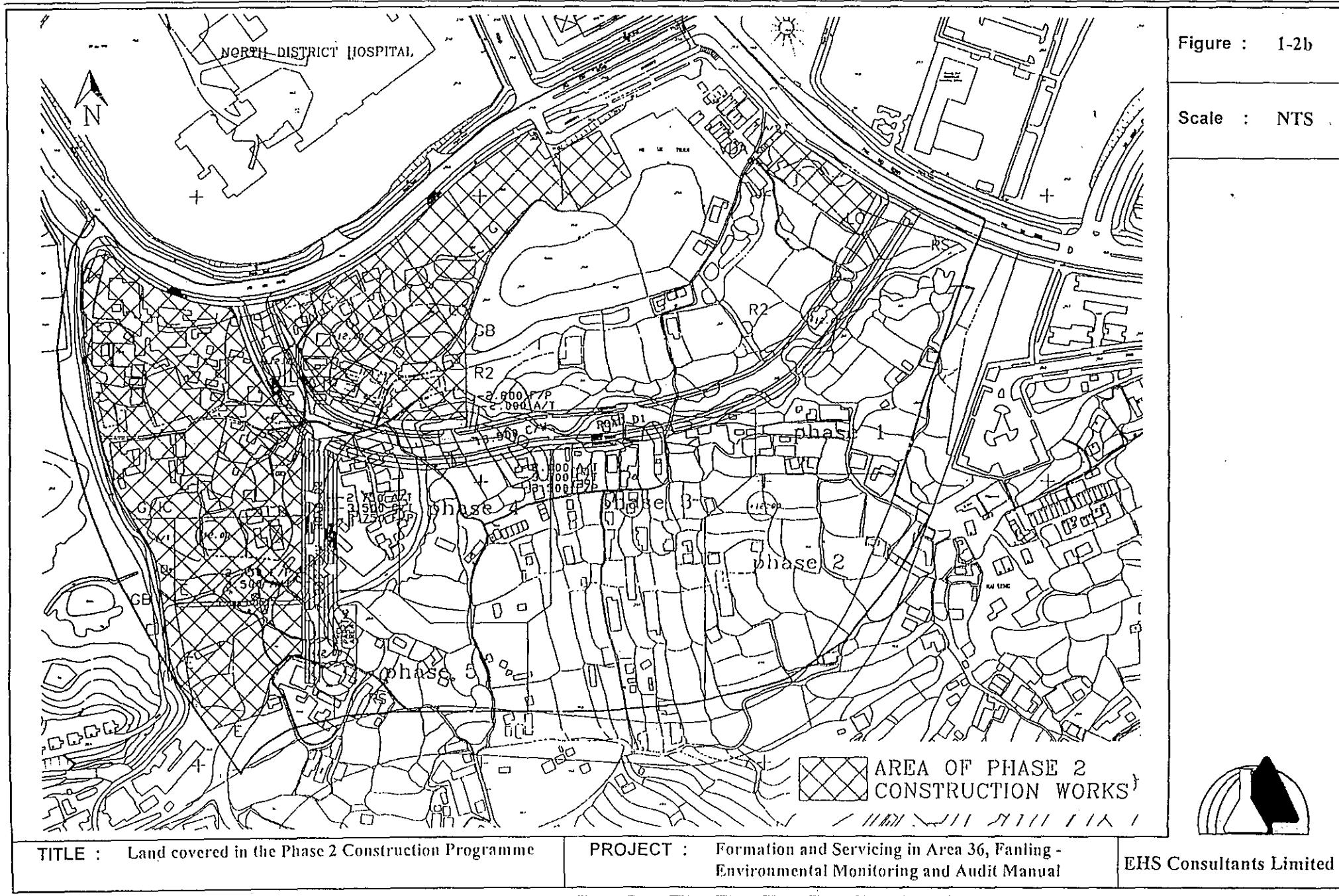
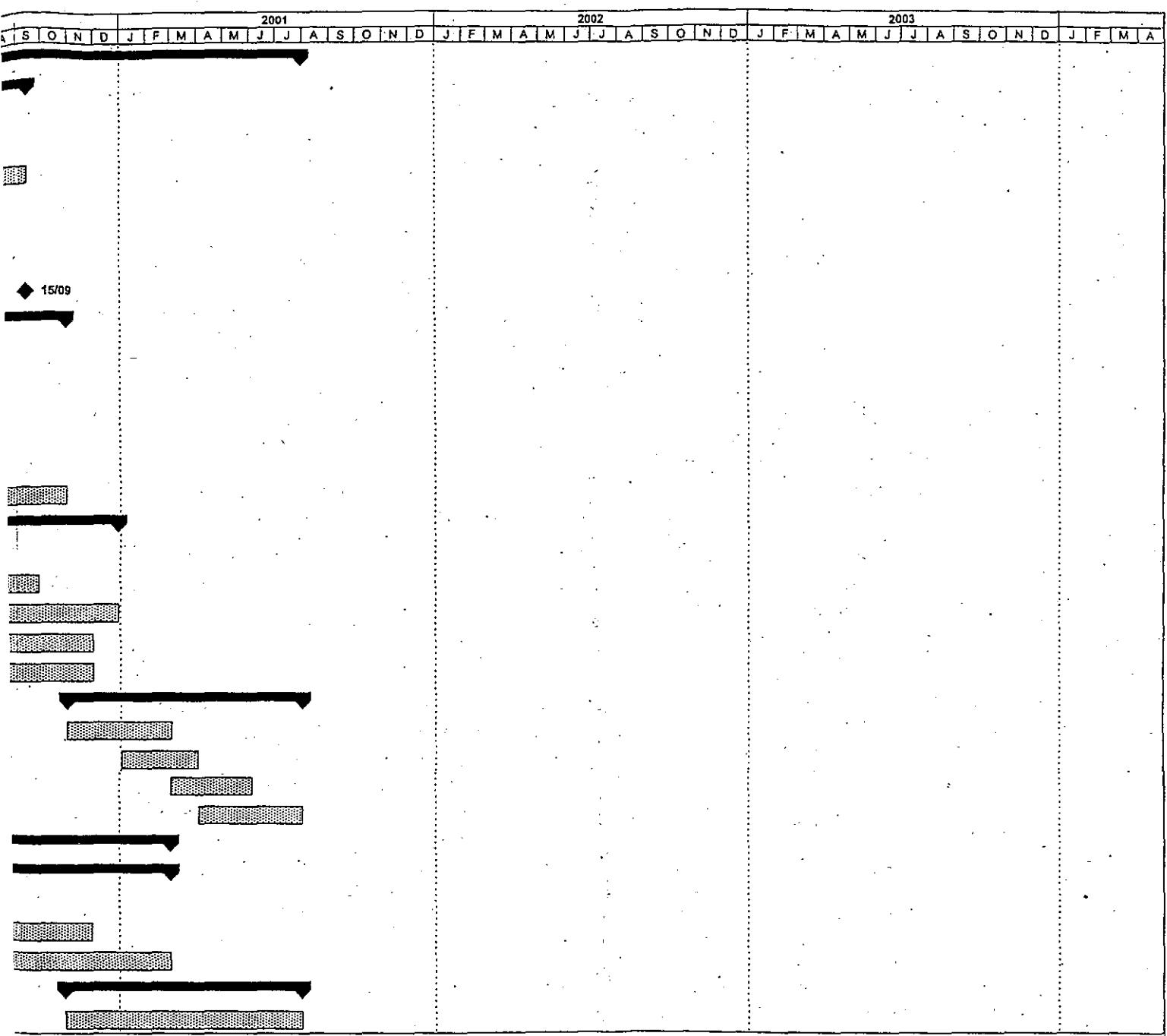


Figure : 1-2a

Scale : NTS







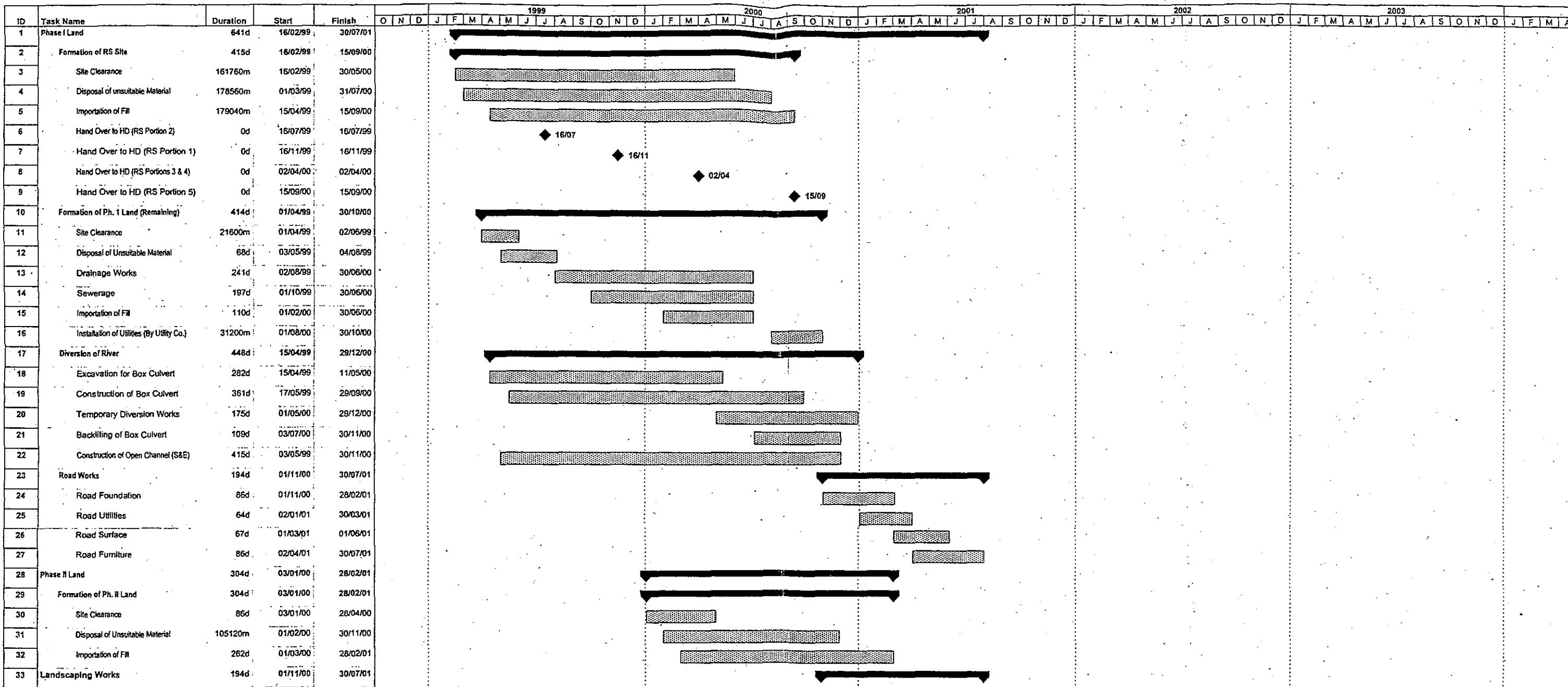


Figure 1-3 Tentative Construction Programme (as at July 1997)

2. CONSTRUCTION DUST MONITORING

2.1 Air Quality Parameters

- 2.1.1 Monitoring and audit of TSP levels shall be carried out by the ET during the construction phase to ensure that any deteriorating air quality could be readily detected and timely action taken to rectify the situation.
- 2.1.2 24-hour and 1-hour Total Suspended Particulate (TSP) levels shall be measured to indicate the impacts of construction dust on air quality. 24 hour and 1-hour TSP levels shall be measured by following the standard high volume sampling method as set out in Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B.
- 2.1.3 Upon approval of the ER, 1-hour TSP levels can alternatively be measured by direct reading methods which are capable of producing comparable results as that by the high volume sampling method, to indicate short event impacts.
- 2.1.4 All relevant data including temperature, pressure, weather conditions, elapsed-time meter reading for the start and stop of the sampler, identification and weight of the filter paper, and other special phenomena and work progress of the concerned site etc. shall be recorded down in details, where appropriate. A sample data sheet is shown in Figure 2-1.

2.2 Monitoring Equipment

- 2.2.1 Regarding the high volume sampling method, High volume sampler (HVS) in compliance with the following specifications shall be used :
 - a) 0.6-1.7 m³/min. (20-60 SCFM) adjustable flow range;
 - b) equipped with a timing/control device with +/- 5 minutes accuracy for 24 hours operation;
 - c) installed with elapsed-time meter with +/- 2 minutes accuracy for 24 hours operation;
 - d) capable of providing a minimum exposed area of 406 cm² (63 in²);
 - e) flow control accuracy: +/- 2.5% deviation over 24-hr sampling period;
 - f) equipped with a shelter to protect the filter and sampler;
 - g) incorporated with an electronic mass flow rate controller or other equivalent devices;
 - h) equipped with a flow recorder for continuous monitoring;
 - i) provided with a peaked roof inlet;
 - j) incorporated with a manometer;
 - k) able to hold and seal the filter paper to the sampler housing at horizontal position;
 - l) easy to change the filter; and
 - m) capable of operating continuously for 24-hr period.

- 2.2.2 A direct reading dust meter capable of achieving results comparable to a HVS for 1-hr sampling with reading in the range of 0.1 - 100 mg/m³ can also be used for 1-hr sampling provided that the instrument is to be calibrated against a traceable primary standard at regular intervals. Sufficient information on the direct reading dust meter shall be submitted to the ER to verify that the instrument is suitable for the 1-hr sampling.
- 2.2.3 During construction works, the ET is responsible for provision of the monitoring equipment. He shall ensure that sufficient number of HVSs with an appropriate calibration kit, and direct reading dust meters are available for the carrying out of baseline monitoring, regular impact monitoring and ad hoc monitoring.
- 2.2.4 The HVSs shall be equipped with an electronic mass flow controller and be calibrated against a traceable standard at regular intervals. All the equipment, calibration kit, filter papers, etc. shall be clearly labelled.
- 2.2.5 Initial calibration of HVSs shall be conducted upon installation and thereafter at bi-monthly intervals. The transfer standard shall be traceable to the internationally recognised primary standard and be calibrated annually. The calibration data shall be properly documented for future reference. All the data should be converted into standard temperature and pressure condition.
- 2.2.6 The flow-rate of the sampler before and after the sampling exercise with the filter in position shall be verified to be constant and be recorded down in the data sheet given in Figure 2-1.
- 2.2.7 Wind data monitoring equipment shall also be provided and set up at conspicuous locations for logging wind speed and wind direction near to the dust monitoring locations. The location for equipment installation shall be proposed by the ET and agreed with the ER. For installation and operation of wind data monitoring equipment, the following points shall be observed:
- a) the wind sensors should be installed on masts at an elevated level 10m above ground so that they are clear of obstructions or turbulence caused by the buildings;
 - b) the wind data should be captured by a data logger and to be downloaded for processing at least once a month;
 - c) the wind data monitoring equipment should be re-calibrated at least once every six months; and
 - d) wind direction should be divided into 16 sectors of 22.5 degrees each.
- 2.2.8 In exceptional situations, the ET may propose alternative methods to obtain representative wind data upon approval from the ER and agreement from EPD.

2.3 Laboratory Measurement / Analysis

- 2.3.1 A clean laboratory with constant temperature and humidity control, and equipped with necessary measuring and conditioning instruments, to handle the dust samples collected, shall be available for sample analysis, and equipment calibration and maintenance. The laboratory should be HOKLAS accredited.
- 2.3.2 If a site laboratory is set up or a non-HOKLAS accredited laboratory is hired for carrying out the laboratory analysis, the laboratory equipment shall be approved by the ET and the ER and the measurement procedures shall be witnessed by the ET and the ER. The ET shall provide the ER with one copy of the Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B for his reference.
- 2.3.3 Filter paper of size 8"x10" shall be labelled before sampling. It shall be a clean filter paper with no pin holes, and shall be conditioned in a humidity controlled chamber for over 24-hr and be pre-weighed before use for the sampling.

- 2.3.4 After sampling, the filter paper loaded with dust shall be kept in a clean and tightly sealed plastic bag. The filter paper is then returned to the laboratory for reconditioning in the humidity controlled chamber followed by accurate weighing by an electronic balance with a readout down to 0.1 mg. The balance shall be regularly calibrated against a traceable standard.
- 2.3.5 All the collected samples shall be kept in a good condition for 6 months before disposal.

2.4 Monitoring Locations

- 2.4.1 The proposed dust monitoring locations (M1 and M2) during the construction works of the Project are shown in Figure 2-2. The monitoring positions are proposed taking into account the locations of most air sensitive receivers and the lack of right to erect samplers on private agricultural lots.
- 2.4.2 The status and locations of dust sensitive receivers may change after issuing this manual. If such cases exist, the ET shall propose updated monitoring locations and seek approval from ER and agreement from EPD of the proposal.
- 2.4.3 When alternative monitoring locations are proposed, the following criteria should be followed as far as practicable :
- at the site boundary or such locations close to the major dust emission source;
 - close to the sensitive receptors; and
 - take into account the prevailing meteorological conditions.
- 2.4.4 The ET shall agree with the ER on the position of the HVS for installation of the monitoring equipment. When positioning the samplers, the following points shall be noted:
- a horizontal platform with appropriate support to secure the samplers against gusty wind should be provided;
 - no two samplers should be placed less than 2 meter apart;
 - the distance between the sampler and an obstacle, such as buildings, must be at least twice the height that the obstacle protrudes above the sampler;
 - a minimum of 2 metres of separation from walls, parapets and penthouses is required for rooftop samplers;
 - a minimum of 2 metre separation from any supporting structure, measured horizontally is required;
 - no furnace or incinerator flue is nearby;
 - airflow around the sampler is unrestricted;
 - the sampler is more than 20 metres from the dripline;
 - any wire fence and gate, to protect the sampler, should not cause any obstruction during monitoring;
 - permission must be obtained to set up the samplers and to obtain access to the monitoring stations; and;
 - a secured supply of electricity is needed to operate the samplers.

2.5 Baseline Monitoring

- 2.5.1 Baseline monitoring shall be carried out by the appointed ET in at least one of the recommended monitoring stations for at least 14 consecutive days to obtain daily 24-hr TSP samples. 1-hr sampling shall also be done at least 3 times per day for the same period of time when the highest dust impact is expected.
- 2.5.2 During the baseline monitoring, there should not be any dust generation construction activities in the vicinity of the monitoring stations.
- 2.5.3 If the ET considers that the ambient conditions have been changed and a repeat of the baseline monitoring is required to be carried out for obtaining the updated baseline levels, the monitoring should be at times when the contractor's activities are not generating dust in the proximity of the monitoring stations. Should change in ambient conditions be determined, the baseline levels and, in turn, the air quality criteria, should be revised. The revised baseline levels and air quality criteria should be agreed with EPD.

2.6 Impact Monitoring

- 2.6.1 The ET shall carry out impact monitoring during the course of the Works at the recommended dust monitoring stations. For regular impact monitoring, a sampling frequency of at least once in every six-days shall be followed at all selected monitoring stations for 24-hr TSP monitoring. For 1-hr TSP monitoring, a sampling frequency of at least three times per day in every six-days should be undertaken during the hours when the highest dust impact is envisaged to occur. The 1-hr TSP monitoring can be undertaken on the same day as the 24-hr TSP monitoring. The specific time to start and stop the 24-hr TSP monitoring shall be clearly defined for each monitoring location and be strictly followed by the operator.
- 2.6.2 In case of non-compliance with the air quality criteria, more frequent monitoring exercise, as specified in the following section, shall be conducted within 24 hours after the result is obtained. This additional monitoring shall be continued until the excessive dust emission or the deterioration in air quality is rectified.

2.7 Event and Action Plan for Air Quality

- 2.7.1 The baseline monitoring results form the basis for determining the air quality criteria for the impact monitoring. The ET shall compare the impact monitoring results with air quality criteria set up for 24-hour TSP and 1-hour TSP. Table 2-1 shows the air quality criteria, namely Action and Limit levels to be used. Should non-compliance of the air quality criteria occurs, the ER should be consulted and the ET and the Contractor shall undertake the relevant action in accordance with the Action Plan in Table 2-2.

Table 2-1 Action and Limit Levels for Air Quality

Parameters	Action	Limit
24 Hour TSP Level in $\mu\text{g}/\text{m}^3$	For baseline level $< 108 \mu\text{g}/\text{m}^3$, Action level = average of baseline level plus 30% and Limit level For baseline level $> 108 \mu\text{g}/\text{m}^3$ and baseline level $< 154 \mu\text{g}/\text{m}^3$, Action level = $200 \mu\text{g}/\text{m}^3$ For baseline level $> 154 \mu\text{g}/\text{m}^3$, Action level = 130% of baseline level	$260 \mu\text{g}/\text{m}^3$
1 Hour TSP Level in $\mu\text{g}/\text{m}^3$	For baseline level $< 154 \mu\text{g}/\text{m}^3$, Action level = average of baseline level plus 30% and Limit level For baseline level $> 154 \mu\text{g}/\text{m}^3$ and baseline level $< 269 \mu\text{g}/\text{m}^3$, Action level = $350 \mu\text{g}/\text{m}^3$ For baseline level $> 269 \mu\text{g}/\text{m}^3$, Action level = 130% of baseline level	$500 \mu\text{g}/\text{m}^3$

Table 2-2 Event/Action Plan for Air Quality

EVENT	ACTION		
	ET	ER	CONTRACTOR
<i>ACTION LEVEL</i>			
1.Exceedance for one sample	<ol style="list-style-type: none"> 1. Identify source 2. Inform ER 3. Repeat measurement to confirm finding 4. Increase monitoring frequency to daily 	<ol style="list-style-type: none"> 1. Notify Contractor 2. Check monitoring data and Contractor's working methods 	<ol style="list-style-type: none"> 1. Rectify any unacceptable practice 2. Amend working methods if appropriate
2.Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> i. identify source ii. inform ER iii. repeat measurements to confirm findings iv. Increase monitoring frequency to daily v. Discuss with ER for remedial actions required vi. If exceedance continues, arrange meeting with ER vii. If exceedance stops, cease additional monitoring 	<ol style="list-style-type: none"> i. Confirm receipt of notification of failure in writing ii. Notify Contractor iii. Check monitoring data and Contractor's working methods iv. Discuss with Environmental Supervisor and Contractor on potential remedial actions v. Ensure remedial actions properly implemented 	<ol style="list-style-type: none"> i. Submit proposals for remedial actions to ER within 3 working days of notification ii. Implement the agreed proposals iii. Amend proposal if appropriate
<i>LIMIT LEVEL</i>			
1.Exceedance for one sample	<ol style="list-style-type: none"> 1. Identify source 2. Inform ER and EPD 3. Repeat measurement to confirm finding 4. Increase monitoring frequency to daily 5. Assess effectiveness of Contractor's remedial actions and keep EPD and ER informed of the results 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing 2. Notify Contractor 3. Check monitoring data and Contractor's working methods 4. Discuss with Environmental Team Leader and Contractor potential remedial actions 5. Ensure remedial actions properly implemented 	<ol style="list-style-type: none"> 1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to ER within 3 working days of notification 3. Implement the agreed proposals 4. Amend proposal if appropriate
2.Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> i. Identify source ii. Inform the Contractor iii. Inform ER and EPD actions taken for the exceedances iv. Repeat measurement to confirm findings v. Increase monitoring frequency to daily vi. Investigate the causes of exceedance vii. Arrange meeting with EPD and ER to discuss the remedial actions to be taken viii. Assess effectiveness of Contractor's remedial actions and keep EPD and ER informed of the results ix. If exceedance stops, cease additional monitoring 	<ol style="list-style-type: none"> i. Confirm receipt of notification of failure in writing ii. Notify Contractor iii. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented iv. Discuss amongst Environmental Team Leader and the Contractor potential remedial actions v. Review Contractor's remedial actions whenever necessary to assure their effectiveness 	<ol style="list-style-type: none"> i. Take immediate action to avoid further exceedance ii. Submit proposals for remedial actions to ER within 3 working days of notification iii. Implement the agreed proposals iv. Resubmit proposals if problem still not under control v. Slow down or stop the relevant portion of works until the exceedance is abated

2.8 Dust Mitigation Measures

- 2.8.1 The EIA report has recommended various dust control and mitigation measures. These measures are listed below. The Contractor shall be responsible for the design and implementation of these measures.
- ◊ frequent watering for particularly dusty construction areas;
 - ◊ side enclosure and covering where practicable of any aggregate or other dusty material storage piles to reduce emissions;
 - ◊ all dusty vehicle loads transported to, from and between site locations should be covered by tarpaulin sheets;
 - ◊ establishment and use of vehicle wheel and body washing stations at exit points of work sites;
 - ◊ where practicable, routing of vehicles and positioning of dust generating construction plant at maximum possible separation distances from ASRs;
 - ◊ use of regular watering, with complete coverage, in dry periods to reduce dust emissions from unpaved roads;
 - ◊ impose a speed limit of 5km/hr for vehicles travelling on access roads; and
 - ◊ instigation of a programme to monitor the construction process in order to enforce controls and modify methods of work if dusty conditions arise.
- 2.8.2 An Environmental Mitigation Implementation Schedule is presented in Appendix I.
- 2.8.3 The effectiveness of these dust control measures shall be checked by the EM&A requirements recommended in the above section. If the above measures are not sufficient to restore the air quality to acceptable levels, upon the advice of ET, the Contractor shall liaise with the ET on some other mitigation measures. The additional dust mitigation measures shall be approved by the ER before implementation.

Monitoring Location	
Details of Location	
Sampler Identification	
Date & Time of Sampling	
Elapsed-time Meter Reading	Start (min.)
	Stop (min.)
Total Sampling Time (min.)	
Weather Conditions	
Site Conditions	
Initial Flow Rate, Qsi	Pi (mmHg)
	Ti (°C)
	Hi (in.)
	Qsi (Std. m ³)
Final Flow Rate, Qsf	Pf (mmHg)
	Tf (°C)
	Hf (in.)
	Qsf (Std. m ³)
Average Flow Rate (Std. m ³)	
Total Volume (Std. m ³)	
Filter Identification No.	
Initial Wt. of Filter (g)	
Final Wt. of Filter (g)	
Measured TSP Level (μg/m ³)	

Name & DesignationSignatureDate

Field Operator : _____

Laboratory Staff : _____

Checked by : _____

TITLE : Data Sheet for TSP Monitoring

PROJECT : Formation and Servicing in Area 36, Fanling -
Environmental Monitoring and Audit Manual

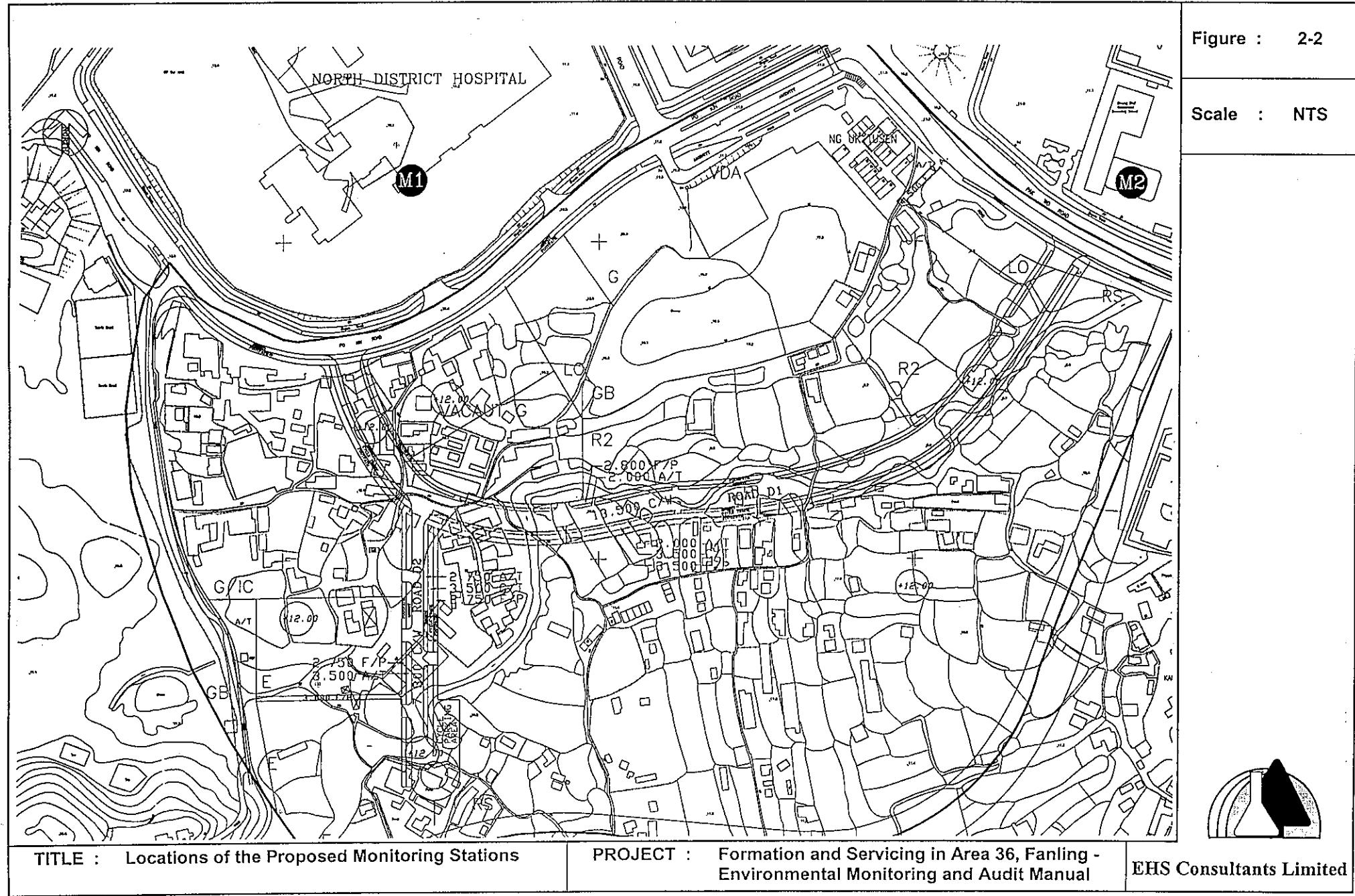
Figure : 2-1

Scale :

NTS



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3. CONSTRUCTION NOISE MONITORING

3.1 Noise Parameters

- 3.1.1 The construction noise level shall be measured in terms of the A-weighted equivalent continuous sound pressure level (L_{eq}). $L_{eq}(30\text{ min.})$ shall be used as the monitoring parameter for the time period between 0700-1900 hours on normal weekdays. For all other time periods, $L_{eq}(5\text{ min})$ shall be employed for comparison with the NCO criteria.
- 3.1.2 As supplementary information for data auditing, statistical results such as L_{10} and L_{90} shall also be obtained for reference. A sample data record sheet is shown in Figure 3-1 for reference.

3.2 Monitoring Equipment

- 3.2.1 As referred to in the Technical Memorandum issued under the Noise Control Ordinance (NCO), sound level meters in compliance with the International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1) specifications shall be used for carrying out the noise monitoring. Immediately prior to and following each noise measurement, the accuracy of the sound level meter shall be checked using an acoustic calibrator generating a known sound pressure level at a known frequency. Measurements may be accepted as valid only if the calibration level from before and after the noise measurement agree to within 1.0dB.
- 3.2.2 Noise measurements should not be made in the presence of fog, rain, wind with a steady speed exceeding 5m/s or wind with gusts exceeding 10m/s. The wind speed shall be checked with a portable wind speed meter capable of measuring the wind speed in m/s.
- 3.2.3 The ET is responsible for the provision of the monitoring equipment. He shall ensure that sufficient noise measuring equipment and associated instrumentation are available for carrying out the baseline monitoring, regular impact monitoring and ad hoc monitoring. All the equipment and associated instrumentation shall be clearly labelled.

3.3 Monitoring Locations

- 3.3.1 The proposed locations for noise monitoring during Phase 1 construction works and when Phase II construction works begin are shown in Figures 3-2 (M1-1 to M1-5) and 3-3 (M2-1 to M2-4), respectively.
- 3.3.2 The status and locations of noise sensitive receivers may change after issuing this manual. If such cases exist, the ET shall propose updated monitoring locations and seek approval from ER and agreement from EPD of the proposal.
- 3.3.3 When alternative monitoring locations are proposed, the monitoring locations should be chosen based on the following criteria:
 - a) at locations close to the major site activities which are likely to have noise impacts;
 - b) close to the noise sensitive receivers (i.e. any domestic premises, hotel, hostel, temporary housing accommodation, hospital, medical clinic, educational institution, place of public worship, library, court of law, performing art centre should be considered as noise sensitive receiver); and
 - c) for monitoring locations located in the vicinity of the sensitive receivers, care should be taken to cause minimal disturbance to the occupants during monitoring.
- 3.3.4 The monitoring station shall normally be at a point 1m from the exterior of the sensitive receivers building facade and be at a position 1.2m above ground. If there is problem with

access to the normal monitoring position, an alternative position may be chosen, and a correction to the measurements shall be made. For reference, a correction of +3dB(A) shall be made to the free field measurements. The ET shall agree with the ER on the monitoring position and the corrections adopted. Once the positions for the monitoring stations are chosen, the baseline monitoring and the impact monitoring shall be carried out at the same positions.

3.4 Baseline Monitoring

- 3.4.1 Baseline noise monitoring shall be carried out by the appointed ET in the absence of construction works in the vicinity of the monitoring stations. The baseline monitoring shall be carried out on a weekday and on a Sunday during 0700-1900 hours for a period of at least 2 weeks. Measurements of the L_{Aeq} , L_{A90} and L_{A10} noise levels shall be made over a 30-minute period. At least one set of measurements shall be undertaken on the monitoring days. A schedule on the baseline monitoring shall be submitted to the ER for approval before the start of the monitoring.
- 3.4.2 In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET shall liaise with EPD to agree on an appropriate set of data to be used as a baseline reference and submit to the ER for approval.

3.5 Impact Monitoring

- 3.5.1 Noise monitoring shall be carried out by the ET at the selected representative noise monitoring stations. One set of measurement shall be monitored between 0700-1900 hours daily on normal working days (i.e. Monday to Saturday) for construction works. L_{Aeq} (30min.) noise levels shall be monitored at the selected representative monitoring stations in the vicinity of work areas.
- 3.5.2 In case of non-compliance with the construction noise criteria, more frequent monitoring as specified in the Action Plan in Section 4.6 shall be carried out. This additional monitoring shall be continued until the recorded noise levels are rectified or proved to be irrelevant to the construction activities.

3.6 Event and Action Plan for Construction Noise

- 3.6.1 The Action and Limit levels for construction noise are defined in Table 3-1. Should non-compliance of the criteria occurs, action in accordance with the Action Plan in Table 3-2, shall be carried out.

Table 3-1 Action and Limit Levels for Construction Noise

Time Period	Action	Limit
0700-1900 hrs on normal weekdays	When one documented complaint is received	75* dB(A)

* 70 dB(A) for the secondary school (M1-3 on Figure 3-2 and M2-3 on Figure 3-3) situated alongside Pak Wo Road which is reduced to 65 dB(A) during the school examination periods.

Table 3-2 Event and Action Plan for Construction Noise Monitoring

EVENT	ACTION	
	ET / ER	Contractor
Action Level	1. Notify Contractor 2. Analyse investigation 3. Require Contractor to propose measures for the analysed noise problem 4. Increase monitoring frequency to check mitigation effectiveness	1. Submit noise mitigation proposals to Environmental Team Leader/Engineer's Representative 2. Implement noise mitigation proposals
Limit Level	i. Notify Contractor ii. Notify EPD iii. Require contractor to implement mitigation measures. Increase monitoring frequency to check mitigation effectiveness	i. Implement mitigation measures ii. Prove to Environmental Team Leader and ER the effectiveness of measures applied

3.7 Noise Mitigation Measures

3.7.1 The EIA report has recommended various construction noise control and mitigation measures. These are summarised below for easy reference. The Contractor shall be responsible for the design and implementation of these recommended measures.

Selecting Quiet Equipment

3.7.2 The Contractor shall diligently seek equivalent models of equipment that are quieter than the standard types given in the "Technical Memorandum on Noise from Construction Works Other than Percussive Piling" (TM). Plants with lower noise levels than those given in the TM for the same type of equipment should be used, whenever possible.

3.7.3 Examples of SWL for specifically silenced PME which are known to be available in Hong Kong are given below : -

Bulldozer	100 dB(A) max;
Concrete Pump	105 dB(A) max;
Dump Truck	110 dB(A) max;
Excavator	105 dB(A) max;
Hand-held Breaker	110 dB(A) max;
Lorry	110 dB(A) max;
Mobile Crane	105 dB(A) max;
Poker	110 dB(A) max.

Use of Temporary Noise Barriers and Machinery Enclosures

- 3.7.4 Where required, three metre high temporary barriers with skid footing and a small cantilevered upper portion shall be erected within a few meters from stationary plants and within 5m from mobile plants to alleviate potential construction noise impact. Design of temporary acoustic barriers are recommended to follow that given in "A Practical Guide for the Reduction of Noise from Construction Works" issued by the EPD. Barriers should have no openings or gaps and preferably have a superficial surface density of at least 10 kg/m².
- 3.7.5 Where practicable, machinery enclosure shall also be employed for certain types of equipment such as generator and concrete pump.

Management Approach and Good Site Practice

- 3.7.6 Good site practice and noise management can significantly reduce the noise impact from construction activities on nearby NSRs. To provide significant noise reduction on site, the following measures should be followed during each phase of construction works :
- ◊ the Contractor shall comply with and observe the Noise Control Ordinance (NCO) and its current subsidiary regulations;
 - ◊ before the commencement of any work, the Contractor shall submit to the ER for his approval the method of working, equipment and sound-reducing measures intended to be used at the site;
 - ◊ the Contractor shall devise and execute working methods that will minimise the noise impact on the surrounding environment; and shall provide experienced personnel with suitable training to ensure that these methods are implemented;
 - ◊ only well-maintained plants should be operated on-site;
 - ◊ plants should be serviced regularly during the construction programme;
 - ◊ machines that may be in intermittent use should be shut down or throttled down to a minimum between work periods;
 - ◊ silencer and mufflers on construction equipment should be utilised and should be properly maintained during the construction programme;
 - ◊ noisy activities can be scheduled to minimise exposure of nearby NSRs to high levels of construction noise. For example, noisy activities can be scheduled for midday or at times coinciding with periods of high background noise (such as during peak traffic hours);
 - ◊ noisy equipment such as emergency generators shall always be sited as far away as possible from noise sensitive receivers;
 - ◊ mobile plants should be sited as far away from NSRs as possible; and
 - ◊ material stockpiles and other structures should be effectively utilised as noise barrier, where practicable.

Reduction in No. of Equipment operating together in the same/ nearby work sites

- 3.7.7 Reduction in numbers of PME operating together in critical areas close to NSRs are recommended to be implemented where required from time to time.

Phasing of Construction Works and Avoid Simultaneous Noisy Activities

- 3.7.8 The construction programme shall be phased such that simultaneous noisy activities on nearby work sites can be avoided. This noise mitigation measures is recommended for the protection of nearby NSRs, especially for the existing secondary school situated alongside Pak Wo Road. It is recommended that the construction programme be phased such that noisy construction activities on work sites situated in close proximity to school be avoided during examination period. The Contractor should liaise with the secondary school and, where necessary, the Examination Authority to ascertain the exact dates and times of all formal examination periods during the course of the contract.
- 3.7.9 An Environmental Mitigation Implementation Schedule is presented in Appendix I.
- 3.7.10 The effectiveness of the above construction noise control measures shall be checked by the specified EM&A requirements. If the above measures are not sufficient to resort the noise quality to an acceptable levels upon the advice of ET, the Contractor shall liaise with the ET on some other mitigation measures. The additional mitigation measures shall be approved by the ER before implementation.

Monitoring Location		
Description of Location		
Date of Monitoring		
Measurement Start Time (hh:mm)		
Measurement Time Length (min.)		
Noise Meter Model/Identification		
Calibrator Model/Identification		
Measurement Results	L_{90} (dB(A))	
	L_{10} (dB(A))	
	Leq (dB(A))	
Major Construction Noise Source(s) During Monitoring		
Other Noise Source(s) During Monitoring		
Remarks		

Name & DesignationSignatureDate

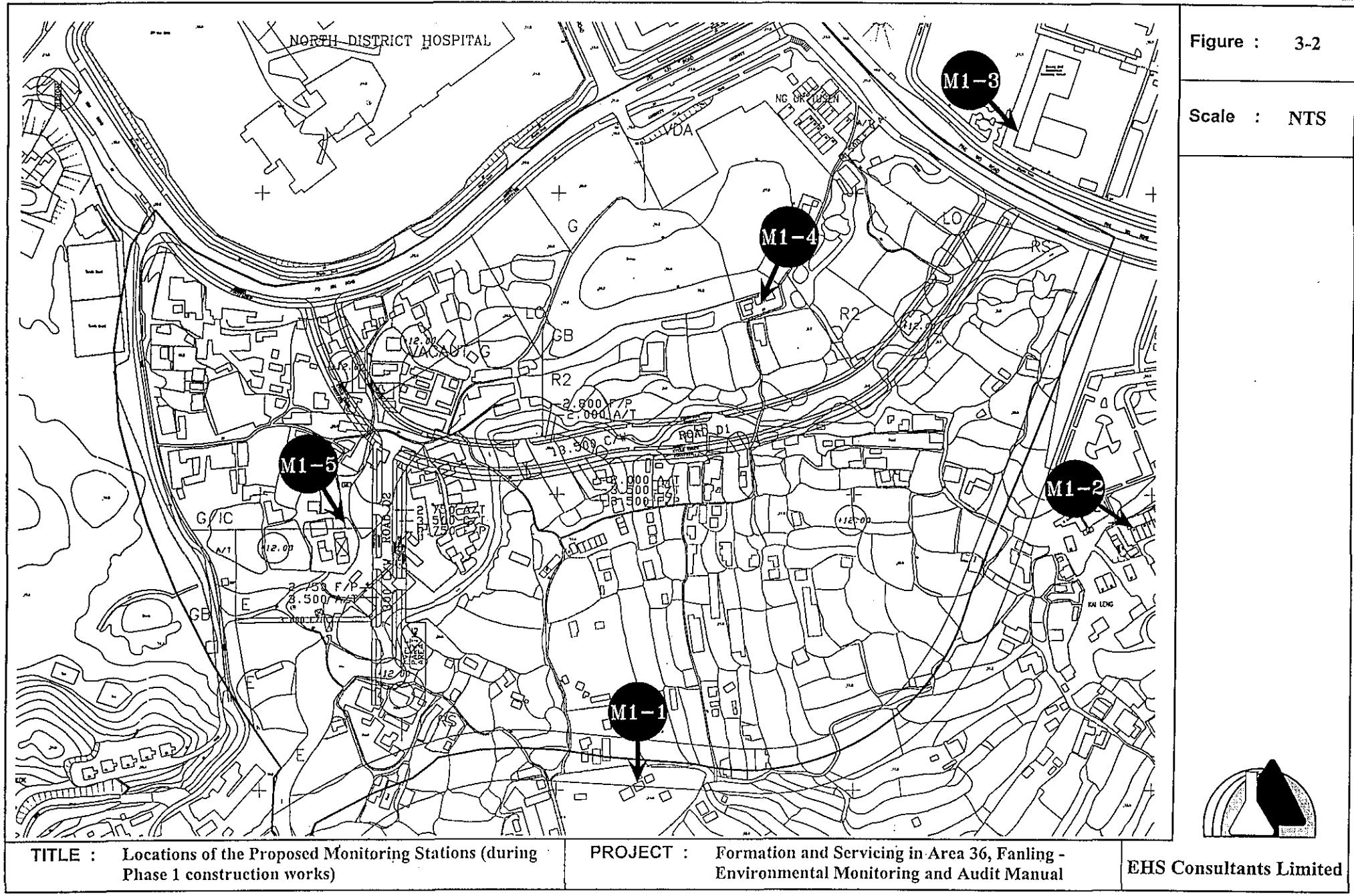
Recorded By : _____

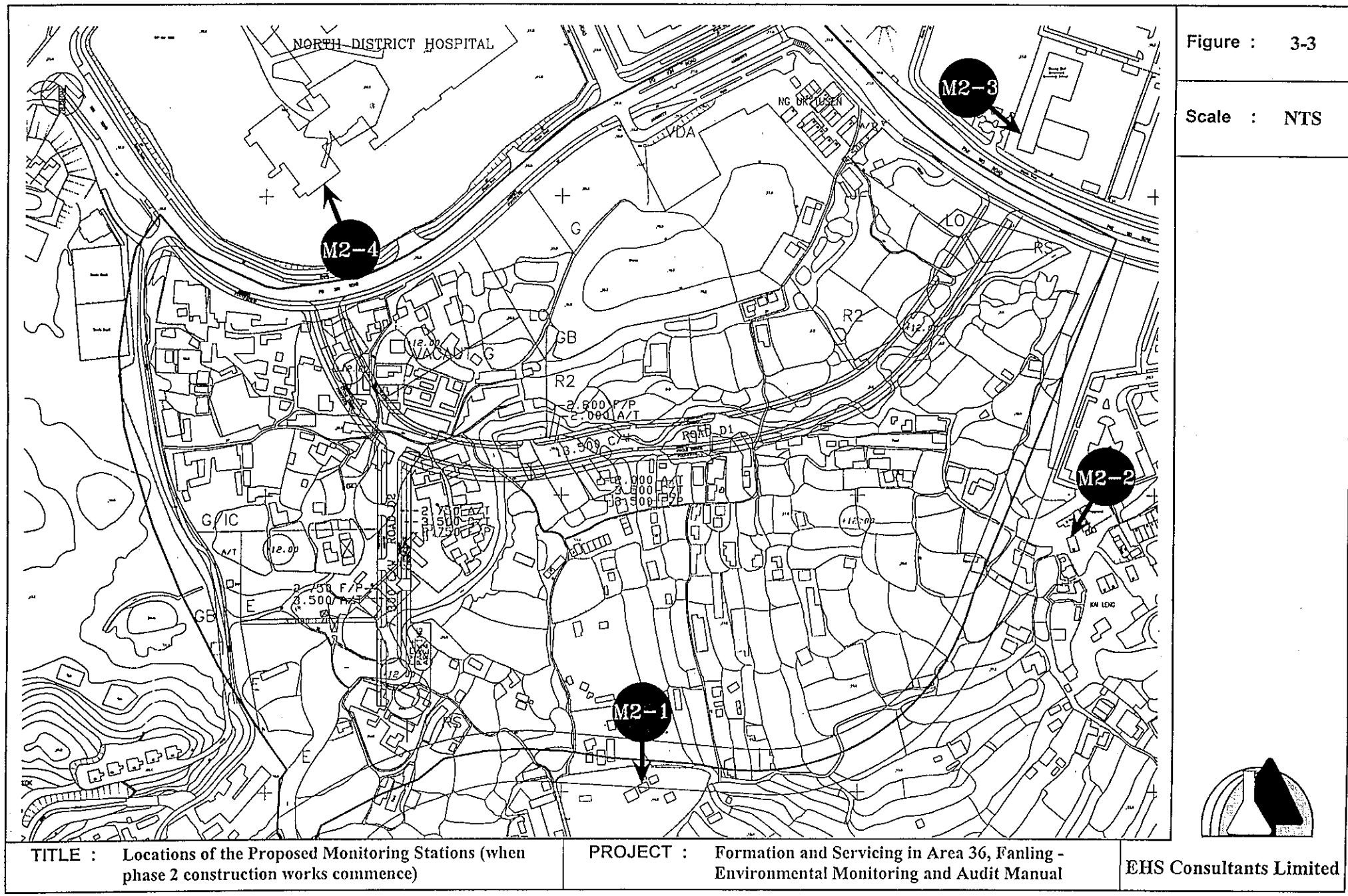
Checked By : _____

TITLE : Noise Monitoring Field Record Sheet		
PROJECT : Formation and Servicing in Area 36, Fanling - Environmental Monitoring and Audit Manual		
Figure : 3-1	Scale : NTS	EHS Consultants Limited

Figure : 3-2

Scale : NTS





4. WATER QUALITY MONITORING

4.1 Introduction

Water quality impacts to Shek Sheung River before/ after the proposed river diversion may arise from the construction phase of the Project. Environmental mitigation clauses for the protection of the local water bodies have been recommended in the EIA. The provision of water quality monitoring and audit would be an essential tool to ensure the implementation of the recommended measures, assess their effectiveness and adequacy, and to identify any required additional mitigation measures.

4.2 Water Quality Parameters

- 4.2.1 Monitoring of turbidity in NTU and suspended solids (SS) in mg/l shall be carried out to ensure that any deteriorating water quality could be readily detected and timely action be taken to rectify the situation. The former parameter is to be measured in-situ while the latter one is determined in laboratory.
- 4.2.2 Relevant data, including the monitoring location/ position, time of monitoring, water depth, water temperature, weather conditions, and any special phenomena and work underway at the construction site, where appropriate, shall also be measured in association with the specified parameters given above.
- 4.2.3 A sample monitoring record sheet is shown in Figure 4-1 for reference.

4.3 Monitoring Equipment

Turbidity Measurement Instrument

- 4.3.1 The instrument should be a portable, weatherproof turbidity-measuring instrument complete with comprehensive operation manual. The equipment should use a DC power source. It should have a photoelectric sensor capable of measuring turbidity between 0-1000 NTU and be complete with a cable (e.g. Hach model 2100P or an approved similar instrument).

Suspended Solids

- 4.3.2 A water sampler comprises a transparent PVC cylinder, with a capacity of not less than 2 litres, and can be effectively sealed with latex cups at both ends. The sampler should have a positive latching system to keep it open and prevent premature closure until released by a messenger when the sampler is at the selected water depth (e.g. Kahlsico Water Sampler or an approved similar instrument).
- 4.3.3 Water samples for suspended solids measurement should be collected in high density polythene bottles, packed in ice (cooled to 4°C without being frozen), and delivered to the laboratory as soon as possible after collection.

Thermometer

- 4.3.4 A certified laboratory standard mercury thermometer with an accuracy of at least 0.5 degree Celsius. Temperature sensors should be calibrated against a mercury thermometer of 0.1°C scale.

Water Depth Detector

- 4.3.5 A portable, battery-operated echo sounder, or other suitable depth measurement device, should be used for the determination of water depth at the selected monitoring stations.

Other Points to Note

- 4.3.6 All in-situ monitoring instrument shall be checked, calibrated and certified by a laboratory accredited under HOKLAS or any other international accreditation scheme before use, and subsequently re-calibrated at 3 monthly intervals throughout all stages of the water quality monitoring. Responses of sensors and electrodes should be checked with certified standard solutions before each use. Wet bulb calibration for a DO meter shall be carried out before measurement at each monitoring location.
- 4.3.7 For the on site calibration of field equipment, the BS 127:1993, "Guide to Field and on-site test methods for the analysis of waters" should be observed.
- 4.3.8 Sufficient stocks of spare parts should be maintained for replacements when necessary. Backup monitoring equipment shall also be made available so that monitoring can proceed uninterrupted even when some equipment some equipment is under maintenance, calibration, etc.

4.4 Laboratory Measurement / Analysis

- 4.4.1 Analysis of suspended solids shall be carried out in a HOKLAS or other international accredited laboratory. Water samples of about 500ml shall be collected at the monitoring stations for carrying out the laboratory SS determination. The SS determination work shall start within 24 hours after collection of the water samples. The SS determination shall follow APHA 17ed 2540D or equivalent methods subject to approval of EPD.
- 4.4.2 If a site laboratory is set up or a non-HOKLAS and non-international accredited laboratory is hired for carrying out the laboratory analysis, the laboratory equipment, analytical procedures, and quality control shall be approved by the EPD. The analysis shall be witnessed by the ER. The ET shall provide the ER with one copy of the relevant chapters of the "Standard Methods for the Examination of Water and Wastewater" (updated edition) and any other relevant document for his reference.
- 4.4.3 For the testing methods of any other parameters (if required by EPD), detailed method procedures should be submitted to EPD for approval prior to the commencement of monitoring programme. If in-house or non-standard methods are proposed, details of the method verification may also be required to submit to EPD. In any circumstances, the sample testing should have comprehensive quality assurance and quality control programmes. The laboratory should prepare to demonstrate the programmes to EPD when requested.

4.5 Monitoring Locations

- 4.5.1 The proposed water quality monitoring locations are shown in Figure 4-2. These include a control station (W1) at the upstream edge of Area 36 and a water quality monitoring station at the downstream side of the site (W2A before river diversion which shall be shifted to W2B after river diversion).
- 4.5.2 The proposed control station (W1) is needed for comparing the water quality from potentially impacted areas with the ambient water quality. The status and locations of water quality sensitive receivers may change after the issuance of this manual. If such cases exist, the ET shall propose updated monitoring locations and seek approval from DEP.
- 4.5.3 Measurements at the control station (W1) and water quality monitoring station (W2A or W2B) are proposed to be undertaken at mid-depth of river water column.

4.6 Baseline Monitoring

- 4.6.1 Baseline conditions of water quality shall be established by the ET and agreed with EPD prior to the commencement of any construction works in the vicinity of existing/ diverted river section. The purposes of the baseline monitoring are to establish ambient conditions prior to the commencement of the works and to demonstrate the suitability of the proposed control and impact monitoring stations.
- 4.6.2 The baseline conditions shall normally be established by measuring the water quality parameters specified in Section 4-2. The measurements shall be taken at the proposed control and monitoring stations for at least 3 days per week and for two weeks, prior to the commencement of any construction works in the vicinity of the existing/ diverted river section that may have water pollution risk.
- 4.6.3 Water samples should be collected at about the same time of day at the selected control and monitoring stations. Samples shall be taken from mid-depth of water column at the control/ monitoring stations. The time when samples should be taken shall be agreed with the EPD prior to commencement of the EM&A programme.
- 4.6.4 If baseline monitoring reveals that the turbidity and SS levels measured at the proposed control station (W1) constantly exhibits a higher value than that at the downstream monitoring station (W2A), a correction factor should be taken into account during consideration of the action/ limit levels.

4.7 Impact Monitoring

- 4.7.1 During the course of the construction works, water quality monitoring shall initially be undertaken two days per week with sampling and measurement at both the control and monitoring stations.
- 4.7.2 After a period of two months, the ER and ET should review the monitoring frequency required based on the monitoring and auditing results. The water quality monitoring locations/ positions shall be the same as that for baseline monitoring described above.
- 4.7.3 The interval between two sets of monitoring shall not be less than 36 hours except when there are exceedances of Action and/ or Limit levels, in which case the monitoring frequency may need to be increased.

4.8 Event and Action Plan for Water Quality

- 4.8.1 The water quality criteria, namely Action and Limit levels are shown in Table 4-1. Should the monitoring results of the water quality parameters at any designated monitoring stations indicate that the water quality criteria are exceeded, the actions in accordance with the Action Plan in Table 4-2 shall be carried out.

Table 4-1 Action and Limit Levels for Water Quality

Parameters	Action	Limit
SS in mg/l	120% of upstream control station's SS at about the same time of the same day	130% of upstream control station's SS at about the same time of the same day
Turbidity (Tby) in NTU	120% of upstream control station's Tby at about the same time of the same day	130% of upstream control station's Tby at about the same time of the same day

Notes:

- If baseline monitoring reveals that the turbidity and SS levels measured at the proposed control station (W1) constantly exhibits a higher value than that at the downstream monitoring station (W2A), a correction factor should be taken into account during consideration of the action/ limit levels.
- It is recommended that the SS and Tby levels at the downstream monitoring station should not be greater than 30% above the upstream SS and Tby levels. However, should baseline monitoring reveals that the SS level upstream constantly exhibits a higher value than the SS or Tby level downstream, a correction factor should be introduced in the determination of Action/ Limit Levels.
- For SS and Tby, non-compliance of the water quality limits occurs when monitoring result is higher than the limits;
- All the figures given in the table are used for reference only and the EPD may amend the figures whenever it is considered as necessary.

Table 4-2 Event and Action Plan for Water Quality

Event	ET	Contractor	ER
Action level being exceeded by one sampling day	<ol style="list-style-type: none"> 1. Repeat in-situ measurement to confirm findings 2. Identify source(s) of impact; 3. Inform contractor 4. Check monitoring data, all plant, equipment and Contractor's working methods 5. Discuss mitigation measures with ER and Contractor 6. Repeat measurement on next day of exceedance 	<ol style="list-style-type: none"> 1. Inform ER and confirm notification of the non-compliance in writing 2. Rectify unacceptable practice; 3. Check all plant and equipment 4. consider changes of working methods 5. Propose mitigation measures to ER and discuss with ET and ER 6. Implement the agreed mitigation measures 	<ol style="list-style-type: none"> 1. Discuss with ET and Contractor on the proposed mitigation measures 2. Make agreement on the mitigation measures to be implemented 3. Assess the effectiveness of the implemented mitigation measures
Action level being exceeded by more than two consecutive sampling days	<ol style="list-style-type: none"> i. Repeat in-situ measurement to confirm findings ii. Identify source(s) of impact; iii. Inform contractor iv. Check monitoring data, all plant, equipment and Contractor's working methods v. Discuss mitigation measures with ER and Contractor vi. Ensure mitigation measures are implemented vii. Prepare to increase the monitoring frequency to daily viii. Repeat measurement on next day of exceedance 	<ol style="list-style-type: none"> i. Inform the Engineer and confirm notification of the non-compliance in writing ii. Rectify unacceptable practice iii. Check all plant and equipment iv. consider changes of working methods v. Propose mitigation measures to ER within 3 working days and discuss with ET and ER vi. Implement the agreed mitigation measures 	<ol style="list-style-type: none"> i. Discuss with ET and Contractor on the proposed mitigation measures ii. Make agreement on the mitigation measures to be implemented iii. Assess the effectiveness of the implemented mitigation measures
Limit level being exceeded by one sampling day	<ol style="list-style-type: none"> 1. Repeat in-situ measurement to confirm findings 2. Identify source(s) of impact 3. Inform contractor and EPD 4. Check monitoring data, all plant, equipment and Contractor's working methods 5. Discuss mitigation measures with ER and Contractor 6. Ensure mitigation measures are implemented 7. Increase the monitoring frequency to daily until no exceedance of Limit level 	<ol style="list-style-type: none"> 1. Inform the Engineer and confirm notification of the non-compliance in writing 2. Rectify unacceptable practice 3. Check all plant and equipment 4. consider changes of working methods 5. Propose mitigation measures to ER within 3 working days and discuss with ET and ER 6. Implement the agreed mitigation measures 	<ol style="list-style-type: none"> 1. Discuss with ET and Contractor on the proposed mitigation measures 2. Request Contractor to critically review the working methods 3. Make agreement on the mitigation measures to be implemented 4. Assess the effectiveness of the implemented mitigation measures
Limit level being exceeded by more than two consecutive sampling days	<ol style="list-style-type: none"> i. Repeat in-situ measurement to confirm findings ii. Identify source(s) of impact iii. Inform Contractor, ER and EPD iv. Check monitoring data, all plant, equipment and Contractor's working methods v. Discuss mitigation measures with ER and Contractor vi. Ensure mitigation measures are implemented vii. Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days 	<ol style="list-style-type: none"> i. Inform the Engineer and confirm notification of the non-compliance in writing ii. Rectify unacceptable practice iii. Check all plant and equipment iv. Consider changes of working methods v. Propose mitigation measures to ER within 3 working days and discuss with ET and ER vi. Implement the agreed mitigation measures vii. Slow down or to stop the relevant part of construction activities as necessary 	<ol style="list-style-type: none"> i. Discuss with ET and Contractor on the proposed mitigation measures ii. Request Contractor to critically review the working methods iii. Make agreement on the mitigation measures to be implemented iv. Assess the effectiveness of the implemented mitigation measures

4.9 Water Quality Mitigation Measures

- 4.9.1 It is important to implement sufficient and effective measures to control runoff and drainage from the construction site, thus preventing high loading of suspended solid from entering the existing river section or the diverted channel. Proper site management, including defined waste management procedures, would be required for prevention of disposal of debris and rubbish into the water bodies.
- 4.9.2 The Best Management Practices (BMPs) in controlling water pollution shall be implemented during the construction phase. Soil erosion from the construction site can be minimised through good on-site management practices by implementing viable erosion control measures which should be incorporated in contract clauses. Guidance on the specific mitigation measures are provided below. The Contractor shall be responsible for the design and implementation of these measures.

Site runoff

- Exposed soil surfaces should be protected from rainfall through, for example, by covering temporarily exposed slope surfaces or stockpiles with tarpaulin and protect temporary access roads by crushed stone or gravel;
- Exposed soil areas should be minimised to reduce the potential for increased siltation and contamination of runoff;
- Minimise the time that soil surfaces are exposed;
- Slow down water run-off flowing across exposed soil surfaces;
- Channels, earth bunds or sand bag barriers should be provided on site to properly direct surface runoff through stormwater drain via sand traps to the proposed cell-single box culvert, or temporary to the existing river section leading to the twin-cell box culvert to be constructed by the private developer of the R2 site. Oil interceptors are also recommended be provided for stormwater drains near plant maintenance/ repair areas, where necessary.
- Manholes (including newly constructed ones) should be adequately covered or temporarily sealed so as to prevent slit, construction materials or debris from getting into the drainage system;
- Appropriate temporary ditches should be constructed along the western end of the Phase I land for the collection of stormwater runoff generated at the west of the work sites; runoff from the ditch should pass through sand traps before discharge;
- Appropriate temporary ditches should be provided along the southern and eastern boundary of Area 36 during the construction of the open channel to receive surface runoff generated from the south of Area 36.
- Construction works should be programmed to minimise soil excavation works where practicable during rainy conditions;
- Drainage facilities must be adequate for the controlled release of storm flows.

Wastewater from construction site

- Sewage generated from the construction workforce should be contained by chemical toilets before connection to public foul sewer can be provided. Chemical toilets should be provided at a minimum rate of about 1 per 50 workers. The facility should be serviced and cleaned by a specialist contractor at regular intervals;
- Foul water from canteens on-site should also be contained by chemical toilets before connection to public foul sewer can be provided;
- Vehicle wheel washing facilities should be provided at every site exit such that mud, debris, etc. deposited onto the vehicle wheels or body can be washed off before leaving the site area;
- Section of construction road between the wheel washing bay and the public road should be paved with backfill to reduce vehicle tracking of soil and to prevent site run-off from entering public road drains;
- bentonite slurry should be reconditioned and reused as far as practicable. Spent bentonite should be kept in a separated slurry collection system for disposal at a marine spoil grounds subject to obtaining a marine dumping licence from EPD. If used bentonite slurry is to be disposed of through public drainage system, it should be treated to meet the TM standards.

Oils and Solvents

- Spillage of fuel oils or other polluting fluids should be prevented at source. It is recommended that all stocks should be stored inside proper containers and sited on sealed areas, preferably surrounded by berms;
- Regular site inspections to ensure the proper implementation of the above measures shall be carried out.

Excavation of river sediments

- 4.9.3 Metal content analysis of rive sediment samples (Section 8.3) revealed that the section of Shek Sheung River within Area 36 is not contaminated and could therefore be left in place and consolidated under the fill during site formation. However, should it found during the detail design stage when site investigation data and laboratory analysis that the removal of river sediment is necessary for ensuring the geotechnical stability and strength of the formed land, required dredging or excavation activities are recommended to be undertaken after the diversion of the river water to the trapezoidal channel. Potential water quality impact from re-suspension of river sediment and increased SS level can thus be prevented.
- 4.9.4 An Environmental Mitigation Implementation Schedule is given in Appendix I.
- 4.9.5 The effectiveness of the above water pollution control measures shall be checked by the EM&A requirements recommended. If the above measures are not sufficient to restore the water quality to an acceptable levels upon the advice of the ET, the Contractor shall liaise with the ET on some other additional mitigation measures. The proposed additional mitigation measures shall be agreed with the ER before implementation.

Location	
Date	
Start Time (hh:mm)	
Weather	
Water Depth (m)	
Monitoring Depth (m)	
Temperature (°C)	
Turbidity (NTU)	
SS Sample Identification	
SS (mg/l)	
Observed Construction	< 100 m from location
Activities	> 100 m from location
Other Observations	

Name & DesignationSignatureDate

Recorded By : _____

Checked By : _____

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

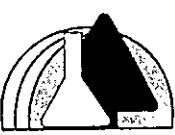
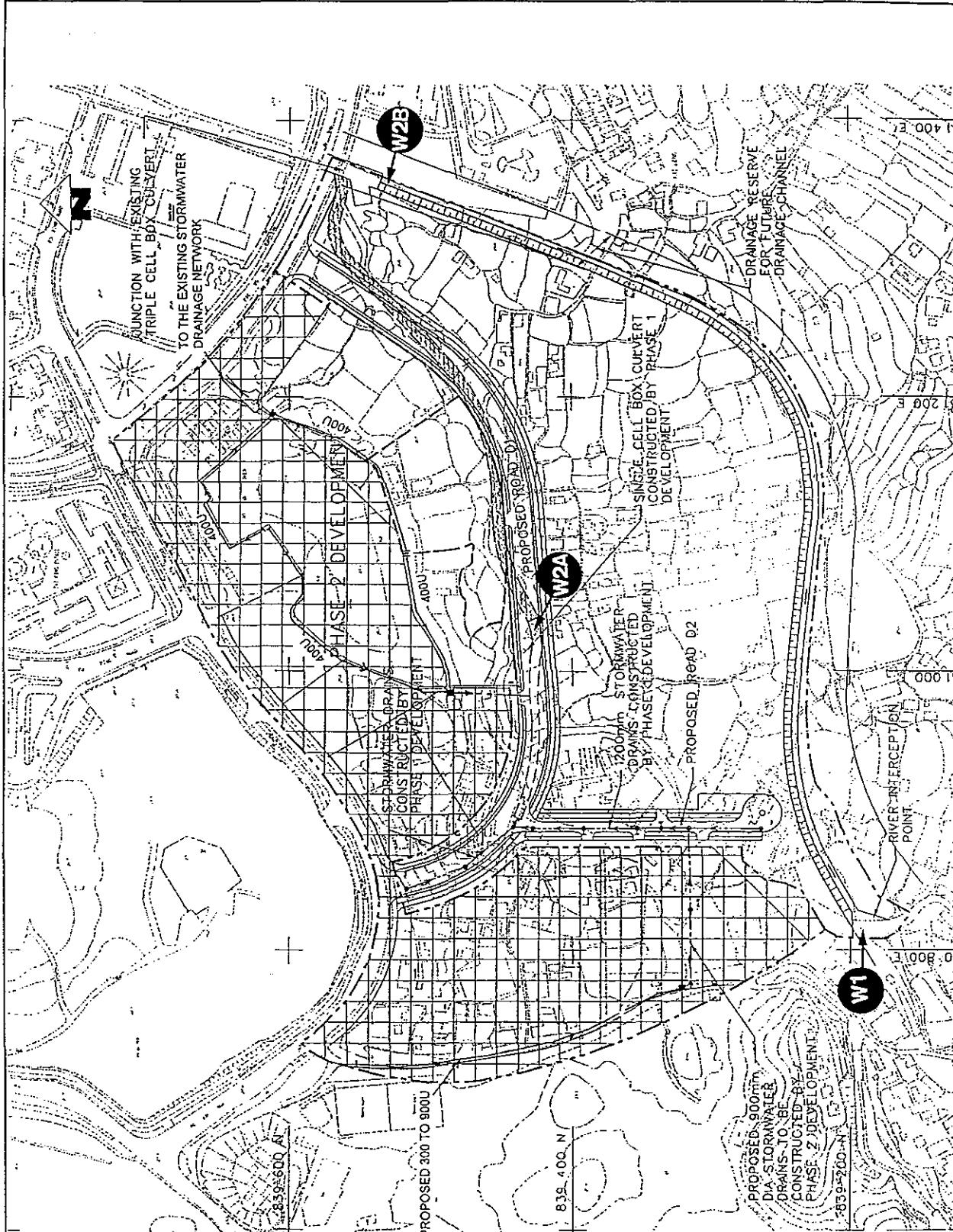
TITLE : Water Quality Monitoring Data Record Sheet		
PROJECT :	Formation and Servicing in Area 36, Fanling - Environmental Monitoring and Audit Manual	
Figure :	4-1	Scale : NTS
		EHS Consultants Limited

Figure : 4-2

Scale : NTS



TITLE : Proposed Locations of the Control and Monitoring Stations

PROJECT : Formation and Servicing in Area 36, Fanling - Environmental Monitoring and Audit Manual

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5. WASTE MANAGEMENT

- 5.1.1 The Contractor is responsible for waste control within the construction site, removal of the waste material produced from the site and to implement any mitigation measures to minimise waste or redress problems arising from the waste from the site. The waste material may include any sewage, waste water or effluent containing sand, cement, silt or any other suspended or dissolved material to flow from the site onto any adjoining land, storm water, sanitary sewer, or any waste matter or refuse to be deposited anywhere the site or onto any adjoining land.
- 5.1.2 The overall construction waste management strategy involves minimisation of waste generation, coupled with maximum reuse and recycling of construction materials, where practicable. Contract requirements should include the responsibilities of the Contractor for waste collection and disposal. The following measures are recommended for handling waste material during the construction phase of the Project.

Site Clearance

- 5.1.3 Site clearance waste includes debris of demolished building structures, packaging materials, wooden boards, plastics, glass, etc. Waste materials should be separated where practicable into two main portions : "inert materials" and "non-inert materials". Inert materials include soil, rock, concrete, brick, cement plaster/ mortar, inert building debris, aggregates and asphalt, whereas non-inert materials refer to timber, paper, glass junk, general refuse and other organic, etc.
- 5.1.4 The inert materials that comply with the conditions as set out in public dumping licence should be delivered to public filling areas. Construction waste with only a small amount of inert materials (not more 20% by volume) will be allowed for disposal at landfills.

Excavated Material

- 5.1.5 Excavated soil should be kept separated, where practicable, from non-inert wastes including refuse and transferred to public filling areas. A small quantity of excavated soil can also be retained on-site for subsequent landscaping works in the Project where practicable.
- 5.1.6 The results of the sediment quality analysis indicated that the sediment of Shek Sheung River is Class A uncontaminated material. Site formation works therefore do not require the river sediment to be removed. However, should site investigation data to be obtained during a later stage of works indicate that removal of the river sediment is required for ensuring the geotechnical stability and strength of the formed land, the uncontaminated river sediments should be :
- delivered to public filling areas - if particle size analysis indicates that the sediment is sandy material suitable for filling purpose; or
 - disposed to landfill - if (i) is not a feasible option.

Concrete

- 5.1.7 Waste concrete generated from construction activities can be crushed where practicable on-site and directly used as fill material for the project or transported to public filling areas. Separation of the inert concrete material from other waste types is essential.

Wooden Materials

- 5.1.8 All wooden materials used in work sites should be kept separated where practicable from other wastes. Wooden boards can be reused on site, though the reusability and quantity of final waste depends on the shape and quality of the boards. Timber which cannot be reused again shall be sorted and stored separately from all inert waste before disposed of in landfill. On-site incineration of wooden waste is prohibited unless a permit is granted from EPD. Arrangement could be made for private contractors to collect used formwork materials for local reuse in other sites.

Site Fencing

- 5.1.9 The types of construction material to be used for hoarding is important. Metal fencing or building panels, compared with wooden panels, are more durable and are recommended to be used whenever practicable. Wooden board used in site fencing shall also be reused in other construction sites as far as practicable.

Chemical Waste Arising

- 5.1.10 The Project will involve the use of various powered mechanical equipment on site. Chemical wastes such as fuel, oil, lubricants, cleaning fluids, and solvents could be generated from leakage or maintenance of these mechanical equipment or vehicles.
- 5.1.11 Chemical waste generated shall be recycled on-site where practicable. If off-site disposal is required, it should be collected and delivered by licensed contractors to the Tsing Yi Chemical Waste Treatment Facility and be disposed of in strict accordance with the Waste Disposal (Chemical Waste) (General) Regulation. Contractors shall register with EPD as Chemical Waste Producers when disposal of chemical waste is required. Chemical waste materials have to be stored on-site with suitable containers so that leakage or spillage are prevent during handling, storage and transportation.

Workforce Waste

- 5.1.12 Throughout the construction phase, the workforce on site will generate general refuse, comprising food scraps, paper and empty containers, etc. In addition to the refuse, human waste will require suitable disposal. A sewerage system or septic tanks shall be provided on-site to collect human waste. Sludge shall be removed regularly by a hygiene service company to a suitable landfill site, subject to the meeting of the acceptance criteria (e.g. dry solid content) of the sludge for landfilling. Besides, on-site refuse collection points shall be provided and collected regularly by private waste collectors for disposal at landfill.
- 5.1.13 An Environmental Mitigation Implementation Schedule is presented in Appendix I.
- 5.1.14 The Contractor shall pay attention to the Waste Disposal Ordinance, the Dumping at Sea Ordinance, the Public Health and Municipal Services Ordinance and the Water Pollution Control Ordinance, and carry out the appropriate waste management work. The relevant licence/permit, such as the effluent discharge licence, the chemical waste producer registration, etc. shall be obtained. The Contractor shall refer to the relevant booklets issued by EPD when applying for the licence/permit.
- 5.1.15 During the site inspections and the document review procedures as mentioned in Sections 7.1 and 7.2 of this manual, the ET shall pay special attention to the issues relating to waste management, and check whether the Contractor has followed the relevant contract specifications and the procedures specified under the laws of Hong Kong.

6. ECOLOGICAL AND VISUAL ASPECTS

6.1 Introduction

6.1.1 The recommended ecological and visual mitigation measures have been incorporated into the design of the Project. The Contractor is responsible for the implementation of these recommended mitigation measures during the construction phase of the Project. The implementation of the ecological and visual mitigation measures shall form part of the ET's site inspection and environmental audit process.

6.2 Ecological Mitigation Measures

Protection of Green Belt Woodland

6.2.1 The portion of the woodland south of Ng Uk Tsuen that lies within the Green Belt zone is not to be affected by the Project. Disturbance to the Green Belt woodland should be prevented through strict control of construction activities. Site workers must be informed by the Environmental Team or the contractor of the need to prevent damage to this woodland and to trees and woodlands outside the works areas.

6.2.2 A barrier, e.g. fencing, should be constructed around the part of the Green Belt woodland adjacent to active works areas, and existing barriers around the woodland should be maintained. Use of a barrier is intended to prevent worker access to the woodland, reduce fire risk, and prevent dumping of fill or construction waste. At the same time, access to the woodland for local residents and grave tenders must be preserved.

6.2.3 Uncontrolled open fires should be prohibited within the works site, and the use of fire on the site should be minimised. Fire fighting equipment must be installed within the works areas. No burning should be allowed within 50 m of the woodland, in order to prevent potential damage to the trees.

Revegetation

6.2.4 *Roadside planting* : Trees and shrubs used in new roadside planting at Area 36 should be native species of documented use to birds and other wildlife, as far as practicable. Table 6-1 lists species recommended for use. Other native species known to be useful to wildlife will also be acceptable. Types of native species selected for roadside planting shall be proposed by the Contractor and agreed by the ER.

Table 6-1 Native Species Recommended for Use in Roadside Planting at Area 36

Latin Name	Common Name	Habit
<i>Bischofia javanica</i>	Autumn Maple	Tree
<i>Cinnamomum camphora</i>	Camphor Tree	Tree
<i>Sapium sebiferum</i>	Tallow-tree	Tree
<i>Psychotria rubra</i>	Wild Coffee	Shrub
<i>Rhaphiolepis indica</i>	Hongkong Hawthorn	Shrub
<i>Rhodomyrtus tomentosa</i>	Rose Myrtle	Shrub

- 6.2.5 *Channelside planting* : Following completion of channel construction, an area of natural soil should be established along both sides of the channel where riparian (channel-side) vegetation will be planted. Topsoil from the existing site should be stockpiled for this use where practicable. Topsoil in storage should be protected from erosion with plastic sheeting.
- 6.2.6 Plantings on both banks of the open channel should consist of trees, grasses and shrubs. Native species of trees and shrubs should be used as far as possible. Preference should be given to species which are known to be used by native species of wildlife including birds, bats, and butterflies and to wide-canopy trees which will provide shade over the river. Candidate tree species are listed in Table 6-2. To enhance survival, preference may be given to hardy pioneer species such as *Macaranga tanarius*, *Mallotus paniculatus* and *Sapium* spp.

Table 6-2 Tree Species for Use in Channel-side Planting, Area 36

Latin Name	Common Name
<i>Celtis sinensis</i>	Chinese Hackberry
<i>Cinnamomum camphora</i>	Camphor Tree
<i>Ficus microcarpa</i>	Chinese Banyan
<i>Ficus variegata</i>	Common Red-stem Fig
<i>Ficus virens</i> var. <i>sub lanceolata</i>	Big-leaved Fig
<i>Macaranga tanarius</i>	Elephant's Ear
<i>Mallotus paniculatus</i>	Turn-in-the-wind
<i>Sapium discolor</i>	Mountain Tallow
<i>Sapium sebiferum</i>	Tallow-Tree
<i>Schefflera octophylla</i>	Ivy Tree
<i>Sterculia lanceolata</i>	Scarlet Sterculia
	Bamboo

- 6.2.7 Types of tree and shrub species to be used in channelside planting shall be proposed by the Landscape Sub-contractor and agreed by the ER. A reliable supply of the needed trees and shrubs should be secured at the earliest possible date, as some native species may take somewhat longer to procure.

Others

- 6.2.8 Downstream watercourses should be protected from sedimentation and pollution through the use of Best Management Practices as described in Section 4.9 - *Water Quality Mitigation Measures*.
- 6.2.9 Nests and eggs of wild birds are protected under the Wild Animals Protection Ordinance and felling of any tree containing a bird nest, or other taking of nests or eggs, requires approval from the Director of Agriculture and Fisheries (DAF). The contractor for tree felling must apply to DAF for permission to take any nests located in trees scheduled to be felled.

6.3 Visual Mitigation Measures

- 6.3.1 The Contractor shall undertake the following mitigation measures during the duration of the construction works to alleviate both transient and long-term visual impacts from the Project on nearby visual sensitive receivers (VSRs).
- ◊ erection of a hoarding along Pak Wo Road and Po Kin Road to screen the construction works from VSRs. The hoarding shall be sympathetically designed to integrate with the existing visual context of the surrounding landscape;
 - ◊ prevent disturbance to the existing site woodland within the Green Belt zone;
 - ◊ use of sympathetic materials for hard landscaping;
 - ◊ planting of riparian tree and shrub species alongside the Shek Sheung River Diversion to reduce the visual impact and improve the visual amenity of the area;
 - ◊ tree and shrub planting in all amenity strips alongside the new roads.
- 6.3.2 An Environmental Mitigation Implementation Schedule, which included the recommended ecological and visual mitigation measures, is presented in Appendix I.
- 6.3.3 During the ET's site inspections and document review procedures as mentioned in Sections 7.1 and 7.2 of the manual, particular attention shall be given to issues relating to the ecological and visual impacts caused by the Project. The ET shall check whether the Contractor has followed the relevant contractual ecological and visual mitigation measures, as well as relevant environmental laws in Hong Kong.

7. SITE ENVIRONMENTAL AUDIT

7.1 Site Inspections under the EM&A Works

- 7.1.1 Site Inspections provide a direct means to trigger and enforce the specified environmental protection and pollution control measures. They shall be undertaken routinely to inspect the construction activities in order to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented by the Contractor. With well defined pollution control and mitigation specifications and a well established site inspection, deficiency and action reporting system, the site inspection is one of the most effective tools to enforce the environmental protection requirements on the construction site.
- 7.1.2 The ET is responsible for formulation of the environmental site inspection, deficiency and action reporting system, and for carrying out the site inspections under the EM&A works. He shall submit a proposal on the site inspection, deficiency and action reporting procedures within 21 days of the construction contract commencement to the Contractor for agreement and to the ER for approval. A preliminary site inspection, deficiency and action reporting system in form of a flow chart is prepared for reference. This is shown in Figure 7-1 for review and refinement by the ET at the commencement of the Project.
- 7.1.3 Regular site inspections shall be carried out at least once per week. The areas of inspection shall not be limited to the environmental situation, pollution control and mitigation measures within the site; it should also review the environmental situation outside the site area which is likely to be affected, directly or indirectly, by the site activities. The ET shall make reference to the following information in conducting the inspection:
- a) the EIA recommendations on environmental protection and pollution control mitigation measures with regard to air quality, noise, water quality, ecological and visual impacts and waste management;
 - b) works progress and programme;
 - c) individual works methodology proposals (which shall include proposal on associated pollution control measures);
 - d) the contract specifications on environmental protection;
 - e) the relevant environmental protection and pollution control laws; and
 - f) previous site inspection results.
- 7.1.4 Monitoring of the effectiveness of the ecological, visual, and construction waste mitigation measures recommended in the EIA is not considered necessary and has not been proposed. The satisfactory implementation of these mitigation measures however shall be checked during the ET's regular site inspections during the relevant phases of construction works.
- 7.1.5 The ET should monitor the fringes of the Green Belt woodland as part of the site inspection areas. Regular audits should take the form of visual inspection to check that existing barriers around the woodland have been maintained, new barriers have been set up as necessary between the Green Belt and active works areas, and the woods inside the Green Belt are unaffected by construction-related activities.
- 7.1.6 The Contractor shall update with the ET all relevant information of the construction contract for him to carry out the site inspections. The inspection results and its associated recommendations on improvements to the environmental protection and pollution control works shall be submitted to the ER and the Contractor within 24 hours, for reference and for taking immediate action. The Contractor shall follow the procedures and time-frame as stipulated in the environmental site inspection, deficiency and action reporting system formulated by the ET to report on any remedial measures subsequent to the site inspections.
- 7.1.7 Ad hoc site inspections shall also be carried out if significant environmental problems are identified. Inspections may also be required subsequent to receipt of an environmental

complaint, or as part of the investigation work, as specified in the Action Plan for environmental monitoring and audit.

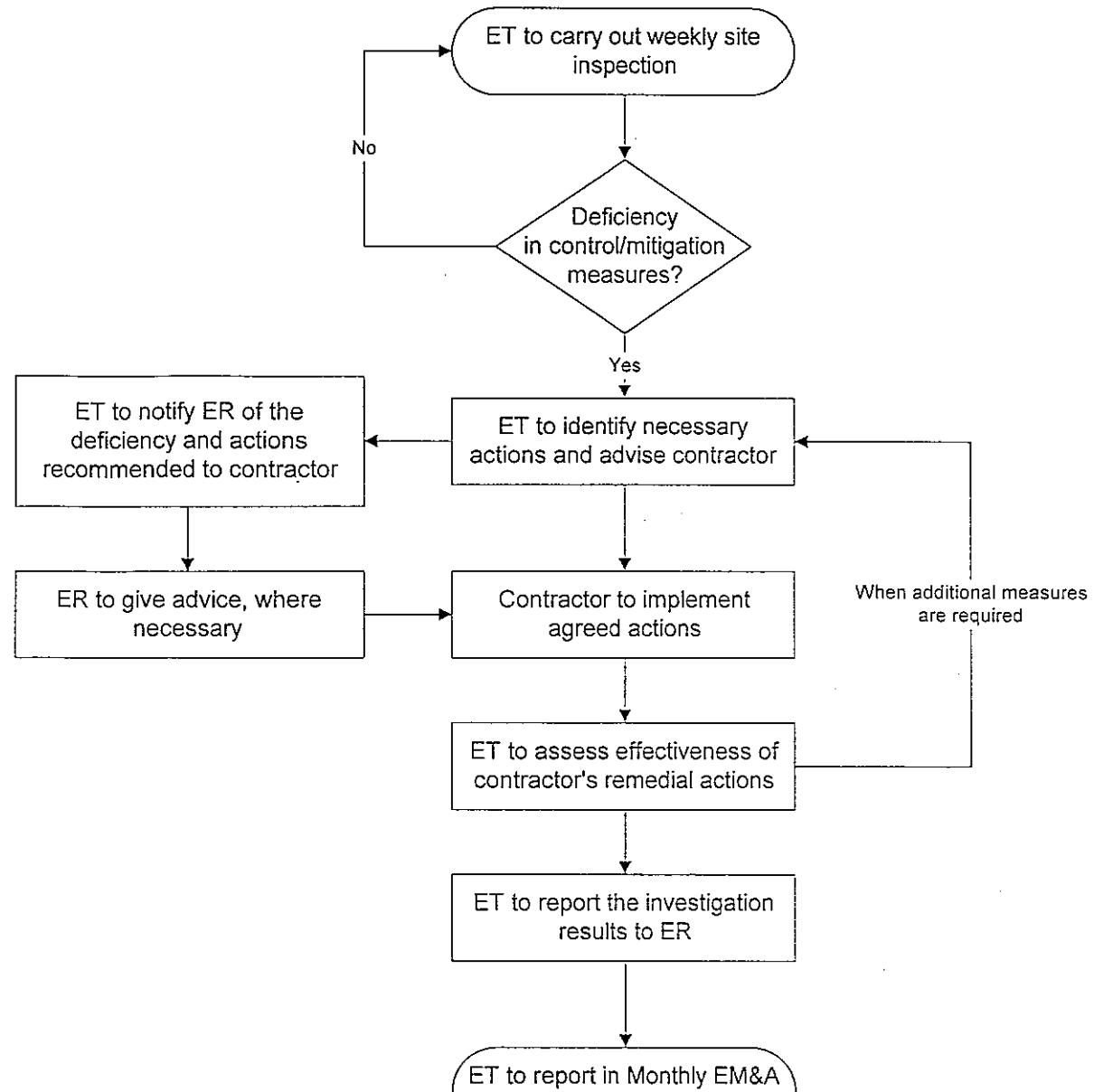
7.2 Compliance with Legal and Contractual Requirements

- 7.2.1 There are contractual environmental protection and pollution control requirements as well as environmental protection and pollution control laws in Hong Kong which the construction activities shall comply with.
- 7.2.2 The ET shall review the progress and programme of the works to check that relevant environmental laws have not been violated, and that any foreseeable potential for violating the laws can be prevented.
- 7.2.3 The Contractor shall regularly copy relevant documents to the ET so that the checking work can be carried out. The document shall at least include the updated Work Progress Reports, the updated Works Programme, the application letters for different licence/permits under the environmental protection laws, and all the valid licence/permit. The site diary shall also be available for the ET's inspection upon his request.
- 7.2.4 After reviewing the document, the ET shall advise the ER and the Contractor of any non-compliance with the contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the ET's review concludes that the current status on licence/permit application and any environmental protection and pollution control preparation works may not cope with the works programme or may result in potential violation of environmental protection and pollution control requirements by the works in due course, he shall also advise the Contractor and the ER accordingly.
- 7.2.5 Upon receipt of the advice, the Contractor shall undertake immediate action to remedy the situation. The ER shall check that appropriate action has been taken by the Contractor in order that the environmental protection and pollution control requirements are fulfilled.

7.3 Environmental Complaints

- 7.3.1 Complaints received on environmental issues shall be referred to the ER who shall notify the ET for carrying out complaint investigation procedures. The ET shall undertake the steps given below in a) to i) upon receipt of the complaints. The complaint investigation procedures are also presented in form of a flow chart in Figure 7-2 for easy reference.
 - a) log complaint and date of receipt onto the complaint database;
 - b) investigate the complaint to determine its validity, and to assess whether the source of the problem is due to works activities;
 - c) if a complaint is valid and due to works, identify mitigation measures;
 - d) if mitigation measures are required, advise the Contractor accordingly;
 - e) review the Contractor's response on the identified mitigation measures, and the updated situation;
 - f) if the complaint is transferred from EPD, submit interim report to EPD on status of the complaint investigation and follow-up action within the time frame assigned by EPD;
 - g) undertake additional monitoring and audit to verify the situation if necessary, and review that any valid reason for complaint does not recur;
 - h) report the investigation results and the subsequent actions to the source of complaint for responding to complainant (If the source of complaint is EPD, the results should be reported within the time frame assigned by EPD); and

- i) record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports.
- 7.3.2 The ER shall notify the project proponent of any complaints received and keep him well informed of the actions being taken to settle these complaints.
- 7.3.3 During the complaint investigation work, the Contractor shall co-operate with the ET in providing all the necessary information and assistance for completion of the investigation. If mitigation measures are identified in the investigation, the Contractor shall promptly carry out the mitigation. The ER shall check that the measures have been carried out by the Contractor.



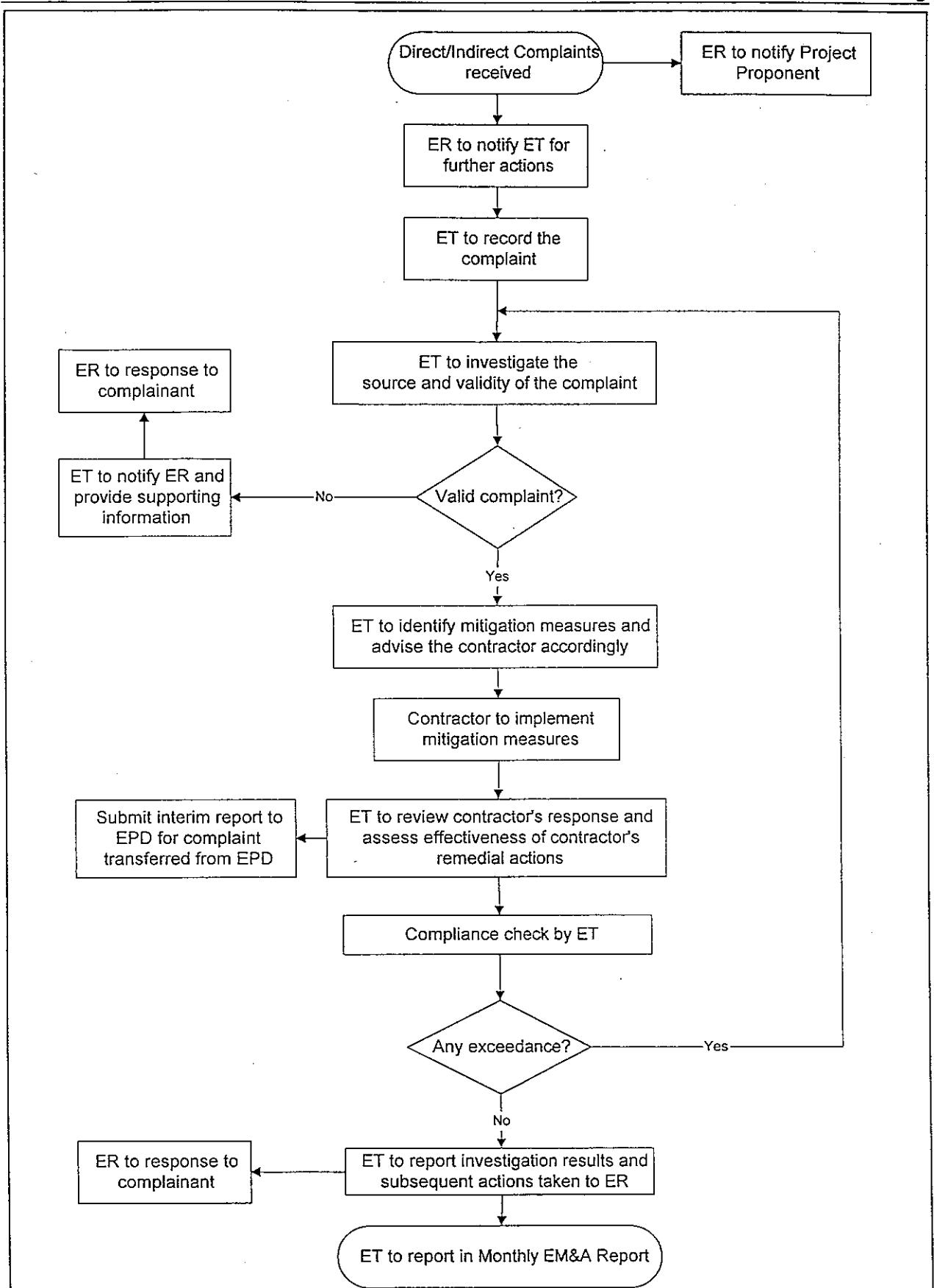
TITLE : Preliminary Site Inspection, Deficiency and Action Reporting System

PROJECT : Formation and Servicing in Area 36, Fanling - Environmental Monitoring and Audit Manual

Figure : 7-1 **Scale :** NTS



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TITLE : Complaint - Response Procedures

PROJECT : Formation and Servicing in Area 36, Fanling - Environmental Monitoring and Audit Manual

Figure : 7-2

Scale : NTS



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8. REPORTING

8.1 General

8.1.1 The following reporting requirements based upon a paper documented approach. However, the same information can be provided in an electronic medium upon agreeing the format with the EPD. This would enable a transition from a paper/historic and reactive approach to an electronic/real time proactive approach.

8.2 Baseline Monitoring Report

8.2.1 The ET shall prepare and submit a Baseline Environmental Monitoring Report within 10 working days of completion of the baseline monitoring. Copies of the Baseline Environmental Monitoring Report shall be submitted to each of the four parties : the Contractor, the ER, EPD and TDD. The ET shall liaise with the relevant parties on the exact number of copies they want. The format of the report and the format of the baseline monitoring data in magnetic media to be submitted to EPD shall be agreed with EPD.

8.2.2 The baseline monitoring report shall include at least the following:

- a) up to half a page executive summary;
- b) brief project background information;
- c) drawings showing locations of the baseline monitoring stations;
- d) monitoring results (in both hard and diskette copies) together with the following information:
 - monitoring methodology;
 - equipment used and calibration details;
 - parameters monitored;
 - monitoring locations (and depth);
 - monitoring date, time, frequency and duration;
- e) details on influencing factors, including:
 - major activities, if any, being carried out on the site during the period;
 - weather conditions during the period;
 - other factors which might affect the results;
- f) determination of the Action and Limit Levels for each monitoring parameter and statistical analysis of the baseline data;
- g) revisions for inclusion in the EM&A Manual; and
- h) comments and conclusions.

8.3 Monthly EM&A Reports

8.3.1 The results and findings of all EM&A work required in the Manual shall be recorded and submitted to the ET. Based on these information a monthly EM&A reports shall be prepared by the ET. The EM&A report shall be prepared and submitted to EPD within 10 working days of the end of each reporting month, with the first report due in the month after construction commences. A maximum of 4 copies of each monthly EM&A report shall be submitted to each of the four parties : the Contractor, the ER, EPD and TDD. Before submission of the first

- EM&A report, the ET shall liaise with the parties on the exact number of copies and format of the monthly reports in both hard copy and electronic medium required.
- 8.3.2 The ET shall review the number and location of monitoring stations and parameters to monitor every 6 months or on as needed basis in order to cater for the changes in surrounding environment and nature of works in progress.
- 8.4 First Monthly EM&A Report**
- 8.4.1 The first monthly EM&A report shall include at least the following :
- a) 1-2 pages executive summary;
 - b) basic project information including a synopsis of the project organisation, programme and management structure, and the work undertaken during the month;
 - c) a brief summary of EM&A requirements including:
 - all monitoring parameters;
 - environmental quality performance limits (Action and Limit levels);
 - event-Action Plans;
 - environmental mitigation measures, as recommended in the project EIA study final report;
 - environmental requirements in contract documents;
 - d) advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA study report, summarised in the updated implementation schedule;
 - e) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
 - f) monitoring results (in both hard and diskette copies) together with the following information;
 - monitoring methodology
 - equipment used and calibration details
 - parameters monitored
 - monitoring locations (and depth)
 - monitoring date, time, frequency, and duration;
 - g) graphical plots of trends of monitored parameters over the past four reporting periods for representative monitoring stations annotated against the following:
 - major activities being carried out on site during the period;
 - weather conditions during the period; and
 - any other factors which might affect the monitoring results;
 - h) advice on the solid and liquid waste management status;
 - i) a summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
 - j) a review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;
 - k) a description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance;

- i) a summary record of all complaints received (written or verbal) for each media, including locations and nature of complaints, liaison and consultation undertaken, actions and follow-up procedures taken and summary of complaints; and
- m) an account of the future key issues as reviewed from the works programme and work method statements.

8.5 Subsequent EM&A Reports

8.5.1 The subsequent monthly EM&A reports shall include the following :

- a) Title Page
- b) Executive Summary (1-2 pages)
 - Breaches of AL levels
 - Complaint Log
 - Reporting Changes
 - Future key issues
- c) Contents Page
- d) Environmental Status
 - Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations
 - Summary of non-compliance with the environmental quality performance limits
 - Summary of complaints
 - Environmental Issues and Actions
 - Review issues carried forward and any follow-up procedures related to earlier non-compliance (complaints and deficiencies)
 - Description of the actions taken in the event of non-compliance and deficiency reporting
 - Recommendations (should be specific and target the appropriate party for action)
 - Implementation status of the mitigation measures and the corresponding effectiveness of the measures
- e) Future Key Issues
- f) Appendix
 - AL levels
 - Graphical plots of trends of monitored parameters at key stations over the past four reporting periods for representative monitoring stations annotated against the following:
 - major activities being carried out on site during the period;
 - weather conditions during the period; and
 - any other factors which might affect the monitoring results
 - Monitoring schedule for the present and next reporting period
 - Cumulative complaints statistics
 - Details of complaints, outstanding issues and deficiencies

8.6 Quarterly EM&A Summary Reports

- 8.6.1 The quarterly EM&A summary report which should generally be around 5 pages (including about 3 of text and tables and 2 of figures) should contain at least the following information:
- a) up to half a page executive summary;
 - b) basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of work undertaken during the quarter;
 - c) a brief summary of EM&A requirements including:
 - monitoring parameters;
 - environmental quality performance limits (Action and Limit levels); and
 - environmental mitigation measures, as recommended in the project EIA study final report;
 - d) advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA study report, summarised in the updated implementation schedule;
 - e) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
 - f) graphical plots of the trends of monitored parameters over the past 4 months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against;
 - the major activities being carried out on site during the period;
 - weather conditions during the period; and
 - any other factors which might affect the monitoring results;
 - g) advice on the solid and liquid waste management status;
 - h) a summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
 - i) a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;
 - j) a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;
 - k) a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
 - l) comments (e.g. effectiveness and efficiency of the mitigation measures), recommendations (e.g. any improvement in the EM&A programme) and conclusions for the quarter; and
 - m) proponents' contacts and any hotline telephone number for the public to make enquiries.

8.7 Forms to be Adopted

8.7.1 To facilitate the management of the EM&A programme for the construction works, the record forms presented in Appendix II (including those presented in Figures 2-1, 3-1, 4-1 and 8-1) should be adopted where applicable during the construction phase of the Project. These forms are listed as follows :

- Implementation Schedule;
- Implementation Status Proforma;
- Data Recovery Schedule;
- Site Inspection Proforma;
- Proactive Environmental Protection Proforma;
- Regulatory Compliance Proforma;
- Compliant Log;
- Sample Template for Interim Notifications of Environmental Quality;
- Limits Exceedances;
- Data Sheet for TSP Monitoring;
- Noise Monitoring Field Record Sheet;
- Water Quality Monitoring Data Record Sheet;
- Data Format for Water Quality Monitoring.

8.8 Data Keeping

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

8.9 Interim Notifications of Environmental Quality Limit Exceedances

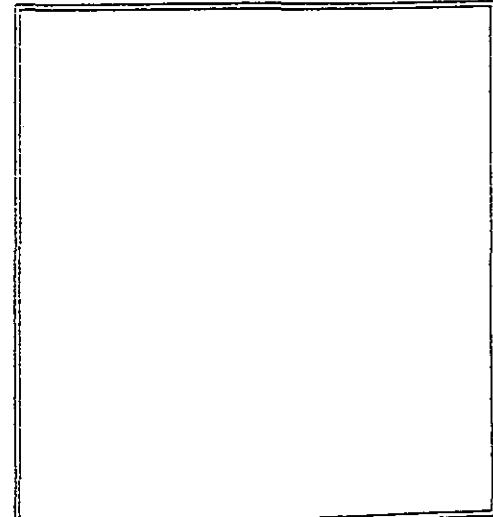
8.9.1 With reference to Event/Action Plans in previous sections, when the environmental quality limits are exceeded, the ET shall immediately notify the ER & EPD, as appropriate. The notification shall be followed up with advice to EPD on the results of the investigation, proposed action and success of the action taken, with any necessary follow-up proposals. A sample template for the interim notifications is shown in Figure 8-1.

Incident Report on Action Level or Limit Level Non-compliance

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

Location Plan

Prepared by : _____



Designation : _____

Signature : _____

Date : _____

TITLE : Sample Template for Interim Notifications of Environmental Quality Limits Exceedances	
PROJECT : Formation and Servicing in Area 36, Fanling - Environmental Monitoring and Audit Manual	
Figure : 8-1	Scale : NTS

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APPENDIX I

Environmental Mitigation Implementation Schedule

Location	Mitigation Measures recommended in the EIA	Responsibility	Timing
Work areas	Dust suppression measures (see Para. 2.8.1 on Page 13)	Contractor	During construction activities
Work areas	Noise mitigation measures (see Section 3.7 on Pages 18-20)	Contractor	During construction activities
Work areas (esp. near the existing/ diverted Shek Sheung River)	Best Management Practices of Water pollution control measures (see Section 4.9 on Pages 29-30)	Contractor	During the construction period
Work areas	Waste Management (See Section 5 on Pages 33-35)	Contractor	During demolition and construction works
Green Belt woodland	Barriers between the Green Belt and the work areas (see Para. 6.2.2 on Page 36)	Contractor	During Phase 2 construction works
Roadside areas in Area 36	Native tree and shrub planting (see Para. 6.2.4 on Page 36)	Contractor	Following completion of road works
New Channel	Native tree and shrub planting (see Para. 6.2.5 - 6.2.6 on Page 37)	Contractor	Following completion of channel construction
Site boundary alongside Pak Wo Road and Po Kin Road	Erection of hoarding (see Section 6.3 on Page 38)	Contractor	During Phases 1 and 2 construction works
Work areas	Use of sympathetic materials for hard landscaping (see Section 6.3 on Page 38)	Contractor	During landscaping works

APPENDIX II

Forms to be adopted during the construction phase of the Project

IMPLEMENTATION SCHEDULE

EIA Ref	EM&A Log Ref	Environmental Protection Measures*	Location/ Timing	Implementation Agent	Implementation Stages**			
					Des	C	O	Dec
R1622.97	R2141-2.98	Dust suppression measures (please refers to Para. 2.8.1 on Page 13 of the EM&A Manual for details)	Work areas/ during construction activities	Contractor				
		Noise mitigation measures (please refers to Section 3.7 on Pages 18-20 of the EM&A Manual for details)	Work areas/ during construction activities	Contractor				
		Best Management Practices of Water pollution control measures (please refers to Section 4.9 on Pages 29-30 of the EM&A Manual for details)	Work areas (esp. near the existing or diverted Shek Sheung River)/ during the construction period	Contractor				
		Waste Management (please refers to Section 5 on Pages 33-35 of the EM&A Manual for details)	Work areas/ during demolition and construction works	Contractor				
		Barriers between the Green Belt and the work areas (please refers to Para. 6.2.2 on Page 36 of the EM&A Manual for details)	Green Belt woodland/ during Phase 2 construction works	Contractor				
		Native tree and shrub planting (please refers to Para. 6.2.4 on Page 36 of the EM&A Manual for details)	Roadside areas in Area 36/ following completion of road works	Contractor				
		Native tree and shrub planting (please refers to Para. 6.2.5 - 6.2.6 on Page 37 of the EM&A Manual for details)	New channel/ following completion of channel construction	Contractor				
		Erection of hoarding (please refers to Section 6.3 on Page 38 of the EM&A Manual for details)	Site boundary alongside Pak Wo Road and Po Kin Road/ during phases 1 and 2 construction works	Contractor				
		Use of sympathetic materials for hard landscaping (please refers to Section 6.3 on Page 38 of the EM&A Manual for details)	Work areas/ during landscaping works	Contractor				

* All recommendations and requirements resulted during the course of EIA/EA Process, including ACE and/or accepted public comment to the proposed project.

** Des = Design, C = Construction, O = Operation, Dec = Decommissioning

Signed by Project Proponent: _____

Date: _____

IMPLEMENTATION STATUS PROFORMA

Ref: _____

Ref**	Environmental Protection Measures*	Implementation Status

* All recommended and requirements resulted during the Course of EIA/EA Process, including ACE and/or accepted public comment to the proposed project

** EIA Ref/EM&A Log Ref/Design Document Ref

Signed by Environmental Team Leader: _____

Date: _____

Audited by Independent Checker (Environment): _____

Date: _____

DATA RECOVERY SCHEDULE

Ref: _____

Date	Air Quality Monitoring					Noise Monitoring					Water Quality Monitoring				
	Monitoring Station *					Monitoring Location*					Monitoring Location*				
	A1	A2	A3	A4	A5	N1	N2	N3	N4	N5	W1	W2	W3	W4	W5
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
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17															
18															
19															
20															
21															
22															
23															
24															
25															
26															
27															
28															
29															
30															
31															
% or R															

* Remark type of parameters

% of R The percentage of Data Recovery is the actual monitoring over the scheduled monitoring

Signed by Environmental Team Leader: _____

Date: _____

Copy to Independent Checker (Environment)

SITE INSPECTION PROFORMA

Ref: _____

Date	Location	Req't Ref.*	Observation/Deficiency	Mitigation Action** (Responsible Agency)	Date*** of Confirmation

* EIA Ref/EM&A Log Ref/Design Document Ref/Environmental Protection Contract Clause

** Specific Environmental Mitigation Measures should be stated, such as, equipment, processes, systems, practices or technologies.

*** The required completion date to confirm the specified Environmental Protection Action

This Proforma is an Environmental Protection Instruction for: _____ on _____

Signed by Environmental Team Leader: _____ Date: _____

Copy to Independent Checker (Environment)

PROACTIVE ENVIRONMENTAL PROTECTION PROFORMA

Ref: _____

Ref*	Proposed Construction Method**	Location / Working Period	Anticipated Impacts	Recommended Mitigation Measures

* EIA Ref/EM&A Log Ref/Design Document Ref

** Details of equipment, vehicles, plants, processes, technologies for the option of construction method

Reviewed by Environmental Team Leader: _____

Date: _____

Approved by Independent Checker (Environment): _____

Date: _____

REGULATORY COMPLIANCE PROFORMA

Ref: _____

Ref**	Environmental License/Permit*	Control Area/Facility/Location	Effective Date

* Name of Applicant, Business Corporation, relevant regulation and remark of license/permit conditions

** File reference of the licensee/permittee

Recorded by Environmental Team Leader: _____

Date: _____

Signed by Independent Checker (Environment): _____

Date: _____

COMPLAINT LOG

Ref: _____

Log Ref	Date/Location	Complainant/ Date of Contact	Details of Complaint	Investigation/Mitigation Action	File Closed

Filed by Environmental Team Leader: _____

Date: _____

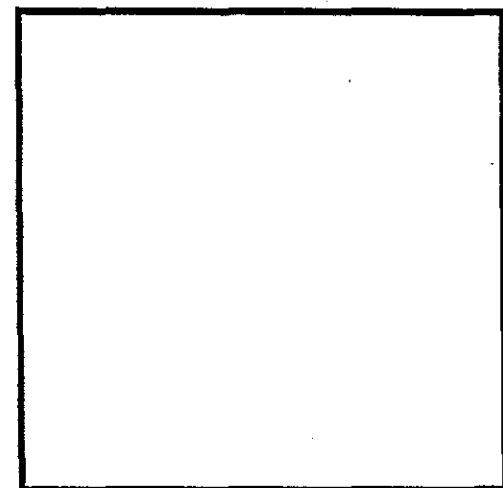
Sample Template for Interim Notifications of Environmental Quality Limits Exceedances

Incident Report on Action Level or Limit Level Non-compliance

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

Location Plan

Prepared by: _____



Designation: _____

Signature: _____

Date: _____

Data Sheet for TSP Monitoring

Monitoring Location		
Details of Location		
Sampler Identification		
Date & Time of Sampling		
Elapsed-time	Start (min.)	
Meter Reading	Stop (min.)	
Total Sampling Time (min.)		
Weather Conditions		
Site Conditions		
Initial Flow	Pi (mmHg)	
	Ti (°C)	
	Hi (in.)	
	Qsi (Std. m ³)	
Final Flow	Pf (mmHg)	
	Tf (°C)	
	Hf (in.)	
	Qsf (Std. m ³)	
Average Flow Rate	(Std. m ³)	
Total Volume	(Std. m ³)	
Filter Identification No.		
Initial Wt. of Filter	(g)	
Final Wt. of Filter	(g)	
Measured TSP Level	($\mu\text{g}/\text{m}^3$)	

Name & Designation

Signature

Date

Field Operator : _____

Laboratory Staff : _____

Checked by : _____

Noise Monitoring Field Record Sheet

Monitoring Location		
Description of Location		
Date of Monitoring		
Measurement Start Time (hh:mm)		
Measurement Time Length (min.)		
Noise Meter Model/Identification		
Calibrator Model/Identification		
Measurement Results	L_{90} (dB(A))	
	L_{10} (dB(A))	
	L_{eq} (dB(A))	
Major Construction Noise Source(s) During Monitoring		
Other Noise Source(s) During Monitoring		
Remarks		

Name & Designation

Signature

Date

Recorded By : _____

Checked By : _____

Water Quality Monitoring Data Record Sheet

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

Name & Designation

Signature

Date

Recorded By : _____

Checked By : _____

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

Data format for water quality monitoring

- A. The data base structure for water quality monitoring is listed below. The ET shall select the related field names to create their own data recording sheet.

Field Name	Type	Width	Dec	Remark
Project/contract ID	C	3		Given by EPD
Work Area ID	C	2		Given by EPD
Sam Stn	C	3		Sampling Station
Latitude	C	10		Latitude of Sampling Station
Longitude	C	10		Longitude of Sampling Station
Easting	C	6		HK Grid (Easting) of Sampling Station
Northing	C	6		HK Grid (Northing) of Sampling Station
Date	D	8		Sampling Date
Time	C	5		Sampling Time
Replicate	C	1		1 = first sample; 2 = duplicated sample; etc
Stn Purpose	C	1		Purpose of Sampling Station (C = control; I = Impact; S = Sensitive receiver; etc)
Sam Purpose	C	1		Purpose of Sample (B = baseline; I = Impact)
Weather	C	20		(sunshine, precipitation, humidity, air temperature)
Tide Status	C	10		Tidal Status (e.g. mid-ebb; mid-flood)
Water Depth	N	4	1	Depth of water column in meter
Sam DepthM	N	4	1	Depth of sample taken in meter
Sam Depth	C	1		Depth of sample taken (S = surface; M = middle; B = bottom)
Water Temp	N	4	1	Water Temperature
Salinity	N	6	2	
DO	N	6	2	Dissolved Oxygen
DOS	N	6	2	Dissolved Oxygen in % saturation
Turbidity	N	6	2	
SS	N	6	2	Suspended solids
Metals T...	N	6	2	Total metals (approx. 7 parameters, and can be more)
Metals D...	N	6	2	Dissolved metals (approx. 7 parameters, and can be more)
Trace organic...	N	6	2	Trace organic (e.g. PAHs, PCBs etc.. can be a lot)
Nutrients	N	6	2	Nutrients (include several parameters such as NO ₂ _N, NO ₃ _N, NH ₄ _N, TP, OP etc.)
BOD	N	6	2	
COD	N	6	2	
Chlorophyll a	N	6	2	
E. coli	N	10	0	
F coliform	N	10	0	Faecal coliform
PARA...				Other parameters not listed above. (Confirm with EPD individually)

(Remark: enter 999.99 to any numeric field that have no reading. Please note that "zero" is also a valid data)

- B. Details of water analytical methods and detection limits for different parameters.

Parameter	Limits of detection for WQ parameters	Units of measurement for WQ parameters	Analytical methods
e.g. DO			
e.g. Cd T			
etc...			

- C. Apart from A and B, the following information shall also be provided:

1. Project name, contract number, consultant name and telephone, contractor name, contact person and telephone number, site staffs and telephone.
2. Project commencement date and the proposed completion date, frequency of sampling and project work nature, e.g. dumping, dredging or reclamation.
3. List of site instrument for water quality monitoring.