Gammon Construction Limited

Reprovisioning and Upgrading of Salt Water Service Reservoirs in Western District for Water Supplies Department: *Environmental Monitoring and Audit Manual*

June 2007

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June 2007

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For and on behalf of
Environmental Resources Management

Approved by: Steve Duckworth

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Date: 26th June 2007

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1 INTRODUCTION

1.1 PROJECT BACKGROUND

The reprovisioning and upgrading the Salt Water Service Reservoirs in Western District for Water Supplies Department (the Project) involves the construction of two salt water service reservoirs in rock beneath the northern hill slopes of Lung Fu Shan immediately adjacent to the present Water Supplies Department (WSD) facilities, south of Pok Fu Lam Road. To minimise environmental impacts, the two salt water service reservoirs will be housed entirely in a rock cavern. The location and general arrangement of the Project are presented in *Figure 1.1*.

1.2 CONSTRUCTION ACTIVITIES AND PROJECT PROGRAMME

The rock cavern will comprise two salt water storage tunnels connecting to a common section leading to an access portal. It will be excavated using a non-explosive drill-and-break tunnelling method. Tunnel boring machine (TBM) and blasting will not be used in the construction of the Project. The cavern will be lined with concrete and the water storage reservoirs will be constructed from reinforced concrete. Each of the two water storage tunnels of the rock cavern will be approximately 60 m in length and 17 m in span. These storage tunnels will be connected to a common section of approximately 40 m in length and 8 m in span, which will lead to an access portal on the hill slope. The internal tank dimensions of each of the salt water service reservoirs will be 46.8m (L) x 15m (W) x 9m (H) approximately. The two reservoirs are designed to provide a combined saltwater storage capacity of 12,000m^3. Construction activities will involve:

- Slope work and portal / access tunnel construction;
- Tunnel excavation for Salt Water Services Reservoirs (SWSR) No. 1;
- SWSR No. 1 Construction;
- Tunnel excavation for SWSR No. 2; and
- SWSR No. 2 Construction

As the Site can be accessed via the access road leading from Pok Fu Lam Road to the existing WSD facilities, formation of new access road and/or haul road will not be required.

The Project will be constructed at the same time as the adjacent works associated with the rearrangement and reprovisioning of other WSD facilities to vacate land for the HKU Centennial Campus development. These concurrent activities associated with other WSD facilities include:

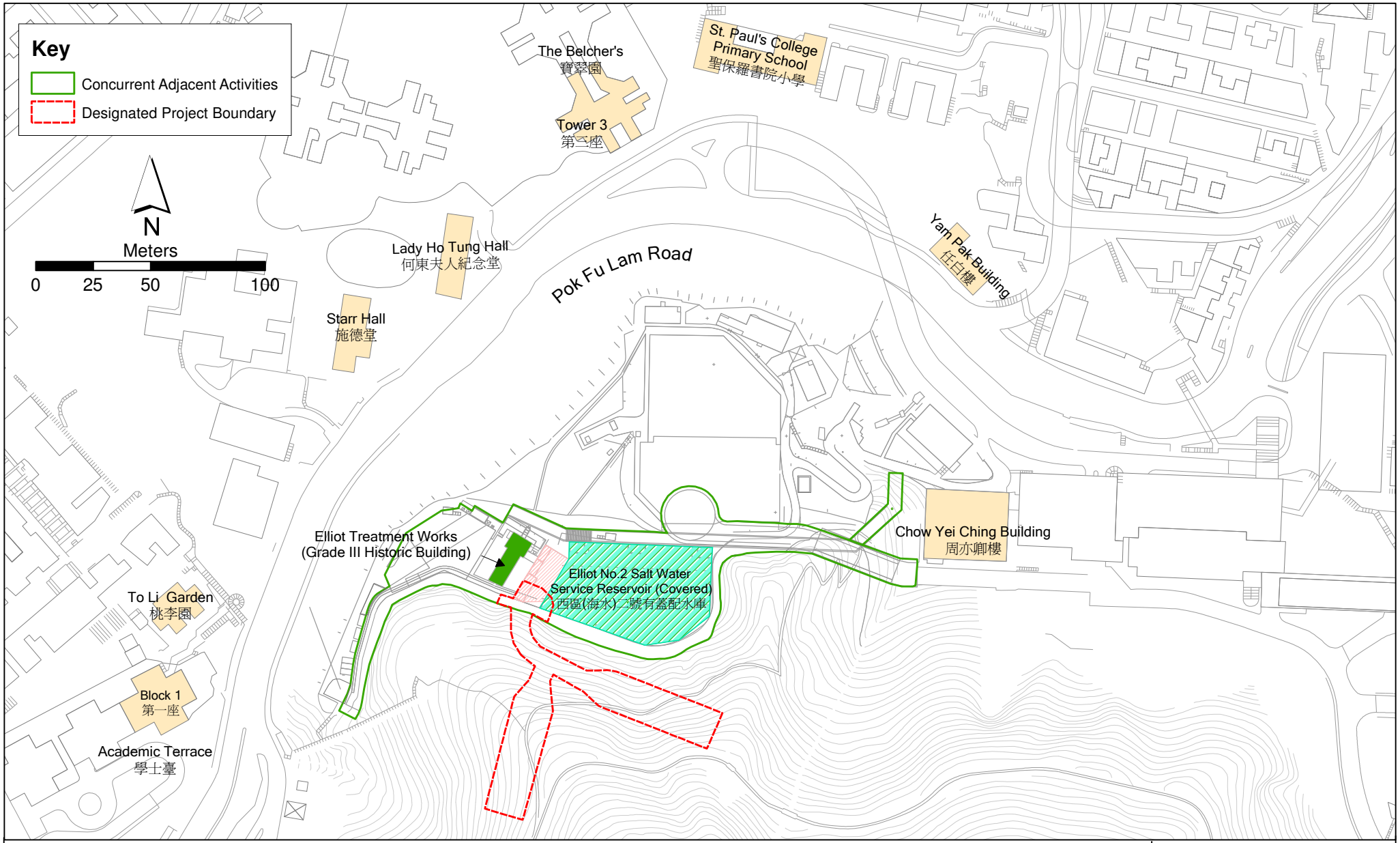

Figure 1.1

Project Location

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- Demolition of Western SWSR No. 2;
- Construction of Fresh Water Service Reservoir No. 1;
- Pipe Gallery Construction;
- Pipe Laying;
- Emergency Vehicle Access (EVA) Construction;
- Slope Stabilisation Works; and
- Landscape Works

The construction activities are scheduled to commence in early July 2007 and the summarised construction programme is provided in *Annex A*.

1.3 REQUIREMENT FOR ENVIRONMENTAL MONITORING AND AUDIT (EM&A)

The Project is classified as a Designated Project by virtue of Item Q.2 (ie underground rock caverns) of Schedule 2 Part I of the *Environmental Impact Assessment Ordinance* (Cap. 499) (EIAO). A Project Profile (PP) "*Reprovisioning and Upgrading of Salt Water Service Reservoirs in Western District for Water Supplies Department*" (Application No. DIR-150/2007) was submitted to Environmental Protection Department (EPD) on 3 April 2007 for permission to apply directly for Environmental Permit. The potential environmental impacts of the Project were studied in the PP. Permission to apply directly for environmental permit was granted with conditions in EPD's letter ref.(16) in Ax(1) to EP2/H10/Q2/151 was issued 15 May 2007 and an Environmental Permit (EP-279/2007) (EP) for the Project was granted on 4 June 2007.

Under the requirement of Condition 2.3 of EP, the EM&A manual should list out the EM&A programme including, at least, the following:

- Requirements on construction noise and dust monitoring with details on methodology, location(s), frequency and duration for baseline and impact monitoring;
- Requirements on structural survey and vibration monitoring on the Elliot Treatment Works with details of methodology, frequency and duration for baseline and impact monitoring;
- Environmental quality performance limits (Action and Limit Levels);
- Event and Action Plans;
- Procedures for reviewing the monitoring results and follow-up;
- Implementation schedule and compliance audit procedures of mitigation measures as recommended in the PP;

- Procedure and flow charts for handling complaints or enquires on environmental nuisances or pollution caused by the Project; and

- A recording system with details on the amount of the waste and construction and demolition material generated, recycled and disposed of at various destination(s) for the purposes of monitoring the disposal of construction waste, avoiding fly-tipping and maximising recycling of the excavated rock material.

1.4 PURPOSE OF THE EM&A MANUAL

ERM-Hong Kong, Limited (ERM) was appointed by Gammon Construction Limited (GCL) as the Environmental Team (ET) to provide independent environmental monitoring and audit services throughout the construction stage of the Project.

The purpose of this EM&A Manual is to provide information, guidance and instruction to personnel with environmental duties and those responsible for undertaking environmental monitoring and auditing works during the construction phase of the Project. It provides systematic procedures for the monitoring and auditing of potential environmental impacts that may arise from the works.

This EM&A Manual serves the following purposes:

- Details the EM&A programme for the construction of the Project, which provides means for the feed-back on the Project's compliance with the recommended mitigation measures;

- Provides a description of the organizational arrangements required for the EM&A programme;

- Stipulates the scope of monitoring, the parameters to be measured, monitoring frequency; and actions to be taken in the event of exceedances of the environmental quality performance criteria;

- Outlines guidelines for construction phase site inspections as a means of identifying and resolving problems, and mechanisms for monitoring the implementation of mitigation measures as recommended during design stage;

- Outlines mechanisms in handling complaints or enquiries in relation to environmental issues; and

- Stipulates associated reporting requirements.

This EM&A Manual is a dynamic document that will be reviewed regularly and to be updated (as necessary) during the later stages of the Project.

1.5 STRUCTURE OF THE EM&A MANUAL

Following this introductory section, the remainder of the Manual is set out as follows:

- *Section 2* – Sets out general requirements of EM&A programme;
- *Section 3* – Outlines the organisation of the various parties involved in the EM&A process and presents their key responsibilities;
- *Section 4* – Details methodology and criteria, monitoring equipment and locations for baseline and impact monitoring for air quality, compliance assessment and Event and Action Plan (EAP);
- *Section 5* – Details methodology and criteria, monitoring equipment and locations for baseline and impact monitoring for noise, compliance assessment and Event and Action Plan (EAP);
- *Section 6* – Details auditing requirements with regard to water quality;
- *Section 7* – Details auditing requirements with regard to waste management;
- *Section 8* – Details auditing requirements with regard to ecology;
- *Section 9* – Details auditing requirements with regard to landscape and visual impact;
- *Section 10* – Details methodology and criteria, monitoring equipment and locations for impact monitoring for Elliot Treatment Works, compliance assessment and Event and Action Plan (EAP);
- *Section 11* – Describes scope and requirements of environmental audit;
- *Section 12* – Details protocols in handling environmental enquires and complaints; and
- *Section 13* – Details the EM&A reporting requirements.

2 GENERAL REQUIREMENTS OF EM&A PROGRAMME

2.1 INTRODUCTION

General requirements of the EM&A programme for the Project are presented with reference to the relevant findings from the Project Profile and requirements stipulated in the EP.

2.2 OBJECTIVES OF THE EM&A PROGRAMME

The PP specifies mitigation measures that need to be implemented to achieve compliance with the required environmental criteria. These mitigation measures and their implementation requirements are presented in the Environmental Mitigation Implementation Schedule (EMIS) given in *Annex B*. To verify that these mitigation measures are fully and effectively implemented, an EM&A programme is established for air quality, noise, water quality, waste management; terrestrial ecology; landscape and visual and cultural heritage issues.

The main objective of the EM&A programme are:

- To provide a database against which any short or long term environmental impacts of the Project can be determined;
- To provide an early indication should any of the environmental control measures or practices fail to achieve the acceptable standards;
- To monitor the environmental performance of the Project and effectiveness of the mitigation measures;
- To verify the environmental impacts predicted in the Project Profile;
- To determine project compliance with regulatory requirements, standards and government policies;
- To take remedial action if unexpected problems or unacceptable impacts arise; and
- To provide data against which environmental audits may be undertaken.

2.3 SCOPE OF THE EM&A PROGRAMME

The scope of the EM&A Programmes is to:

- Establish baseline air quality and noise levels at designated locations, and the existing building conditions at the Elliot Treatment Works;

- Implement construction impact monitoring programmes for air quality, noise and the building conditions of the Elliot Treatment Works;

- Implement inspection and audit programmes for air quality, noise, water quality, waste management; terrestrial ecology; landscape and visual and cultural heritage issues;

- Liaise with, and provide environmental advice (as requested or when otherwise necessary) to construction site staff on the comprehension and consequences of the environmental monitoring data and exceedances;

- Identify and resolve environmental issues and other functions as they may arise from the works;

- Check and advice the Contractor's overall environmental performance, the implementation of Event and Action Plans (EAPs), and remedial actions taken to mitigate adverse environmental impacts as they may arise from the works;

- Conduct monthly reviews of monitored impact data as the basis for assessing compliance with the defined criteria and to ensure that necessary mitigation measures are identified and implemented, and to undertake additional ad hoc monitoring and auditing as required by special circumstances;

- Evaluate and interpret all environmental monitoring data to provide an early indication should any of the environmental control measures or practices fail to achieve the acceptable standards, and to verify the environmental impacts predicted in the Project Profile;

- Manage and liaise with other individuals or parties concerning other environmental issues deemed to be relevant to the construction process;

- Conduct regular site inspections to assess:

    - the level of the Contractor’s general environmental awareness;

    - the Contractor’s implementation of the conditions in the EP and the recommendations in the PP;

    - the Contractor’s performance as measured by the EM&A programme;

    - the need for specific mitigation measures to be implemented or the continued usage of those previously agreed;

    - to advise the Site Staff of any identified potential environmental issues; and

- Submit Monthly EM&A Reports which summarises environmental monitoring and auditing data, with full interpretation illustrating the

acceptability or otherwise of any environmental impacts and identification or assessment of the implementation status of agreed mitigation measures.

2.4 METHODOLOGY AND CRITERIA

The environmental issues associated with the construction phase of the Project will be mitigated through the monitoring and mitigation measures specified in the PP and this EM&A Manual.

During the construction phase, air quality, noise, water quality, waste arising, ecology, landscape and visual as well as cultural heritage issues will be subject to EM&A, with environmental monitoring being undertaken for air quality, noise and the building conditions of the Elliot Treatment Works.

The monitoring of the effectiveness of the mitigation measures will be achieved through the environmental monitoring programme as well as through site inspections. The inspections will include within scope, mechanisms to review and assess the implementation of the recommended mitigation measures, and that the timely resolution of received complaints are managed and controlled in a manner consistent with the recommendations given in the PP and the EM&A Manual.

2.5 ENVIRONMENTAL MONITORING

The environmental monitoring works throughout the construction period should be carried out in accordance with the EM&A Manual and reported by the ET. Monitoring should be conducted at the chosen and agreed representative sensitive receivers.

2.6 ACTION AND LIMIT (A/L) LEVELS

Action and Limit (A/L) Levels are defined levels for impact recorded by the environmental monitoring works, which represent levels at which a prescribed response is required. These levels are described in the principle below and later quantitatively defined in the relevant sections of the EM&A Manual:

- Action Level – beyond which there is a clear indication of a deteriorating ambient environment for which appropriate remedial actions are likely to be necessary to prevent environmental quality from falling outside the Limit Levels, which will be unacceptable.

- Limit Level – statutory limits stipulated in the relevant pollution control ordinances, Hong Kong Planning Standard Guidelines, or Environmental Quality Objectives established by the EPD. If these are exceeded, works should not proceed without appropriate remedial action, including a critical review of plant and working methods.

2.7 *EVENT AND ACTION PLANS*

The purpose of the EAPs is to provide, in association with the environmental monitoring activities, procedures for ensuring that if any significant environmental impacts occur in the form of exceedance of A/L Levels identified in the EM&A programme, cause(s) will be quickly identified and remediated.

2.8 *ENVIRONMENTAL AUDIT*

In addition to the monitoring of air quality, noise and building condition of Elliot Treatment Works, as a means of assessing the Contractor's environmental performance, the ET should undertake environmental audit of the compliance with stipulated procedures and site inspections of on-site practices. The primary objective is to assess the effectiveness of the implementation of the environmental mitigation measures as recommended in the PP and the EM&A Manual.

Whilst environmental audit will complement the environmental monitoring activity with regard to the effectiveness of dust suppression, noise attenuation and vibration control, the criteria against which the audit should be derived from the clauses within the Contract, which seek to enforce the recommendations of the PP and the EM&A Manual.

The findings of the environmental audit and site inspection should be made known to the Contractor at the time of the audit / inspection to enable rapid resolution of identified non-compliances or observations. Non-compliances, observations, the corrective / follow-up actions undertaken will be reported in the Monthly EM&A Reports.

2.9 *ENQUIRIES, COMPLAINTS AND REQUESTS FOR INFORMATION*

Enquiries, complaints and requests for information will be expected from a wide range of individuals and organizations including members of the public, government departments, nearby residents, press and community groups.

All enquiries concerning the environmental effects of the construction works, irrespective of the channel of receipt, will be directed to the Public Relation Officer (PRO) of the Contractor, and copied to the Supervising Officer (SO) and HKU. Procedures for handling enquiry and complaints should follow the procedures set out in *Section 11*.

In all cases, the complainant should be notified of the findings, and environmental audit and site inspection should be put in place to minimize the reoccurrence of similar problems.

2.10 REPORTING

During the construction phase, Environmental Baseline Monitoring Report, Monthly EM&A Reports and Final EM&A Summary Report should be prepared and certified by the ET Leader prior to submission to the Contractor, the SO, HKU and EPD. Details of reporting requirement and submission schedule should be in accordance with the guidelines set out in *Section 13*.

2.11 CHANGE OR CESSATION OF EM&A PROGRAMME

The ET should carry out the EM&A programme in accordance with the EM&A Manual throughout the construction phase of the Project. Any change or cessation of the EM&A programme, or any part of it, should be justified by the ET Leader and submitted to the EPD for approval.

The roles and responsibilities of the various parties involved in the construction phase EM&A programme are outlined below. The organization and lines of communication with respect to environmental management for the Project are shown in *Figure 3.1*.

The duties and responsibilities of respective parties are as follow:

Supervising Officer (SO)

- Oversee the construction works ensuring that they are undertaken by the Contractor in accordance with the Specification and Contract requirements;
- Monitor the Contractor's compliance with Contract Specifications, including the implementation and maintenance of environmental mitigation measures and other aspects of the EM&A programme;
- Monitor the implementation of EM&A programme;
- Instruct the Contractor to follow the agreed Event and Action Plans (EAPs) or protocols or those in the Contract Specifications in the event of exceedance or complaint;
- Comply with the agreed EAPs in the event of any exceedance; and
- Assist ET, as necessary in the implementation of the EM&A programme.

Contractor

- Report to the SO;
- Work within scope of the construction Contract and other Contract Documents;
- Ensure thorough implementation of mitigation measures as required;
- Participate in site inspections undertaken by the Environmental Team (ET) and implement the corrective / follow-up actions / recommendations instructed by the SO;
- Take responsibility and strictly adhere to the guidelines of the EM&A programme and complementary protocols developed by their staff;
- Follow the procedures stipulated in the agreed EAPs or protocols in the event of exceedance or complaint;
- Provide necessary information to the ET for the execution of duties and compilation of reports; and

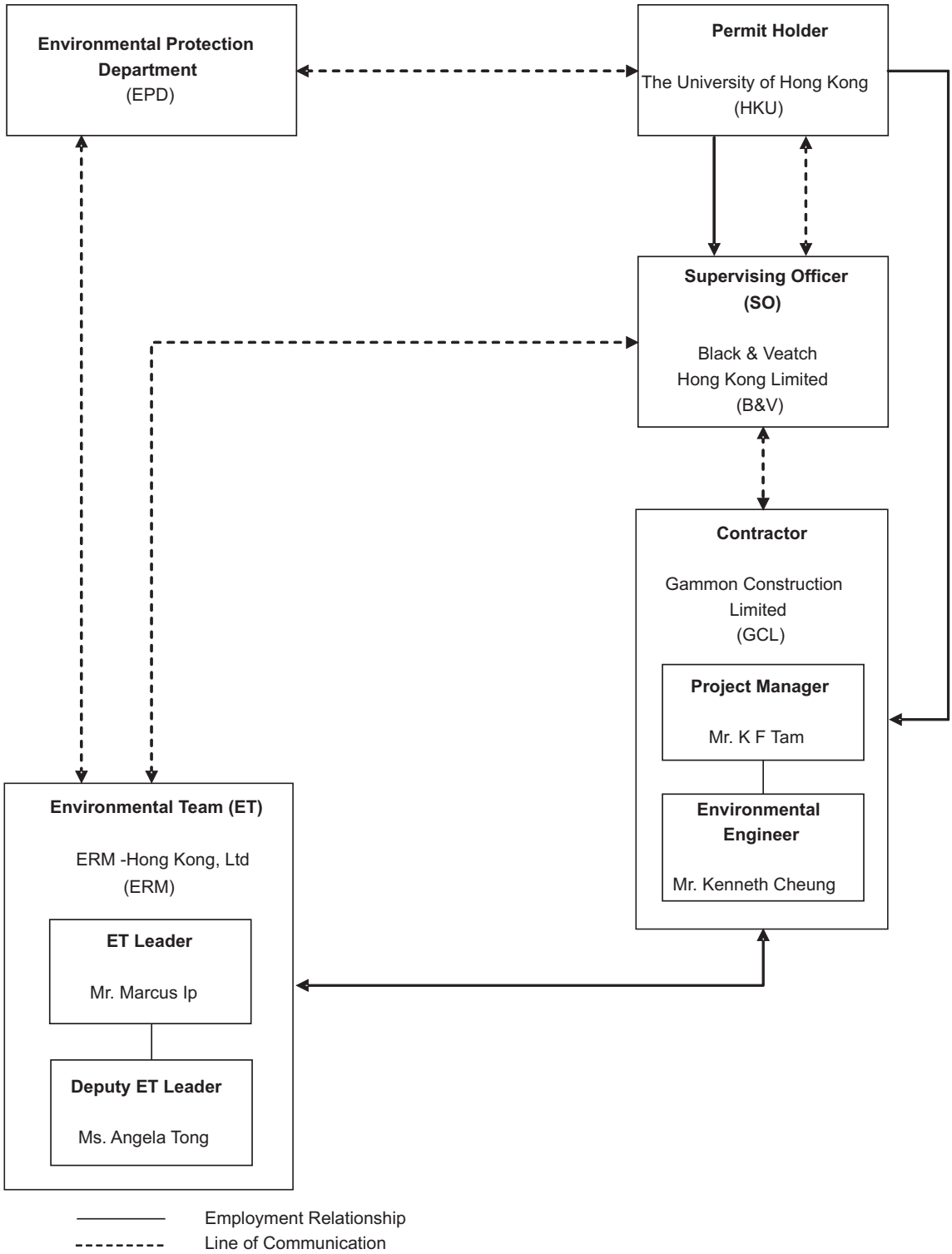

Figure 3.1 Project Organisation and Lines of Communication

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- Report all findings of site inspections and corrective / follow-up actions taken to the SO.

Environmental Team (ET)

- Report to the relevant parties;
- Designate an ET Leader (ETL) fulfilling condition of Environmental Permit (EP) to certify submissions as required by the EP;
- Provide advice on all environmental issues to the Contractor;
- Conduct the monitoring of various environmental parameters in accordance with the EM&A Manual;
- Conduct regular site inspections to check that the mitigation measures are effectively implemented;
- Inspect the Contractor's equipment and work methodologies with respect to pollution control and environmental mitigation, and review the programme of works, in order to anticipate environmental issues that may require mitigation before the problem arises;
- Audit the environmental monitoring data and report the status of general site environmental conditions and of the implementation of mitigation measures resulting from site inspections;
- Follow the procedures stipulated in the agreed EAPs or protocols in the event of exceedance or complaint;
- Report the EM&A results and wider environmental issues and conditions to the Contractor, SO, and EPD; and
- Prepare EM&A Reports as required in the EM&A Manual.

4 AIR QUALITY

4.1 INTRODUCTION

In this section, the requirements, methodology, equipment, monitoring locations, criteria and protocols for the monitoring and audit of air quality impacts during construction of the Project are presented.

The objectives of the monitoring of Total Suspended Particulates (TSP) are:

- To identify the extent of construction dust impacts on sensitive receivers;
- To determine the effectiveness of mitigation measures to control dust generation from construction activities;
- To audit the compliance of the Contractor with regard to dust control and relevant dust impact criteria; and
- To recommend further mitigation measures if found to be necessary.

4.2 METHODOLOGY AND CRITERIA

Monitoring and audit of TSP levels will be carried out by the ET to ensure that any deterioration in air quality could be readily detected and timely actions taken to rectify the situation.

According to *Hong Kong Air Quality Objectives* (*HKAQO*), the criterion of 24-hour TSP at air sensitive receivers (ASRs) is 260 μgm^{-3}.

Continuous 24-hour monitoring should be performed using High Volume Samplers (HVS) with appropriate sampling inlets installed, located at the designated monitoring station. The performance specification of HVS should comply with the standard method "*Determination of Suspended Particulate Matter in the Atmosphere (High Volume Method)*" as stipulated in *US EPA Standard Title 40, Code of Federation Regulations Chapter 1 (Part 50 Appendix B)*.

The HVS is fitted with a conditioned, pre-weighed filter paper, at a controlled rate. After sampling for 24 hours, the filter paper with retained particles should be collected and returned to the laboratory for the testing of TSP levels. Continuous 24-hour TSP levels should be calculated from the ratio of the mass of particulates retained on the filter paper to the total volume of air sampled. The analysis process normally takes about two days to complete.

All relevant data including temperature, pressure, weather conditions, elapsed-time meter reading for the start and stop of sampler, identification and weight of the filter paper, and other special phenomena and work progress of the concerned site etc. will be recorded in detail. A sample data record sheet is shown in *Annex C*.

4.3 MONITORING EQUIPMENT

HVS in compliance with the following specifications will be used for carrying out 24-hour TSP monitoring:

- 0.6 - 1.7 m^3 per minute (20 - 60 standard cubic feet per minute) adjustable flow range;
- equipped with a timing/ control device with ± 5 minutes accuracy for 24 hours operation;
- installed with elapsed-time meter with ± 2 minutes accuracy for 24 hours operation;
- capable of providing a minimum exposed area of 406 cm^2 (63 in^2);
- flow control accuracy: ± 2.5% deviation over 24-hour sampling period;
- incorporated with an electronic mass flow rate controller or other equivalent devices;
- equipped with a flow recorder for continuous monitoring;
- provided with a peaked roof inlet;
- incorporated with a manometer;
- able to hold and seal the filter paper to the sampler housing at horizontal position;
- easy to change the filter; and
- capable of operating continuously for a 24-hour period.

The ET will provide the monitoring equipment, and ensure that sufficient number of HVS with appropriate calibration kit is available for carrying out the baseline and regular impact monitoring. The HVS should be equipped with an electronic mass flow controller and be calibrated against a traceable standard at regular intervals, in accordance with requirements stated in the manufacturers operating manual. All the equipment, calibration kit, filter papers, etc, should be clearly labelled.

The flow rate of each HVS with mass flow controller will be calibrated using an orifice calibrator. Initial calibration of the dust monitoring equipment will be conducted upon installation and prior to commissioning. Five-point calibration will be carried out every two months.

The flow-rate of the sampler before and after the sampling exercise with the filter in position will be verified to be constant and be recorded on the data sheet.

For the collection of meteorological data, it should be obtained from the Hong Kong Observatory (HKO) Meteorological Station at King's Park.

4.4 LABORATORY MEASUREMENT / ANALYSIS

A clean laboratory with constant temperature and humidity control, and equipped with the necessary measuring and conditioning instruments to handle the dust samples, will be available for sample analysis and equipment calibration and maintenance. The laboratory will be either a HOKLAS-accredited or an internationally accredited laboratory.

If a site laboratory or a non-HOKLAS accredited laboratory is used, the laboratory equipment will be approved by the SO. Measurement performed by the laboratory will be demonstrated to the satisfaction of the SO. The ET will conduct regular audits to determine the accuracy of the measurement results.

Filter paper of size 8"x10" will be labelled before sampling. It will be a clean filter paper with no pin holes, and will be conditioned in a humidity controlled chamber for over 24-hr and be pre-weighed before use for the sampling.

After sampling, the filter paper loaded with dust will 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 will be regularly calibrated against a traceable standard.

All the collected samples will be kept in a good condition for 6 months before disposal.

4.5 MONITORING LOCATION

Considering that Chow Yei Ching Building (CYCB) is the air sensitive receivers nearest to the Site and its access road, it is the most appropriate location for obtaining the necessary data on potential construction dust impact, and therefore it is selected to be the air quality monitoring station (*Table 4.1*). The location of the monitoring station is presented in *Figure 4.1*.

Table 4.1 Air Quality Monitoring Station

Monitoring Station	Description
AM1	Chow Yei Ching Building, HKU

The status and locations of air sensitive receivers (ASRs) may change after issuing this Manual and the location of the air quality monitoring station may need to be adjusted accordingly. If such changes occur, the ET should propose an updated monitoring location for agreement by the SO and the EPD.

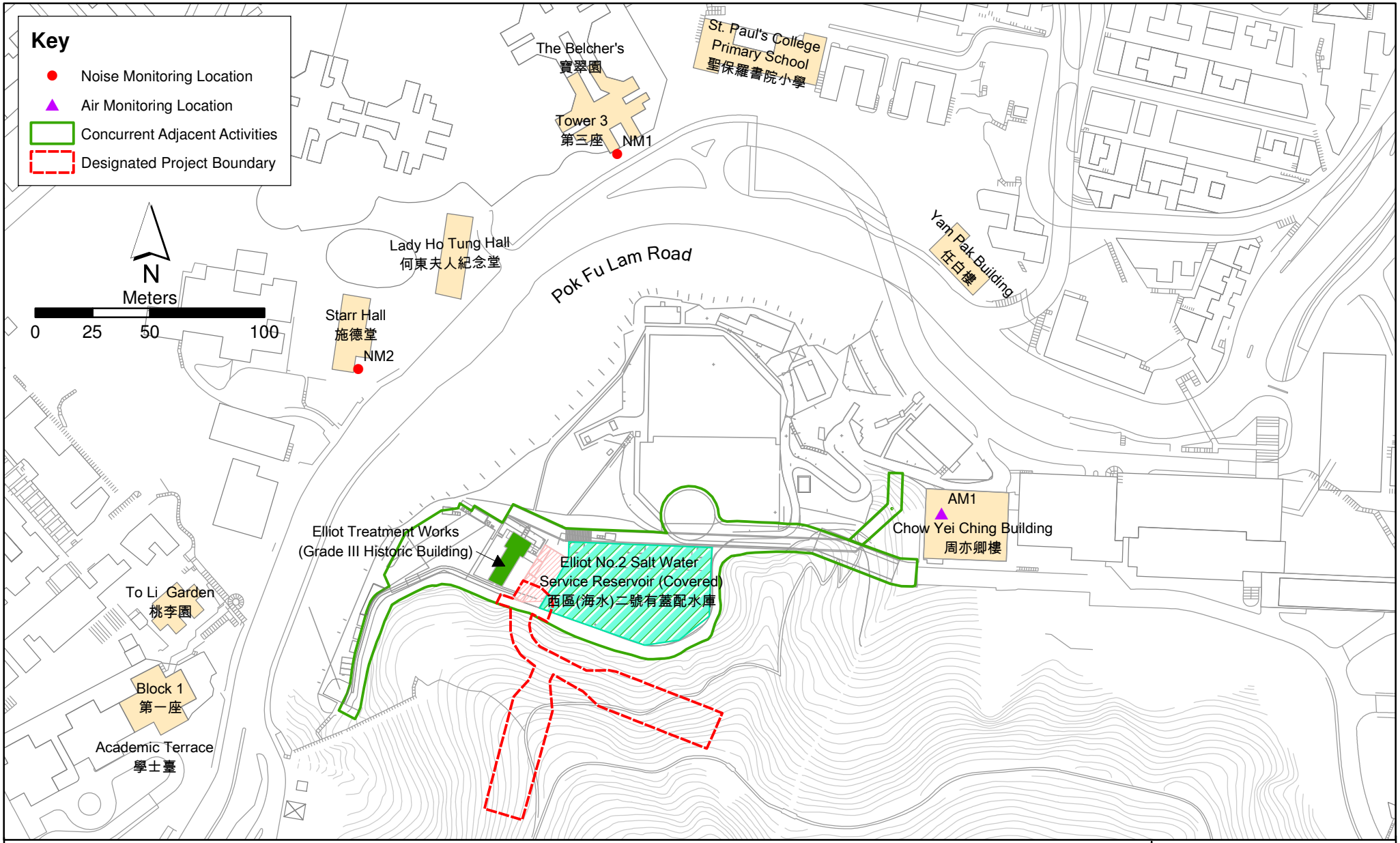

Figure 4.1

Air and Noise Monitoring Locations

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When alternative monitoring location is proposed, the following criteria, as far as practicable, should be followed:

- At the site boundary or such locations close to the major dust emission source;
- Close to the sensitive receptors;
- Take into account the prevailing meteorological conditions; and
- For monitoring location located in the vicinity of the ASR, care should be taken to cause minimal disturbance to the occupants during monitoring.

Prior to the commencement of the EM&A programme, the proposed air quality monitoring station should be discussed and agreed with the SO, the EPD and the owner and occupant of the premises. When positioning the HVS, the following points should be noted:

- a horizontal platform with appropriate support to secure the samples against gusty wind shall be provided;
- no two sampler shall be placed less than 2 m 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 m separation from walls, parapets and penthouses is required for rooftops samplers;
- a minimum of 2 m separation from any supporting structure, measures horizontally is required;
- no furnace or incinerator flue is nearby;
- airflow around the sampler is unrestricted;
- the sampler is more than 20 m from the dripline;
- any wire fence and gate to protect the sampler, shall 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.

4.6 BASELINE MONITORING

Baseline monitoring will be carried out to determine the ambient 24-hour and 1-hr TSP levels at the monitoring station prior to the commencement of the construction works. Continuous 24-hour TSP monitoring and 3 sets of 1-

hour TSP monitoring will be carried out daily for a period of at least two weeks at the designated monitoring station. General meteorological conditions and notes regarding any significant adjacent dust producing sources will also be recorded throughout the baseline monitoring period.

Before commencing the baseline monitoring, ET leader will inform the Contractor, the SO and EPD of the baseline monitoring schedule such that relevant parties may conduct on-site audit of the baseline monitoring.

During the baseline monitoring, there should not be any construction or dust generating activities in the vicinity of the monitoring stations.

In case the baseline monitoring could not be carried out at the designated monitoring location during the baseline monitoring period, the ET will carry out the monitoring at alternative location which could effectively represent the baseline conditions at the impact monitoring locations. The alternative baseline monitoring locations should be agreed with the SO and EPD.

In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET will liaise with the SO and EPD to agree on an appropriate set of data to be used as a baseline reference.

The baseline monitoring will provide data for the determination of the appropriate Action Levels with the Limit Levels set against statutory or otherwise agreed limits.

4.7 IMPACT MONITORING

During the construction stage of the Project, a 24-hour TSP monitoring will be conducted at the frequency of once per week. The monthly schedule of the impact monitoring programme should be drawn up by the ET prior to the commencement of the scheduled construction period and a 2-month impact monitoring schedule will be provided in the Monthly EM&A Reports.

The specific time to start and stop the 24-hour TSP monitoring will be clearly defined for each location and be followed by the ET.

4.8 COMPLIANCE ASSESSMENT

Action and Limit (A/L) Levels provide an appropriate framework for the interpretation of monitoring results. The air quality monitoring data will be checked against the agreed A/L Levels as listed in *Table 4.2*.

Table 4.2 Derivation of Action and Limit Level for Air Quality Monitoring

Parameter	Action Level	Limit Level
24-hour TSP	• For baseline Level <= 200μgm^{-3}, Action Level = (Baseline level *1.3 + Limit Level) / 2 • For baseline Level >200μgm^{-3}, Action Level = Limit Level	260μgm^{-3}

4.9 EVENT AND ACTION PLAN

The baseline monitoring results will be used for the determination of Action and Limit Level during the impact monitoring. The ET will compare the impact monitoring results with the air quality criteria. In case where exceedance of these criteria occurs, the ET, the Contractor and the SO should strictly observe relevant actions of the EAP shown in *Table 4.3*.

Table 4.3 Event and Action Plan for Air Quality Monitoring

Event	Action		
	ET Leader	**Contractor**	**SO**
Action Level			
Exceedance for one sample	1. Notify SO and Contractor. 2. Investigate the source(s) of exceedance. 3. Report the investigation results and whether exceedance is due to contractor's works to the Contractor and SO. 4. Review Contractor's air quality mitigation proposal and advise accordingly. 5. Ensure remedial measures are properly implemented. 6. Review subsequent monitoring results and report the findings to Contractor and SO.	1. Take immediate action to avoid further exceedance and rectify any unacceptable practice accordingly. 2. Submit air mitigation proposal to ET and SO for agreement if ET indicates that exceedance is related to the construction works. 3. Implement agreed proposal within a time scale as agreed with ET and SO.	1. Confirm receipt of notification of exceedance in writing. 2. Require Contractor to submit air mitigation proposal. 3. Supervise the implementation of remedial measures.
Exceedance for two or more consecutive samples	1. Notify SO and Contractor. 2. Investigate the source(s) of exceedances. 3. Report the investigation results and whether exceedances are due to contractor's works to the Contractor and SO. 4. Review Contractor's air mitigation proposal and advise accordingly. 5. Supervise and ensure remedial measures are properly implemented. 6. Increase monitoring frequency to twice per week if exceedances are considered related to contractor's works until exceedance stops, and report the findings to Contractor and SO. 7. If exceedances continue after 2 consecutive monitoring events, request meeting with Contractor and SO to discuss remedial actions.	1. Take immediate action to avoid further exceedance and rectify any unacceptable practice accordingly. 2. Submit air mitigation proposal to ET and SO for agreement if ET indicates that exceedances are related to the construction works. 3. Implement agreed proposal within a time scale as agreed with ET and SO. 4. If exceedances continue after 2 consecutive monitoring events, meet with ET and the SO to formulate and implement further remedial measures until exceedance ceases.	1. Confirm receipt of notification of exceedances in writing. 2. Require Contractor to submit air mitigation proposal. 3. Supervise the implementation of remedial measures. 4. If exceedances continue after 2 consecutive monitoring events, arrange meeting with ET and the Contractor to formulate further remedial works until exceedance ceases.

Event	Action		
	ET Leader	**Contractor**	**Supervising Officer**
Limit Level			
Exceedance for one sample	1. Notify EPD, Contractor and SO. 2. Investigate the source(s) of exceedance. 3. Report the investigation results and whether exceedance is due to contractor's works to EPD, Contractor and SO. 4. Review Contractor's air mitigation proposal and advise accordingly. 5. Ensure remedial measures are properly implemented. 6. Increase monitoring frequency to twice per week if exceedance is considered related to contractor's works until exceedance stops, and report the results to EPD, Contractor and SO.	1. Take immediate action to avoid further exceedance and rectify any unacceptable practice. 2. Submit air mitigation proposal to ET and SO for agreement if ET indicates that exceedance is related to the construction works. 3. Implement agreed proposal within a time scale as agreed with ET and The SO.	1. Confirm receipt of notification of exceedances in writing. 2. Require Contractor to submit air mitigation proposal. 3. Supervise the implementation of remedial measures.
Exceedance for two or more consecutive samples	1. Notify EPD, Contractor and SO. 2. Investigate the source(s) of exceedances. 3. Report the investigation results and whether exceedance is due to contractor's works to EPD, Contractor and SO. 4. Review Contractor's air mitigation proposal and advise accordingly. 5. Ensure remedial measures are properly implemented. 6. Increase monitoring frequency to daily if exceedances are considered related to contractor's works until exceedance stops, and report the results to EPD, Contractor and SO. 7. If exceedances continue after 2 consecutive monitoring events, request meeting with Contractor and SO to discuss remedial actions.	1. Take immediate action to avoid further exceedance and rectify any unacceptable practice. 2. Submit air mitigation proposal to ET and SO for agreement within 3 working days of notification if ET indicates that exceedances are related to the construction works. 3. Implement agreed proposal within a time scale as agreed with ET and SO. 4. Amend working methods and proposal if appropriate. 5. If exceedances continue after 2 consecutive monitoring events, meet with ET and the SO to formulate and implement further remedial measures, or stop relevant portion(s) of works as advised by the ET and / or as required by SO.	1. Confirm receipt of notification of failure in writing. 2. Require Contractor to submit air mitigation proposal. 3. Supervise the implementation of remedial measures. 4. If exceedances continue after 2 consecutive monitoring events, arrange meeting with ET and the Contractor to formulate further remedial works and to consider what portion(s) of works should be further mitigated or have to stop.

4.10 AUDIT REQUIREMENTS

In order to ensure no adverse air quality impact will arise from the construction of the Project, it is also necessary to undertake regular environmental audits and site inspections to ensure those recommended mitigation measures are properly implemented. *Section 11* of the Manual sets out the requirements of the environmental audit programme.

The audit programme will verify the implementation status and evaluate the effectiveness and stability of the mitigation measures.

4.11 MITIGATION MEASURES

Air quality control and mitigation measures recommended in the PP are outlined in the Environmental Mitigation Implementation Schedule (EMIS) (*Annex B*). In the event of exceedances or complaints, the ET and the Contractor should be responsible for reviewing the effectiveness of these mitigation measures and for proposing, designing and implementing alternative or additional measures as appropriate.

5 NOISE

5.1 INTRODUCTION

The requirements, methodology, equipment, monitoring locations, criteria and protocols for the monitoring and audit of noise impacts during construction of the Project are presented in this section.

5.2 METHODOLOGY AND CRITERIA

Noise measurements should be carried out in accordance with the guidelines given in *Annex – General Calibration and Measurement Procedures* of *Technical Memorandum on Noise from Construction Work other than Percussive Piling* (*GW-TM*).

Whilst the *Noise Control Ordinance* (*NCO*) does not provide for the statutory control of construction activities occurring on weekdays during normal working hours (ie Monday to Saturday inclusive 0700-1900 hours), a daytime standard of $L_{eq(30min)}$ 75dB(A) as stipulated in Annex 5 of the *Technical Memorandum on Environmental Impact Assessment Process* (*EIAO-TM*) will be adopted as the noise criterion for all residential dwellings; while a daytime standard of $L_{eq(30min)}$ 70dB(A) will be adopted for all educational institutions during normal school days and $L_{eq(30min)}$ 65dB(A) during examination periods.

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

Supplementary information for data auditing, two statistical sound levels L_{10} and L_{90}; the levels exceeded for 10 and 90 percent of the time respectively, should also be recorded during the monitoring for reference. A sample data record sheet is shown in *Annex C* for reference.

Noise measurements should generally not be made in the presence of fog, rain, wind with a steady speed exceeding $5ms^{-1}$ or wind with gusts exceeding $10ms^{-1}$. The wind speed should be checked with a portable wind speed meter capable of measuring the wind speed in ms^{-1}.

5.3 MONITORING EQUIPMENT

As referred to the *GW-TM*, 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 levels from before and after the noise measurement agree to within 1.0 dB.

The ET will ensure that the equipment is maintained in a good working order in accordance with the manufacturer's recommendations with sufficient spare equipment available in the event of breakdown to maintain the planned monitoring programme.

The ET is responsible for the provision of the monitoring equipment and will ensure that sufficient noise measuring equipment and associated instrumentation are available for carrying out the baseline monitoring and impact monitoring. All the equipment and associated instrumentation will be clearly labelled.

5.4 MONITORING LOCATIONS

Representative locations were selected to monitor the noise levels from the construction of the Project. The noise monitoring stations are listed in *Table 5.1* and presented in *Figure 4.1*.

Table 5.1 Noise Monitoring Station

Monitoring Station	Description
NM1	The Belcher's, Tower 3
NM2	Starr Hall, HKU

The status and locations of noise sensitive receivers (NSRs) may change after issuing this Manual and the location of the noise monitoring station may need to be adjusted accordingly. If such changes occur, the ET should propose an updated monitoring location for the agreement from The SO and EPD.

When alternative monitoring location is proposed, the following criteria, as far as practicable, should be followed:

- At locations close to the major site activities which are likely to have noise impacts;
- Close to the NSRs; and
- For monitoring locations located in the vicinity of the NSRs, care should be taken to cause minimal disturbance to the occupants during monitoring.

The monitoring station will normally be at a point 1 m from the exterior of the NSR building façade and at a height of approximately 1.2 m above ground or at the height that has the least obstructed view of the construction activity in relation to the NSR. If there is a problem with access to the normal monitoring position, an alternative position will be chosen, and a correction to the measurements should be made. For reference, a correction of +3 dB(A) will be made to the free field measurements. The ET will agree with the SO, the EPD and the owners/occupants of the premises on the monitoring position. Once the positions for the monitoring stations are chosen, the

baseline monitoring and the impact monitoring will be carried out at the same positions.

5.5 *BASELINE MONITORING*

The ET should carry out baseline noise monitoring prior to the commencement of the construction works. The baseline monitoring should be measured for a continuous period of at least 14 consecutive days at a minimum logging interval of 30 minutes for daytime and 15 minutes (as three consecutive $L_{eq(5min)}$ readings) for evening, holidays and night-time.

Before commencing the baseline monitoring, ET will inform the Contractor, the SO and the EPD of the baseline monitoring schedule such that relevant parties could conduct on-site audit of the baseline monitoring.

During the baseline monitoring, there should not be any construction activities in the vicinity of the monitoring stations. Any non-Project related construction activities in the vicinity of the stations during the baseline monitoring should be noted and the source(s) and location(s) be recorded.

In case the baseline monitoring could not be carried out at any of the designated monitoring locations during the baseline monitoring period, the ET will carry out the monitoring at alternative location which could effectively represent the baseline conditions at the impact monitoring locations. The alternative baseline monitoring locations should be agreed with the SO and EPD.

In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET will liaise with the SO and EPD to agree on an appropriate set of data to be used as a baseline reference.

5.6 *IMPACT MONITORING*

Noise monitoring should be carried out at all the designated monitoring stations. An initial guide on the monitoring is to obtain one set of 30-minute measurement at each station between 0700 and 1900 hours on normal weekdays at a frequency of once a week when construction activities are underway.

If construction works are extended to include works during the hours between 1900 and 0700 hours, or on general holidays and Sundays, applicable Construction Noise Permits (CNPs) will be obtained by the Contractor under the *NCO* requirements, and the frequency and scope of monitoring will be determined by EPD in the capacity of the Noise Control Authority.

5.7 *COMPLIANCE ASSESSMENT*

Action and Limit (A/L) Levels provide an appropriate framework for the interpretation of monitoring results. Interpretation of monitoring results is

undertaken through checking them against the Action and Limit (A/L) Levels defined in *Table 5.2*.

Table 5.2 Action and Limit Level for Construction Noise Monitoring

Time Period	Action Level	Limit Level
0700 – 1900 hours on normal weekdays	When one documented complaint is received from any one of the sensitive receivers	75 dB(A)(Note)

Note:

Acceptable Noise Levels for Area Sensitivity Rating of A/B/C. Limit Level is reduced to 70dB(A) for schools and 65dB(A) during school examination periods.

To account for cases where ambient noise levels, as identified by baseline monitoring, approach or exceed the stipulated Limit Level prior to commencement of construction, a Maximum Acceptable Impact Level, which incorporates the baseline noise level and the identified construction noise Limit Level, might be defined upon agreement with the EPD. This amended level will, therefore, be greater than 75 dB(A) and will represent the maximum acceptable noise level at a specific monitoring station.

For compliance checking, after taking into account any adjustments agreed with EPD, comparison with either the Limit or the Maximum Acceptable Impact Level will represent the governing criteria for noise impact assessment during impact monitoring.

5.8 EVENT AND ACTION PLAN

The ET will compare the impact monitoring results with the noise criteria as defined in *Table 5.2*. In cases where exceedance of these criteria occurs, the ET, the Contractor and the SO should strictly observe relevant actions of the EAP as shown in *Table 5.3*.

Table 5.3 Event and Action Plan for Construction Noise

Event	Action		
	ET Leader	**Contractor**	**SO**
Action Level			
Exceedance of Action Level	1. Notify the Contractor and SO. 2. Investigate the causes and check compliance of the Contractor. 3. Report the investigation results to the Contractor and SO. If the exceedance (complaint) is related to construction works, classify the complaint as "valid", and discuss with the Contractor for their formulation of noise mitigation proposal. 4. Review the noise mitigation proposal by the Contractor and advise accordingly. 5. Ensure noise mitigation proposal are properly implemented, and conduct additional monitoring to verify the mitigation effectiveness. 6. Produce complaint investigation report detailing complaint, investigation findings, actions taken and their effectiveness to the Contractor and SO.	1. Take immediate action to avoid further exceedance. 2. Submit noise mitigation proposals to ET and SO. 3. Implement noise mitigation proposal within the agreed time frame. 4. Upon the receipt of complaint investigation report from ET, in consultation with the SO, provide responses to the complainant.	1. Confirm receipt of notification of exceedance (complaint) in writing. 2. If the exceedance (complaint) is related to construction works, require Contractor to submit noise mitigation proposal for the analyzed noise problem. 3. Supervise the implementation of noise mitigation proposal.

Event	Action		
	ET Leader	**Contractor**	**SO**
Limit Level			
Exceedance of Limit Level	1. Notify the Contractor, SO and EPD. 2. Conduct additional noise monitoring and analyze Contractor's working procedures to determine possible cause(s) of exceedance. 3. Provide interim report to the Contractor, SO and EPD on the causes and proposed actions to be taken for the exceedances if exceedance is related to construction works. 4. Review Contractor's proposals for remedial actions and advise accordingly. 5. Assess effectiveness of remedial actions by additional monitoring and report the results to the Contractor, SO and EPD. 6. If exceedance continues, request meeting with Contractor and SO to discuss further remedial actions. 7. If exceedance stops, cease additional monitoring.	1. Take immediate action to avoid further exceedance. 2. In responding to the interim report provided by the ET, prepare and submit proposals for remedial actions to ET and SO within 3 working days. 3. Implement the agreed proposals. 4. Resubmit proposals if problem still not under control. 5. Meet with the ET and the SO to determine further remedial actions, and stop the relevant portion of works as advised by the ET and instructed by the SO until the exceedance is abated.	1. Confirm receipt of notification of exceedance in writing. 2. Require Contractor to submit proposals for remedial actions for the analyzed noise problem. 3. Supervise the implementation of remedial measures. 4. If exceedance continues, arrange meeting with the Contractor and ET to determine further remedial actions, and consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.

5.9 AUDIT REQUIREMENTS

In order to ensure no adverse noise impact will arise from the construction of the Project, it is necessary to undertake regular environmental audits and site inspections to ensure those recommended mitigation measures were properly implemented. *Section 11* of the Manual sets out requirements of the environmental audit programme.

The audit programme will verify the implementation status and evaluate the effectiveness and stability of the mitigation measures.

5.10 MITIGATION MEASURES

The noise control and mitigation measures recommended in the PP are outlined in the Environmental Mitigation Implementation Schedule (EMIS) (*Annex B*). In the event of exceedances or complaints, the ET and the Contractor should be responsible for reviewing the effectiveness of these mitigation measures and for proposing, designing and implementing alternative or additional measures as appropriate.

6 WATER QUALITY

6.1 INTRODUCTION

No adverse water quality impact is anticipated during the construction phase with the implementation of good site practices and appropriate mitigation measures in accordance with the *Practice Note for Professional Persons* on *Construction Site Drainage* (*ProPECC PN 1/94*) and other relevant guidelines. The recommended mitigation measures include the provision of dedicated propriety treatment system and associated site runoff collection system.

6.2 AUDIT REQUIREMENTS

In order to ensure no adverse water quality impact will arise from the construction of the Project, it is necessary to undertake regular environmental audits and site inspections to ensure those recommended mitigation measures were properly implemented. *Section 11* of the Manual sets out requirements of the environmental audit programme.

The audit programme will verify the implementation status and evaluate the effectiveness and stability of the mitigation measures.

6.3 MITIGATION MEASURES

The mitigation measures recommended in the PP are outlined in the Environmental Mitigation Implementation Schedule (EMIS) (*Annex B*). In the event of complaints, or non-compliance / area of improvement is observed, the ET and the Contractor should be responsible for reviewing the effectiveness of these mitigation measures and for proposing, designing and implementing alternative or additional measures as appropriate.

7 WASTE MANAGEMENT

7.1 INTRODUCTION

This section sets out the handling, recycling, storage, transportation and disposal measures which are recommended to avoid, and minimize potential adverse impacts associated with waste arising from the construction of the Project.

7.2 WASTE MANAGEMENT APPROACH

7.2.1 Management of Waste Disposal

In accordance with the *Waste Disposal (Charges for Disposal of Construction Waste) Regulation*, the Contractor should open a billing account with the EPD. Every construction waste or public fill load to be transferred to the Government waste disposal facilities, namely public fill reception facilities, construction waste sorting facilities, and landfills will require a valid "chit" which contains information of the account holder (the Contractor) to facilitate waste transaction recording and billing to the waste producer.

Inert C&D material generated from the Project will be transferred to Quarry Bay Temporary Public Filling Barging Point (QBTPF), or other public fill reception facilities, managed by Civil Engineering and Development Department (CEDD), while the non-inert C&D material, after segregation, will be sent to Island West Transfer Station (IWTS), or other waste disposal facilities, managed by the EPD.

A trip-ticket system will be maintained in accordance with *Environment, Transport and Works Bureau Technical Circular No. 31/2004* and a recording system will also established for recording the amount of waste and C&D material generated, reused, recycled and disposed of (including the disposal sites) in a form of similar to relevant appendices of *Environment, Transport and Works Bureau Technical Circular No. 19/2005*. A sample of waste flow table (WFT) is presented in *Annex C* to record the quantities of waste and C&D material generated each month. The quantities and details of all the recyclable and reused materials will also be recorded in the monthly summary WFT. The quantities of waste and C&D material generated, reused and recycled during the reporting month, together with the disposal sites, will be presented in monthly EM&A report.

7.2.2 Approach to Reduce Waste Generation

Excavated Material

Excavated material from slope works and cavern excavation works will generate small amount soft material and significant volume of rocks respectively.

While small amount of soft material will be disposed of at the QBTPF, rocks material will be segregated and delivered to the Lam Tei Quarry and / or Anderson Road Quarry for crushing and then reused in other construction projects.

Construction and Demolition (C&D) Material

C&D Material consisting of waste concrete/shotcrete, timber, packaging material, steel etc will be generated from the construction of the cavern and salt water services reservoirs.

The waste concrete and shotcrete will be segregated from other non-inert C&D material and be disposed of at QBTPF, or other public fill reception facilities.

The non-inert C&D material will be further segregated into recyclable material, such as cardboard, carton box, waste paper and scrap metal for the collection by recyclers and non-recyclable material, such as waste timber and packaging material, which will be disposed of at IWTS, or other waste disposal facilities.

General Refuse

General refuse will be generated from daily site office operation and workforce. Recycling bins will be provided at strategic locations, such as the entrance of site office to facilitate recovery of aluminium cans and waste paper generated from the Site. Materials collected in the recycling bins will be collected by or sold to local recyclers.

7.2.3 Management of Chemical Waste

The Contractor will register as a chemical waste producer with the EPD, and handle the chemical waste in accordance with the *Code of Practice on the Package, Labelling and Storage of Chemical Wastes*. A brief summary of the site arrangement should be as follows:

Storage Containers

- Be suitable for the substance they are holding, resistant to corrosion, maintained in a good condition, and securely closed;
- Have a capacity of less than 450L unless specifications have been approved by the EPD; and
- Display a label in English and Chinese in accordance with instructions prescribed in Schedule 2 of the Regulations.

Storage Area

- Be clearly labelled and used solely for the storage of chemical waste;
- Be enclosed on at least 3 sides;

- Have an impermeable floor and bunding, of a capacity to accommodate 110% of the volume of the largest container or 20% by volume of the chemical waste stored in that area, whichever is the greatest;

- Have adequate ventilation;

- Be covered to prevent rainfall entering (with water collected within the bund be disposed of as chemical waste when necessary); and

- Be arranged so that incompatible materials are appropriately separated.

Disposal

- Be collected by licensed chemical waste collector; and

- Be disposed / transferred to a facility licensed to receive chemical waste, such as Chemical Waste Treatment Facility (CWTF) at Tsing Yi or other chemical waste recyclers.

7.3 STAFF TRAINING

At the commencement of the construction works, training will be provided to workers on the concepts of site cleanliness and on appropriate waste management procedures, including waste reduction, reuse and recycling.

Location map and label showing different waste facilities on site will be provided at conspicuous locations to facilitate waste storage, segregation and recycling.

Tool box talk regarding waste management practices on site will be arranged on regular basis to maintain and / or improve site practices.

7.4 REGULAR AUDIT AND SITE INSPECTION

To review the practices of waste management on site, regular audit and site inspection will be carried out, which helps to identify any non-compliance or area of improvement which will be followed up by the Contractor. Details of audit requirements are given in the following sections.

The objectives of the audit and site inspection is to:

- Review whether wastes arising from works are handled, stored, collected, transferred and disposed of in an environmentally acceptable manner and comply with the relevant requirements under the Waste Disposal Ordinance and its regulations;

- Review Contractor's implementation of waste pollution control mitigation measures, as outlined the Environmental Mitigation Implementation Schedule (EMIS); and

- Review the effectiveness of current waste management practices and look for area of improvement.

7.5 AUDIT REQUIREMENTS

The ET should conduct regular site inspection covering waste management issues. The inspection will look at all aspects of on-site waste management practices including waste generation, storage, recycling, transport and disposal. Apart from site inspection, documents including licences, permits, disposal and recycling records should be reviewed and audited for compliance with the legislation and Contract requirements. Designated staff of the Contractor responsible for resources allocation, staff training and controlling the relevant documents will also be interviewed to review the effectiveness of site management.

Section 11 of the Manual sets out requirements of the environmental audit programme. The audit programme will verify the implementation status and evaluate the effectiveness and stability of the mitigation measures.

7.6 MITIGATION MEASURES

Waste management approach recommended in the PP is outlined in the Environmental Mitigation Implementation Schedule (EMIS) (*Annex B*). In the event of complaints, or non-compliance / area of improvement is observed, the ET and the Contractor should be responsible for reviewing the effectiveness of these mitigation measures and for proposing, designing and implementing alternative or additional measures as appropriate.

8 ECOLOGY

8.1 INTRODUCTION

No adverse ecological impact is anticipated during the construction phase. Mitigation measures are recommended to further reduce the potential impacts and disturbance to the surrounding habitats.

8.2 AUDIT REQUIREMENTS

In order to ensure no adverse ecological impact will arise from the construction of the Project, it is necessary to undertake regular site inspections to ensure those recommended mitigation measures were properly implemented. *Section 11* of the Manual sets out inspection requirements and the programme for verifying the implementation and evaluating the effectiveness of the mitigation measures.

8.3 MITIGATION MEASURES

The ecological mitigation measures recommended in the PP are outlined in the Environmental Mitigation Implementation Schedule (EMIS) (*Annex B*). In the event of complaints, or non-compliance / area of improvement is observed, the ET and the Contractor should be responsible for reviewing the effectiveness of these mitigation measures and for proposing, designing and implementing alternative or additional measures as appropriate.

9 LANDSCAPE AND VISUAL CONSIDERATIONS

9.1 INTRODUCTION

The PP identified that there will be slight to moderate visual impacts to the visual sensitive receivers (VSRs) during the construction phase of the Project. Mitigation measures were specified for implementation during construction phase to minimize potential visual impacts during construction of the Project.

9.2 AUDIT REQUIREMENTS

In order to ensure landscape and visual impact is controlled and mitigated during construction of the Project, it is necessary to undertake regular site inspections to ensure those recommended mitigation measures were properly implemented. *Section 11* of the Manual sets out inspection requirements, and the inspection programme will verify the implementation status and evaluate the effectiveness and stability of the mitigation measures.

9.3 MITIGATION MEASURES

The landscape and visual mitigation measures recommended in the PP are outlined in the Environmental Mitigation Implementation Schedule (EMIS) (*Annex B*). In the event of complaints, or non-compliance / area of improvement is observed, the ET and the Contractor should be responsible for reviewing the effectiveness of these mitigation measures and for proposing, designing and implementing alternative or additional measures as appropriate.

10 CULTURAL HERITAGE

10.1 INTRODUCTION

This section specifies the requirements for the monitoring of the Elliot Treatment Works (ETW) during construction of the Project with details of methodology, frequency and duration for baseline and impact monitoring.

10.2 METHODOLOGY

Building settlement markers and building tiltmeter will be installed at the ETW to monitor any potential building movements during the course of cavern excavation.

10.3 MONITORING LOCATIONS

The monitoring locations have been agreed with Antiquities and Monuments Office (AMO) of Leisure and Cultural Services Department (LCSD) and are presented in *Annex D*.

10.4 BASELINE AND IMPACT MONITORING

Prior to the commencement of cavern excavation, a survey of the existing building condition will be conducted for the ETW. The survey will focus on the quality of the construction and finishes and the general condition of the structure and finishes. A set of initial readings of all instruments will also be submitted to SO for record.

A schedule of defects (including cracks) supported by photos will also be prepared for the establishment of the baseline condition of the building and the records will be deposited to the SO and AMO.

The monitoring frequency will depend on the location of the construction works being undertaken and is summarised in *Table 10.1*.

Table 10.1 Monitoring Frequency for ETW

Scenario	Description	Instrument	Reading Frequency
Case 1	Prior to commencement of substructure works within 50m of the instrument or tunnelling works within 100m of the instrument.	Building settlement markers	Initial Reading
		In place electrolevel, tilt plate, tilt meter	Initial Reading
Case 2	Geotechnical works (Note) ongoing within 50m of the instrument or tunnelling works within 100m of the instrument.	Building settlement markers	Every 4 days
		In place electrolevel, tilt plate, tilt meter	Every 4 days
Case 3	Geotechnical works (Note)ongoing within 20m of the instrument or tunnelling works within 50m of the instrument.	Building settlement markers	Daily
		In place electrolevel, tilt plate, tilt meter	Daily
Case 4	After completion of all geotechnical works, monitoring may be discontinued once four consecutive readings show that movements have stopped to the satisfaction of the SO.	Building settlement markers	Every 4 weeks
		In place electrolevel, tilt plate, tilt meter	Every 4 weeks
Case 5	All other times prior to completion of all geotechnical works(Note).	Building settlement markers	Monthly
		In place electrolevel, tilt plate, tilt meter	Monthly

Note:
Geotechnical works include all excavations, construction of associated temporary works and backfilling of all underground structures.

A complete record of monitoring readings will be continuously updated and kept on site for inspection by SO.

10.5 COMPLIANCE ASSESSMENT

Alert, Action and Alarm Levels have been established and agreed with AMO. These Levels are presented in *Table 10.2*.

Table 10.2 Alert, Action and Alarm Levels

Instrument		Alert Level	Action Level	Alarm Level
Building settlement markers	Vertical	12 mm or 4 mm/day	20 mm or 6 mm/day	25 mm or 8 mm/day
	Tilt	1:1000	1:600	1:500
	Horizontal	4 mm	6 mm	8 mm
In place electrolevel, tilt plate, tilt meter		0.1 Degree	0.15 Degree	0.2 Degree

10.6 EVENT AND ACTION PLAN

The impact monitoring results will be compared with the Alert, Action and Alarm Levels presented in *Table 10.2*. In cases where exceedance of the criterion occurs, or when damage to the decoration and structure of the building was observed, the ET, the Contractor and the SO should strictly observe relevant actions of the EAP shown in *Table 10.3*.

Table 10.3 Event and Action Plan for Monitoring of Potential Building Movements

Event	Action		
	ET Leader	**Contractor**	**SO**
Exceedance of Alert Level	1. Notify the EPD and AMO. 2. Review the action plan prepared by the Contractor and advise accordingly. 3. Ensure action plan are properly implemented, review subsequent monitoring results to verify the mitigation effectiveness.	1. Notify the SO and ETL immediately. 2. Submit a brief report describing the works being undertaken close by and other relevant observations. 3. Propose a suitable plan of action which may include the installation of additional instruments and/or increasing the monitoring frequency. 4. Submit a report to review the instrument responses, including differential deformations assess the effects on the monitored elements in the light of the relevant construction activities and predict further responses and their effect, based on the data trend to date. 5. Submit a detailed action plan to the SO describing the measure to be taken in the event of an alarm trigger level being attained. The action plan will be subject to the approval of the SO. 6. Report subsequent monitoring results to SO and ETL. 7. Make preparations for implementing the Alarm Level trigger actions, in accordance with the approved action plan.	1. Review the brief report submitted by the Contractor. 2. Review and approve the action plan prepared by the Contractor. 3. Supervise the implementation of action plan upon approval, review subsequent monitoring results and verify the mitigation effectiveness.

Event	Action		
	ET Leader	**Contractor**	**SO**
Exceedance of Action Level	1. Notify EPD and AMO immediately. 2. Review the emergency plan prepared by the Contractor and advises accordingly. 3. Ensure remedial proposal are properly implemented. 4. Ensure action plan are properly implemented, review subsequent monitoring results to verify the mitigation effectiveness. 5. Review the investigation report and report findings to EPD and AMO accordingly.	1. Notify the SO and ETL immediately 2. Undertake a joint inspection of the works with the SO. 3. Implement the Alarm Level trigger actions, phased as appropriate, so that the Action Level is not reached in accordance with the action plan. 4. Within 48 hours of exceeding an Action Level, devise and submit an emergency plan describing the measures to be taken in the event of an Alarm Level being attained. 5. Discuss with the SO on the instrument response and review the effectiveness of the emergency plan. 6. Agree with the SO, undertake additional measures in the affected area to avoid reaching the Action Level. 7. Within 7 days, submit an investigation report to review the instrument responses, including differential deformations, assess the effect on monitored elements in the light of the relevant construction activities and predict further responses and their effect, based on the data trend to date.	1. Undertake a joint inspection of works with the Contractor. 2. Review and approve the emergency plan prepared by the Contractor. 3. Supervise the implementation of action plan upon approval, review subsequent monitoring results and verify the mitigation effectiveness. 4. Review and approve the investigation report.
Exceedance of Alarm Level	1. Notify EPD and AMO immediately. 2. Review the emergency plan prepared by the Contractor and advises accordingly. 3. Ensure remedial proposal are properly implemented. 4. Ensure action plan are properly implemented, review subsequent monitoring results to verify the mitigation effectiveness. 5. Review the investigation report and report findings to EPD and AMO accordingly.	1. Suspend all works within 30m of the instrument. 2. Notify the SO and ETL immediately 3. Undertake a joint inspection of the works with the SO. 4. Implement emergency trigger action(s) based on the emergency plan approved by the SO. These emergency trigger actions will include measures to diminish the deformations and ground responses. 5. Within 3 days, provide an investigation report to examine the construction method and a detailed report to review the deformation and ground response history and the trigger actions adopted related to the construction activities.	1. Undertake a joint inspection of works with the Contractor. 2. Confirm the Contractor has stopped relevant construction works. 3. Review and approve the emergency plan prepared by the Contractor. 4. Supervise the implementation of action plan upon approval, review subsequent monitoring results and verify the mitigation effectiveness. 5. Review and approve the investigation report.

10.7 AUDIT REQUIREMENTS

In order to protect the structure of the ETW during the construction of the Project, it is necessary to undertake regular site inspections to ensure that necessary protective measures agreed with AMO and/or required under the EP are implemented. *Section 11* of the Manual sets out requirements of the environmental audit programme.

The audit programme will verify the implementation and evaluate the effectiveness and stability of the mitigation measures.

10.8 MITIGATION MEASURES

The Project Profile has recommended mitigation measures to monitor and protect the structure of the ETW during construction phase of the Project. These are outlined in the Environmental Mitigation Implementation Schedule (EMIS) given in *Annex B*. In the event of exceedances or notification of damage, the Contractor, in consultation with the ET should review the effectiveness of these mitigation measures and propose, design and implement alternative or additional measures as appropriate.

11 ENVIRONMENTAL AUDIT

11.1 SITE INSPECTION

Site inspections provide a direct means to track and ensure the enforcement of specified environmental protection and pollution control measures. The inspections will be undertaken by the Environmental Team (ET) to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented. Additionally, the ET will be responsible for defining the scope of the inspections, detailing any deficiencies that are identified, and reporting any necessary action or mitigation measures that are implemented as a result of the inspection.

Site inspections will be carried out at least once per week. The areas of inspection will include the general environmental conditions in the vicinity of the site and the pollution control and mitigation measures within the site; the environmental conditions outside the site area which are likely to be affected, directly or indirectly, by site activities will also be reviewed. The ET will make reference to the following information in conducting the inspections:

- the Project Profile, EP requirements and EM&A recommendations on environmental protection and pollution control mitigation measures;
- ongoing results of the EM&A programme;
- works progress and programme;
- individual works method statements which shall include proposals on associated pollution control measures;
- relevant environmental legislation and guidelines; and
- previous site inspection results undertaken.

The inspection results and their associated recommendations on improvements to the environmental protection and pollution control works will be submitted to the Contractor, as appropriate, within one working day, for reference and for taking immediate action. They will also be presented, along with the remedial actions taken, in the monthly EM&A report. The Contractor will follow the procedures and time-frames stipulated in the environmental site inspection for the implementation of mitigation proposal. An action reporting system will be formulated and implemented to report on any remedial measures implemented subsequent to the site inspections.

Ad hoc site inspections will also be carried out by the ET if significant environmental problems are identified. Inspections may also be required subsequent to receipt of an environmental complaint, or as part of the associated investigation work.

11.2 COMPLIANCE WITH LEGAL AND CONTRACTUAL REQUIREMENTS

There are contractual environmental protection and pollution control requirements, which the Contractor will comply with, in addition to Hong Kong's environmental protection and pollution control laws.

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

The Contractor should also make available for inspection relevant documents to the ET so that the checking and auditing process can be carried out. The relevant documents are expected to include the updated work progress reports, the updated works programme, the application letters for different licences/permits under the environmental protection laws, all valid licences/permits and environmental related records. The site diary will also be available, upon request, to the ET during his site inspection.

After reviewing the documentation, the ET will advise 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 is incompatible with the works programme or may result in a potential violation of environmental protection and pollution control requirements by the works in due course, he will also advise the Contractor accordingly.

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

12 ENVIRONMENTAL ENQUIRIES AND COMPLAINTS

12.1 INTRODUCTION

This section sets out the handling protocol in dealing with environmental related complaints and enquiries. The handling protocols aimed at:

- Ensuring that environmental complaints and enquiries are received are recorded and communicated to the SO, Public Relations Representative of Hong Kong University (HKUPR) and WSD.
- Ensuring that the SO, HKUPR and WSD is kept fully informed of action taken to address the calls received.
- Enabling mobilization of resources quickly to mitigate the potential impacts.

12.2 HANDLING PROTOCOLS

The Contractor has established a community liaison office with a 24-hour hotline (Tel. No.: 9855 1949) for receiving enquiry and complaint from the public on the construction activities related to the Project.

In addition, the Contractor has established guidance in handling enquiry or complaints via phone calls, correspondence, classification of complaint and enquiry, assignment of responsible staff, investigation procedures, follow-up action to be taken and compilation of complaint record for inspection as given in *Annex E*. In general, complaints made via phone calls will be responded immediately by the designated holder or relevant staff.

All environmental related complaints via phone call or correspondence should be forwarded to the ET to carry out an independent complaint investigation with the following procedures:

- Contractor log complaint and date of receipt onto the complaint database; and forward the environmental related complaints to the ET;
- ET investigate the complaint to determine its validity, and assess whether the source of the problem is due to works activities;
- identify mitigation measures if a complaint is valid and due to works;
- advise the Contractor if mitigation measures are required;
- review the Contractor's response to identified mitigation measures, and the updated situation;
- submit interim report to the EPD on status of the complaint investigation and follow-up action;

- upon the identification of follow-up action, the Contractor should implement it as soon as possible;

- ET should review the implementation status and its effectiveness, and when necessary, undertake additional monitoring and audit to verify the situation, and review that circumstances leading to the complaint do not recur;

- ET record the complaint, investigation, the subsequent actions and results into the Complaint Investigation Form as shown in *Annex F* and submit to the Contractor, SO, EPD or the complainant directly (if required); and

- ET close the complaint and update the complain log as shown in *Annex F*, if the environmental condition is acceptable.

During the complaint investigation stage, the Contractor and the SO should cooperate with the ET in providing all necessary information and assistance for completion of the investigation. If mitigation measures are required following the investigation, the Contractor should promptly carryout the measures. The ET should ensure that the measures have been carried out by the Contractor.

A flow chart showing the handling procedures for environmental complaint is shown in *Figure 12.1*.

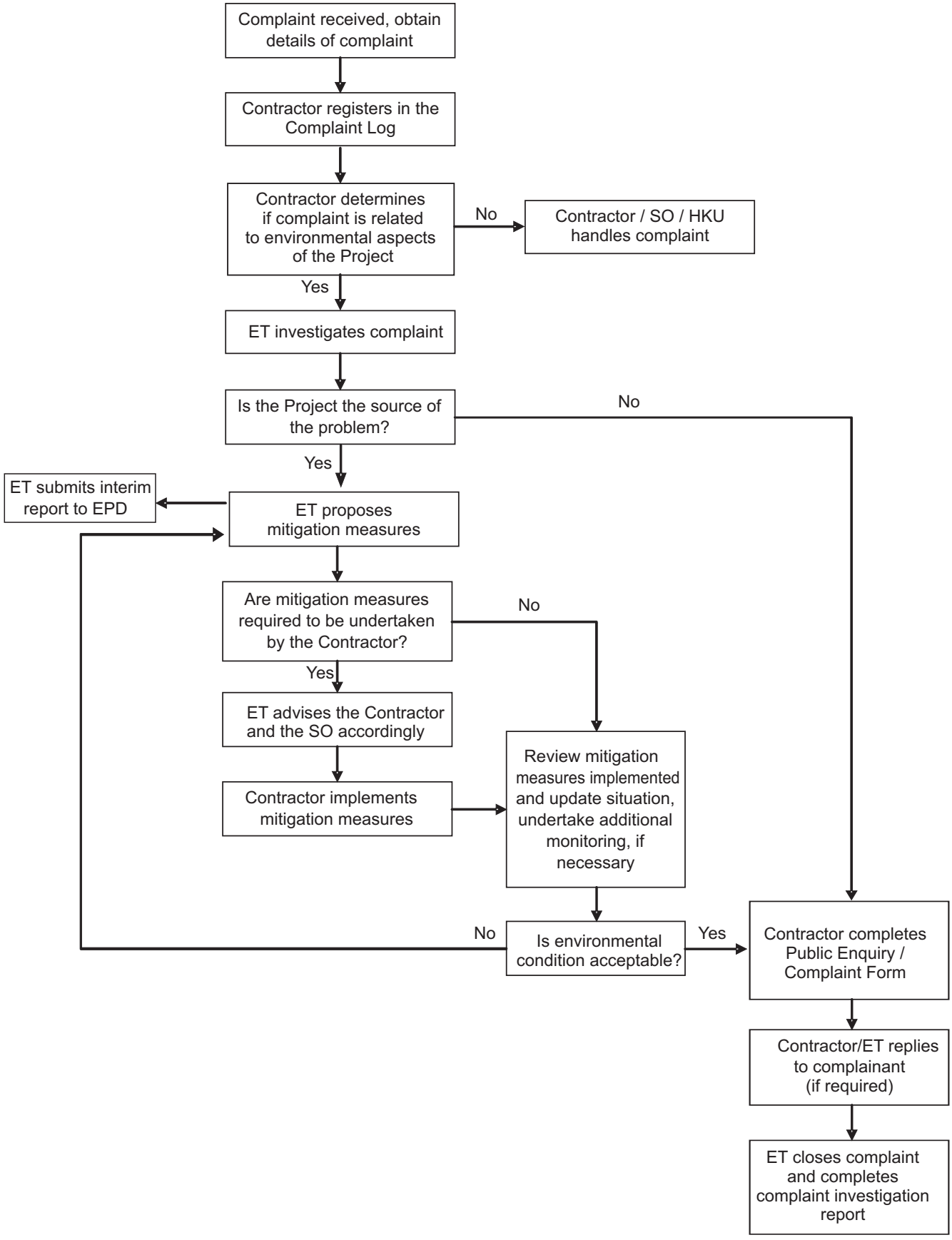


Figure 12.1 Environmental Complaint Handling Procedure

FILE: 0067560c
DATE: 31/05/2007

Environmental Resources Management

ERM

13 REPORTING

13.1 GENERAL

Reports can be provided in an electronic medium upon agreeing the format with the SO and the EPD. This will enable a transition from a paper / historic and reactive approach to an electronic/real time proactive approach.

Types of reports that the ET will prepare and submit include Baseline Monitoring Report, Monthly EM&A Report and Final EM&A Summary Report.

13.2 INTERIM NOTIFICATION OF ENVIRONMENTAL QUALITY LIMIT EXCEEDANCES

With reference to the Event and Action Plan, when the environmental quality performance limits are exceeded, the ET Leader will immediately notify relevant parties, as appropriate. The notification will be followed up with advice to the Contractor, the SO and EPD on the results of the investigation, proposed actions and success of the actions taken, with any necessary follow-up proposals. A sample template for the interim notifications is presented in *Annex G*.

13.3 ELECTRONIC REPORTING OF EM&A INFORMATION

In order to facilitate public inspection of Baseline Monitoring Report and Monthly EM&A Reports via electronic media, electronic copies of these Reports will be prepared in Hyper Text Markup Language (HTML) and in Portable Document Format and will be submitted at the same time as the hard copies. For the HTML version, a content page capable of providing hyperlink to each section and sub-section of these Reports will be included at the beginning of the document. Hyperlinks to all figures, drawings and tables in these Reports will be provided in the main text from where the respective references are made. All graphics in these Reports will be in interlaced GIF format unless otherwise agreed by EPD. The content of the electronic copies of these reports must be the same as the hard copies. The Baseline Monitoring Report and Monthly EM&A Reports will be made available to the public via a dedicated Internet Website in the shortest possible time and in any event no later than 2 weeks after the relevant environmental monitoring data are collected or become available, unless otherwise agreed with EPD.

For environmental monitoring data and results, they will be made available to the public through a dedicated web site within two working days for construction noise data and two weeks for other data/results after the relevant environmental monitoring data are collected or become available.

The Internet website will enable user-friendly public access to the environmental monitoring data, project information and the EP. The Internet website will have features capable of:

- Providing access to all environmental monitoring data of this Project collected since the commencement of construction;
- Providing access to all finalized submissions as required under this Permit;
- Searching by date;
- Searching by types of monitoring data (air quality, noise and water quality); and
- Hyperlinks to relevant monitoring data after searching;

13.4 BASELINE MONITORING REPORT

The ET Leader will certify the Baseline Monitoring Report which will be submitted to the Contractor, SO and EPD. The Baseline Monitoring Report will be submitted to EPD at least one week before commencement of construction of the Project. The ET Leader will liaise with the relevant parties on the exact number of copies they require.

The baseline monitoring report will include at least the following:

- up to half a page executive summary;
- brief project background information;
- drawings showing locations of the baseline monitoring stations;
- an updated construction programme;
- monitoring results (in both hard and diskette copies) together with the following information:
  - monitoring methodology;
  - name of laboratory and types of equipment used and calibration details;
  - parameters monitored;
  - monitoring locations;
  - monitoring date, time, frequency and duration; and
  - quality assurance (QA) / quality control (QC) results and detection limits;
- details on influencing factors, including:

- major activities, if any, being carried out on the site during the period;
- weather conditions during the period; and
- other factors which might affect results;

- determination of the Action and Limit Levels (A/L levels) for each monitoring parameter and statistical analysis of the baseline data;
- revisions for inclusion in the EM&A Manual; and
- comments and conclusions.

13.5 EM&A REPORTS

The results and findings of all EM&A work required in the Manual will be recorded in the Monthly EM&A Reports prepared by the ET Leader. the Monthly EM&A Reports will be prepared and certified by the ET Leader and submitted to the Contractor, SO and EPD within 10 working days after the end of each reporting month, with the first report due in the month after construction commences. The ET Leader will liaise with the each party on the exact number of copies of the Monthly EM&A Reports in both hard copy and electronic medium requirement.

13.5.1 First Monthly EM&A Report

The first monthly EM&A report will include at least the following:

- executive summary (1-2 pages):
  - breaches of Action and Limit levels;
  - complaint log;
  - notifications of any summons and successful prosecutions;
  - reporting changes; and
  - future key issues.
- basic project information:
  - project organization including key personnel contact names and telephone numbers;
  - construction programme;
  - management structure, and
  - works undertaken during the month;
- environmental status:

- works undertaken during the month with illustrations (such as location of works etc); and
- drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring stations;

- a brief summary of EM&A requirements including:
  - all monitoring parameters;
  - environmental quality performance limits (Action and Limit levels);
  - Event and Action Plans;
  - environmental mitigation measures, as recommended in the Project Profile; and
  - environmental requirements in contract documents;
- implementation status:
  - advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the Project Profile, summarized in the updated implementation schedule;
- monitoring results (in tabulated form in both hard and diskette copies) together with the following information:
  - monitoring methodology;
  - name of laboratory and types of equipment used and calibration details;
  - parameters monitored;
  - monitoring locations;
  - monitoring date, time, frequency, and duration;
  - weather conditions during the period;
  - graphical plots of the monitored parameters in the month annotated against:
  - the major activities being carried out on site during the period;
  - weather conditions that may affect the results; and
  - any other factors which might affect the monitoring results
  - any other factors which might affect the monitoring results; and

- quality assurance (QA) / quality control (QC) results and detection limits;

- report on non-compliance, complaints, notifications of summons and successful prosecutions:
  - record of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
  - record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
  - record of all notification of summons and successful prosecutions for breaches of current environmental protection / pollution control legislations, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
  - review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
  - description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance;

- others
  - an account of the future key issues as reviewed from the works programme and work method statements;
  - advice on the solid and liquid waste management status including the amount of waste generated, recycled and disposed during the period; and
  - comments (for examples, effectiveness and efficiency of the mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions.

13.5.2 Subsequent Monthly EM&A Reports

The subsequent monthly EM&A reports will include at least the following:

- executive summary (1 - 2 pages):
  - breaches of Action and Limit Levels;
  - complaints log;
  - notifications of any summons and successful prosecutions;

- reporting changes; and
- future key issues.

- environmental status:
  - construction programme;
  - works undertaken during the month with illustrations including key personnel contact names and telephone numbers; and
  - drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.

- implementation status:
  - advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the Project Profile, summarized in the updated implementation schedule;

- monitoring results (in tabulated form in both hard and diskette copies) together with the following information:
  - monitoring methodology;
  - name of laboratory and types of equipment used and calibration details;
  - parameters monitored;
  - monitoring locations;
  - monitoring date, time, frequency, and duration;
  - weather conditions during the period;
  - graphical plots of the monitored parameters in the month annotated against;

- the major activities being carried out on site during the period;
- weather conditions that may affect the results; and
- any other factors which might affect the monitoring results;
  - any other factors which might affect the monitoring results; and
  - quality assurance (QA) / quality control (QC) results and detection limits.

- report on non-compliance, complaints, and notifications of summons and successful prosecutions:

- record of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
- record of all notification of summons and successful prosecutions for breaches of current environmental protection / pollution control legislations, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
- review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
- a description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.

- others
  - an account of the future key issues as reviewed from the works programme and work method statements;
  - advice on the solid and liquid waste management status including the amount of waste generated, recycled and disposed during the period; and
  - comments (for examples, effectiveness and efficiency of the mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions.

- appendix
  - Action and Limit levels;
  - graphical plots of trends of monitored parameters at key stations over the past four reporting periods for representative monitoring stations

13.5.3 Final EM&A Summary Report

The Final EM&A Summary Report will include at least the following:

- an executive summary;
- basic project information including a synopsis of the project organisation, contacts of key management, and a synopsis of work undertaken during the entire construction period;
- 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 PP;
- advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the Project Profile, summarized in the updated implementation schedule;
- drawings showing the Project area, any environmental sensitive receivers and the locations of the monitoring stations;
- graphical plots of the trends of monitored parameters over the construction period for representative monitoring stations annotated against:
  - the major activities being carried out on-site during the period;
  - weather conditions during the period;
  - any other factors which might affect the monitoring results; and
  - the return of ambient environmental conditions in comparison with baseline data
- advice on the environmental acceptability of the Project with reference to the specific impact hypothesis;
- advice on the solid and liquid waste management status;
- a summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;
- a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;
- a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- review monitoring methodology adopted and with the benefit of hindsight, comment on its effectiveness (including cost effectiveness);
- a summary record of notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, locations and nature of breaches, investigation, follow-up actions taken and results;

- review the practicality and effectiveness of the EM&A programme (for examples, a review of the effectiveness and efficiency of the mitigation measures), recommend any improvement in the EM&A programme; and

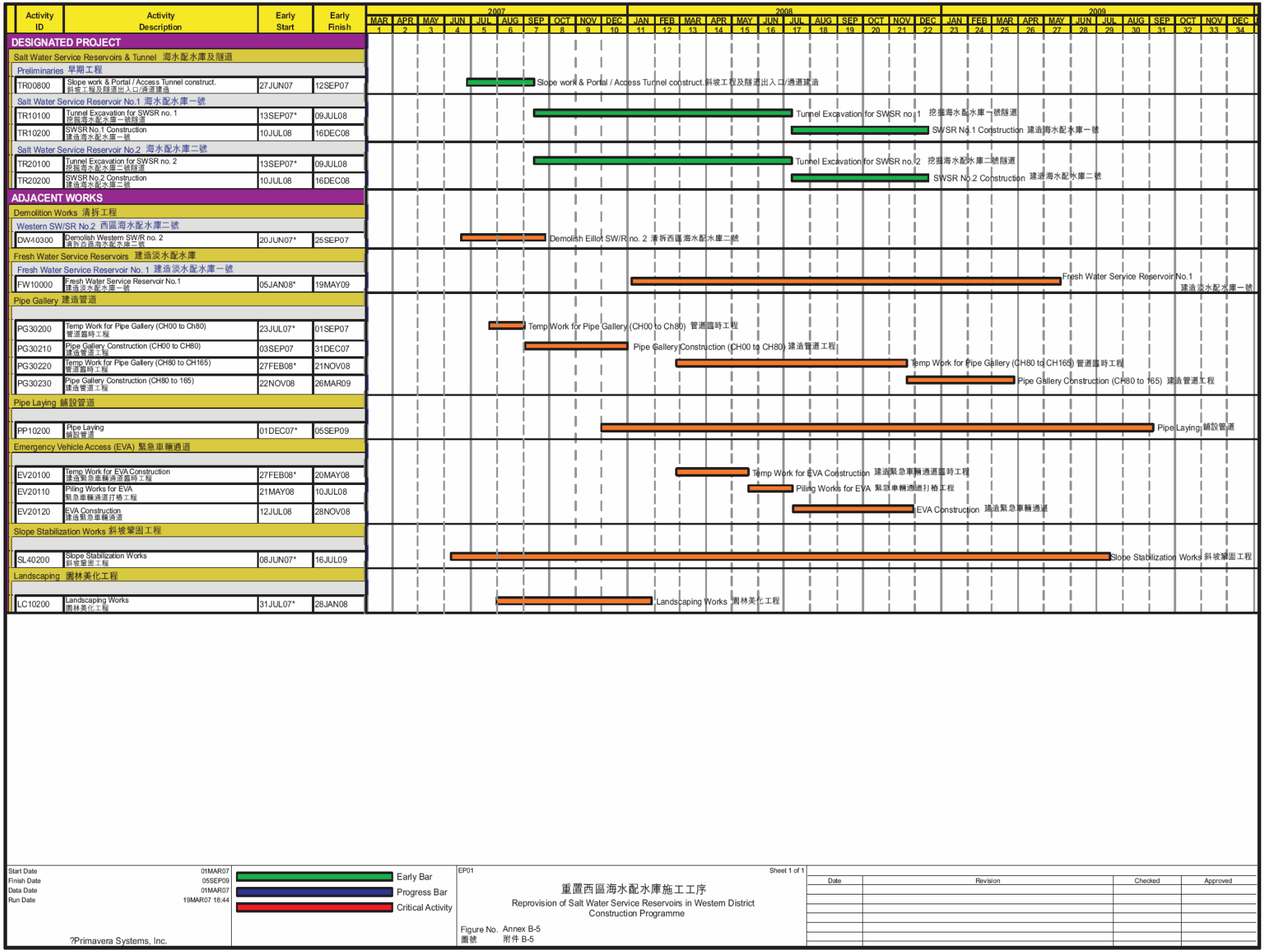
- a conclusion to state the return of ambient and/or the predicted scenario as per findings in the Project Profile.

13.6 DATA KEEPING

Documentation 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, such documents will be well kept by the ET, as appropriate, and will be available for inspection upon request. All relevant information will be clearly and systematically recorded in the documents. Monitoring data will be recorded in electronic format, and the soft copy will be available upon request. All documents and data will be kept for at least one year following completion of the construction contract.

Annex A

Summarised Construction Programme


Activity ID
Activity Description
Early Start
Early Finish
2007
2008
2009
MAR APR MAY JUN JUL AUG SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34
DESIGNATED PROJECT
Salt Water Service Reservoirs & Tunnel 海水配水庫及隧道
Preliminaries 早期工程
TR00800 Slope work & Portal / Access Tunnel construct. 斜坡工程及隧道出入口/通道建造 27JUN07 12SEP07
Slope work & Portal / Access Tunnel construct.斜坡工程及隧道出入口/通道建造
Salt Water Service Reservoir No.1 海水配水庫一號
TR10100 Tunnel Excavation for SWSR no. 1 挖掘海水配水庫一號隧道 13SEP07* 09JUL08
Tunnel Excavation for SWSR no.1 挖掘海水配水庫一號隧道
TR10200 SWSR No.1 Construction 建造海水配水庫一號 10JUL08 16DEC08
SWSR No.1 Construction 建造海水配水庫一號
Salt Water Service Reservoir No.2 海水配水庫二號
TR20100 Tunnel Excavation for SWSR no. 2 挖掘海水配水庫二號隧道 13SEP07* 09JUL08
Tunnel Excavation for SWSR no.2 挖掘海水配水庫二號隧道
TR20200 SWSR No.2 Construction 建造海水配水庫二號 10JUL08 16DEC08
SWSR No.2 Construction 建造海水配水庫二號
ADJACENT WORKS
Demolition Works 清拆工程
Western SW/SR No.2 西區海水配水庫二號
DW40300 Demolish Western SW/R no. 2 清拆西區海水配水庫二號 20JUN07* 25SEP07
Demolish Eillot SW/R no. 2 清拆西區海水配水庫二號
Fresh Water Service Reservoirs 建造淡水配水庫
Fresh Water Service Reservoir No. 1 建造淡水配水庫一號
FW10000 Fresh Water Service Reservoir No.1 建造淡水配水庫一號 05JAN08* 19MAY09
Fresh Water Service Reservoir No.1 建造淡水配水庫一號
Pipe Gallery 建造管道
PG30200 Temp Work for Pipe Gallery (CH00 to Ch80) 管道臨時工程 23JUL07* 01SEP07
Temp Work for Pipe Gallery (CH00 to Ch80) 管道臨時工程
PG30210 Pipe Gallery Construction (CH00 to CH80) 建造管道工程 03SEP07 31DEC07
Pipe Gallery Construction (CH00 to CH80) 建造管道工程
PG30220 Temp Work for Pipe Gallery (CH80 to CH165) 管道臨時工程 27FEB08* 21NOV08
Temp Work for Pipe Gallery (CH80 to CH165) 管道臨時工程
PG30230 Pipe Gallery Construction (CH80 to 165) 建造管道工程 22NOV08 26MAR09
Pipe Gallery Construction (CH80 to 165) 建造管道工程
Pipe Laying 鋪設管道
PP10200 Pipe Laying 鋪設管道 01DEC07* 05SEP09
Pipe Laying 鋪設管道
Emergency Vehicle Access (EVA) 緊急車輛通道
EV20100 Temp Work for EVA Construction 建造緊急車輛通道臨時工程 27FEB08* 20MAY08
Temp Work for EVA Construction 建造緊急車輛通道臨時工程
EV20110 Piling Works for EVA 緊急車輛通道打樁工程 21MAY08 10JUL08
Piling Works for EVA 緊急車輛通道打樁工程
EV20120 EVA Construction 建造緊急車輛通道 12JUL08 28NOV08
EVA Construction 建造緊急車輛通道
Slope Stabilization Works 斜坡鞏固工程
SL40200 Slope Stabilization Works 斜坡鞏固工程 08JUN07* 16JUL09
Slope Stabilization Works 斜坡鞏固工程
Landscaping 園林美化工程
LC10200 Landscaping Works 園林美化工程 31JUL07* 28JAN08
Landscaping Works 園林美化工程
Start Date 01MAR07
Finish Date 05SEP09
Data Date 01MAR07
Run Date 19MAR07 18:44
?Primavera Systems, Inc.
Early Bar
Progress Bar
Critical Activity
EP01
Sheet 1 of 1
重置西區海水配水庫施工工序
Reprovision of Salt Water Service Reservoirs in Western District
Construction Programme
Figure No. Annex B-5
圖號 附件 B-5
Date
Revision
Checked
Approved

0063857j

Annex B

Environmental Mitigation Implementation Schedule (EMIS)

Annex B Environmental Mitigation Implementation Schedule

Environmental Protection Measures	Location	Implementation Agent	Implementation Status
Construction Air Quality			
The areas for temporary stockpiling of excavated materials should be provided with enclosed shelters.	Stockpile zone	Contractor	
Stockpile of dusty material outside the cavern and the stockpile zone shelters should be covered entirely with impervious sheeting or sprayed with water or a dust suppression chemical to keep the entire surface wet.	Work areas	Contractor	
Skip hoist for material transport should be totally enclosed by impervious sheeting.	Work areas	Contractor	
Every vehicle should be washed to remove any dusty materials from its body and wheels before leaving a construction site.	Work areas	Contractor	
The area where vehicle washing takes place and the section of the road between the washing facilities and the exit point should be paved with concrete, bituminous materials or hardcores.	Work areas	Contractor	
Where a site boundary adjoins a road, streets or other accessible to the public, hoarding of not less than 2.4 m high from ground level should be provided along the entire length except for a site entrance or exit.	Work areas	Contractor	
Every stock of more than 20 bags of cement should be covered entirely by impervious sheeting placed in an area sheltered on the top and the 3 sides.	Work areas	Contractor	
All dusty materials should be should be sheltered, covered entirely or sprayed with water prior to any loading, unloading or transfer operation so as to maintain the dusty materials wet.	Work areas	Contractor	
The height from which excavated materials dropped should be controlled to a minimum practical height to limit fugitive dust generation from unloading.	Work areas	Contractor	
The load of dusty materials carried by vehicle leaving a construction site should be covered entirely by clean impervious sheeting to ensure dust materials do not leak from the vehicle.	Work areas	Contractor	
Diesel-powered equipment should be properly maintained to control gaseous emissions.	Work areas	Contractor	
Regular watering should be provided to the unpaved haul road and dusty material.	All unpaved haul roads, bulldozed material, exposed site areas	Contractor	

Remarks:

✔ Implemented
@ Partially implemented
✕ Not implemented
N/A Not Applicable

Environmental Protection Measures	Location	Implementation Agent	Implementation Status
Excavation / earth moving operation should be sprayed with water.	Work areas	Contractor	
Continuous 24-hour TSP monitoring should be conducted at designated location once per week throughout the construction period.	Designated location	ET	
Construction Noise			
Noise enclosure at the portal of the Project should be provided in accordance with the submitted noise enclosure design plan.	Portal area	Contractor	
Noise enclosure should be properly maintained to ensure that it is properly functioning throughout the construction stage of the Project.	Portal area	Contractor	
Idling PME should be switched off.	Work areas	Contractor	
Noisy PME should be placed inside the cavern or sited as far away from the NSRs as practicable.	Work areas	Contractor	
Quiet PME should be used as far as practicable.	Work areas	Contractor	
Stored materials and temporary structures, if applicable, should be sited in practical locations to screen NSRs from noisy on-site construction activities.	Work areas	Contractor	
Work sequences should be scheduled to avoid the simultaneous use of noisy PME in close proximity to NSRs.	Work areas	Contractor	
Quieter power units of stationary and earth moving plant with partial or full enclosures or vibratory isolation	All areas	Contractor	
All plant and equipment to be used on the construction site shall be properly maintained in good operating condition.	All areas	Contractor	
Construction noise monitoring should be conducted at designated locations once per week throughout the construction period	Designated locations	ET	
Construction Water Quality			
Discharge license for discharge of effluent from the construction site should be applied under the WPCO. The discharge quality must meet the requirements specified in the discharge license. All the runoff and wastewater generated from the works areas should be treated so that it satisfies all the standards listed in the TM-DSS.	-	Contractor	
Provide proper sewage treatment and disposal facilities in the form of chemical toilets for site staff and workers.	Work areas	Contractor	

Remarks:

✔ Implemented
@ Partially implemented
✕ Not implemented
N/A Not Applicable

Environmental Protection Measures	Location	Implementation Agent	Implementation Status
Open stockpiles of construction material on the work site should be covered with tarpaulin or similar fabric during rainstorms.	Work areas	Contractor	
Treatment facility (e.g. WetSep) should be provided on site to treat all tunneling groundwater.	Work areas	Contractor	
All runoff should be properly collected and treated prior to discharge to the stormwater drain.	Work areas	Contractor	
Peripheral interceptor drains around the site boundary should be provided to segregate surface runoff.	Site boundary	Contractor	
Silt removal facilities, channels and manholes should be maintained and the deposited silt and grit should be removed regularly, at the onset of and after each rainstorm to ensure that these facilities are functioning properly at all times	Work areas	Contractor	
Earthworks final surfaces should be well compacted and the subsequent permanent work or surface protection should be carried out immediately after the final surfaces are formed to prevent erosion caused by rainstorms. Appropriate drainage like intercepting channels should be provided where necessary.	Work areas	Contractor	
Open stockpiles of construction materials (e.g. aggregates, sand and fill material) on sites should be covered with tarpaulin or similar fabric during rainstorms. Measures should be taken to prevent the washing away of construction materials, soil, silt or debris into any drainage system.	Work areas	Contractor	
Manholes (including newly constructed ones) should always be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris from getting into the drainage system, and to prevent storm run-off from getting into foul sewers. Discharge of surface run-off into foul sewers must always be prevented in order not to unduly overload the foul sewerage system.	Work areas	Contractor	
Water used in ground boring and drilling or rock /soil anchoring should as far as practicable be re-circulated after sedimentation. When there is a need for final disposal, the wastewater should be discharged into storm drains via silt removal facilities.	Work areas	Contractor	

Remarks:

✔ Implemented
@ Partially implemented
✕ Not implemented
N/A Not Applicable

Environmental Protection Measures	Location	Implementation Agent	Implementation Status
A wheel washing bay should be provided at every site exit if practicable and wash-water should have sand and silt settled out or removed before discharging into storm drains. The section of construction road between the wheel washing bay and the public road should be paved with backfall to reduce vehicle tracking of soil and to prevent site run-off from entering public road drains.	Wheel washing bay	Contractor	
Wastewater generated from building construction activities including concreting, plastering, internal decoration, cleaning of works and similar activities should not be discharged into the stormwater drainage system. If the wastewater is to be discharged into foul sewers, it should undergo the removal of settleable solids in a silt removal facility, and pH adjustment as necessary.	Work areas	Contractor	
Construction Waste			
Contractor should register as a chemical waste producer if chemical wastes would be produced from the construction activities.	-	Contractor	
Good quality containers compatible with the chemical wastes should be used, and incompatible chemicals should be stored separately. Appropriate labels should be securely attached on each chemical waste container.	Work areas	Contractor	
The Contractor shall use a licensed collector to transport and dispose of the chemical wastes in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.	Work areas	Contractor	
Training to site personnel in proper waste management and chemical handling procedures should be provided.	Work areas	Contractor	
Regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors should be conducted.	Work areas	Contractor	
Appropriate measures to minimize windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers should be implemented.	Work areas	Contractor	
Sufficient waste disposal points and regular collection of waste should be provided.	Work areas	Contractor	
Sorting of demolition debris and excavated materials from demolition works to recover reusable/ recyclable portions (ie soil, broken concrete, metal, etc) should be implemented.	All areas	Contractor	

Remarks:

✔ Implemented
@ Partially implemented
✕ Not implemented
N/A Not Applicable

Environmental Protection Measures	Location	Implementation Agent	Implementation Status
Different types of waste should be segregate and stored in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal.	Work areas	Contractor	
Encourage collection of aluminum cans by individual collectors by providing separate labeled bins to enable this waste to be segregated from other general refuse generated by the work force.	Work areas	Contractor	
Proper storage and site practices should be implemented to minimize the potential for damage to contamination of construction materials.	Work areas	Contractor	
Construction materials should be carefully planned and stocked to minimize amount of waste generated and avoid unnecessary generation of waste.	Work areas	Contractor	
General refuse should be stored in enclosed bins or compaction units separate from C&D material. A reputable waste collector should be employed by the contractor to remove general refuse from the site, separately from C&D material. Preferably an enclosed and covered area should be provided to reduce the occurrence of 'wind blown' light material.	Work areas	Contractor	
A Waste Management Plan should be prepared in accordance with ETWB TCW No. 19/2005 and to be implemented throughout the construction stage.	Work areas	Contractor	
A recording system with details on the amount of wastes and construction and demolition material generated, recycled and disposed (including the disposal sites) should be developed in accordance with ETWB TCW No.31/2004.	Work areas	Contractor	
Ecology			
No construction works should be carried out on the ground surface within the secondary woodland habitat as shown in Figure 2 of Environmental Permit EP-279/2007. Fence or hoardings should be provided along the boundary to prevent vehicles movement, and encroachment of personnel, onto adjacent woodland areas.	Woodland areas	Contractor	
No construction discharge should be discharged into the two natural seasonal streams as shown in Figure 2 of Environmental Permit EP-279/2007.	Work areas	Contractor	

Remarks:

✔ Implemented
@ Partially implemented
✕ Not implemented
N/A Not Applicable

Environmental Protection Measures	Location	Implementation Agent	Implementation Status
Storm water runoff should be directed into existing drainage channel via silt removal facility.	Work areas	Contractor	
Channels, bunds or sand bag barriers will be provided on site to properly direct site runoff to such silt removal facilities.	Work areas	Contractor	
Landscape and Visual			
Site hoarding, roof covers, noise barriers and offices should be coloured to complement the surrounding landscape and to minimize visual impacts.	Site boundary	Contractor	
The Contractor should maintain the site in a neat and tidy state during construction phase.	All areas	Contractor	
The portal should be finished with materials and finishes that complement the surrounding landscape and are of low reflectivity.	All areas	Contractor	
New plantings should be installed at the location that is not conflicts with the completion of the reprovisioning works.	All areas	Contractor	
Cultural Heritage			
Fencing should be erected around the entire Elliot Treatment Works.	Elliot Treatment Works	Contractor	
Concurrent construction works of the Project with the adjacent works should be carefully planned to minimize the potential building movement on the Elliot Treatment Works.	Elliot Treatment Works	Contractor	
Monitoring should be conducted at designated locations in accordance with the EM&A Manual.	Designated locations	Contractor	

Remarks:

✔ Implemented
@ Partially implemented
✕ Not implemented
N/A Not Applicable

Annex C

Sample Data Record Sheet for Air Quality, Noise and Waste Management

Data Sheet for 24-Hour TSP Monitoring

Monitoring Location		
Details of Location		
Equipment No.		
Pump Serial Number		
Date of Sampling		/ /
Time of Sampling (hh:mm)		
Weather Condition		Sunny / Fine / Cloudy / Rainy
Elapsed-time Meter Reading	**Initial**	
	Final	
Total Sampling Time (hours)		
Initial Flow Rate (m^3/min.)		
Final Flow Rate (m^3/min.)		
Average Flow Rate (m^3/min)		
Total Sampling Volume (m^3)		
Filter Identification Number		
Initial Weight of Filter (g)		
Final Weight of Filter (g)		
Weight of Particulate (g)		
Particulate Concentration (ug/m^3)		
Action & Limit Level (ug/m^3)		/ **260.0**
Site Condition		☐ Normal Operation ☐ Breaker/Excavator/Back- ☐ hoe ☐ Traffic Emission ☐ Dust from other activities Others:_____
Remarks		

	Name	**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 :			

Waste Flow Table Proforma

Project : Reprovisioning and Upgrading of Salt Water Service Reservoirs in Western District for Water Supplies Department

Yearly Summary Waste Flow Table

Year	Estimated Annual Quantity of Inert C&D Materials (in '000m³)										Estimated Annual Quantities of C&D Wastes									
	Total Quantity Generated		Broken Concrete (see Note 2)		Reused in the Contract		Reused in other Projects		Disposed as Public Fill		Metals		Paper/ cardboard packaging		Plastics (see Note 3)		Chemical Waste		Others, e.g. general refuse	
	(a)		(b)		(c)		(d)		(a-b-c-d)		(in '000 kg)		(in '000kg)		(in '000kg)		(in '000kg)		(in '000m³)	
	Est.	Act.	Est.	Act.	Est.	Act.	Est.	Act.	Est.	Act.	Est.	Act.	Est.	Act.	Est.	Act.	Est.	Act.	Est.	Act.
2007																				
2008																				
2009																				
2010																				
GRAND TOTAL																				

Notes: (1) The waste flow table shall also include C&D materials that are specified in the Contract to be imported for use at the Site.
(2) Broken concrete for recycling into aggregates.
(3) Plastic refer to plastic bottles/containers, plastic sheets/foam from packaging material.

Waste Flow Table Proforma

Project: Reprovisioning and Upgrading of Salt Water Service Reservoirs in Western District for Water Supplies Department

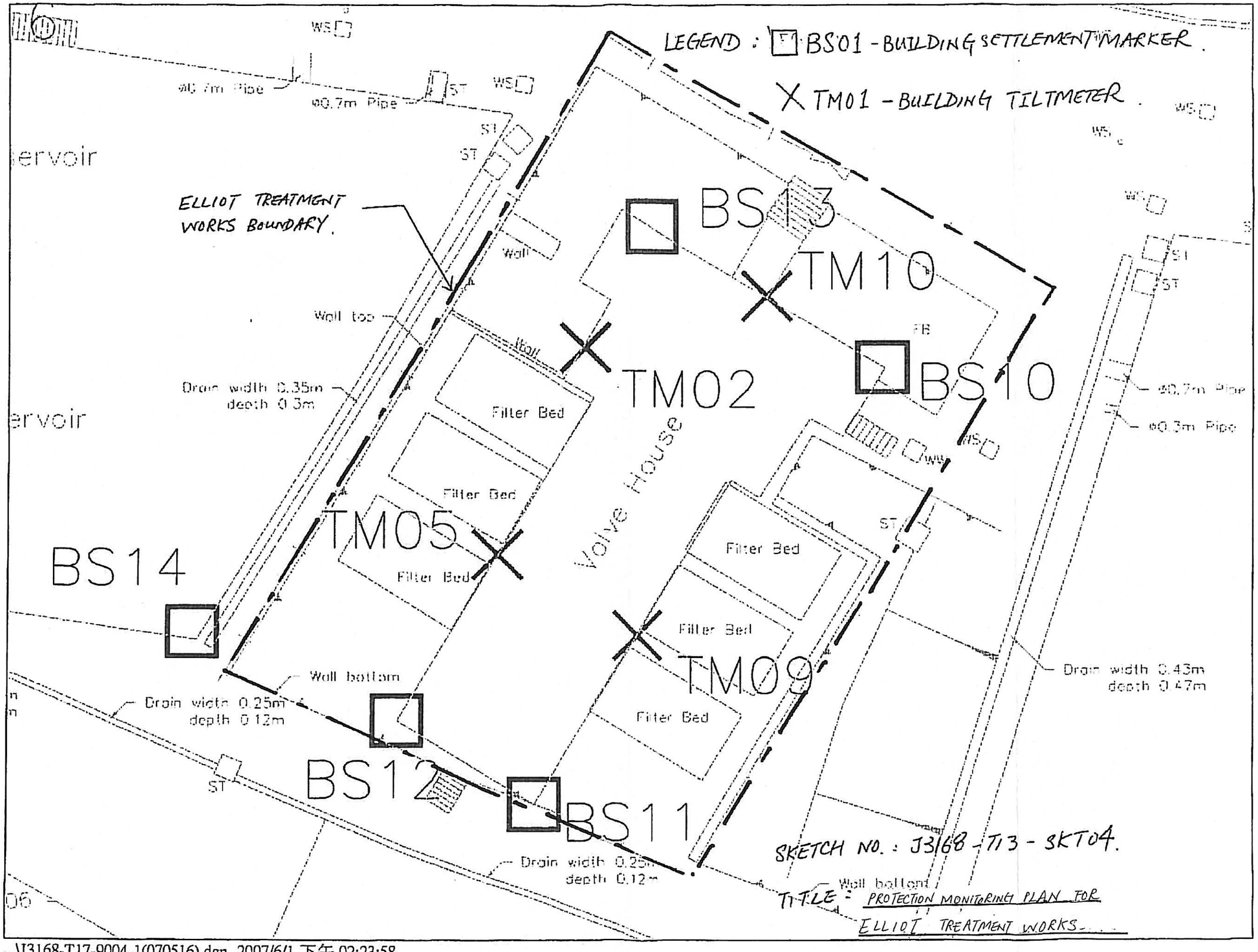
Monthly Summary Waste Flow Table for _____ (year)

Month	*Actual Quantities of Inert C&D Materials Generated Monthly*					*Actual Quantities of C&D Wastes Generated Monthly*				
	Total Quantity Generated	*Broken Concrete (see Note 2)*	*Reused in the Contract*	*Reused in other Projects*	*Disposed as Public Fill*	*Metals*	*Paper/ cardboard packaging*	*Plastics (see Note 3)*	*Chemical Waste*	*Others, e.g. general refuse*
	(in '000m³)	*(in '000m³)*	*(in '000m³)*	*(in '000m³)*	*(in '000m³)*	*(in '000kg)*	*(in '000kg)*	*(in '000kg)*	*(in'000kg)*	*(in '000m³)*
Jan										
Feb										
Mar										
Apr										
May										
June										
Sub-total										
July										
Aug										
Sept										
Oct										
Nov										
Dec										
Total										

Notes: (1) The waste flow table shall also include C&D materials that are specified in the Contract to be imported for use at the Site.
(2) Broken concrete for recycling into aggregates
(3) Plastics refer to plastic bottles/containers, plastic sheets/foam from packaging material

Annex D

Monitoring Locations for Elliot Treatment Works



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Annex E

Contractor's Complaint Handling Procedure

Annex D – Gammon Construction Limited Enquiry and Complaints Handling Procedure

1.1 General

Any member of the public can make a telephone call for enquiry or complaint about activities that may relate to the project using the telephone number 9855 1949. The hotline will have the ringer turned on and a message recording system will be set to answer after 6 rings. The outgoing message on the message recording system will be in Cantonese and then English. The outgoing message will be:

"Thank you for calling the "Design and Construction of Reprovisioning of WSD Facilities " project enquiry hotline. We are sorry that we cannot answer your call right now, please leave your name, contact number and message and we will get back to you as soon as possible, Thank you"

"多謝致電 "西區水庫重置工程"之熱線電話.對不起我們暫時不能接聽你的電話, 請留底你的姓名、電話及查詢, 我們會盡快回覆. 不便之處, 敬請原諒.

1.2 Incoming telephone calls and correspondence

Calls received on the Hotline

When the hotline is ringing, a designated holder will answer the phone and record the details of the conversation. The designated holder will take any immediate follow up action where practically needed including notify the Public Relation Officer (PRO) and Project Manager or relevant staffs for any follow up calls or action to the public. The PRO will log down the enquiry or complaint and the follow up action for record.

Enquiry or Complaint Correspondence received via mail

When enquiry or complaint correspondence is received, the Public Relation Officer (PRO) will scan the original copy then email to SO, HKUPR, WSD and copy to Project Manager to delegate a suitable person to take immediate follow action. The PRO will file the record.

Staff will make every effort to be polite and helpful when talking to members of the public.

The detail of the handling procedure is presented in **Attachment A**.

1.3 Record classification and assignment of responsible staff

The Project Manger will classify the record as either a complaint or an enquiry, and then assign a suitable member or members of staff to take follow up action and then notify the PRO for further follow up with the assigned staff member.

1.4 Investigation and follow up action

The staff assigned to take action will arrange for the PRO to contact the caller and obtain additional information about the enquiry or complaint. The assigned staff member will record actions taken to correct the problem and prevent recurrence on the Public Enquiry/ Complaint Form. After completing the investigation and follow up action, the PRO will email the Public Enquiry/Complaint Form to SO, HKUPR, WSD and then use the original copy for updating the Log and filing of the original record.

The example of the Public Enquiry/ Complaint Form is attached in **Attachment B**.

1.5 Define the complaint

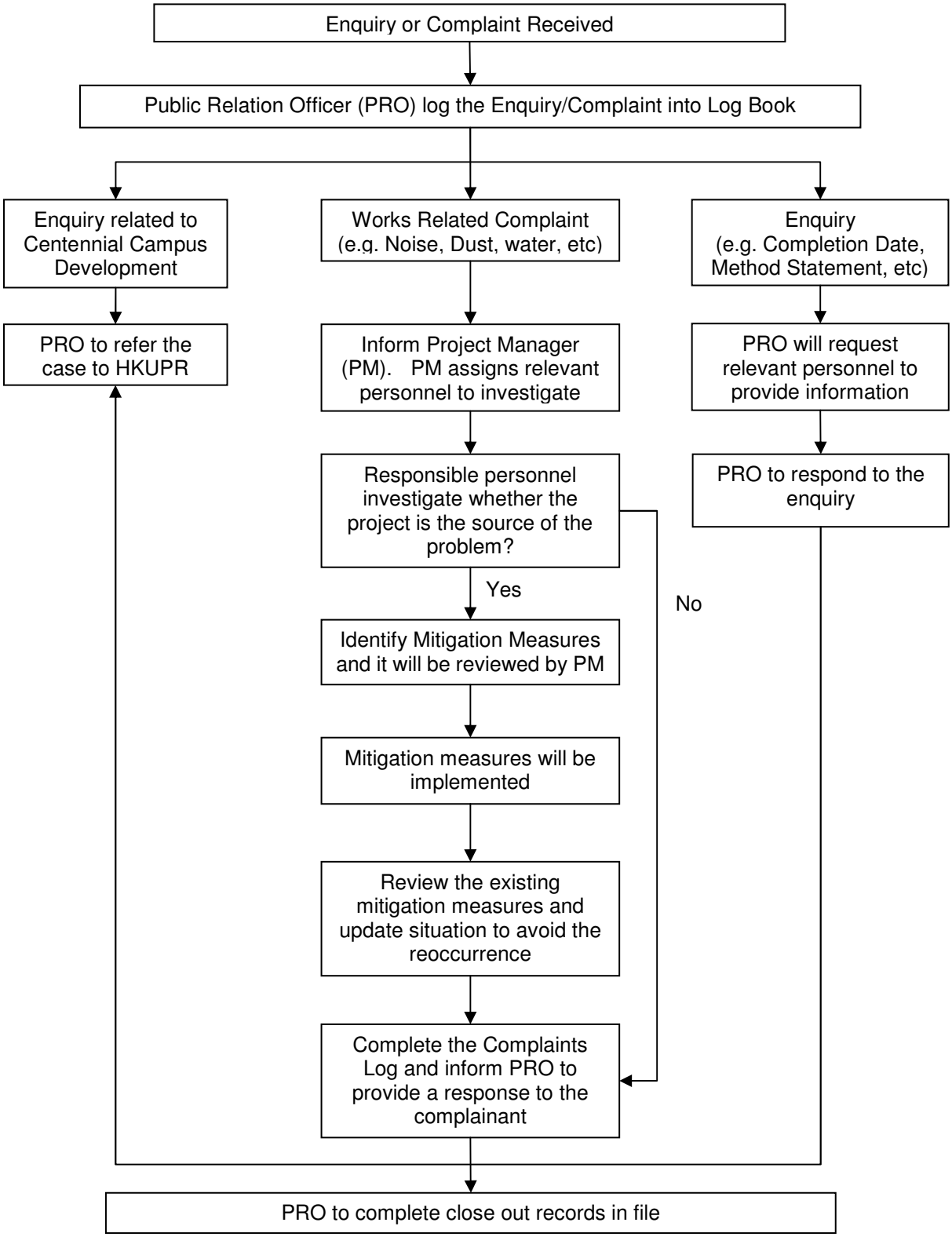
The Project Manager will classify the complaint is invalid or valid subject to the body of characteristics.

1.6 Review of enquiries by the Supervision Officer

SO will be kept informed of enquiries and complaints by receiving the Public Enquiry and Complaint Form immediately after information is received and after corrective and preventive measures are carried out.

Attachment A

General Enquiry/Complaint Handling Process



Attachment B

Public Enquiry/Complaint Form

Division/Department:	**Date:**	**Ref:**
Project:		**Job No.:**
COMPLAINANT		
Name: Tel: Fax:	Address:	
ENQUIRY/COMPLAINT INVESTIGATION		
Item	Description (cause of impact, type of impact and location, etc.)	
CORRECTIVE & PREVENTIVE ACTION(S)		
Action	Proposed Action to be taken	To be completed by/on
Prepared by: Name**:**	Signature**:**	Date**:**
Endorsed by (Project Manager): Name**:**	Signature**:**	Date**:**
FOLLOW UP ACTION(S)		
Confirmed by: Name:	Signature:	Date:
ATTACHMENTS:		

Annex F

Complaint Investigation Form and Complaint Log

ERM-Hong Kong Ltd

Reprovisioning and Upgrading of Salt Water Service Reservoirs in Western District for Water Supplies Department

Investigation Report – Complaint Received on _____

Log No.	Complaint Log No. S___
Date of Investigation Report	
Date & Time of Complaint	
Description of Complaint	
Investigation Report	
Immediate Measures Taken	
Further Measures Taken	
Recommendations	-
Status of Complaint	Closed / Not yet closed

Annex E Complaint Log

Log No.	*Location*	*Complaint made on*	*Details of Complaint*	*Investigation and Mitigation Action*	*Status*

Annex G

Notification of Exceedance

ERM-Hong Kong Ltd

Reprovisioning and Upgrading of Salt Water Service Reservoirs in Western District for Water Supplies Department

Notification of Exceedance

Log No.	
Date	
Monitoring Station	
Parameter	
Action & Limit Levels	
Measured Level	
Possible Reason for Action or Limit Level Non-compliance	
Actions Taken / To Be Taken	
Remarks	-

Reported by : _____ (Environmental Team Leader)

Date : _____