

Civil Engineering Department  
The Government of the Hong Kong Special Administrative Region

Agreement No. CE 68/99

# **Infrastructure for Penny's Bay Development Engineering Design and Construction**

**Decommissioning of Cheoy Lee Shipyard  
At Penny's Bay**

**EM&A Manual (Final)**

February 2002

**Maunsell Consultants Asia Ltd.**

in association with

Maunsell Geotechnical Services Ltd

Maunsell Environmental Management Consultants Ltd

**Table of Content**

<b>1</b>	<b>INTRODUCTION .....</b>	<b>1</b>
	BACKGROUND .....	1
	PURPOSE OF THE MANUAL .....	1
	PROPOSED WORKS .....	2
	OBJECTIVES OF THE ENVIRONMENTAL MONITORING AND AUDIT .....	3
<b>2</b>	<b>ENVIRONMENTAL MANAGEMENT SYSTEM .....</b>	<b>4</b>
	INTRODUCTION .....	4
	GENERAL .....	4
	THE EM&A MANUAL .....	4
	CONTRACTUAL DOCUMENTATION .....	4
	REVISION OF EM&A MANUAL .....	5
	ENVIRONMENTAL MANAGEMENT PLANS .....	5
	ENVIRONMENTAL PERFORMANCE REVIEWS .....	6
	CONSTRUCTION METHOD STATEMENT .....	6
<b>3</b>	<b>ORGANISATION AND STRUCTURE OF THE EM&amp;A .....</b>	<b>8</b>
	INTRODUCTION .....	8
	PROJECT ORGANISATION .....	8
<b>4</b>	<b>EM&amp;A GENERAL REQUIREMENT .....</b>	<b>10</b>
	INTRODUCTION .....	10
	GENERAL .....	10
	ENVIRONMENTAL MONITORING .....	10
	ACTION AND LIMIT LEVELS .....	10
	EVENT AND ACTION PLANS .....	11
	SITE INSPECTIONS .....	11
	ENQUIRIES, COMPLAINTS AND REQUESTS FOR INFORMATION .....	12
	REPORTING .....	12
	CESSATION OF EM&A .....	12
<b>5</b>	<b>LAND CONTAMINATION .....</b>	<b>13</b>
	INTRODUCTION .....	13
	GROUNDWATER RECHARGE DURING EXCAVATION .....	13
	REMOVAL OF FREE PRODUCT ENCOUNTERED DURING EXCAVATION .....	14
	CONFIRMATION SAMPLING /TESTING FOR SOIL EXCAVATION .....	15
	CONFIRMATION SAMPLING/TESTING FOR BIOWALL TREATMENT .....	16
	CONFIRMATION SAMPLING/TESTING FOR SOLIDIFICATION TREATMENT .....	17
	CONFIRMATION SAMPLING/TESTING FOR THERMAL DESORPTION TREATMENT .....	18
<b>6</b>	<b>AIR QUALITY MONITORING .....</b>	<b>20</b>
	INTRODUCTION .....	20
	METHODOLOGY AND CRITERIA .....	20
	MONITORING EQUIPMENT .....	22
	LABORATORY MEASUREMENT/ANALYSIS .....	24
	MONITORING LOCATIONS .....	24
	BASELINE MONITORING .....	26

	IMPACT MONITORING.....	26
	COMPLIANCE ASSESSMENT .....	28
	EVENT AND ACTION PLAN (EAP).....	28
	MITIGATION MEASURES.....	31
<b>7</b>	<b>WATER QUALITY .....</b>	<b>32</b>
	INTRODUCTION.....	32
	MONITORING REQUIREMENTS .....	32
	COMPLIANCE ASSESSMENT AND ACTION PLAN.....	32
	MITIGATION MEASURES.....	33
<b>8</b>	<b>WASTE MANAGEMENT.....</b>	<b>34</b>
	INTRODUCTION.....	34
	WASTE CONTROL AND MITIGATION MEASURES.....	34
	CONSTRUCTION AND DEMOLITION PHASE.....	34
	SLOPE IMPROVEMENT PHASE .....	38
	REMEDIATION PHASE .....	38
<b>9</b>	<b>ECOLOGY .....</b>	<b>44</b>
	MONITORING AND MAINTENANCE OF TRANSPLANTED PLANTS.....	44
	MONITORING OF THE RELOCATED FISH SPECIES .....	45
<b>10</b>	<b>ENVIRONMENTAL AUDITING .....</b>	<b>47</b>
	SITE INSPECTIONS.....	47
	COMPLIANCE WITH LEGAL AND CONTRACTUAL REQUIREMENTS .....	48
	ENVIRONMENTAL COMPLAINT .....	48
<b>11</b>	<b>REPORTING .....</b>	<b>49</b>
	GENERAL .....	49
	BASELINE MONITORING REPORT.....	49
	MONTHLY EM&A REPORTS .....	50
	QUARTERLY EM&A SUMMARY REPORTS .....	53
	FINAL EM&A REVIEW REPORTS .....	54
	DATA KEEPING.....	56
	INTERIM NOTIFICATIONS OF ENVIRONMENTAL QUALITY LIMIT EXCEEDANCES.....	56

## List of Tables

Table 1.1	Preliminary Project programme
Table 5.1	Event and Action Plan for the Groundwater Level Monitoring during Groundwater Recharge
Table 5.2	Event and Action Plan for Removal of Encountered Free Product during Excavation
Table 5.3	Event and Action Plan for Confirmation Sampling/Testing for Soil Excavation
Table 5.4	Event and Action Plan for Confirmation Sampling/Testing for Biopile Treatment
Table 5.5	Event and Action Plan for Confirmation Sampling/Testing for Solidification Treatment
Table 5.6	Event and Action Plan for Confirmation Sampling/Testing for Thermal Desorption Treatment
Table 5.7	Concerned Action Levels and Cleanup Targets for Soil Remediation
Table 6.1	Ambient Air Quality Monitoring Stations and their Commencement Time
Table 6.2	Impact ambient air monitoring programme
Table 6.3	Plant Emission Monitoring Requirements
Table 6.4	Proposed Action and Limit Levels for Ambient Monitoring
Table 6.5	Proposed Action and Limit Levels for Plant Emissions Monitoring
Table 6.9	Event / Action Plan for Ambient Air Quality Monitoring
Table 6.10	Event / Action Plan for Plant Emissions Monitoring
Table 7.1	Event and Action Plan for the Effluent Discharge Monitoring

## List of Figures

Figure 1.1	Site Location Map
Figure 1.2	Locations of Air Quality Sensitive Receivers
Figure 1.3	Locations of Water Quality Sensitive receivers
Figure 1.4	Habitat Map – Cheoy Lee Shipyard
Figure 1.5	Habitat Map – To Kau Wan
Figure 5.1	Schematic of Groundwater Level Monitoring During Recharging
Figure 6.1	Typical Dioxins High Volume Air Sampler
Figure 6.2	Sampling Train for Stack Dioxin Sampling
Figure 6.3	Ambient Air Monitoring Station During Demolition and Excavation Phase Monitoring
Figure 6.4	Ambient Air Monitoring Station During Remediation Phase Monitoring

## List of Appendices

Appendix A	Implementation Schedule of Mitigation Measures
Appendix B	Sample Data Sheets for Air Quality Monitoring
Appendix C	Sample Template for the Interim Notification

## 1 INTRODUCTION

### Background

- 1.1 The former Cheoy Lee Shipyard at Penny's Bay will be decommissioned to make room for the construction of infrastructures associated with Hong Kong Disneyland Phase 1, including the Penny's Bay Section of the Chok Ko Wan Link Road (CKWLR), Road P2 and the water recreation centre, etc. The decommissioning of Cheoy Lee Shipyard (the Project) will be on the critical path for the construction of the Hong Kong Disneyland Theme Park.
- 1.2 Main activities associated with the Project are demolition of buildings in Cheoy Lee Shipyard (CLS), excavation of contaminated soil from CLS, off-site soil treatment at a reclaimed land of To Kau Wan (TKW), slope improvement work behind CLS and filling of CLS site after decommissioning. As identified in the Environmental Impact Assessment Report for the Decommissioning of Cheoy Lee Shipyard (hereafter referred to as the EIA), key environmental impacts arising from the Project include air quality impact at the sensitive receiver adjacent to the CLS and TKW sites, local contamination impact at the groundwater recharge point during dewatering, loss of habitats of the restricted/ protected plant species behind CLS and impact to Mong Tung Hang & the potential rice fish population.
- 1.3 In relation to the anticipated environmental impacts of the Project, respective mitigation measures and environmental monitoring and audit requirements have been recommended in the EIA report. This Environmental Monitoring and Audit (EM&A) Manual has been prepared in supplement of the EIA report to provide details of the EM&A requirements and the environmental management system activities during the Project.

### Purpose of the Manual

- 1.4 The purpose of this Manual is to guide the set up of an EM&A programme to ensure compliance with the EIA study recommendations, to assess the effectiveness of the recommended mitigation measures and to identify any further need for additional mitigation measures or remedial action. This Manual outlines the monitoring and audit programme for the construction/ demolition and remediation phases of the proposed project. It aims at providing systematic procedures for monitoring, auditing and minimising environmental impacts associated with decommissioning works and activities.
- 1.5 Hong Kong environmental regulations and the Hong Kong Planning Standards and Guidelines have served as environmental standards and guidelines in the preparation of this Manual. In addition, the EM&A Manual has been prepared in accordance with the requirements stipulated in Annex 21 of the Technical Memorandum on the EIA Process (EIAO-TM).
- 1.6 This Manual contains the following information:

- responsibilities of the Contractor, the Engineer or Engineer's Representative (ER), Environmental Team (ET), and the Independent Environmental Checker (IEC) with respect to the environmental monitoring and audit requirements during the course of the project;
- project organisation for the project;
- the basis for, and description of the broad approach underlying the EM&A programme;
- requirements with respect to the construction programme schedule and the necessary environmental monitoring and audit programme to track the varying environmental impact;
- details of the methodologies to be adopted, including all field laboratories and analytical procedures, and details on quality assurance and quality control programme;
- the rationale on which the environmental monitoring data will be evaluated and interpreted;
- definition of Action and Limit levels;
- establishment of Event and Action plans;
- requirements for reviewing pollution sources and working procedures required in the event of non-compliance with the environmental criteria and complaints;
- requirements for presentation of environmental monitoring and audit data and appropriate reporting procedures; and
- requirements for review of EIA predictions and the effectiveness of the mitigation measures / environmental management systems and the EM&A programme.

1.7 For the purpose of this manual, the ET leader, who will be responsible for and in charge of the ET, shall refer to the person delegated the role of executing the EM&A requirements.

### **Proposed Works**

1.8 The Project proposes to decommission the existing CLS at Penny's Bay in order to make space available for the infrastructure construction in association with the Hong Kong Disneyland Phase 1 development. Key works of the Project comprise:

- (a) Demolition of the existing structures within CLS;
- (b) Removal of abandoned equipment/ installation/ facilities and waste materials in CLS;
- (c) Excavation of the contaminated soil in CLS and transportation to the off-site treatment plants at To Kau Wan;
- (d) Installation and operation of the off-site treatment plants;
- (e) Decommissioning of the off-site treatment plants, site re-instatement and associated clean up work
- (f) Slope improving works behind the CLS; and
- (g) Filling of the CLS to a new formation level after decommissioning.;

1.9 The Project will be scheduled to commence in mid 2002. The preliminary Project programme is given in Table 1.1.

**Table 1.1 Preliminary Project programme**

Project Components	Preliminary Working Period	
	From	To
Demolition & excavation of contaminated soil	July 2002	March 2003
Operation of on-site soil treatment plant	November 2002	May 2003
Slope works behind CLS	July 2002	December 2003
Preparation of TKW site	July 2002	October 2002
Biopile operation at TKW	November 2002	November 2004
Solidification operation at TKW	March 2004	March 2006
Thermal desorption operation at TKW	February 2004	February 2006
Filling of CLS after decommissioning	October 2002	July 2003
TKW decommissioning	February 2006	July 2006

- 1.10 The layout of the work sites is shown in Figure 1.1. Air quality, water quality and ecological sensitive receivers that may be affected by the Project have been identified in the EIA report. They are shown in Figures 1.2 to 1.5.

### Objectives of the Environmental Monitoring and Audit

- 1.11 The main objectives 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 performance of the project and the effectiveness of mitigation measures;
  - to verify the environmental impacts predicted in the EIA Study;
  - 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 ENVIRONMENTAL MANAGEMENT SYSTEM

### Introduction

- 2.1 This section sets out the proposed environmental management system approaches that will be implemented to ensure that the recommendations of the EIA are fully and effectively implemented during the Project.

### General

- 2.2 The EIA Report provides an assessment of the predicted scope and extent of likely impacts resulting from the decommissioning of the CLS and soil remediation work at TKW. Mitigation recommendations have been specified to ensure that the environmental quality objectives are met. The recommended mitigation measures from the EIA Report are summarised in the form of an Implementation Schedule (IS) (Appendix A).
- 2.3 An integral part of these recommendations is the requirement to undertake an EM&A process to verify the level of environmental performance achieved and the effectiveness of the recommended mitigation measures.

### The EM&A Manual

- 2.4 The EM&A Manual outlines the monitoring & auditing protocols which will be necessary to achieve the objective of the EM&A programme. Implementation of the EM&A programme and the EM&A data will reflect the Project's compliance of the environmental quality standard. It also serves as a feedback to the Contractor, Civil Engineering Department (CED, the Project Proponent), and the Environmental Protection Department (EPD) in determining if the existing mitigation measures are adequate.
- 2.5 The EM&A Manual is a dynamic document that will be reviewed and updated, where necessary upon commencement of the Project.

### Contractual Documentation

- 2.6 In order to ensure that Contractor implement the recommended mitigation measures upon the Project commencement, the contract specifications shall include clauses related to compliance with the appropriately recommended mitigation measures/environmental monitoring requirements. In addition, the contract specifications shall define appropriate contractual mechanisms to ensure compliance with these environmental requirements.
- 2.7 The contractual documentation shall require the Contractor to prepare, implement and maintain an Environmental Management Plan (EMP).



### **Revision of EM&A Manual**

- 2.8 It should be noted that this EM&A Manual has been prepared during the design phase of the Project and shall be reviewed and updated in accordance with any conditions or requirements stipulated in the future Environmental Permit.
- 2.9 Upon the Project commencement where the ENPO system is in place, updating and maintaining this EM&A Manual shall be done by the ENPO. Alternatively, the ET Leader shall take up the responsibility.

### **Environmental Management Plans**

- 2.10 In order to ensure the effective contract specific implementation and reporting on compliance with the stated mitigation measures, as well as the monitoring and auditing requirements and remedial actions defined in the EIA Report, an appropriate contractual and supervisory framework shall be established. Upon commencement of the Project, the Contractor shall prepare an Environmental Management Plan (EMP) that shall form the framework within which the implementation of mitigation measures and good site practices are to be managed.
- 2.11 An EMP is similar in nature to a quality plan and provides details of the means by which the Contractor (and all subcontractor working to the Contractor) shall implement the recommended mitigation measures and achieve the environmental performance standards defined in Hong Kong environmental legislation, the Contract and in the EIA documentation. The primary reason for adopting the EMP approach is to make the Contractor aware of his environmental responsibilities and to be pro-active about the commitment to achieve the standards specified, rather than relying on the EM&A programme.
- 2.12 The EMP also provides opportunities for the Contractor to draw upon the strength of other institutional processes such as ISO 9000/14000 to ensure that the achievement of the required standards and fulfilment of commitments are documented.
- 2.13 The provision of an EMP shall be a contractual requirement, and the EMP needs to be approved by the Engineer following verification from the IEC.
- 2.14 The contractual requirement for an EMP generally comprises appropriate extracts from (and references to) the Project EIA Report and EM&A Manual, and include such typical elements as the relevant statutory environmental standards, general environmental control clauses and specific environmental management clauses, as well as an outline of the scope and content of the EMP. In drafting the documentation, due consideration should be given to the predictive nature of the EIA process and the consequent need to manage and accommodate the actual impacts arising from the construction process. In particular, the Contractor must be placed under a clear obligation to identify and control any implications arising from changes to the working methods assumed in the EIA Report, or to the progress rates and other estimates made during the preliminary design phase.

### **Environmental Performance Reviews**

- 2.15 The environmental performance review programme comprises the regular assessment of the effectiveness of the EMP, site practices and procedures to ensure that the required mitigation measures are routinely implemented and that they are being effective in achieving the required environmental standards.
- 2.16 The criteria of the reviews shall be derived from the following:
- the approaches, procedures and commitments given by the Contractor in their EMP;
  - the clauses contained within the Contractor' Contractual Documentation; and
  - those parts of the Contractor' method statements which relate to the minimisation of environmental impacts or other specified environmental protection measures.
- 2.17 The reviews shall focus on the effectiveness of the implemented measures to achieve the purpose, not simply the fact that a measure has been implemented.
- 2.18 Review protocols shall be developed by the ET Leader prior to the commencement of works and it is suggested that the protocols should include inspection and auditing of the following:
- the allocation of responsibility for fulfilling environmental requirements, and agreed mitigation measures, and the effectiveness of lines of communication with regard to environmental issues;
  - compliance with procedures established to enable an effective response to environmental incidents, exceedances or non-compliance;
  - the extent and accuracy of record-keeping related to environmental performance indicators;
  - the effectiveness of staff training in ensuring high levels of awareness with regard to environmental requirements; and
  - the effectiveness of environmental management activities.
- 2.19 The protocols shall comprise checklists of environmental requirements and shall be amended, throughout the construction phase as necessary, to focus on areas of frequent non-compliance and to reflect the potential impacts associated with specific activities within the construction programme.

### **Construction Method Statement**

- 2.20 It is common practice for the Contractor to submit details of forthcoming works to the Engineer to seek approval for the commencement of the works as well as the methodology and equipment proposed to be used.

- 
- 2.21 The ET Leader shall comment on deviations of the specific works from that assumed in the Project EIA and advise on the implications of the changes in construction methods for achieving the environmental performance criteria set out in the EIA documentation and the EMP.
- 2.22 This ongoing requirement for the Contractor to review proposed working methods, in terms of their potential to impact upon the environment, will reduce the time taken to implement the necessary environmental control measures and reduce the number of iterations a measure may have to go through before becoming effective.
- 2.23 Any changes in construction methods shall be reflected in a revised EMP or the Contractor is required to demonstrate the manner in which the existing EMP shall accommodate the proposed changes.

### 3 ORGANISATION AND STRUCTURE OF THE EM&A

#### **Introduction**

- 3.1 In this Section, the various parties involved in the EM&A process are outlined and the proposed organisational structure of the organisations responsible implementing the EM&A programme and their key responsibilities are presented. Furthermore an alternative organisational structure is presented with reference to the fact that a number of the construction contracts may be undertaken concurrently in the future.

#### **Project Organisation**

- 3.2 The roles and responsibilities of the various parties involved in the construction phase EM&A process outlined above are further expanded upon in the following sections.
- 3.3 The duties and responsibilities of respective parties are as follows:

#### ***The Contractor:***

- employ an Environmental Team (ET) to undertake monitoring, laboratory analysis and reporting of environmental monitoring and audit;
- provide assistance to ET in carrying out monitoring;
- submit proposals on mitigation measures in case of exceedances of Action and Limit levels in accordance with the Event and Action Plans;
- implement measures to reduce impact where Action and Limit levels are exceeded; and
- adhere to the procedures for carrying out complaint investigation.

#### ***Environmental Team:***

- monitor various environmental parameters as required in the EM&A Manual;
- analyse the environmental monitoring and audit data and review the success of EM&A programme to cost-effectively confirm the adequacy of mitigatory measures implemented and the validity of the EIA predictions and to identify any adverse environmental impacts arising;
- carry out site inspection to investigate and audit the Contractors' site practice, equipment and work methodologies with respect to pollution control and environmental mitigation, and effect proactive action to pre-empt problems;
- audit and prepare audit reports on the environmental monitoring data and site environmental conditions;
- report on the environmental monitoring and audit results to the IEC, Contractor, the ER and EPD or its delegated representative;
- recommend suitable mitigation measures to the Contractor in the case of exceedance of Action and Limit levels in accordance with the Event and Action Plans; and

- adhere to the procedures for carrying out complaint investigation.

***Engineer or Engineer's Representative:***

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

***Independent Environmental Checker:***

- review the EM&A works performed by the ET (at not less than monthly intervals);
- audit the monitoring activities and results (at not less than monthly intervals);
- report the audit results to the ER and EPD in parallel;
- review the EM&A reports (monthly and quarterly summary reports) submitted by the ET;
- review the proposal on mitigation measures submitted by the Contractor in accordance with the Event and Action Plans; and
- adhere to the procedures for carrying out complaint.

- 3.4 Sufficient and suitably qualified professional and technical staff shall be employed by the respective parties to ensure full compliance with their duties and responsibilities, as required under the EM&A programme for the duration of the Project.

## 4 EM&A GENERAL REQUIREMENT

### Introduction

- 4.1 In this Section, the general requirements of the EM&A programme for the Project are presented with reference to the relevant findings from the EIA Report that have formed the basis of the scope and content of the programme. .

### General

- 4.2 The environmental issues, which were identified during the EIA process and are associated with the decommissioning of the CLS have been addressed through the monitoring and controls specified in this EM&A Manual and in the decommissioning contracts.
- 4.3 During the demolition and remediation phases of the Project, air quality, water quality, groundwater recharging, waste arising and terrestrial ecology shall be subject to EM&A, with environmental monitoring being undertaken for air quality, groundwater recharging and terrestrial ecology as per the EIA.
- 4.4 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 shall include within their scope, mechanisms to review and assess the Contractor's environmental performance, ensuring that the recommended mitigation measures have been properly implemented, and that the timely resolution of received complaints are managed and controlled in a manner consistent with the recommendations of the EIA Report.

### Environmental Monitoring

- 4.5 The environmental monitoring work throughout the Project period shall be carried out by the ET. Monitoring works shall comprise of quantitative assessment of physical parameters such as air quality impacts; possible impact from groundwater recharge and terrestrial ecology impacts also forms an important part of the whole monitoring programme. Monitoring programme shall be conducted at chosen representative sensitive receivers in the vicinity of the CLS and TKW.

### Action and Limit Levels

- 4.6 Action and Limit (A/L) Levels are defined levels of impact recorded by the environmental monitoring activities which represent levels at which a prescribed response is required. These Levels are quantitatively defined later in the relevant sections of this manual and described in principle below:

- **Action Limits:** 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 would be unacceptable; and
- **Limit Levels:** statutory and/or agreed contract limits stipulated in the relevant pollution control ordinances, HKPSG 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.

### **Event and Action Plans**

- 4.7 The purpose of the Event and Action Plans (EAPs) is to provide, in association with the monitoring and audit activities, procedures for ensuring that if any significant environmental incident (either accidental or through inadequate implementation of mitigation measures on the part of the Contractor) does occur, the cause will be quickly identified and remediated, and the risk of a similar event recurring is reduced. This also applies to the exceedances of A/L criteria identified in the EM&A programme.

### **Site Inspections**

- 4.8 In addition, to monitoring noise, air and water quality levels as a means of assessing the ongoing performance of the Contractor, the ET shall undertake regular site inspections and audits of on-site practices and procedures. The primary objective of the inspection and audit programme will be to assess the effectiveness of the environmental controls established by the Contractor and the implementation of the environmental mitigation measures recommended in the EIA Report.
- 4.9 Whilst the audit and inspection programme will undoubtedly complement the monitoring activity with regard to the effectiveness of dust suppression, noise attenuation measures and water quality control, the criteria against which the audits shall be undertaken shall be derived from the clauses within the Contract Documents which seek to enforce the recommendations of the EIA Report and the established management systems.
- 4.10 The findings of site inspections and audits shall be made known to the Contractor at the time of the inspection to enable the rapid resolution of identified non-compliances. Non-compliances, and the corrective actions undertaken, shall also be reported in the monthly EM&A Reports.
- 4.11 Section 10 of this Manual presents details of the scope and frequency of on-site inspections and defines the range of issues that the audit protocols shall be designed to address.

**Enquiries, Complaints and Requests for Information**

- 4.12 Enquiries, complaints and requests for information can be expected from a wide range of individuals and organisations including members of the public, Government departments, the press and television media and community groups.
- 4.13 All enquiries concerning the environmental effects of the construction works, irrespective of how they are received, shall be reported to the Engineer and via the Contractor directed to the ET which shall set up procedures for the handling, investigation and storage of such information.
- 4.14 In all cases the complainant shall be notified of the findings, and audit procedures shall be put in place to minimise the change of reoccurrence of the problem.

**Reporting**

- 4.15 Monthly, annual and bi-annual reports shall be prepared and certified by the ET and verified by the IEC. These reports shall be submitted to the Engineer and EPD. The monthly reports shall be prepared and submitted within 2 weeks of the end of each calendar month.

**Cessation of EM&A**

- 4.16 The ET shall continue to carry out environmental monitoring and site inspections until the completion of the Project works. The cessation of EM&A programme is subject to the satisfactory completion of the EM&A Final Review Report.



## 5 LAND CONTAMINATION

### Introduction

- 5.1 EM&A requirements for the secondary impacts, such as of air and water quality, arising from the remediation work have been addressed elsewhere in this Manual. The soil remedial proposal has recommended excavating the contaminated soil at CLS and on-site and/or off-site treatment of soil. The contaminated soil shall be separated from the soil system, hence no monitoring for soil and groundwater at CLS is required. The progress monitoring of soil treatment system is to gauge the effectiveness of the remedial systems, a purpose other than environmental impacts and would not be included in the scope of EM&A.
- 5.2 Whenever the dewatering is needed during excavation, the groundwater shall be recharged within 10m of the extraction point and below the water table. Regular monitoring of groundwater level at the recharge point and the proximate locations is recommended to ensure insignificant migration of contaminant in groundwater or soils due to the locally risen groundwater level.
- 5.3 TPH free product was encountered during the site investigation in one monitoring well in Building D (located at Area 1 of the CLS site). It has been recommended in the EIA Report that any free product encountered during excavation at Building D (or other areas of the CLS site) shall be skimmed, containerised and collected by a licensed chemical waste collector for final disposal. In this regard, it has also been recommended in the EIA Report that monitoring and confirmation sampling/testing be carried out to ensure complete removal of any free product encountered during excavation.
- 5.4 In addition, it has been recommended in the EIA Report that confirmation sampling/testing shall be carried out for: (i) soil excavation (to ensure complete excavation of contaminated soil); (ii) biopile treatment (to ensure attainment of cleanup targets); (iii) solidification (to ensure attainment of cleanup targets); and (iv) thermal desorption process (to ensure attainment of cleanup target).

### Groundwater Recharge during Excavation

#### *Monitoring Requirements*

- 5.5 Where the dewatering is needed during excavation, the groundwater shall be recharged within 10m of the extraction point and below the water table. It is recommended that during dewatering groundwater level shall be monitored at five locations, viz. one (1) at the recharge point; one (1) at 5m down-gradient to the recharge point along the direction aligning the groundwater extraction point ; and three (3) at 5m from the recharge point in other 3 directions. The schematic arrangement of the five monitoring locations is given in Figure 5.1.
- 5.6 Baseline groundwater levels at each monitoring location shall be measured at the beginning of working day and before any recharge. Where there is heavy rain, the baseline monitoring shall be undertaken 1 or 2 days after the last rainy day. Regular monitoring of groundwater

level at the five locations is recommended to ensure insignificant migration of contaminant in groundwater or soils due to the locally risen groundwater level. The frequency of the monitoring is recommended to be every 5 minutes in the first hour and every hour afterwards.

### ***Compliance Assessment and Event/Action Plan***

- 5.7 The purpose of the groundwater level monitoring is to detect any likelihood of migration of soil contaminants due to the locally risen groundwater level by the recharge. Should the likelihood of migration be evident, the groundwater recharge needs to be reduced in flow rate or to be suspended. The event and action plan is suggested in Table 5.1.

**Table 5.1 Event and Action Plan for the Groundwater Level Monitoring during Groundwater Recharge**

<b>Event</b>	<b>Action</b>	<b>Action Party</b>
1. During recharge, the rise of groundwater level with reference to the baseline at recharge point EXCEEDS 1 metre.	i) The recharge rate shall be reduced, AND/ OR ii) The recharge shall be suspended until the groundwater level at recharge point falls back to less than 1m difference with the baseline.	Contractor
2. The level difference between recharge point and the monitoring location to the direction of extraction point is SMALLER than those between recharge point and the other 3 monitoring locations.	The recharge shall be suspended and the recharge point shall be reviewed of its suitability by the ET in consultation with the IEC.	Contractor

### **Removal of Free Product Encountered during Excavation**

#### ***Monitoring and Confirmation Sampling /Testing Requirements***

- 5.8 Where TPH free product is encountered at groundwater surface during excavation at Building D or other areas within the CLS site, the free product shall be skimmed off manually. The skimmed free product shall be containerised properly and collected by a licensed chemical waste collector.
- 5.9 Skimming of free product shall continue until there is no detectable free product on the groundwater surface. (The usual detection limit of an oil/water interface probe is 1.5mm). At that time, a confirmation sample of groundwater shall be collected at the surface of the groundwater and analysed for TPH by a laboratory accredited by the Hong Kong Laboratory Accreditation Scheme (HOKLAS).

### ***Compliance Assessment and Event/Action Plan***

- 5.10 Removal of all encountered TPH free product is considered complete when: (i) there is no detectable free product present on the surface of the groundwater where free product has been encountered and (ii) the TPH concentration of the confirmation sample is below 2.13E+02

mg/L (allowable" TPH concentration derived from risk-based assessment in the EIA Report). Skimming of free product shall be continued until all encountered free product has been removed. The event and action plan for the removal of encountered free product is given in Table 5.2.

**Table 5.2 Event and Action Plan for Removal of Encountered Free Product during Excavation**

Event	Action	Action Party
Detectable free product is present on the surface of groundwater at excavated area(s) where free product has been encountered during excavation. (The usual detection limit of an oil/water interface probe is 1.5mm.)	Skimming of free product shall be continued until no detectable free product is present on the groundwater surface.	Contractor
TPH concentration in the confirmation groundwater sample is higher than 2.13E+02 mg/L (allowable" TPH concentration derived from risk-based assessment in the EIA Report).	Skimming of free product shall be continued until the TPH concentration in the confirmation groundwater sample is below 2.13E+02 mg/L.	Contractor

### Confirmation Sampling /Testing for Soil Excavation

#### *Sampling and Testing Requirements*

- 5.11 After excavation, confirmation samples shall be undertaken at limits of excavation to confirm that all contaminated soils have been excavated. The confirmation samples shall be analysed by an HOKLAS accredited laboratory for the chemicals that exceeded the action level for soil remediation.
- 5.12 For small excavation areas (i.e. measure approximately 10m by 10m in size), one confirmation sample shall be collected from the base and one from each sidewall of the excavation. The depth of sampling shall be based on the depth of the original SI sample result that triggered excavation in that area. If SI samples from multiple depths exceeded action levels and triggered excavation, confirmation samples shall be collected for each depth where a sample exceeded these values. Furthermore, if there are any visible indications of impact, samples shall be collected from the apparent impact zone(s).
- 5.13 For larger excavation areas, confirmation samples shall be collected from sidewalls of the excavation with a lateral spacing of not more than 15m. At least one confirmation sample shall be collected from each sidewall. Depth of sidewall samples shall be based on the depth of the original SI sample result that triggered excavation in that area. If SI samples from multiple depths exceeded action levels and triggered excavation, confirmation samples shall be collected for each depth where a sample exceeded these values. Confirmation samples from the base of larger excavation areas shall be collected on a grid spacing not larger than 15m by 15m (i.e. one sample per approximately every 225m<sup>2</sup>). In both cases, if there are any visible indications of impact, samples shall be collected from the apparent impact zone(s).

***Compliance Assessment and Event/Action Plan***

- 5.14 If the analytical results of the confirmation samples are below the concerned action levels for soil remediation, removal of the contaminated soil shall be considered complete. If the analytical results exceed the relevant action levels, more soil shall be excavated either laterally or vertically depending on whether the exceeding confirmation sample is from a sidewall or excavation base, and additional confirmation samples shall be collected and analysed until all confirmation samples are below the relevant action levels. The event and action plan for confirmation sampling/testing for soil excavation is provided in Table 5.3.

**Table 5.3 Event and Action Plan for Confirmation Sampling/Testing for Soil Excavation**

<b>Event</b>	<b>Action</b>	<b>Action Party</b>
The concentration of the chemical(s) that triggered the excavation exceed the relevant action levels for soil remediation (as tabulated in Table 5.7).	i) More soil shall be excavated either laterally or vertically depending on whether the exceeding confirmation sample is from a sidewall or excavation base.	Contractor
	ii) Additional confirmation samples shall be collected and analysed until all confirmation samples are below the relevant action levels.	Contractor

**Confirmation Sampling/Testing for Biopile Treatment*****Sampling and Testing Requirements***

- 5.15 The objective of the biopile closure assessment is to collect soil samples for testing in order to ensure that the soil contaminant levels in the biopiles are below the cleanup targets for TPH and SVOCs. Furthermore, for soil to be treated subsequently by cement solidification, the levels of the concerned metals will also be analysed to provide the baseline conditions.
- 5.16 Confirmation samples shall be collected with sampling frequency of one sample per 100m<sup>3</sup> soil treated. The samples shall be collected at representative locations distributed evenly throughout the biopile and at various depths within the biopile. Sample locations within the biopile shall be documented accurately so that the analytical results can be correlated with locations within the biopile.
- 5.17 Access to the sampling locations shall be through opening of heat bonded cover panels. These openings shall be closed after each access. Extracting the soil samples shall be accomplished using a hand auger or other methods approved by the Engineer.
- 5.18 All soil samples shall be analysed in an HOKLAS accredited laboratory for TPH (USEPA Method 8015 Mod), SVOCs (USEPA Method 8270C) and the concerned metals (USEPA Method 9010B/9012A for total cyanide; USEPA Method 7199 for hexavalent chromium; and USEPA Method 6010B for other metals).

***Compliance Assessment and Event/Action Plan***

- 5.19 The laboratory results are considered satisfactory when the levels of TPH and SVOCs in 95% of the samples meet the cleanup targets. This acceptability of 95% serves to allow for laboratory error for soil analysis. In the event that more than 5% of the samples still exceed any cleanup targets, the biopile decontamination system shall have to be restarted to fully remediate the soil. The event and action plan for confirmation sampling/testing for biopile treatment is given in Table 5.4.

**Table 5.4 Event and Action Plan for Confirmation Sampling/Testing for Biopile Treatment**

Event	Action	Action Party
More than 5% of the samples still exceed the respective cleanup targets for soil remediation (as tabulated in Table 5.7).	Biopile decontamination system shall have to be restarted to fully remediate the soil	Contractor

**Confirmation Sampling/Testing for Solidification Treatment**

***Sampling and Testing Requirements***

- 5.20 Following solidification treatment for metal-contaminated soil and curing of the solidified soil, confirmation sampling/testing shall be undertaken to ensure that the cleanup targets have been attained.
- 5.21 Confirmation samples shall be collected with sampling frequency of one sample per 100m<sup>3</sup> of treated material. Each sample shall be a composite sample collected at 5 locations throughout the treated soil pile, and the same volume of sample shall be collected at each of the locations so that the composite sample is not biased.
- 5.22 Confirmation samples shall be analysed in an HOKLAS accredited laboratory for the concerned soluble metals using Toxicity Characteristics Leaching Procedure (TCLP) in accordance with USEPA Method 1311.
- 5.23 In order to ensure the soil will be solidified in the solidification process, all the soil treated with solidification/stabilisation shall be tested for unconfined compressive strength. All the treated soil shall have unconfined compressive strength of at least 150 pound-force per square inch (psi), with reference to USEPA guideline (USEPA 1986) for hazardous waste solidification requirement.

***Compliance Assessment and Event/Action Plan***

- 5.24 The “Universal Treatment Standards” (UTS) shall be used for interpretation of the TCLP test results to assess if the cleanup targets have been attained.

- 5.25 If either the cleanup targets or the target unconfined compressive strength have been achieved, the treated material shall be crushed and returned to the solidification process. The event and action plan for confirmation sampling/testing for solidification treatment is given in Table 5.5.

**Table 5.5 Event and Action Plan for Confirmation Sampling/Testing for Solidification Treatment**

Event	Action	Action Party
Respective cleanup targets (as tabulated in Table 5.7) of any confirmation samples have not been attained.	The treated material shall be crushed and returned to the solidification until the respective cleanup targets have been achieved.	Contractor
Unconfined compressive strength of 150 pound-force per square inch (psi) has not been attained for all confirmation samples.	The treated material shall be crushed and returned to the solidification until the respective cleanup targets have been achieved.	Contractor

**Confirmation Sampling/Testing for Thermal Desorption Treatment**

***Sampling and Testing Requirements***

- 5.26 Following thermal treatment, confirmation sampling/testing shall be undertaken to confirm that the dioxin-contaminated soil has been treated to the cleanup target.
- 5.27 Initially, the sampling frequency shall be 1 sample per 50m<sup>3</sup> of treated soil. Following the establishment of acceptable system performance, we propose to collect one composite sample per day to ensure the predefined cleanup objective is achieved. The composite is made up from samples collected every 4 hours so that the composite is representative of the entire day's performance. Subject to the soil feed rate, the sampling frequency shall be either one composite sample per day or 1 sample per 100m<sup>3</sup>, whichever is more frequent.
- 5.28 The confirmation samples shall be analysed for dioxins (USPEA Method 8280A or 8290) and the concerned metals (USEPA Method 9010B/9012A for total cyanide; USEPA Method 7199 for hexavalent chromium; and USEPA Method 6010B for other metals).

***Compliance Assessment and Event/Action Plan***

- 5.29 If the dioxin concentration of all confirmation samples is below the cleanup target for dioxin (1 ppb TEQ), the treated soil having metals concentrations exceeding the action levels for soil remediation shall be subsequently treated using solidification. If the cleanup target of dioxins is exceeded, the whole batch of treated soil discharged by the thermal desorption unit since the last confirmation sample achieving the cleanup target shall be re-treated until the clean up target is met.

**Table 5.6 Event and Action Plan for Confirmation Sampling/Testing for Thermal Desorption Treatment**

Event	Action	Action Party
The cleanup target of 1 ppb TEQ for dioxins is not achieved for any confirmation sample.	The whole batch of treated soil discharged by the thermal desorption unit since the last confirmation sample achieving the cleanup target shall be re-treated until the clean up target is met	Contractor

**Table 5.7 Concerned Action Levels and Cleanup Targets for Soil Remediation**

Item	Parameter	Action Level (mg/kg or otherwise specified)	Cleanup Target (mg/kg or otherwise specified)
1	TPH	1000 (total)	1000 (total)
2	Arsenic	30	5 (mg/L as TCLP)
3	Barium	400	21 (mg/L as TCLP)
4	Cadmium	5	0.11 (mg/L as TCLP)
5	Chromium (total)	250	0.6 (mg/L as TCLP)
6	Cobalt	50	Not available
7	Copper	100	7.8 (mg/L as TCLP)
8	Lead	150	0.75 (mg/L as TCLP)
9	Nickel	100	11 (mg/L as TCLP)
10	Molybdenum	40	Not available
11	Tin	50	Not available
12	Zinc	500	4.3 (mg/L as TCLP)
13	Cyanide (total)	50	590 (mg/L as TCLP)
14	Phenol	1	1
15	Styrene	5	5
16	Naphthalene	5	5
17	Benzo(a)pyrene (1,2-benzopyrene)	1	1
18	Total PCB	1 (total)	1 (total)
19	Hexachlorobenzene	0.4	0.4
20	Benzo(a)anthracene	0.9	0.9
21	Bis(2-ethylhexyl)phthalate	46	46
22	Benzo(b)fluoranthene	0.9	0.9
23	Indeno(1,2,3-cd)pyrene	0.9	0.9
24	Dibenz(a,h)anthracene	0.09	0.09
25	Antimony	31	1.15 (mg/L as TCLP)
26	Hexavalent Chromium	270	Not available
27	Dioxins (2,3,7,8-TCDD equivalent)	0.001	0.001

## 6 AIR QUALITY MONITORING

### Introduction

- 6.1 In this section, the requirements, methodology, equipment, monitoring locations, criteria and protocols for the monitoring and audit of air quality impacts during the decommissioning of the CLS and off-site soil remediation are presented.
- 6.2 Two types of monitoring programme shall be conducted in connection with the Project. Ambient air quality for TSP and dioxin shall be monitored at CLS and TKW during both demolition & excavation and remediation phases. For the soil remediation plants at TKW, emissions from the plant stacks (i.e. biopile stack and thermal desorber stack) shall be regularly monitored.
- 6.3 The objectives of the air quality monitoring shall be:
- to identify the extent of construction dust and dioxin impacts on sensitive receivers during both demolition & excavation and remediation phases;
  - to determine the effectiveness of mitigation measures to control fugitive dust and dioxin emission from activities during both demolition & excavation and remediation phases;
  - to audit the compliance of the Contractor with regard to dust control, contract conditions and the relevant dust impact criteria;
  - to recommend further mitigation measures if found to be necessary; and
  - to comply with Action and Limit (AL) Levels for air quality as defined in this Manual.

### Methodology and Criteria

- 6.4 Monitoring and audit of the air pollutants levels shall be carried out by the ET to ensure that any deterioration in air quality can be readily detected and timely actions taken to rectify the situation.

#### *Ambient Monitoring at Sensitive Receivers*

- 6.5 The criteria against which ambient air quality monitoring shall be assessed are:

#### For Total Suspended Particulate (TSP),

- The Hong Kong Air Quality Objectives (AQOs) for TSP, 24-hour TSP levels of 260  $\mu\text{g}/\text{m}^3$ ; and
- The statutory 1-hour TSP limit of 500  $\mu\text{g}/\text{m}^3$ .



For dioxin.

- The 1-hour Health Protection Concentration Level (HPCL) of 33.6 pg I-TEQ/m<sup>3</sup> as stipulated in the Technical Memorandum for Issuing Air Pollution Abatement Notices to Control Air Pollution From Stationary Pollution Processes. It should be noted that there is no relevant 24-hr air quality criterion for dioxin. For the purpose of this EM&A Manual, the receptor concentration level (RCL) of 24-hr average shall be normalised to a reference receptor concentration level (RRCL) which is subject to compliance checking with the 1-hr HPCL. The normalisation procedure with reference to the *TM for Issuing Air Pollution Abatement Notices to Control Air Pollution From Stationary Polluting Processes* is given below.

$$RRCL_{(1-hr)} = RCL_{(24-hr)} (t_{HPCL} / t_{RCL})^{-0.28047};$$

Where  $t_{HPCL}$  is 1 which is the averaging time for 1-hr HPCL;

$t_{RCL}$  is 24 which is the averaging time the measurement taken at the ASR.

- California Air Resources Board (CARB) of US Environmental Protection Agency suggests a significant cancer risk of greater than 10<sup>-4</sup> and unit risk factor of 38 (µg/m<sup>3</sup>)<sup>-1</sup>. The annual average dioxin concentration at the receiver for significant cancer risk therefore proposed for the purpose of this Manual is 2.63 pg I-TEQ/m<sup>3</sup> (i.e. the dividend of significant cancer risk over unit risk factor). Average of quarterly 24-hour monitoring results shall be checked for compliance with this annual limit.

- 6.6 These levels are not to be exceeded at Air Sensitive Receivers (ASRs).
- 6.7 The 1-hour and 24-hour TSP and 24-hour dioxin levels shall be measured to indicate their impacts arising from the demolition & excavation activities at CLS. The TSP and dioxin levels shall be measured by following the standard method as set out in High Volume Method for Total Suspended Particulates, Part 50 Chapter 1 Appendix B, Title 40 of the Code of Federal Regulations of the USEPA and USEPA Method TO-9A<sup>1</sup>.
- 6.8 24-hour average TSP concentrations should be measured by drawing air through a high volume sampler (HVS) fitted with a conditioned, pre-weighed filter paper, at a controlled rate. After sampling for 24-hours, the filter paper with retained particles is collected and returned to the laboratory for drying in a desiccator followed by accurate weighing. 24-hour average TSP levels are 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.
- 6.9 For sampling of dioxin, a high-volume sampler with the pretreated quartz-fiber filter and PUF glass cartridge should be used for 24 hours to sample 325 to 400m<sup>3</sup> ambient air. After 24-hr

<sup>1</sup> Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air.: Method TO-9A, Second Edition, U. S. Environmental Protection Agency, EPA/625/R-96/010b, January 1999.

sampling, the PUF cartridge should be covered with another quartz filter filter and the whole glass cartridge is then wrapped with the original aluminum foil, capped with Teflon® end caps, placed back into the original shipping container, identified, and shipped to the analytical laboratory for sample processing and analysis by HRGC-HRMS.

- 6.10 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 shall be recorded down in detail. A sample data sheet is shown in Appendix B.

### ***Plant Emissions Monitoring***

- 6.11 The plant emission limits adopted for the purpose of this Manual are:
- 0.1 ng/m<sup>3</sup> (at 0°C, 101.325 kPa, 11% O<sub>2</sub> and dry condition) for the concentration limit of dioxins; and
  - 20 mg/m<sup>3</sup> (at 0°C, 101.325 kPa, 11% O<sub>2</sub> and dry condition) for the concentration limit of Total Organic Carbons (TOC).
- 6.12 For stack sampling of dioxin for the thermal desorption plant, a sample is withdrawn isokinetically from the gas stream and collected in the sample probe, on a glass fiber filter, and on a packed column of adsorbent material. The sample cannot be separated into a particle and vapor fraction. The PCDD's and PCDF's are extracted from the sample, separated by high resolution gas chromatography (HRGC), and measured by high resolution mass spectrometry (HRMS). The standard method of stack sampling and measurements shall be in accordance with USEPA Method 23.<sup>2</sup>
- 6.13 TOC emissions from the stack of thermal desorption and from biopile vents shall be monitored. Continuous emission monitoring (CEM) system to be proposed by the Contractor shall be able to measure TOC emission and other plant performance parameters, such as oxygen, carbon dioxide and carbon monoxide continuously. The measurement results shall be immediately recorded and processes such that timely remedial action can be implemented in case of exceedance of emission standard.

### **Monitoring Equipment**

#### ***Ambient Monitoring at Sensitive Receivers***

- 6.14 For measuring TSP, a high volume sampler (HVS) in compliance with the following specifications shall be used for carrying out the 1-hr and 24-hr monitoring:
- 0.6 - 1.7 m<sup>3</sup>/min (20-60 SCFM) adjustable flow range;

---

<sup>2</sup> Determination of Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans from Municipal Waste Combustors, USEPA Method 23.

- 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<sup>2</sup> (63 in<sup>2</sup>);
  - 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 24-hr period.
- 6.15 For dioxin, HVS capable of pulling ambient air through the filter/adsorbent cartridge at a flow rate of approximately 8 standard cubic feet per minute (scfm) (0.225 std m<sup>3</sup>/min) to obtain a total sample volume of greater than 325 scm over a 24-hour period shall be used. A typical dioxin HVS is shown in Figure 6.1.
- 6.16 The ET shall be responsible for the provision of the monitoring equipment. He shall ensure that sufficient number of HVSs with an appropriate calibration kit are available for carrying out the baseline, regular impacts monitoring and ad-hoc monitoring. The HVSs shall 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 and as described below. All the equipment, calibration kit, filter papers, etc shall be clearly labelled.
- 6.17 The flow rate of each HVS with mass flow controller shall be calibrated using an orifice calibrator. Initial calibration of the dust monitoring equipment shall be conducted upon installation and prior to commissioning. One point flow rate calibration shall be carried out every two months. Five-point calibration shall be carried out every six months.
- 6.18 The flow-rate of the sampler before and after the sampling exercise with the filter in position shall be verified to be constant and be recorded down on the data sheet as mentioned in Appendix B.
- 6.19 Wind monitoring equipment shall also be provided and set up at conspicuous locations for logging wind speed and wind direction near to the dust monitoring locations. For installation and operation of the wind data monitoring equipment, the following points shall be observed:
- the wind sensors should be installed on masts at an elevated level 10 m above the ground, so that they are clear of obstructions or turbulence caused by building(s);

- the wind data should be captured by a data logger and to be downloaded for processing at least once a month;
  - the wind data monitoring equipment should be re-calibrated at least once every six months; and
  - wind direction should be divided into 16 sectors of 22.5 degrees.
- 6.20 In exceptional situations, the ET may propose alternative methods to obtain representative wind data upon approval from the IEC and Engineer, and agreed with EPD.

### ***Plant Emissions Monitoring***

- 6.21 For dioxin sampling of the thermal desorption plant, the sampling equipment shall conform with the USEPA Method 23. The schematic sampling train is shown in Figure 6.2. In particular, sealing greases shall not be used in assembling the train.
- 6.22 Monitoring of TOC for the thermal desorption plant and biopile shall be accomplished by a CEM system. The specification and detection range of the CEM system shall be proposed by the contractor/ ET for the IEC's approval before the CEM system commences.

### **Laboratory Measurement/Analysis**

- 6.23 A clean laboratory with constant temperature and humidity control, and equipped with the necessary measuring and conditioning instruments to handle the dust samples, shall be available for sample analysis and equipment calibration and maintenance. The laboratory shall be either HOKLAS accredited or another internationally accredited laboratory.
- 6.24 If a site laboratory or a non-HOKLAS accredited laboratory is used, the laboratory equipment and measurements shall meet with the satisfaction of the Engineer in consultation with the IEC. The ET shall conduct regular audits to determine the accuracy of the measurement results.

### **Monitoring Locations**

#### ***Ambient Monitoring at Sensitive Receivers***

- 6.25 Air quality monitoring stations representing the air sensitive receivers have been identified in vicinity of the CLS and TKW. The air quality at each monitoring station shall be monitored based on the Project phases. Locations of the monitoring station (Figures 6.3 and 6.4) and the commencement time for each Project phase is presented in Table 6.1.

**Table 6.1 Ambient Air Quality Monitoring Stations and their Commencement Time**

ASR No.	Location	Ambient Air Quality Parameters to be Monitored			
		Building demolition and slope improvement phase	Remediation phase		TKW decommissioning phase
			At CLS	At TKW	
AM1	Penny's Bay Power Station	TSP	TSP & Dioxin	--	--
AM2	Dockyard Building next to TKW	--	--	TSP & Dioxin	TSP
AM3	Toll Plaza Administration Building of North Lantau Expressway	--	--	TSP & Dioxin	TSP

6.26 Prior to the commencement of the EM&A programme, the proposed air quality monitoring stations shall be discussed and agreed with the Engineer, the ET, IEC and EPD. When positioning the samplers, the following points shall 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.

### ***Plant Emissions Monitoring***

6.27 Emissions of thermal desorption stack and biopile vent shall be measured during soil remediation phase upon commissioning of the remediation plant at TKW. Monitoring points shall be at a stack/ vent location after treatment and before discharge and shall be agreed with the IEC and the Engineer

## **Baseline Monitoring**

### ***Ambient Monitoring at Sensitive Receivers***

- 6.28 Baseline monitoring shall be carried out to determine the ambient 24-hour and 1-hour TSP and 24-hour dioxin levels at the monitoring locations prior to the commencement of the Project works. During the baseline monitoring, there shall not be any construction or dust generating activities in the vicinity of the monitoring stations.
- 6.29 For TSP, baseline monitoring shall be carried out for a continuous period of at least two weeks under typical weather conditions with the 24-hour and three 1-hour ambient measurements taken daily at each monitoring location. For dioxin, baseline monitoring shall be carried out for 7 consecutive days with typical weather conditions with the 24-hour ambient measurements taken daily at each monitoring location. General meteorological conditions (wind speed, direction and precipitation) and notes regarding any significant adjacent dust producing sources shall also be recorded throughout the baseline monitoring period.
- 6.30 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.
- 6.31 Baseline checking of ambient TSP and dioxin levels shall be carried out every six months at each monitoring location, when no dusty works activities are in operation. If the ET considers that significant changes in the ambient conditions have arisen, a repeat of the baseline monitoring may be carried out to update the baseline levels and air quality criteria, after consultation and agreement with the Engineer, the IEC and the EPD.

### ***Plant Emissions Monitoring***

- 6.32 Before commencement, the remediation plant shall be subject to a satisfactory commissioning test on the plant performance and emission compliance. Upon the commissioning test result, compliance standards of plant performance parameters, such as oxygen, carbon dioxide and carbon monoxide shall be determined and shall be checked against during impact monitoring.

## **Impact Monitoring**

### ***Ambient Monitoring at Sensitive Receivers***

- 6.33 The monthly schedule of the compliance and impact monitoring programme shall be drawn up by the ET one month prior to the commencement of the scheduled construction period. For regular impact monitoring, a sampling frequency of at least once in every six-days shall be strictly observed at all of the monitoring stations for 24-hour TSP monitoring. In case of complaints, 1-hour TSP monitoring shall be conducted at least three times in every six-days when the highest dust impacts are likely to occur.

- 6.34 It is recommended that 24-hour dioxin levels at monitoring stations shall be monitored monthly for the first 6 months. After review of the 6-month monitoring result and subject to the agreement of the IEC, the Engineer and EPD, the monitoring frequency shall be stepped down to once every 3 months.
- 6.35 The impact monitoring programme can be summarized in Table 6.2.

**Table 6.2 Impact ambient air monitoring programme**

Parameter	Sampling hours	Frequency
TSP	1 hour	• 3 times every 6 days (as required in case of complaints)
	24 hours	• Once every 6 days
Dioxin	24 hours	<ul style="list-style-type: none"> <li>• Once every month for the first 6 months</li> <li>• After review of monitoring results and subject to the agreement of the IEC, the Engineer and EPD, then once every 3 months</li> </ul>

- 6.36 Before commencing the monitoring, the ET shall inform the IEC of the impact monitoring programme such that the IEC can conduct an on-site audit to ensure the accuracy of the impact monitoring results.

### *Plant Emissions Monitoring*

- 6.37 While TOC emissions of the plants are to be measured by a CEM system, the dioxin emission of the thermal desorption stack be composite sampled and determined at least monthly during the plant operation. Monitoring requirements are summarized in Table 6.3.

**Table 6.3 Plant Emission Monitoring Requirements**

Emission Point	Parameter	Sampling hours	Sampling details	Frequency
Biopile gas vent	TOC	Continuous	CEM system	Continuous
Stack of thermal desorption plant	TOC, O <sub>2</sub> , CO & CO <sub>2</sub>	Continuous	CEM system	Continuous
	Dioxin	3 hours (180 mins)	Composite of 12 nos. of 15-min samples taken during the plant operation hours	Once every month

### Compliance Assessment

- 6.38 Action and Limit (A/L) levels that provide an appropriate framework for the interpretation of monitoring results has to be agreed between ET, IEC, EPD and the Engineer before commencement of the air monitoring. The air quality monitoring data shall be checked against the agreed A/L levels. Recommended A/L levels are listed in Tables 6.4 and 6.5.

**Table 6.4 Proposed Action and Limit Levels for Ambient Monitoring**

Parameters	Average Time	Action Level	Limit Level
TSP	24 hour	-- For baseline level $\leq 200 \mu\text{g}/\text{m}^3$ , Action Level = (baseline level * 1.3 + Limit level)/2; -- For baseline level $> 200 \mu\text{g}/\text{m}^3$ , Action level = Limit level	HKAQO of $260 \mu\text{g}/\text{m}^3$
	1 hour	-- For baseline $\leq 384 \mu\text{g m}^{-3}$ , Action Level = (baseline level * 1.3 + Limit level)/2 -- For baseline $\leq 384 \mu\text{g m}^{-3}$ Action Level = Limit level	EIAO Statutory Limit of $500 \mu\text{g}/\text{m}^3$
Dioxin	24 hour	-- For baseline level $\leq 10.6 \text{ pg I-TEQ}/\text{m}^3$ , Action level = (baseline level * 1.3 * $(1/24)^{-0.28047}$ + Limit level)/2; -- For baseline level $> 10.6 \text{ pg I-TEQ}/\text{m}^3$ , Action level = Limit level	HPCL <sub>(1-hr)</sub> of $33.6 \text{ pg I-TEQ}/\text{m}^3$
	Average of 24-hour measurements in the monitoring year	-- Action level = Limit level	Annual average of $2.63 \text{ pg I-TEQ}/\text{m}^3$ as derived from CARB's suggestion of the significant cancer risk and unit risk factor.

**Table 6.5 Proposed Action and Limit Levels for Plant Emissions Monitoring**

Emission Point	Parameter	Limit level
Biopile vent	Total Organic Carbon (TOC)	$20 \text{ mg}/\text{m}^3$ at $56 \text{ m}^3/\text{min}$
Thermal desorption stack	Dioxin	$0.1 \text{ ng}/\text{m}^3$ at $60 \text{ m}^3/\text{min}$
	Total Organic Carbon (TOC)	$20 \text{ mg}/\text{m}^3$ at $60 \text{ m}^3/\text{min}$
	Oxygen, Carbon dioxide, Carbon monoxide	To be agreed between ET, IEC, the Engineer and EPD

### Event and Action Plan (EAP)

- 6.39 The principle upon which the EAP is based on the prescription of procedures and actions associated with the measurement of certain defined levels of air pollution recorded by the environmental monitoring process and the agreed A/L levels. In cases where exceedance of these A/L levels occurs, the ET, the IEC, the Engineer and the Contractor shall strictly observe the relevant actions of the respective EAP (Tables 6.9 and 6.10) as described below.



Table 6.9 Event / Action Plan for Ambient Air Quality Monitoring

EVENT	ACTION			CONTRACTOR
	ET	IEC	ER	
<b>ACTION LEVEL</b>				
1. Exceedance for one sample	<ol style="list-style-type: none"> <li>Identify source, investigate the causes of exceedance and propose remedial measures;</li> <li>Inform IEC and ER;</li> <li>Repeat measurement to confirm findings;</li> <li>Increase monitoring frequency to daily.</li> </ol>	<ol style="list-style-type: none"> <li>Check monitoring data submitted by ET;</li> <li>Check Contractor's working method.</li> </ol>	<ol style="list-style-type: none"> <li>Notify Contractor.</li> </ol>	<ol style="list-style-type: none"> <li>Rectify any unacceptable practice;</li> <li>Amend working methods if appropriate.</li> </ol>
2. Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> <li>Identify source;</li> <li>Inform IEC and ER;</li> <li>Advise the ER on the effectiveness of the proposed remedial measures;</li> <li>Repeat measurements to confirm findings;</li> <li>Increase monitoring frequency to daily;</li> <li>Discuss with IEC and Contractor on remedial actions required;</li> <li>If exceedance continues, arrange meeting with IEC and ER;</li> <li>If exceedance stops, cease additional monitoring.</li> </ol>	<ol style="list-style-type: none"> <li>Check monitoring data submitted by ET;</li> <li>Check Contractor's working method;</li> <li>Discuss with ET and Contractor on possible remedial measures;</li> <li>Advise the ET on the effectiveness of the proposed remedial measures;</li> <li>Supervise Implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>Confirm receipt of notification of exceedance in writing;</li> <li>Notify Contractor;</li> <li>Ensure remedial measures properly implemented.</li> </ol>	<ol style="list-style-type: none"> <li>Submit proposals for remedial to ER within 3 working days of notification;</li> <li>Implement the agreed proposals;</li> <li>Amend proposal if appropriate.</li> </ol>
<b>LIMIT LEVEL</b>				
1. Exceedance for one sample	<ol style="list-style-type: none"> <li>Identify source, investigate the causes of exceedance and propose remedial measures;</li> <li>Inform IEC, ER, Contractor and EPD;</li> <li>Repeat measurement to confirm finding;</li> <li>Increase monitoring frequency to daily;</li> <li>Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results.</li> </ol>	<ol style="list-style-type: none"> <li>Check monitoring data submitted by ET;</li> <li>Check Contractor's working method;</li> <li>Discuss with ET and Contractor on possible remedial measures;</li> <li>Advise the ER on the effectiveness of the proposed remedial measures;</li> <li>Supervise implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>Confirm receipt of notification of exceedance in writing;</li> <li>Notify Contractor;</li> <li>Ensure remedial measures properly implemented.</li> </ol>	<ol style="list-style-type: none"> <li>Take immediate action to avoid further exceedance;</li> <li>Submit proposals for remedial actions to IEC within 3 working days of notification;</li> <li>Implement the agreed proposals;</li> <li>Amend proposal if appropriate.</li> </ol>
2. Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> <li>Notify IEC, ER, Contractor and EPD;</li> <li>Identify source;</li> <li>Repeat measurement to confirm findings;</li> <li>Increase monitoring frequency to daily;</li> <li>Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented;</li> <li>Arrange meeting with IEC and ER to discuss the remedial actions to be taken;</li> <li>Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results;</li> <li>If exceedance stops, cease additional monitoring.</li> </ol>	<ol style="list-style-type: none"> <li>Discuss amongst ER, ET, and Contractor on the potential remedial actions;</li> <li>Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly;</li> <li>Supervise the implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>Confirm receipt of notification of exceedance in writing;</li> <li>Notify Contractor;</li> <li>In consolidation with the IEC, agree with the Contractor on the remedial measures to be implemented;</li> <li>Ensure remedial measures properly implemented;</li> <li>If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.</li> </ol>	<ol style="list-style-type: none"> <li>Take immediate action to avoid further exceedance;</li> <li>Submit proposals for remedial actions to IEC within 3 working days of notification;</li> <li>Implement the agreed proposals;</li> <li>Resubmit proposals if problem still not under control;</li> <li>Stop the relevant portion of works as determined by the ER until the exceedance is abated.</li> </ol>

**Table 6.10 Event / Action Plan for Plant Emissions Monitoring**

EVENT	ACTION				CONTRACTOR
	ET	IEC	ER	ER	
<b>ACTION/ LIMIT LEVEL</b>					
1. Exceedance for one sample	<ol style="list-style-type: none"> <li>1. Identify source, investigate the causes of exceedance and propose remedial measures;</li> <li>2. Inform IEC, ER, Contractor and EPD;</li> <li>1. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET;</li> <li>2. Check Contractor's working method;</li> <li>3. Discuss with ET and Contractor on possible remedial measures;</li> <li>4. Advise the ER on the effectiveness of the proposed remedial measures;</li> <li>5. Supervise implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of exceedance in writing;</li> <li>2. Notify Contractor;</li> <li>3. Ensure remedial measures properly implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance;</li> <li>2. Submit proposals for remedial actions to IEC within 3 working days of notification;</li> <li>3. Implement the agreed proposals;</li> <li>4. Amend proposal if appropriate.</li> </ol>	
1. Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> <li>1. Notify IEC, ER, Contractor and EPD;</li> <li>2. Identify source;</li> <li>3. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented;</li> <li>4. Arrange meeting with IEC and ER to discuss the remedial actions to be taken;</li> <li>5. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results;</li> <li>6. If exceedance stops, cease additional monitoring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss amongst ER, ET, and Contractor on the potential remedial actions;</li> <li>2. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly;</li> <li>3. Supervise the implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of exceedance in writing;</li> <li>2. Notify Contractor;</li> <li>3. In consolidation with the IEC, agree with the Contractor on the remedial measures to be implemented;</li> <li>4. Ensure remedial measures properly implemented;</li> <li>5. If exceedance continues, instruct the Contractor to slow down or stop the process until the exceedance is abated.</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance;</li> <li>2. Submit proposals for remedial actions to IEC within 3 working days of notification;</li> <li>3. Implement the agreed proposals;</li> <li>4. Resubmit proposals if problem still not under control;</li> <li>5. Slow down or stop the process as determined by the ER until the exceedance is abated.</li> </ol>	

**Mitigation Measures**

- 6.40 The EIA Report has recommended air quality control and mitigation measures during the construction phases of the Project. These are outlined in the Implementation Schedule (Appendix A). In the event of exceedances or complaints, the Contractor shall be responsible for reviewing the effectiveness of these measures and for proposing, designing and implementing alternative measures as appropriate.

## 7 WATER QUALITY

### Introduction

- 7.1 As identified in the EIA Report, no adverse impact arising from building demolition at CLS, slope improvement and construction of remediation plants at TKW are expected with the implementation of good practices stipulated in EPD's *ProPECC Note PN 1/94 'Construction Site Drainage'*. Also the seepage of CLS groundwater would have no significant water quality impact on the marine water and drainage channel in vicinity. However, the effluent of the centralised wastewater treatment unit in TKW that cater leachate, contaminated runoff, wheel wash water and decontamination water is to be monitored before being discharged into local sewers/ drainage channels. Auditing works during every Project phase should be carried out to ensure that the Contractor implements the good practices to minimize the impact.

### Monitoring Requirements

- 7.2 At every Project phase, the Contractor shall monitor the water quality of effluent of centralised water treatment units on-site, in accordance with the requirements of licence issued under Water Pollution Control Ordinance. Subject to the licence requirement, the monitoring location(s) shall be at each final effluent discharge point. The effluent shall be monitored weekly for the first 3 months and then monthly for the following parameters as minimum.
- Suspended solids,
  - TPH,
  - Metals (Ar, Cd, Cr, Cu, Pb, Ni, Zn), and
  - Dioxin.
- 7.3 The effluent sample shall be analysed by a HOKLAS laboratory for all parameters. The analytical method for every parameter shall be proposed by the Contractor/ ET for agreement with the IEC, EPD and the Engineer prior to effluent testing.

### Compliance Assessment and Action Plan

- 7.4 Discharge limits of water quality parameter shall be specified in the *Waste Disposal Ordinance* licence and shall conform to the *Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters* (TM-ES). Since TM-ES has no provision for dioxin, it is proposed for the purpose of this Manual that 'undetectable concentration' (i.e. < 10 pg I-TEQ/L) be adopted as the effluent discharge standard for dioxin. The analytical method shall be subject to EPD's agreement prior to commencement of testing.
- 7.5 Should any of the effluent discharge standards be exceeded, the Contractor shall follow the event and action plan as suggested in Table 7.1.

**Table 7.1 Event and Action Plan for the Effluent Discharge Monitoring**

Event	Action
1. Exceedance of discharge limit for any water quality parameter	<ul style="list-style-type: none"><li>• The Contractor/ ET to notify IEC, EPD and the Engineer</li><li>• The Contractor to stop the effluent discharge</li><li>• The Contractor to propose remedial action for IEC &amp; EPD's acceptance and the Engineer's approval</li><li>• The Contractor resumes the discharge with the approved remedial action implemented.</li></ul>

### Mitigation Measures

- 7.6 The EIA Report has recommended water quality control and mitigation measures during every phase of the Project. These are outlined in the Implementation Schedule (Appendix A). In the event of exceedances or complaints, the Contractor shall be responsible for reviewing the effectiveness of these measures and for proposing, designing and implementing alternative measures as appropriate.

## 8 WASTE MANAGEMENT

### Introduction

- 8.1 During construction phase, waste management will be the contractor's responsibility to ensure that all wastes produced during every Project phase in accordance with good waste management practices and EPD's regulations and requirements. The Contractor shall also follow the Waste Management Plan when managing all different types of wastes on site.
- 8.2 Waste materials generated during demolition/ excavation or remediation activities, such as construction and demolition (C&D) materials, chemical wastes, asbestos and general refuse from the workforce, are recommended to be audited at regular intervals (at least monthly) to ensure that proper storage, transportation and disposal practices are being implemented. This monitoring of waste management practices will ensure that these solid and liquid wastes generated during construction are not disposed of into the surrounding storm drains. The Contractor will be responsible for the implementation of any mitigation measures to minimise waste or redress problems arising from the waste materials.

### Waste Control and Mitigation Measures

- 8.3 Mitigation measures for waste management are summarised below. With the appropriate handling, storage and removal of waste arisings during the Project period as defined below, the potential to cause adverse environmental impacts will be minimised.

### Construction and Demolition Phase

#### Good Site Practice and Waste Reduction Measures

- 8.4 It is not expected adverse waste impacts would arise provided that good site practice is strictly followed. Recommendations for good site practice during the decommissioning and demolition activities include:
- Use waste haulier authorised or licensed to collect specific category of waste;
  - Obtain the necessary registration and licences under the *Waste Disposal Ordinance* and the *Waste Disposal (Chemical Waste) (General) Regulation* from the Environmental Protection Department;
  - Nomination of an approved person, such as a site manager, to be responsible for good site practice, arrangements for collection and effective disposal to an appropriate facility, of all wastes generated at the site;
  - training of site personnel in proper waste management and chemical waste handling procedures;
  - provision of sufficient waste disposal points and regular collection for disposal;
  - appropriate measures to minimise windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers;

- separation of chemical wastes for special handling and appropriate treatment at a licensed facility;
- regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors;
- a recording system for the amount of wastes generated, recycled and disposed of (including the disposal sites);
- In order to monitor the disposal of C&D material and solid wastes at public filling facilities and landfills, and control fly-tipping, a trip-ticket system shall be included as one of the contractual requirements and implemented by the Environmental Team. One may make reference to WBTC No. 5/99 for details; and
- A Waste Management Plan (WMP) shall be prepared and this WMP shall be submitted to the Engineer for approval. One may make reference to WBTC No. 29/2000 for details.

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

- segregation and storage of different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal;
- to encourage collection of aluminium cans, paper waste and plastic bottles by individual collectors, separate labelled bins shall be provided to segregate this wastes from other general refuse generated by the work force;
- any unused chemicals or those with remaining functional capacity shall be recycled;
- use of reusable non-timber formwork to reduce the amount of C&D material;
- prior to disposal of C&D waste, it is recommended that wood, steel and other metals shall be separated for re-use and / or recycling to minimise the quantity of waste to be disposed of to landfill;
- proper storage and site practices to minimise the potential for damage or contamination of construction materials; and
- plan and stock construction materials carefully to minimise the amount of waste disposal and avoid unnecessary generation of waste.

8.6 In addition to the above good site practice and waste reduction measures, specific mitigation measures are recommended below for the identified waste arising to minimise environmental impacts during handling, transportation and disposal of these wastes.

### Waste Recycling

8.7 To minimise the amount of waste disposal to landfills, the general refuse (not contaminated) shall be reused and recycled as much as practical. Waste sorting and segregation shall be carried out in accordance with the following categories for recycling:

- Plastic (i.e. plastic bag, plastic bottle, plastic packaging, etc.)
- Rubber;

- Paper;
- Wood/ timber;
- Glass;
- Textile; and
- Metal (i.e. aluminium can, steel metal, ferrous metal, and non-ferrous metal).

### Asbestos

- 8.8 Although not covered in this Report, the removal shall follow the approved AAP and conditions stipulated in the EP for Asbestos Abatement work in CLS at Penny's Bay and the Code of Practice on the Handling, Transportation and Disposal of Asbestos Waste.

### Chemical Waste

- 8.9 *Removal Sequence:* As asbestos removal will precede building demolition, so the concern will be non-asbestos chemical waste. To avoid disturbance of potential chemical waste during building demolition, all movable objects including sand/ grit/ deposits inside the building under demolition shall be cleared in advance. "Movable objects" shall mean all items inside the building other than those belong parts of the building structure or are anchored firmly on the building structure/ existing ground. All movable objects including sand/ grit/ deposits shall be treated as chemical wastes and placed in drums and delivered to a centralised covered area on site. No mixing or off-site disposal of the waste shall be allowed. The non-removable objects shall be covered with the heavy-duty polythene sheets for later disposal. Transportation and storage of the waste shall be in accordance with the relevant chemical waste regulations. Particularly the requirement of spill prevention measures, worker protection (e.g. PPE) and proper segregation from other wastes shall be observed. Whereas all other chemical wastes outdoors (except dioxin-contaminated soil which shall be transported by roll-off trucks for added safety) shall be handled and stored in accordance with *Waste Disposal Ordinance* and *Waste Disposal (Chemical Waste) (General) Regulation*.
- 8.10 Workers involved in the handling of chemical waste shall be suitably trained and shall wear appropriate protective masks and clothing when handling such materials. Chemical wastes shall be handled according to the *Code of Practice* on the Packaging, Labelling and Storage of Chemical Wastes. Spent chemicals shall be stored and collected by licensed collectors for disposal at licensed facilities in accordance with the *Waste Disposal (Chemical Waste) (General) Regulation*.
- 8.11 Containers used for the storage of chemical waste shall:
- Be suitable for the substance they are holding, resistant to corrosion, maintained in good condition, and securely closed;
  - Have a capacity of less than 450 litres unless the 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.



8.12 The storage area for chemical waste shall:

- 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 capacity to accommodate 100% 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 (water collected within the bund must be tested and disposal as chemical waste if necessary); and
- Be arranged so that incompatible materials are adequately separated.

8.13 Disposal of chemical waste shall:

- Be via a licensed waste collector; and
- Be at a facility licensed to receive chemical waste, such as CWTC which offers a chemical waste collection service and can supply the necessary storage containers; or
- Be a recycler of the waste, with waste disposal licence from the EPD.

#### Sorting of C&D Material On-site

8.14 The Contractor shall separate the C&D material including steel, timber and scrap metals from other wastes, as far as practical, and shall arrange for recycling and reuse on site to the extent possible. All C&D materials arising from demolition work shall be sorted on-site and be separated into different groups for disposal at landfills, PFAs, or recycling as appropriate in accordance with *WBTC No. 5/98*. To maximise landfill life, Government policy discourages the disposal of C&D wastes with more than 20% inert material by volume (or 30% inert material by weight) at landfill. Inert C&D material (public fill) is directed to reclamation areas or to an approved public filling area (PFA), where it has the added benefit of offsetting the need for removal of materials from borrow areas for reclamation purposes. Due to limited space at landfills, disposal at reclamation sites or PFAs would be the preferred option. A trip-ticket system for disposal of C&D material as detailed in *WBTC No. 5/99* shall be followed. Finally, a method statement for the sorting, processing and disposal of C&D materials arising from demolition work shall be submitted by the Contractor to the Engineer for his approval.

#### Building Indoor Surfaces Containing Contaminated Residues

8.15 Building sampling shall be carried out prior to demolition to characterise the contaminants present on the building surfaces and identify suitable reagents for decontamination. After contaminants characterisation, a Decommissioning Plan shall be prepared by the specialist Contractor recommending the indoor remediation protocols as well as the demolition method (preferably a top-down and non-explosive approach) for the Engineer's approval. Those building containing contaminated residues shall be decontaminated first before demolition. In general, the building decontamination may include the following processes:

- Power washing;
  - Scabbling;
  - Grit blasting; and
  - Confirmation testing.
- 8.16 Power washing and grit blasting will produce secondary wastes, so scabbling is the preferred method of cleaning. To ensure effective and proper cleaning, adequate on-site supervision by competent personnel is required.
- 8.17 After completion of building decontamination, the material can be discarded as normal C&D material. The chemical deposits or residues from scabbling will be disposed of to CWTC for ultimate disposal.

#### General Refuse

- 8.18 General refuse shall be stored in enclosed bins or compaction units separated from C&D material and chemical wastes. No open stockpile of general refuse is allowed on site to minimise environmental impacts. A reputable waste collector shall be employed by the contractor to remove general refuse from the site, separately from C&D material and chemical wastes, on a daily or every second day basis to minimise odour, pest and litter impacts.
- 8.19 Aluminium cans, paper waste and plastic bottles are often recovered from the waste stream by individual collectors if they are segregated or easily accessible, so separate labelled bins for their deposit shall be provided if feasible. Site office waste can be reduced through recycling of paper if volumes are large enough to warrant collection. Participation in a local collection scheme shall be considered if one is available.

#### **Slope Improvement Phase**

- 8.20 The excavated soil and rock shall be disposed of to PFAs. In addition, a Waste Management Plan shall be prepared by the Contractor in order to keep waste arising to a minimum and to ensure that waste is handled, transported and disposed of in a suitable manner.
- 8.21 The design of slope work shall be planned carefully to maximise the preservation of existing profiles with stabilisation as necessary to minimise cutting and filling.

#### **Remediation Phase**

##### Cheoy Lee Shipyard Site

- 8.22 On handling contaminated soil, especially of dioxin-contaminated, site workers and the backhoe operators shall be protected from skin contact and inhalation of soil gas. The

protection shall be achieved by providing each worker/ operator sufficient personal protective equipment, such as coverall, respirator, etc. and suitable training on handling contaminated waste.

8.23 Chemical wastes shall be handled in compliance with the provisions of *Waste Disposal (Chemical Waste) (General) Regulation*. The site contractors, workers and operatives shall also be required to follow appropriate procedures on handling chemical wastes according to the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes*.

8.24 Identified asbestos waste shall be handled in accordance with the Project Profile of Asbestos Abatement Work in CLS, however, the asbestos discovered in soil of Area 3 shall follow the following requirements:

- While the APCO requires registered professionals to undertake the abatement work, the *Waste Disposal Ordinance* and the *Waste Disposal (Chemical Waste) (General) Regulation* provide control on the packaging, labelling, storage, collection and disposal of asbestos waste. Asbestos wastes shall be handled in accordance with the *Code of Practice on the Handling, Transportation and Disposal of Asbestos Waste* issued by the Environment and Food Bureau.
- Asbestos waste, by definition under the *Waste Disposal (Chemical Waste) (General) Regulation*, is categorised as chemical waste of which the arrangement of production, collection and disposal will follow the 'trip-ticket' system as with other chemical wastes. The registered asbestos contractor who is the waste producer shall appoint a licensed asbestos waste collector to collect the packaged asbestos waste and deliver to the designated landfill for disposal. Under the *Waste Disposal Ordinance* and *Waste Disposal (Chemical Waste) (General) Regulation*, directions of asbestos disposal shall be obtained from the EPD and prior arrangement with the landfill operator shall be made before disposal.

#### Collection and Transportation of Wastes

8.25 Dump trucks will be extensively used for the transit of waste, other than material contaminated with dioxin which will be transported by roll-off trucks between the excavation area and TKW. The following precautionary measures shall be taken to avoid spillage, wind erosion and incident in transit.

- Transportation of contaminated soil shall be escorted to improve road safety;
- Strict speed limit shall be imposed on the whole length of the haul road;
- Never overload the trucks to prevent spillage of contaminated soils;
- Dioxin-contaminated material shall be transported in roll-off trucks (containers).
- Always cover the payload on each dump truck with strong and low permeable sheeting or the likes to withstand wind and rain while the truck is travelling; and
- Adequately but not excessively wet the payload to reduce dust generation.

- 8.26 As dioxin-contaminated soil is classified as chemical waste, the trucks shall be labelled, handled and transported in accordance with the *Waste Disposal Ordinance* and the *Waste Disposal (Chemical Waste) (General) Regulation*. When the trucks approach the TKW Site, they will approach from west well clear of the east side of the site thereby avoid disturbance to the area where the group of egrets was sighted.
- 8.27 Dioxin condensate (oily residue) generated from the thermal desorption plant shall be transported in heavy duty and sealable drums, which will then be collected by CWTC's own fleets which are designed and licensed for the collection of hazardous and chemical wastes.
- 8.28 Finally, a contingency plan shall be prepared by the Contractor to spell out the necessary procedures to be taken and in case of accident and/ or emergency when transporting the contaminated soil to off-site location(s). All responsible parties and/ or persons and their contact numbers shall be listed in the plan.

#### Material Handling, Transportation and Storage

- 8.29 The movement of contaminated material between the shipyard and the off-site treatment area needs to be carried out in a controlled manner taking reasonable precautions to minimize potential losses that might otherwise have significant environmental impacts. The measures recommended need to take into account the degree of contamination of the material involved and the potential impact of losses. This subsection considers the requirements for material handling, transportation and storage in order to arrive at an appropriate scheme to minimise environmental risks in a cost effective manner.
- 8.30 **Material Handling and Transportation:** Material contaminated with heavy metals, TPH and SVOCs will be handled in the established manner using bulk earth moving equipment for on-land works including excavation by excavators on site. Dump trucks with sealed rear gates will be used to move the contaminated material between the shipyard and the To Kau Wan works area. The contaminated material in the trucks shall be covered with low permeability sheeting (i.e. HDPE) to prevent ingress of rainwater during transportation.
- 8.31 Additional precautions relating to the material handling and land transportation for dioxin-contaminated soil are recommended. Roll-off trucks (containerised) are recommended to minimise the risk of material loss during material handling and transportation, particularly in the event of an incident. Direct loading of material into containers at the point of excavation is recommended to minimise double handling and any associated losses. The use of containers will also minimise the risk of material loss during transportation by road. Contingency plans will need to be prepared by the Contractor to specify the accident response action, containment and retrieval procedure.
- 8.32 Assuming 6 to 10m<sup>3</sup> capacity trucks the total number of laden truck movements of excavated non-dioxin contaminated material from CLS to TKW would be between 900 to 1,500. On the

basis that this excavation work was carried out over a period of 6 months this equates to around 6 to 10 truck loads per day.

- 8.33 The use of roll-off trucks (containerised) have been assumed for dioxin-contaminated material shipments. These containers would be reused after each shipment. The size of containers varies and a rated capacity between  $6\text{m}^3$  and  $12\text{m}^3$  has been assumed. Allowing for a shipment of between  $6\text{m}^3$  and  $12\text{m}^3$  (11.3 tonnes to 22.7 tonnes) of contaminated material and based on the estimated total volume of about  $30,000\text{m}^3$  of dioxin-contaminated material, a total of between 2,500 and 5,000 truck loads would be required. On the basis that excavation work was carried out over a 6 month period this equates to around 16 to 32 truck loads per day.
- 8.34 **Storage:** A number of factors could affect the method of storage of material contaminated with dioxin. These include the need for and method and extent of transportation to the off-site treatment area, the available storage area and any potential need to move the material to an alternative treatment area.
- 8.35 The use of controlled stockpiling within a reinforced concrete storage bin area has been recommended. Assuming a height of 3 metres for the surrounding wall and a free stockpile height above the top of the wall of an additional 3 metres, the net area required for storage would be 0.66 ha. The storage bin solution preferred where site area is limited because of the more efficient use of available landuse.
- 8.36 To further reduce impacts on air quality, the use of a structure over the storage area has been included. The proposed scheme involves a storage height of 5 metres with additional height for headroom and a roof. The roof structure would be in place prior to the deposition, storage or removal of material from the storage building.
- 8.37 Only one-sided operation is provided for within the storage building. The roofing will protect against rain and wind and as such, rainwater will not enter the storage area but will be diverted to the sides of the building and collected in gutters and drain pipes and discharged into the stormwater drainage system.
- 8.38 For the bulk storage of general contaminated material for solidification only, a stockpile is proposed for storage up to an overall height of 5 metres over a net storage area of 1.0ha. Material stored to the design height shall be covered using a low permeability sheeting.

#### Treatment Area

- 8.39 As discussed in Sections 3 and 4, the off-site treatment area will be temporarily used for stockpiling of contaminated and treated soil, and soil remediation including biopiling, solidification and thermal desorption. Chemical wastes/ by-products will be generated from such operations and processes. During soil handling and transportation, spillage or leakage may occur resulting the potential contamination of the surfaces of housing unit. The bin

structure for stockpiles, containment structure and concrete floor at the treatment site shall be decontaminated after completion of remediation. It is recommended that these structures be decontaminated by scabbling and then be discarded as normal C&D material. The chemical deposits or residues from scabbling will be disposed of at CWTC for ultimate disposal.

- 8.40 Note that the potential land pollution will be limited to the surfaces of the housing unit and will unlikely be extended to the subsurface strata as the whole site will be concrete paved, and the stockpiling areas will be lined and installed with proper containment structures.

#### Off-Site Decontamination Works

- 8.41 Most of the soils after treatment will turn to clean inert materials suitable for public filling. The condensate as the end product of the thermal desorption process and other chemical wastes (e.g. spent activated carbons & filters) generated shall be temporarily stored in a secure hut. Such waste will be collected by licensed collectors and disposed of at the CWTC bi-daily to avoid bulk storage at treatment site. Pending collection, the chemical waste shall be packaged and where necessary stored temporarily on-site in accordance with the *Waste Disposal (Chemical Waste) (General) Regulation*.
- 8.42 It was known that the CWTC is able to handle the chemical wastes generated over the course of this Project. However, prior arrangement shall be made to avoid compromising the daily operation of CWTC.

#### Treatment of Oily Residue at CWTC

- 8.43 Though CWTC is designed to handle hazardous organic pollutants including PCB and dioxins, the following measures are proposed to ensure the handling of dioxin condensate arising from this Project will not compromise the performance & operation of CWTC:
- A batch of the oily condensate will be sent to CWTC for a performance test and treatment shall begin only after performance tests have been passed.
  - Treatment of condensate shall be in batches with a campaign every week or every two weeks.

#### Precautionary Measures during Wet and Typhoon Seasons

- 8.44 The following measures are recommended to minimise the water quality impact at the treatment site during typhoon seasons:
- Surface runoff from the treatment site shall be directed into storm drains via adequately designed sand/ silt removal facilities such as sand traps, silt traps and sediment basins. Channels, earth bunds or sand bag barriers shall be provided on site to properly direct stormwater to such site removal facilities.
  - Catch-pits and perimeter channels shall be constructed in advance of site preparation works.

- Open stockpiles on site shall be covered with tarpaulin during rainstorms. Measures shall be taken to prevent the washing away of soil into any drainage system.
- The storage area for excavated soil from CLS shall be roofed and covered. In addition, run-on/ run-off control elements shall be constructed. Finally, the floor shall be concrete paved.
- A dedicated water treatment unit (standalone from the water treatment unit of the thermal desorption for polishing the aqueous condensate) shall be constructed for the treatment of contaminated run-off, leachate collected and decontamination water.

#### Equipment Decontamination Requirement

- 8.45 For excavation and transport equipment at the CLS or treatment site, if it stays within the contaminated zone, such as excavation and stockpiling areas, it shall be decontaminated (typically steam cleaning) prior to leaving the contaminated zone. The contaminated zone shall need to be clearly defined with fencing. The exit of the contaminated zone shall have a decontamination pad for cleaning of the equipment before it leaves the zone. The decontamination water shall be collected and disposed of at the on-site water treatment unit. Care shall be exercised by the Contractor to prevent contamination of areas outside the contaminated zone.
- 8.46 In treatment area, particularly for a large-scale ongoing operation, separate equipment shall be employed for transport of treated materials to prevent any potential for recontamination. A "contaminated" loader shall load only the contaminated soils into the decontamination system, and a "clean" loader shall be assigned to remove the treated soils from the stockpile at the outlets of the decontamination systems.
- 8.47 Lining of trucks with plastic is recommended to prevent spills and leakage during transport. Besides, draping of plastic over the sides of trucks can minimise the amount of soil accumulates on the outside of the body. For transport within the contaminated zone, the cover fabrics/ plastic sheeting can be reused depending on the truck and cover configuration, otherwise they shall be dumped into landfill.
- 8.48 No water discharge is allowed prior to on-site treatment.

## 9 ECOLOGY

- 9.1 The ecological assessment in this report has revealed some families of restricted/protected plants and fish species (*Oryzias curvinotus*) in the Mong Tung Hang Stream will be impacted from the Project and mitigation measures have been recommended. The mitigation measure includes transplantation, seed collection and plant storage and cutting collection/cultivation for the restricted/protected plants and habitat recreation for the fish species in the Mong Tung Hang Stream.

### **Monitoring and Maintenance of transplanted plants**

- 9.2 To maximise success rate of relocation, the plants and their environment need to be carefully monitored after transplantation. The monitoring team shall include a suitably qualified plant biologist with at least 3 years relevant experience, familiar with species in question and with a sound understanding of transplanting projects and previous vegetation monitoring experience. Additionally, the team should include a qualified horticulturist with at least 3 years practical experience, available to provide info on seed preservation and cultivation.
- 9.3 The receptor site shall be visited over a period of 3 years. Monitoring should be carried out twice weekly for first 4 months after transplanting, and once a month for the remainder of the programme.

### **Monitoring**

- 9.4 Monitoring shall include:
- Checking of the species composition, percentage coverage and condition of vegetation on each of the tagged areas of transplanted wetland and *N.mirabilis* plants;
  - Recording of the condition of the wetland/plants in terms of the presence of flowers/seeds, leaf colour, signs of disease/pests, signs of stress (e.g., resulting from lack of water/too much sunlight); and evidence of self regeneration;
  - Determining the abiotic factors including water quality parameters (water depth, dissolved oxygen, pH, salinity, temperature) and soil conditions; and
  - Recording of any signs of plant stress together with actions taken.
- 9.5 During monitoring, routine maintenance of the receptor site should be implemented. The most important maintenance tasks shall include:
- Ensuring the wetlands/plants are receiving sufficient water
  - Controlling invasive plant species such as exotic climbers, which may smother the transplanted species.



9.6 Short reports containing results of field investigation and measurements should be prepared after each monthly survey. Submitted by the contractors monitoring team for review by the IEC and EPD within 15 days of the end of the reporting month. Reports should contain details of:

- Monitoring work undertaken during the reporting period;
- Plant survival;
- Signs of plant stress; and
- Any management actions undertaken.

#### ***Remedial Measures***

9.6 Routine monitoring and maintenance should ensure the wetland plants become successfully established at the receptor site. However, if large numbers of plants die back and do not re-grow, remedial strategies must be implemented. These strategies should include the germination of stored seeds, and the transplanting of stored plants and *N.mirabilis* cuttings from KFBG.

9.7 Remedial measures to be implemented at specific action levels are detailed below:

#### **Less than 50% survival**

- Instigate germination of a portion of seed for the species in question, and arrange for the planting of stored plants/cultivated cuttings
- Review the conditions at the receptor site to ensure it is still considered suitable for the species prior to replanting.

#### **Less than 30% survival**

Very low survival levels may indicate that the receptor site is not suitable for the species in question. Therefore, other sites where the species of concern are known to occur should be identified and monitored, in order to:

- document additional information on species preferences, flowering time and seed production;
- collect seeds in a controlled manner to ensure that there is a genetic resource of this species;
- undertake trials to grow seedlings of these rare species;
- cultivate seedlings and replant species in alternative receptor sites;
- ensure that plants of these target species at existing sites are adequately protected.

#### **Monitoring of the Relocated Fish Species**

9.8 Before relocation, the recreated habitat should be monitored to ensure that the habitat has been colonised by aquatic invertebrates and other organisms. It is important that *O.curvinotus*

are moved to the recreated habitat following the completion of slope/fill works, and the construction of the channelised section of MTHS.

- 9.9 After relocation, the *O.curvinotus* population should be regularly monitored over a period of 1 year by a suitably qualified ecologist/biologist with 3 years relevant experience. Monitoring should be carried out every two weeks for the first three months after relocation, and monthly for the remainder of the monitoring period.

## 10 ENVIRONMENTAL AUDITING

### Site Inspections

- 10.1 Site inspections provide a direct means to track and ensure the enforcement of specified environmental protection and pollution control measures. The inspections should be undertaken routinely by the ET to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented. Additionally, the ET shall be responsible for defining the scope of the inspections, detailing any deficiencies that are identified, and reporting any necessary action or mitigation measures that were implemented as a result of the inspection.
- 10.2 Site inspections shall be carried out at least once per week. The areas of inspection should include the general environmental conditions in the vicinity of the site and the pollution control and mitigation measures within the site; it should also review the environmental conditions outside the site area which are likely to be affected, directly or indirectly, by site activities. The ET shall make reference to the following information in conducting the inspections:
- the EIA 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;
  - the contract specifications on environmental protection;
  - the relevant environmental protection and pollution control laws; and
  - previous site inspection results undertaken.
- A monthly waste management audit will be carried out as part of the site audit programme.
- 10.3 The inspection results and their associated recommendations on improvements to the environmental protection and pollution control works shall be submitted to the Contractor, as appropriate, within 24 hours, for reference and for taking immediate action. They shall also be presented, along with the remedial actions taken, in the monthly EM&A report. The Contractor shall follow the procedures and time-frames stipulated in the environmental site inspection for the implementation of mitigation proposals and the resolution of deficiencies in the Contractor' EMS. An action reporting system shall be formulated and implemented to report on any remedial measures implemented subsequent to the site inspections.
- 10.4 Ad hoc site inspections shall 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.

### **Compliance with Legal and Contractual Requirements**

- 10.5 There shall be contractual environmental protection and pollution control requirements, which the Contractor shall comply with, in addition to Hong Kong's environmental protection and pollution control laws.
- 10.6 The ET shall review the progress and programme of the works to check that relevant environmental laws have not been violated, and that any foreseeable potential for violating the laws can be prevented.
- 10.7 The Contractor shall 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, and all the valid licences/permit. The site diary shall also be available, upon request, to the ET during his site inspection.
- 10.8 After reviewing the documentation, the ET shall 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 shall also advise the Contractor accordingly.
- 10.9 Upon receipt of the advice, the Contractor shall undertake immediate action to remedy the situation. The Engineer shall follow up to ensure that appropriate action has been taken by the Contractor in order that the environmental protection and pollution control requirements are fulfilled.

### **Environmental Complaint**

- 10.10 Complaints shall be referred to the Permit Holder who shall implement the complaint investigation procedures; which shall comprise the complaint event and action plan.
- 10.11 During the complaint investigation work, the Contractor and Engineer shall co-operate with the ET and IEC in providing all the necessary information and assistance for completion of the investigation. If mitigation measures are identified in the investigation, the Contractor shall promptly carry out the mitigation works. The Engineer shall ensure that the measures have been carried out by the Contractor.

## 11 REPORTING

### General

- 11.1 Reports can be provided in an electronic medium upon agreeing the format with the ER and EPD. This would enable a transition from a paper / historic and reactive approach to an electronic / real time proactive approach. All the monitoring data (baseline and impact) shall also be made available through a dedicated internet website that would be agreed with relevant authority.
- 11.2 Types of reports that the ET Leader shall prepare and submit include baseline monitoring report, monthly EM&A report, quarterly EM&A summary report and final EM&A review report. In accordance with Annex 21 of the EIAO-TM, a copy of the monthly, quarterly summary and final review EM&A reports shall be made available to the Director of Environmental Protection.

### Baseline Monitoring Report

- 11.3 The ET Leader shall prepare and submit a Baseline Environmental Monitoring Report within 10 working days of completion of the baseline monitoring. Copies of the Baseline Environmental Monitoring Report shall be submitted to the Contractor, the IEC, the ER and the EPD. The ET Leader shall liaise with the relevant parties on the exact number of copies they require. The report format and baseline monitoring data format shall be agreed with the EPD prior to submission.
- 11.4 The baseline monitoring report shall include at least the following:
- (i) up to half a page executive summary;
  - (ii) brief project background information;
  - (iii) drawings showing locations of the baseline monitoring stations;
  - (iv) 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;
  - (v) details of 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;
- (vi) determination of the Action and Limit Levels for each monitoring parameter and statistical analysis of the baseline data, the analysis shall conclude if there is any significant difference between control and impact stations for the parameters monitored;
- (vii) revisions for inclusion in the EM&A Manual; and
- (viii) comments, recommendations and conclusions.

### **Monthly EM&A Reports**

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

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

- 11.7 The first monthly EM&A report shall include at least the following :
- (i) 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.
  - (ii) basic project information:
    - project organisation including key personnel contact names and telephone numbers;
    - programme;
    - management structure, and
    - works undertaken during the month;
  - (iii) environmental status:
    - works undertaken during the month with illustrations (such as location of works, daily excavation rate, etc); and

- drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations (with co-ordinates of the monitoring locations);
- (iv) a brief summary of EM&A requirements including:
- all monitoring parameters;
  - environmental quality performance limits (Action and Limit levels);
  - Event-Action Plans;
  - environmental mitigation measures, as recommended in the project EIA study final report; and
  - environmental requirements in contract documents;
- (v) implementation status:
- advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA;
- (vi) monitoring results (in both hard and diskette copies) together with the following information:
- monitoring methodology;
  - name of laboratory and types of equipment used and calibration details;
  - parameters monitored;
  - monitoring locations;
  - monitoring date, time, frequency, and duration;
  - weather conditions during the period;
  - any other factors which might affect the monitoring results; and
  - QA/QC results and detection limits;
- (vii) 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 legislation, 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;
- (viii) 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; and
- comments (for examples, effectiveness and efficiency of the mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions.

### *Subsequent EM&A Reports*

11.8 Subsequent monthly EM&A reports shall include the following :

- (i) 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.
- (ii) basic project information:
  - project organisation including key personnel contact names and telephone numbers;
  - programme;
  - management structure; and
  - work undertaken during the month;
- (iii) environmental status:
  - works undertaken during the month with illustrations (such as location of works, daily excavation rate, etc.); and
  - drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.
- (iv) implementation status:
  - advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA;
- (v) monitoring results (in both hard and diskette copies) together with the following information:
  - monitoring methodology;
  - name of laboratory and types of equipment used and calibration details;
  - parameters monitored;
  - monitoring locations;
  - monitoring date, time, frequency, and duration;
  - weather conditions during the period;
  - any other factors which might affect the monitoring results; and
  - QA / QC results and detection limits.



(vi) 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 legislation, 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.

(vii) 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; and
- comments (for examples, effectiveness and efficiency of the mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions.

(viii) 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 annotated against the following:
  - a) major activities being carried out on site during the period;
  - b) weather conditions during the period; and
  - c) any other factors that might affect the monitoring results.
- monitoring schedule for the present and next reporting period;
- cumulative statistics on complaints, notifications of summons and successful prosecutions; and
- outstanding issues and deficiencies.

### Quarterly EM&A Summary Reports

11.9 A quarterly EM&A summary report of around 5 pages shall be produced and submitted within 15 working days of the end of last reporting month, The quarterly report shall contain at least the following information:

- (i) executive summary (1 - 2 pages);
- (ii) basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of works undertaken during the quarter;
- (iii) a brief summary of EM&A requirements including:
  - monitoring parameters;
  - environmental quality performance limits (Action and Limit levels); and
  - environmental mitigation measures, as recommended in the project EIA Final Report;
- (iv) advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA Final Report, summarised in the updated implementation schedule;
- (v) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- (vi) graphical plots of any trends in monitored parameters over the past four months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:
  - the major activities being carried out on site during the period;
  - weather conditions during the period; and
  - any other factors which might affect the monitoring results;
- (vii) advice on the solid and liquid waste management status;
- (viii) a summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- (ix) a brief review of the reasons for and the implications of any non-compliance, including a review of pollution sources and working procedures;
- (x) a summary description of actions taken in the event of non-compliance and any follow-up procedures related to any earlier non-compliance;
- (xi) a summarised record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- (xii) comments (for examples, a review of the effectiveness and efficiency of the mitigation measures and the performance of the environmental management system, that is, of the overall EM&A programme); recommendations (for example, any improvement in the EM&A programme) and conclusions for the quarter; and
- (xiii) proponents' contacts and any hotline telephone number for the public to make enquiries.

### **Final EM&A Review Reports**

- 11.10 The final EM&A report shall be prepared and submitted within 20 working days of the end of last reporting month, it shall contain at least the following information:

- (i) executive summary (1 - 2 pages);
- (ii) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- (iii) basic project information including a synopsis of the project organisation, contacts of key management, and a synopsis of work undertaken during the course of the project or past twelve months;
- (iv) a brief summary of EM&A requirements including:
  - environmental mitigation measures, as recommended in the project EIA Report;
  - environmental impact hypotheses tested;
  - environmental quality performance limits (Action and Limit levels);
  - all monitoring parameters;
  - Event-Action Plans;
- (v) a summary of the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA Report, summarised in the updated implementation schedule;
- (vi) graphical plots and the statistical analysis of the trends of monitored parameters over the course of the project, including the post-project monitoring for all monitoring stations annotated against:
  - the major activities being carried out on site during the period;
  - weather conditions during the period; and
  - any other factors which might affect the monitoring results;
- (vii) a summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- (viii) a review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate;
- (ix) a description of the actions taken in the event of non-compliance;
- (x) a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- (xi) a summary record of notifications of summons and successful prosecutions for breaches of the current environmental protection / pollution control legislation, locations and nature of the breaches, investigation follow-up actions taken and results;
- (xii) a review of the validity of EIA predictions and identification of shortcomings in EIA recommendations; and
- (xiii) comments (for examples, a review of the effectiveness and efficiency of the mitigation measures and of the performance of the environmental management system, that is, of the overall EM&A programme);

- (xiv) recommendations and conclusions (for example, a review of success of the overall EM&A programme to cost-effectively identify deterioration and to initiate prompt effective mitigatory action when necessary).

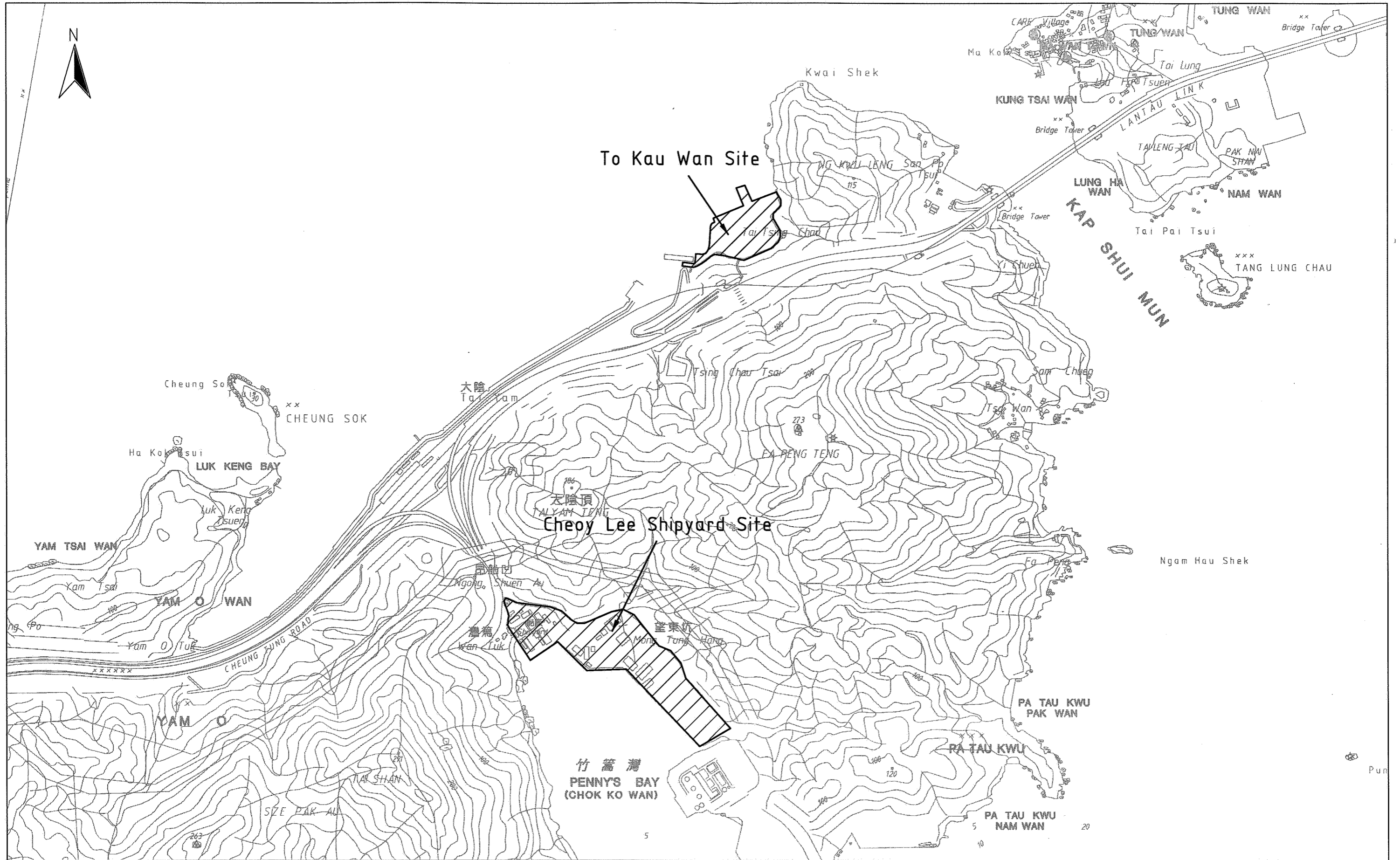
### **Data Keeping**

- 11.11 No site-based documents (such as monitoring field records, laboratory analysis records, site inspection forms, etc.) are required to be included in the monthly EM&A reports. However, any such document shall be well kept by the ET Leader and be ready for inspection upon request. Particularly, under WDO the Contractor shall keep trip-ticket records and also the relevant staff training record on site for inspection. All relevant information shall be clearly and systematically recorded in the document. Monitoring data shall also be recorded in magnetic media form, and the software copy must be available upon request. Data format shall be agreed with the EPD. All documents and data shall be kept for at least one year following completion of the construction contract.

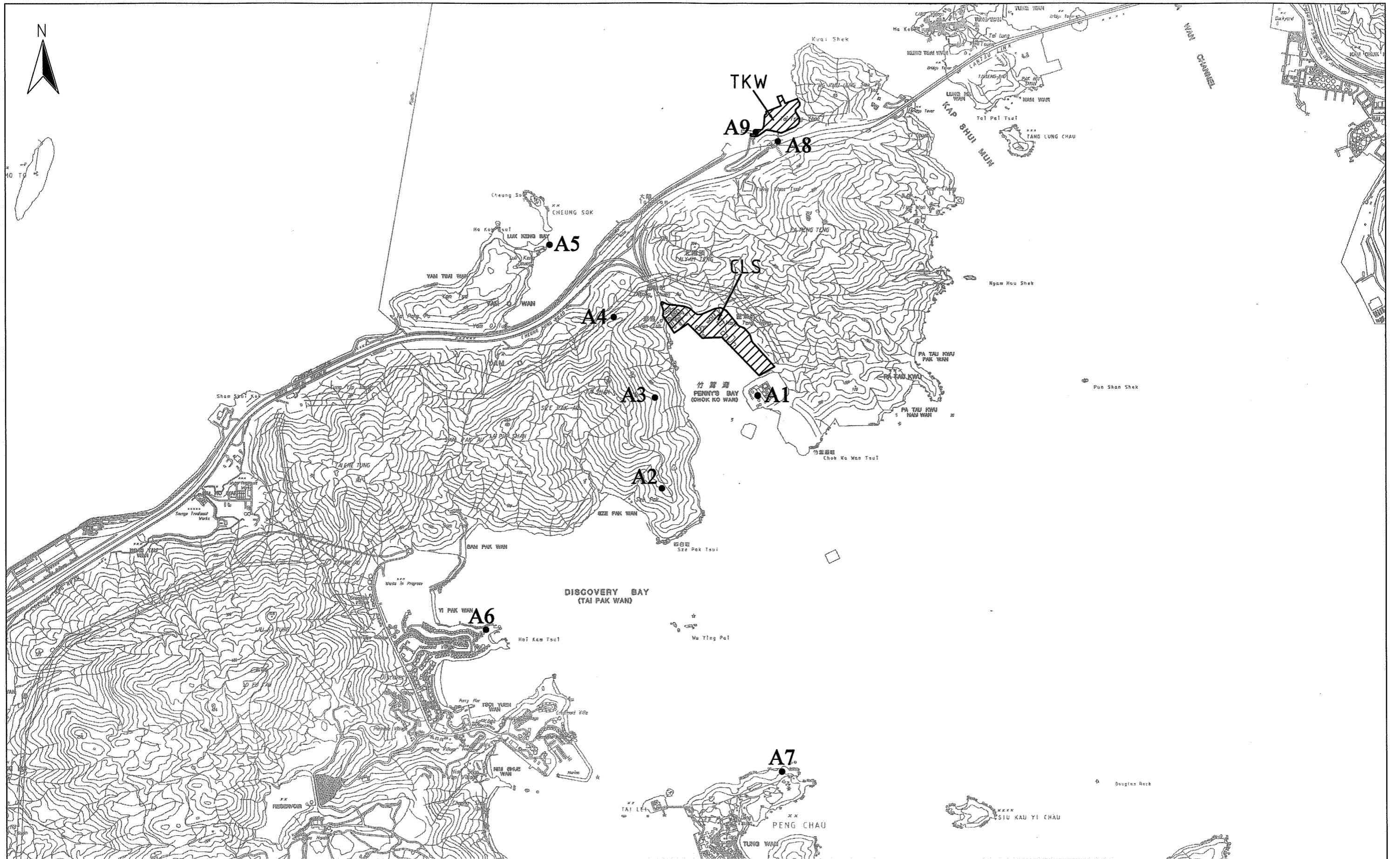
### **Interim Notifications of Environmental Quality Limit Exceedances**

- 11.12 With reference to the Event and Action Plan, when the environmental quality performance limits are exceeded, the ET Leader shall immediately notify the IEC and EPD, as appropriate. The notification shall be followed up with advice to IEC 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 Appendix C.

**FIGURES**



<b>Title</b> Agreement No. CE 68/99 Infrastructure for Penny's Bay Development - Engineering Design and Construction Decommissioning of Cheoy Lee Shipyard  <b>Site Location Map</b>	<b>Scale</b> 1 : 15000	<b>Project No.</b> R06100	
	<b>Date</b> Feb 2002	<b>Figure No.</b> 1.1	



<b>Title</b> Agreement No. CE 68/99 Infrastructure for Penny's Bay Development - Engineering Design and Construction Decommissioning of Cheoy Lee Shipyard  <b>Locations of Air Quality Sensitive Receivers</b>	<b>Scale</b> 1 : 30000	<b>Project No.</b> R06100	
	<b>Date</b> Feb 2002	<b>Figure No.</b> 1.2	



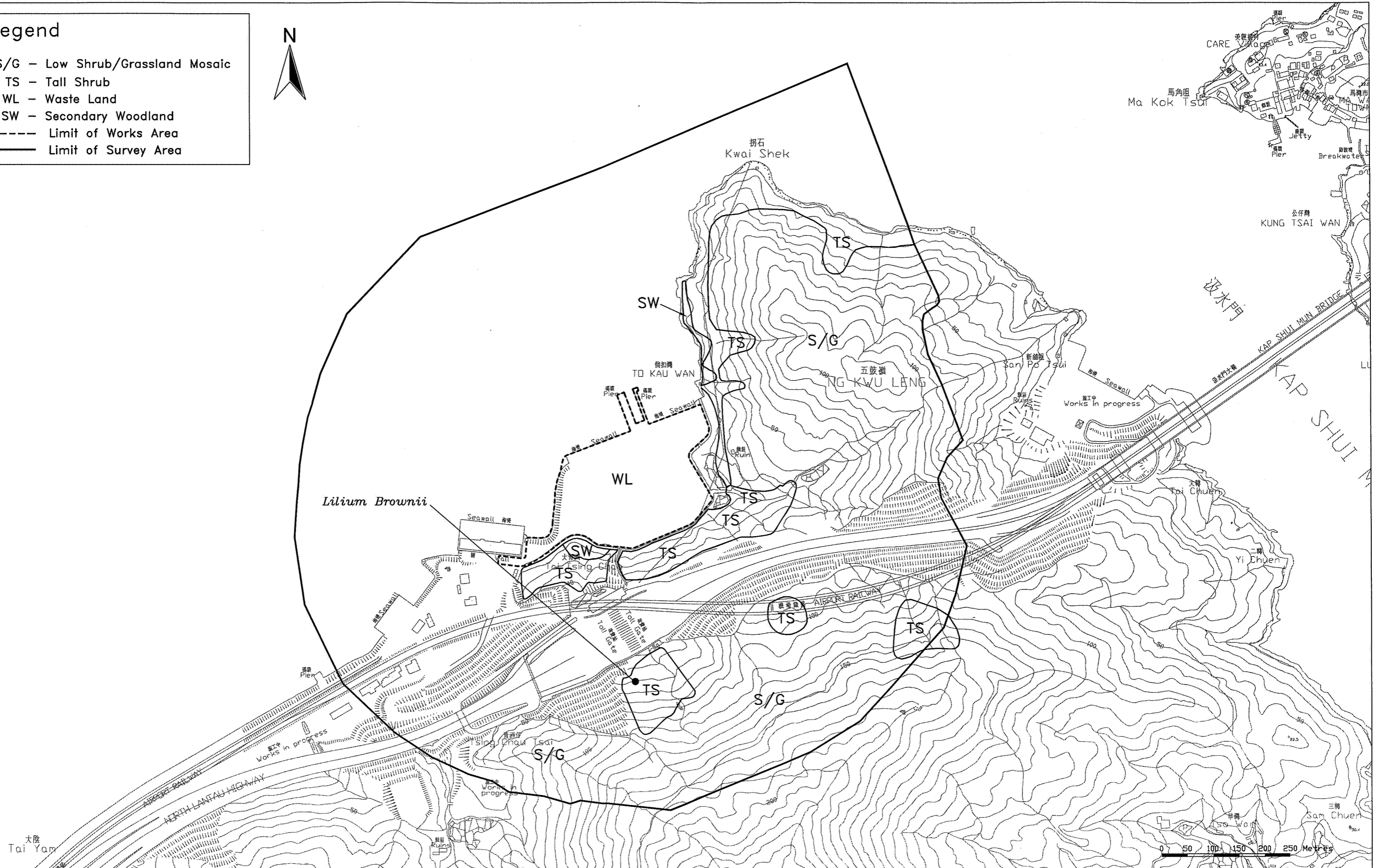
Title	Agreement No. CE 68/99 Infrastructure for Penn's Bay Development - Engineering Design and Construction Decommissioning of Cheoy Lee Shipyard Habitat Map - Cheoy Lee Shipyard	Scale	1 : 7500	Project No.	R06100
		Date	Feb 2002	Figure No.	1.4





**Legend**

- S/G - Low Shrub/Grassland Mosaic
- TS - Tall Shrub
- WL - Waste Land
- SW - Secondary Woodland
- Limit of Works Area
- Limit of Survey Area

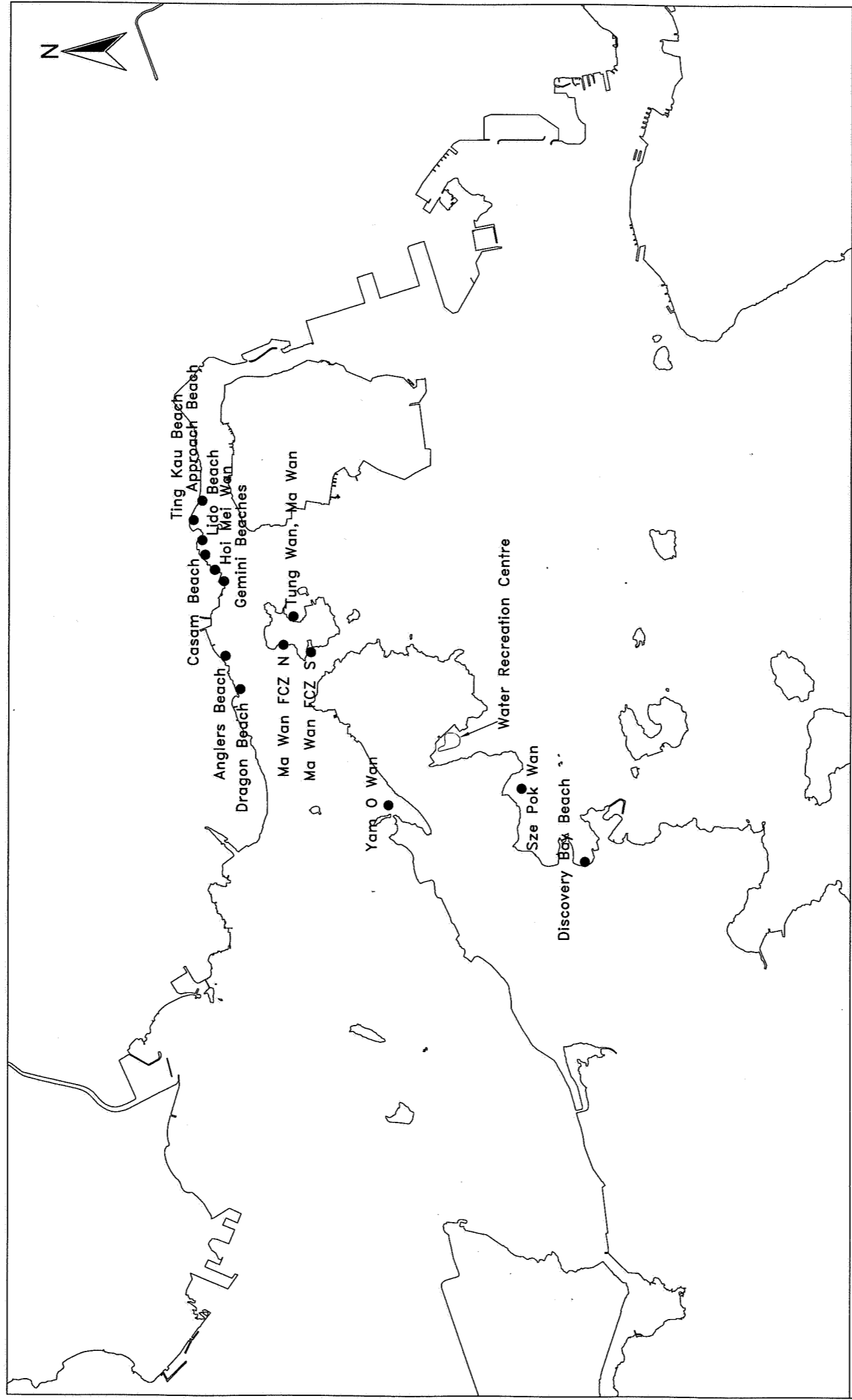


Title Agreement No. CE 68/99 Infrastructure for Penn's Bay Development - Engineering Design and Construction  
 Decommissioning of Cheoy Lee Shipyard  
**Habitat Map - To Kau Wan**

Scale 1:5000  
 Date Feb 2002

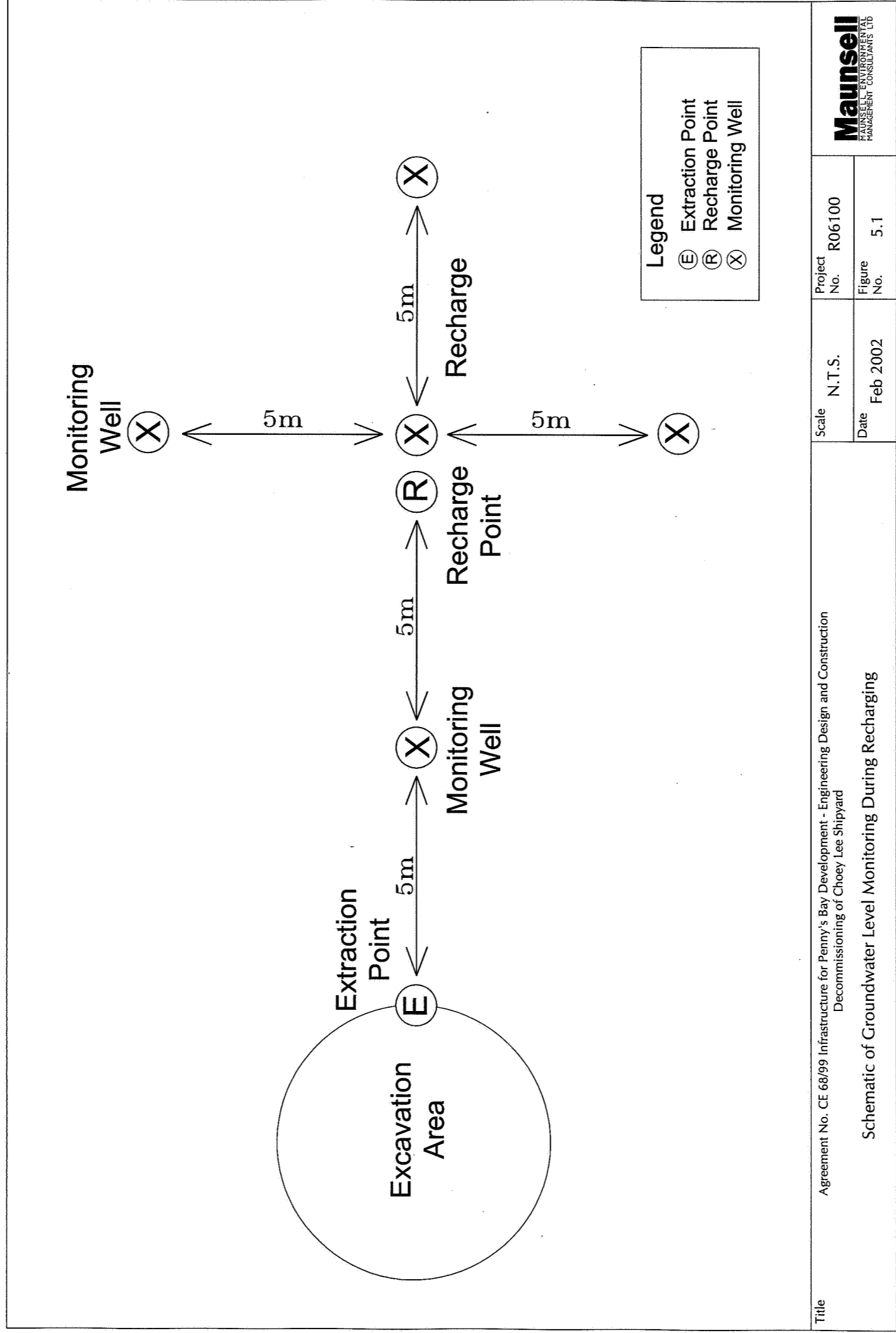
Project No. R06100  
 Figure No. 1.5





Title	Agreement No. CE 68/99 Infrastructure for Penny's Bay Development - Engineering Design and Construction Decommissioning of Cheoy Lee Shipyard		Scale	1 : 100000	Project No.	R06100
	Locations of Water Quality Sensitive Receivers		Date	Feb 2002	Figure No.	1.3





Title Agreement No. CE 68/99 Infrastructure for Penny's Bay Development - Engineering Design and Construction  
Decommissioning of Choey Lee Shipyard

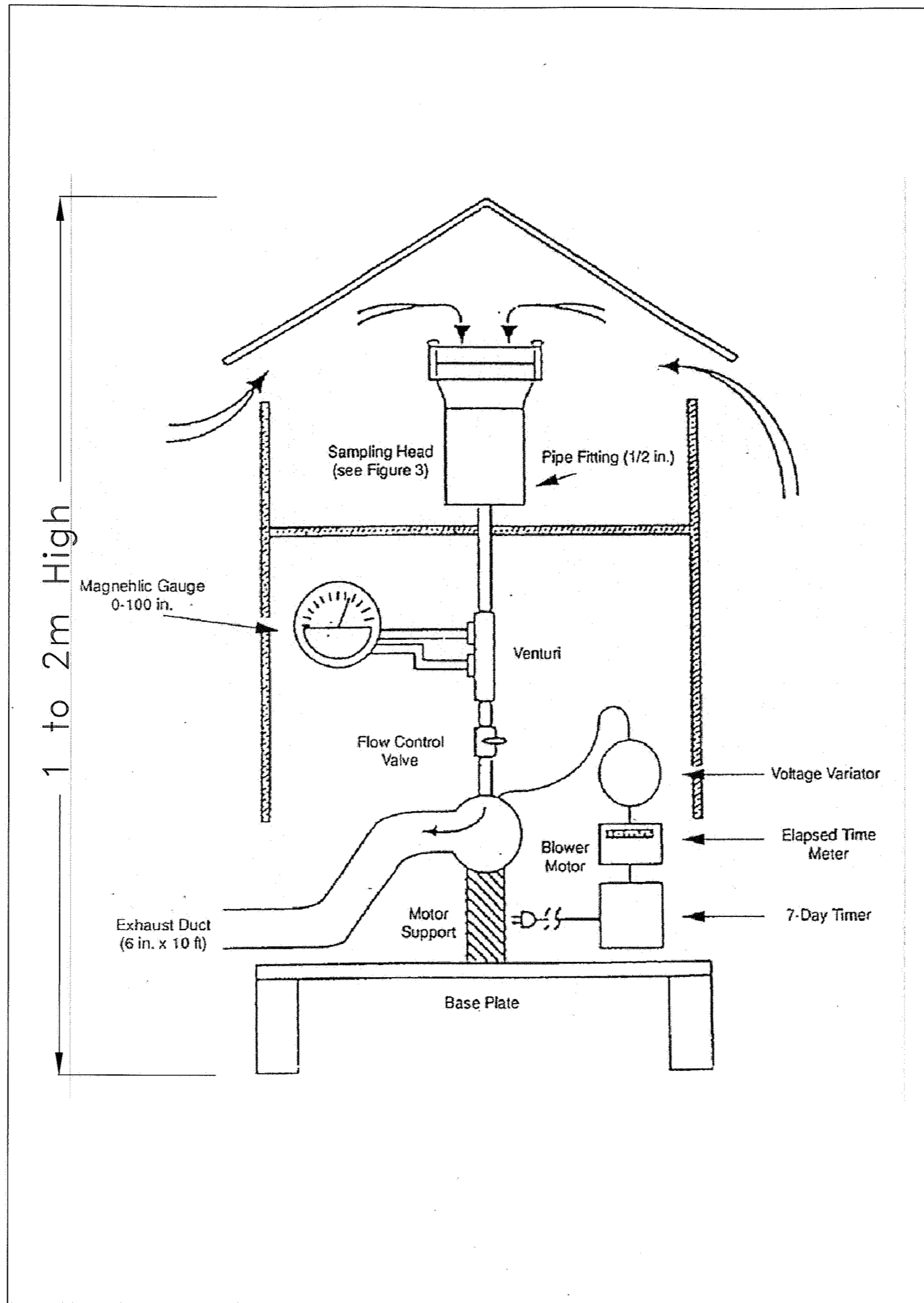
Scale N.T.S.

Project No. R06100

Schematic of Groundwater Level Monitoring During Recharging

Date Feb 2002

Figure No. 5.1



Title Agreement No. CE 68/99 Infrastructure for Penny's Bay Development -  
Engineering Design and Construction Decommissioning of Cheoy Lee Shipyard

Typical Dioxins High Volume Air Sampler

Scale N.T.S.

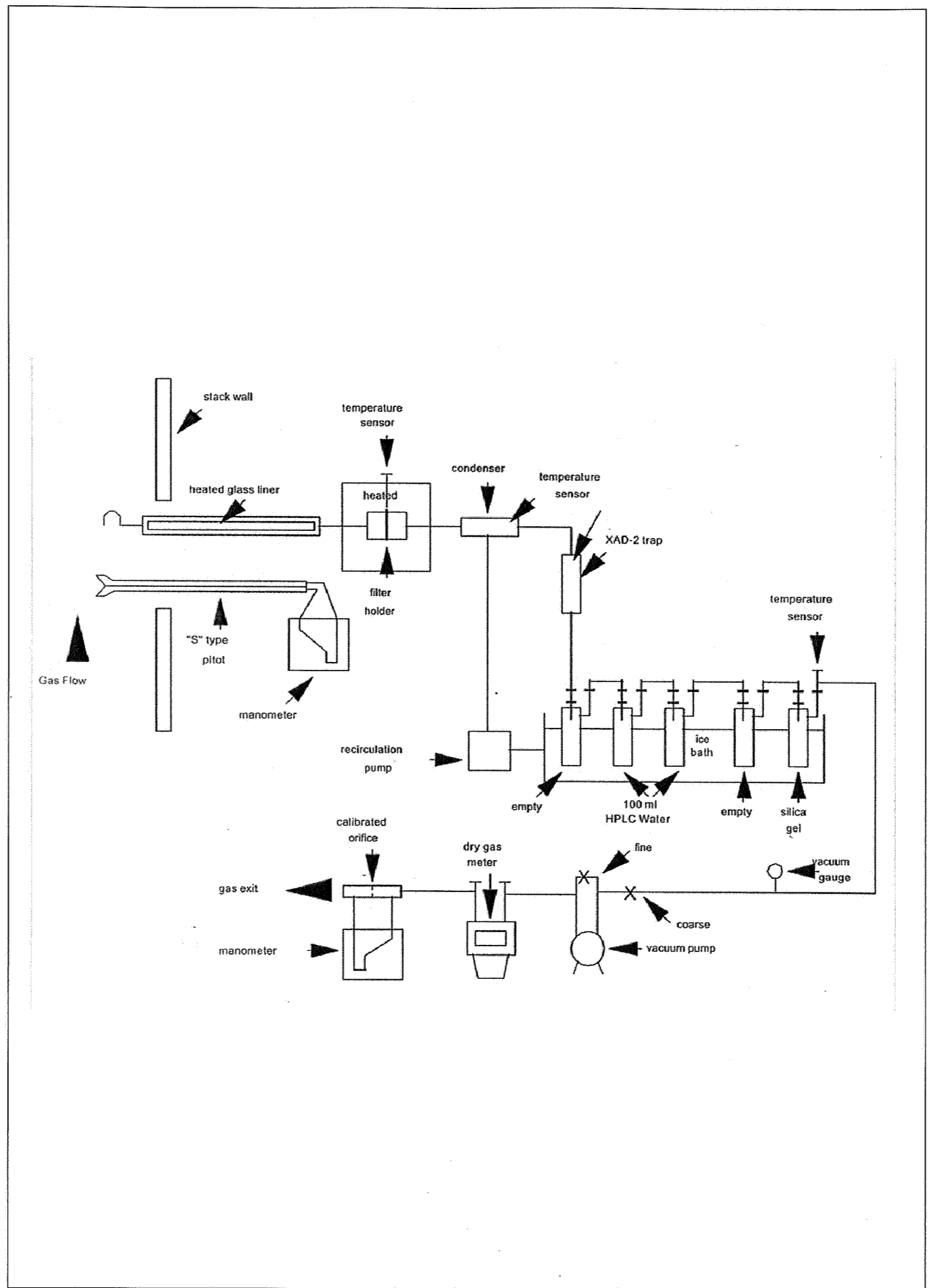
Date Feb 2002

Project No. R06100

Figure No. 6.1



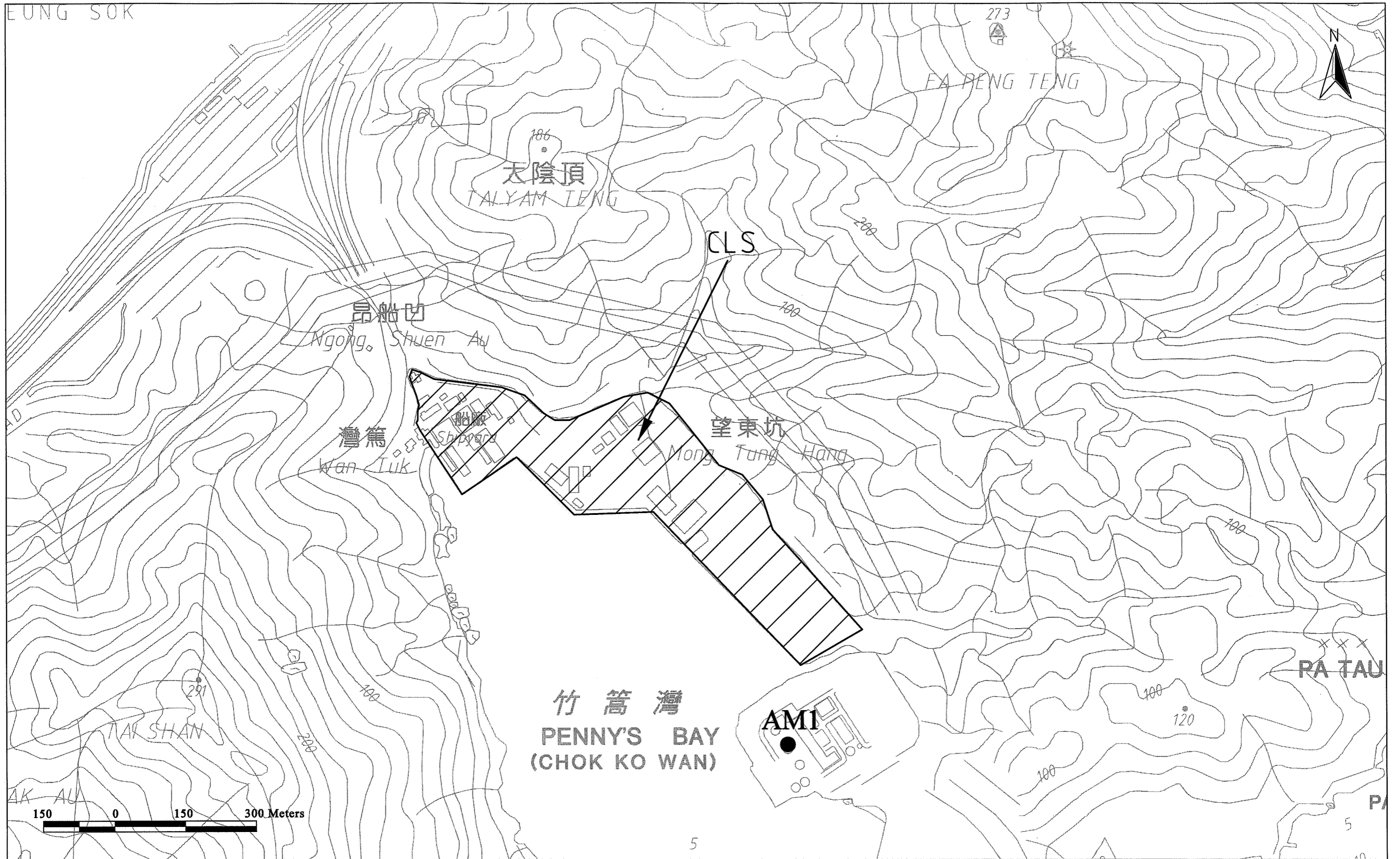
K:\R06100\EM\EM&A\Dec01\Fig\_6-1.dwg



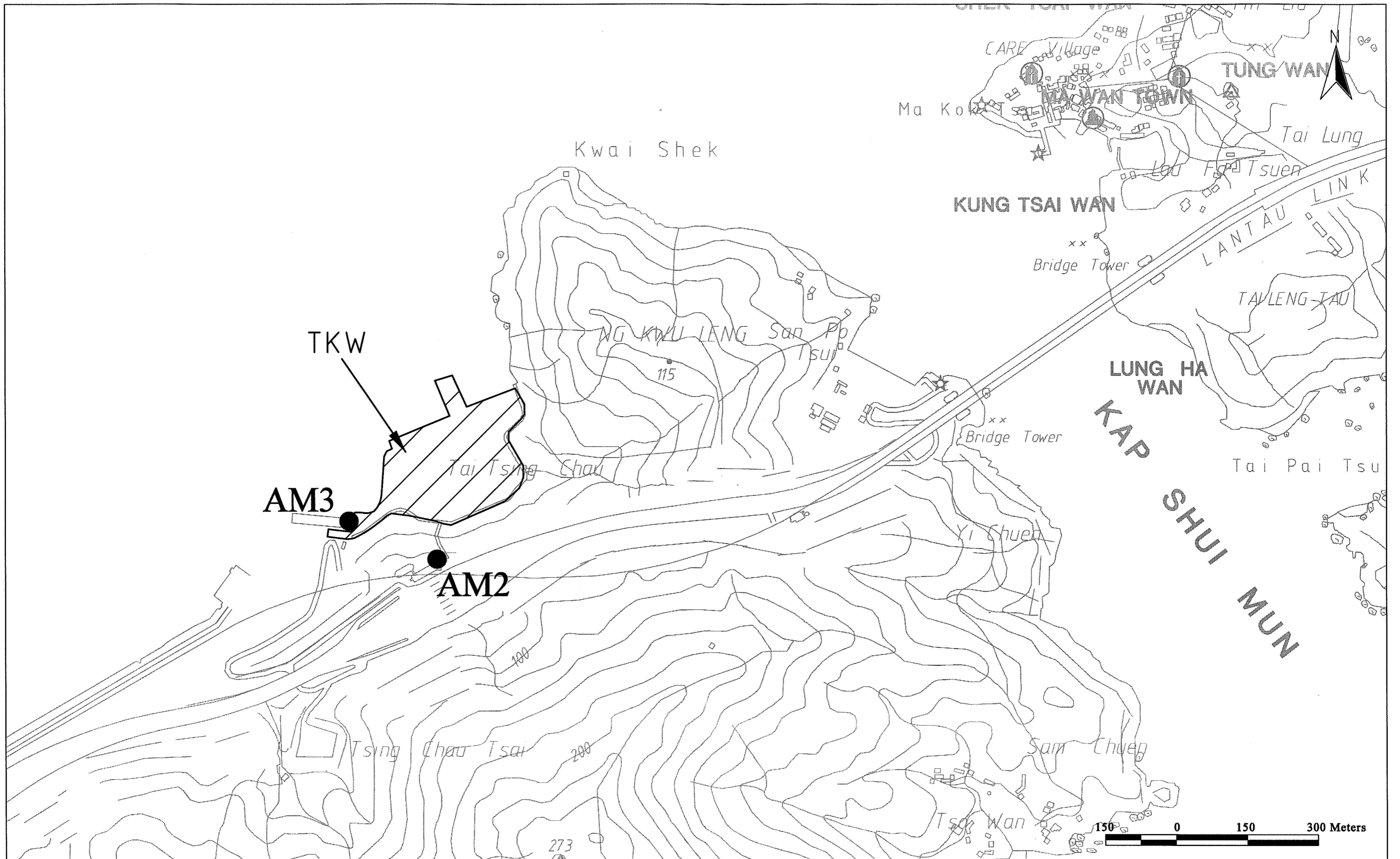
Title	Agreement No. CE 68/99 Infrastructure for Penny's Bay Development - Engineering Design and Construction Decommissioning of Cheoy Lee Shipyard	Scale	N.T.S.	Project No.	R06100
	Sampling Train for Stack Dioxin Sampling	Date	Feb 2002	Figure No.	6.2



K:\R06100\EM&A\Dec01\Fig\_6-2.dwg



<b>Title</b> Agreement No. CE 68/99 Infrastructure for Penny's Bay Development - Engineering Design and Construction Decommissioning of Cheoy Lee Shipyard  <b>Ambient Air Monitoring Station for Cheoy Lee Site</b>	<b>Scale</b> N.T.S.	<b>Project No.</b> R06100	
	<b>Date</b> Feb 2002	<b>Figure No.</b> 6.3	



Title	Agreement No. CE 68/99 Infrastructure for Penny's Bay Development - Engineering Design and Construction Decommissioning of Cheoy Lee Shipyard		Project No. R06100	<b>Maunsell</b> MAUNSELL ENVIRONMENTAL MANAGEMENT CONSULTANTS LTD
	Ambient Air Monitoring Station for To Kau Wan Site			
	Scale	N.T.S.	Date	Feb 2002

**APPENDICES**



**APPENDIX A - IMPLEMENTATION OF MITIGATION MEASURES**

**Table A.1 Implementation Schedule for Land Contamination**

EIA Ref#	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	SI/ Dem	Ex	Tre	
S.4.96 & S.4.214	<p><u>Site decontamination and Soil remediation</u></p> <ul style="list-style-type: none"> <li>Where free product is detected at groundwater surface at during excavation, the free product shall be skimmed off, containerised and disposed of properly. Monitoring of free product and sampling/analysis of groundwater shall be conducted to ensure complete removal of the free product.</li> </ul>	At CLS / During Soil Excavation	Contractor			✓		
S.4.97	<ul style="list-style-type: none"> <li>Where dewatering is necessary during excavation, the groundwater shall be recharged within 10m of the extraction point and below the water table. Regular monitoring of groundwater level at various locations shall be undertaken to ensure insignificant migration of contaminant in groundwater or soils due to locally risen groundwater level.</li> </ul>	At CLS / During Soil Excavation	Contractor			✓		
S.4.95, S.4.222 & S.4.290	<ul style="list-style-type: none"> <li>Personal protective equipment (PPE) shall be used by site workers during soil excavation / free product skimming / groundwater dewatering.</li> </ul>	At CLS / During Soil Excavation	Contractor			✓		
S.4.222	<ul style="list-style-type: none"> <li>Excavated areas shall be fenced off to restrict unauthorised entrance.</li> </ul>	At CLS / During Soil Excavation	Contractor			✓		
S.4.158- S.4.160	<ul style="list-style-type: none"> <li>All contaminated soils at CLS shall be excavated and treated on site or transported out of the site for off-site treatment.</li> </ul>	At CLS and/or TKW / During Design, Soil Excavation, & Soil Treatment	CED / Contractor	✓		✓		✓

EIA Ref#	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation and Guidelines
				Des	SI/ Dem	Ex Tre	
S.4.158 & S.4.206-S.4.219	<ul style="list-style-type: none"> <li>After excavation, confirmation sampling and testing shall be conducted to ensure complete excavation of contaminated soils.</li> </ul>	At CLS / During Design & Soil Excavation	CED / Contractor	✓	✓	✓	
S.4.214	<ul style="list-style-type: none"> <li>Contaminated soils shall be sorted and handled with respect of their contamination.</li> </ul>	At CLS / During Soil Excavation	Contractor		✓		
S.4.220	<ul style="list-style-type: none"> <li>Precautionary measures shall be implemented to avoid environmental nuisance during excavation.</li> </ul>	At CLS / During Soil Excavation	Contractor		✓		
S.4.221-S.4.222	<ul style="list-style-type: none"> <li>Health and safety plan for excavation shall be followed.</li> </ul>	At CLS / During Soil Excavation	Contractor		✓		Occupational Safety & Health Ordinance; Guidelines on Occupational Exposure
S.4.223-S.4.265	<ul style="list-style-type: none"> <li>The following remediation processes shall be applied for different types of soil contamination:                             <ul style="list-style-type: none"> <li>Biopiling for TPH/SVOCs contamination;</li> <li>Cement solidification for metal contamination; and</li> <li>Thermal desorption for dioxin contamination.</li> </ul> </li> </ul>	At CLS and/or TKW / During Design, & Soil Excavation, & Soil Treatment	CED / Contractor	✓	✓	✓	
S.4.239-S.4.243	<ul style="list-style-type: none"> <li>Upon completion of biopile treatment, confirmation sampling and testing shall be undertaken for biopile closure assessment to ensure the cleanup targets have been achieved.</li> </ul>	At TKW / During Design & Soil Treatment	CED / Contractor	✓		✓	
S.4.251-S.4.256	<ul style="list-style-type: none"> <li>Upon completion of solidification treatment, confirmation sampling and testing shall be undertaken to ensure the cleanup targets have been achieved.</li> </ul>	At CLS & TKW / During Design & Soil Treatment	CED / Contractor	✓		✓	
S.4.265	<ul style="list-style-type: none"> <li>Upon completion of thermal desorption process, confirmation sampling and testing shall be undertaken to ensure the cleanup targets have been achieved.</li> </ul>	At TKW / During Design & Soil Treatment	CED / Contractor	✓		✓	

EIA Ref#	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	SI/ Dem	Ex	Tre	
	<p>ensure the cleanup target has been achieved.</p> <ul style="list-style-type: none"> <li>Mitigation measures for air quality and water quality impacts associated with the site decontamination and soil remediation works are presented in the relevant sections of this schedule.</li> </ul>	Treatment						
S.4.290	<p><u>Health and Safety Measures (General)</u></p> <ul style="list-style-type: none"> <li>During the course of the site remediation, the following basic health and safety measures shall be implemented as far as practicable:                             <ul style="list-style-type: none"> <li>Set up a list of safety measures for site workers;</li> <li>Provide written information and training on safety for site workers;</li> <li>Keep a log-book and plan showing the contaminated zones and clean zones;</li> <li>Maintain a hygienic working environment;</li> <li>Prohibit eating and cooking inside the contaminated zones;</li> <li>Avoid dust generation;</li> <li>Provide face and respiratory protection gear to site workers;</li> <li>Provide personal protective clothing (e.g. chemical resistant jackboot, liquid tight gloves) to site workers; and</li> <li>Provide first aid training and materials to site workers.</li> </ul> </li> </ul>	At CLS & TKW sites / During Soil Excavation & Soil Treatment	Contractor			✓	✓	Occupational Safety & Health Ordinance; Guidelines on Occupational Exposure

EIA Ref#	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	SI/ Dem	Ex	Tre	
S.4.291- S.4.294	<p><u>Personal Protective Equipment for Workers during Excavation of Dioxin-contaminated Soil</u></p> <p>The workers engaged in the excavation of dioxin-contaminated soil shall put on appropriate PPE to minimise the exposure to the carcinogens via inhalation, ingestion and dermal contact:</p> <ul style="list-style-type: none"> <li>• An air purifying respirator;</li> <li>• Latex gloves;</li> <li>• Protective clothing.</li> </ul> <p>If other contaminants are identified or the levels of contaminant are expected to be very high, a higher level of protection, such as self-supplied respirators, space suit, may be required.</p>	At CLS / During Soil Excavation	Contractor		✓		Occupational Safety & Health Ordinance; Guidelines on Occupational Exposure	
S.4.295	<p><u>Safety Measures for Handling Dioxin-containing Residue</u></p> <p>Storage and conveyance of dioxin-containing residue shall be undertaken in accordance with the relevant Dangerous Goods Ordinance.</p>	At TKW / During Soil Treatment	Contractor			✓	Dangerous Goods Ordinance	

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

\* Des - Design, Slo/Dem – Slope Improvement and Building Demolition, Exc – Soil Excavation, and Tre – Soil Treatment

**Table A.2 Implementation Schedule for Air Quality Control**

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	Slo/Dem	Exc	Tr	
S5.75	<p><u>General Measures for Construction Sites</u></p> <ul style="list-style-type: none"> <li>Dust mitigation measures stipulated in the <i>Air Pollution Control (Construction Dust) Regulation</i> shall be incorporated to control dust emission. Notice shall be given to the authority prior to commencing of work.</li> </ul>	CLS, slope behind CLS and TKW / During building demolition, slope improvement soil excavation and setting up of treatment plant	Contractor	✓	✓	✓	✓	Air Pollution Control (Construction Dust) Regulation
S5.76	<p><u>Transportation from CLS to TKW</u></p> <ul style="list-style-type: none"> <li>Dioxins contaminated soils shall be transported in enclosed roll-off truck with sealable top, which shall be delivered to enclosed material handling shed and storage areas. In addition, material handling process such as screening and crushing shall be conducted in an enclosed environment.</li> <li>General contaminated soils transported to the storage bin at TKW by truck shall be properly covered with impermeable sheeting to minimize wind erosion and fugitive emission. The storage bin shall be fully enclosed on four sides and top to eliminate dust emission.</li> </ul>	Haul road between CLS and TKW/ During soil transportation and unloading	Contractor		✓		✓	
S5.76	<p><u>Soil Excavation</u></p> <ul style="list-style-type: none"> <li>Excavation of dioxins contaminated soils shall be limited to 200 m<sup>3</sup>/hr; whereas excavation of styrene and chromium VI contaminated soils shall be limited to 20 m<sup>3</sup>/hr.</li> <li>The top layer soils shall be sprayed with fine misting of water immediately before the excavation.</li> <li>Inactive excavated area shall be covered by impermeable sheeting to minimise dust emissions.</li> </ul>	At CLS site / During soil excavation	Contractor		✓			--

EIA Ref #	Environmental Measures	Protection Measures	Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
						Des	Exc	Tre	Dem	
S5.77-S5.79	<p><u>Solidification</u></p> <ul style="list-style-type: none"> <li>Temporary stockpiles shall be covered by impermeable sheets to minimize wind erosion.</li> <li>Handling and mixing of cement shall follow Air Pollution Control (Construction Dust) Regulation to limit cement emission.</li> <li>Mixing process at TKW shall be conducted in enclosed area.</li> </ul> <p><u>Biopiling</u></p> <ul style="list-style-type: none"> <li>Emission characterisation study to identify exact concentration of individual species of VOCs.</li> <li>Biopiles shall be at all times covered by impermeable sheeting to prevent wind erosion.</li> <li>TOC emission to the atmosphere shall be limited to 20mg/m<sup>3</sup>, with maximum flow of no more than 56 m<sup>3</sup>/min, expressed at 298K, 1 atmosphere, dry and 11% oxygen content condition..</li> <li>Carbon absorber with 99% control efficiency shall be installed to ensure TOC level of off-gas comply with the emission limit before discharged.</li> </ul> <p><u>Thermal desorption</u></p> <ul style="list-style-type: none"> <li>Gaseous fuel shall be used for thermal desorption</li> <li>The thermal desorption shall be of enclosed process.</li> <li>The flue stack shall be of at least 10m high.</li> <li>The following emission limits (expressed at 298K, 1 atmosphere, dry and 11% oxygen content condition) from the thermal desorption process shall be satisfied; <ul style="list-style-type: none"> <li>- 0.1ng/m<sup>3</sup> for dioxin;</li> <li>- 20mg/m<sup>3</sup> for TOC; and</li> </ul> </li> </ul>	<p>At CLS and TKW site / During soil treatment</p> <p>At TKW site / During soil treatment</p> <p>At TKW site / During soil treatment</p> <p>At TKW site / During soil treatment</p>	<p>Contractor</p> <p>Contractor</p> <p>Contractor</p> <p>Contractor</p>					<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>	<p>Air Pollution Control (Construction Dust) Regulation -</p>	

EIA Ref #	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	Slo/ Dem	Exc	Tre	
	<ul style="list-style-type: none"> <li>- exhaust gas flowrate of no more than 60m<sup>3</sup>/min.</li> <li>• The air treatment unit associated with the thermal desorption facility shall allow no more than 0.0001% of SVOC, PAHs and dioxins from the soils, escaped as gaseous pollutants.</li> <li>• Approval from authority is required for installation of chimney with gaseous consumption rate more than 1150 MJ/hr</li> </ul>							Air Pollution Control (Furnaces, Ovens and Chimneys) (Installation and Alternation) Regulation

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

\* Des - Design, Slo/Dem – Slope Improvement and Building Demolition, Exc – Soil Excavation, and Tre – Soil Treatment

Table A.3 Implementation Schedule for Water Quality Control

EIA Ref#	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	Slo/Dem	Exc	Tre	
S7.70 - S7.73	<p><b>Building Demolition, Slope Improvement, Soil Remediation Plants Construction and Remediation Plants Decommissioning</b></p> <p><u>Surface Run-off</u></p> <p>Catchpits and perimeter channels shall be constructed in advance of site formation works and earthworks. Surface run-off from the construction sites shall be directed into storm drains via adequately designed wastewater treatment facilities such as sand traps, silt traps and sediment basins. Channels, earth bunds or sand bag barriers shall be provided on site to properly direct stormwater to such facilities</p> <p>Silt removal facilities, channels and manholes shall be maintained and the deposited silt and grit shall be removed regularly, at the onset of and after each rainstorm to ensure that these facilities are functioning properly at all times.</p> <p>Open stockpiles of demolition materials on site shall be avoided or where unavoidable covered with tarpaulin or similar fabric during rainstorms. Measures shall be taken to prevent the washing away of construction materials, soil, silt or debris into any drainage system.</p> <p>Manholes (including any newly constructed ones) shall always be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris from getting into the drainage system.</p>	<p>1. Building demolition at CLS</p> <p>2. Slope Improvement behind CLS</p> <p>3. Remediation Plant Construction at TKW</p> <p>4. Remediation plant decommissioning at TKW</p>	Contractor	<p>✓</p> <p>✓</p>	<p>✓</p> <p>✓</p>	<p>✓</p> <p>✓</p>	EIAO-TM, WPCO	



EIA Ref#	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	Slc/Dem	Exc	Trc	
S7.74	<p><u>Wheel Washing Water</u></p> <p>All vehicles and plant shall be cleaned before they leave the construction site to ensure that no earth, mud or debris is deposited by them on roads. A wheel washing bay shall be provided at every site exit, if practicable, and wash-water shall have sand and silt settled out or removed before being discharged into the storm drains. In any case, discharge of wheel wash water shall be minimised and recycled where possible. The section of construction road between the wheel washing bay and the public road shall be paved with backfill to reduce vehicle tracking of soil and to prevent surface run-off from entering public road drains</p> <p><u>Wastewater from Site Facilities</u></p> <p>Shall the use of chemical toilets be necessary then these shall be provided by a licensed contractor, who will be responsible for appropriate disposal and maintenance of these.</p> <p><u>Storage and Handling of Oil, Other Petroleum Products and Chemicals</u></p> <p>All fuel tanks and chemical storage areas shall be provided with locks and be sited on sealed areas. The storage areas shall be surrounded by bunds with a capacity equal to 110% of the storage capacity of the largest tank to prevent spilled oil, fuel and chemicals from reaching the receiving waters. The Contractors shall prepare guidelines and procedures for immediate clean-up actions following any spillages of oil, fuel or chemicals.</p>							
S7.75								
S7.76								

EIA Ref#	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	Slo/Dem	Exc	Tre	
S7.77	<p><u>Wastewater Treatment Facilities</u></p> <p>Sufficient wastewater treatment facilities shall be provided to treat the surface runoff and wheel wash water to the discharge standards as stipulated in the <i>Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters</i>. In addition, discharge licence under the <i>Water Pollution Control Ordinance</i> shall be obtained for any discharge of treated runoff and wheel wash water to the environment.</p>							
S7.79 – S7.81	<p><b>Soil Remediation</b></p> <p><u>Excavation and Dewatering at CLS</u></p> <p>All exposed pits shall be whenever possible backfilled immediately or covered and banded. Further, all excavated soil shall be loaded into dump truck directly to avoid stockpiles of contaminated soil next to excavation pits</p> <p>Final surfaces after excavation shall be well compacted and the subsequent permanent work or surface protection shall be carried out as soon as practical after the final surfaces are formed to prevent erosion caused by rainstorms. Appropriate intercepting channels and partial shelters shall be provided where necessary to prevent rainwater from collecting within the trenches or footing excavations. The contractor shall develop contingency plans for capture and control of any runoff prior to backfill during runoff-producing rainfall events.</p>	Soil excavation at CLS	Contractor		✓			--

EIA Ref#	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	Slc/Dem	Exc	Trc	
	Groundwater drawn from the dewatering process during excavation and rainwater collected within the trenches or excavation pits shall be pumped out and recharged back the ground in the vicinity.							
S7.83 – S7.85	<p><u>Operation of the Solidification Facility</u></p> <p>The designated stockpiling area before incepting contaminated soils shall be concrete-paved or lined with impervious floor membrane and shall have its perimeter constructed of a concrete bund in order to avoid any contaminated leachate from migrating out of the area. The leachate shall be collected and treated prior to disposal. Temporary stockpiles upon formation shall be immediately covered with low permeability cover to stop precipitation from washing the contaminated soil thus generating contaminated runoff. The contractor shall formulate contingency plans for the runoff collection and control.</p> <p>The solidification facility shall be sheltered and area of soil unloading/ loading shall be provided with shed to avoid contaminated runoff. Excessive addition of water during the process shall be avoided during the process.</p> <p>As an additional measure, any pits used for solidification area shall be shallower than the water table to minimize the leaching of the contaminated soils. And a impermeable membrane/sheet shall be placed at the bottom of any solidification pit during the solidification process</p>	Operation of the solidification facility at CLS	Contractor				✓	--

EIA Ref#	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	Slc/Dem	Exc	Tre	
S7.86	<p><u>Decontamination Water and Wheel Wash Water</u></p> <p>During soil excavation, dump trucks or excavators shall be decontaminated before they leave the site to ensure that no contaminated earth, mud or debris is deposited by them on roads. A wheel washing bay shall be provided at every site exit that equipped with an adequately sized centralised wastewater treatment unit. The wastewater treatment unit shall deploy flocculation/ sedimentation and activated carbon filtering by which processes sands/silts with dioxin cohered are to be settled out and other soil contaminants in wheel washes and decontamination water removed. The polluting parameters in effluent shall comply with TM discharge standards and dioxin in effluent shall be cleared of to an undetectable range before the effluent being discharged into the storm drains. The installation and operation of the wastewater treatment unit shall be licensed and subject to the effluent monitoring as required under the <i>Waste Disposal Ordinance</i>. In any case, discharge of wheel wash water shall be minimised and recycled where possible. The section of construction road between the wheel washing bay and the public road shall be paved with backfill to reduce vehicle tracking of soil and to prevent surface runoff from entering public road drains.</p> <p><u>Biopiling</u></p> <p>Impermeable liner shall be placed at the bottom of the biopiles and leachate collection sump shall be constructed along the perimeter of the biopiles to prevent leachate from contaminating the underlying soil/groundwater. Concrete bund shall be constructed along the perimeter of biopiles to prevent the runoff coming out from the</p>	Soil excavation at CLS	Contractor		✓		EIAO-TM, WDO	
S7.89- S7.90	<p><u>Biopiling</u></p> <p>Impermeable liner shall be placed at the bottom of the biopiles and leachate collection sump shall be constructed along the perimeter of the biopiles to prevent leachate from contaminating the underlying soil/groundwater. Concrete bund shall be constructed along the perimeter of biopiles to prevent the runoff coming out from the</p>	Soil treatment at TKW	Contractor			✓	EIAO-TM, WDO	

EIA Ref#	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	Slo/ Dem	Exc	Tre	
	<p>contaminated soil. All leachate collected shall be treated in a centralised wastewater treatment unit. The wastewater treatment unit shall deploy flocculation/ sedimentation and activated carbon filtering by which processes sands/silts with dioxin cohered are to be settled out and other soil contaminants in wheel washes and decontamination water removed. The polluting parameters in effluent shall comply with TM discharge standards and dioxin in effluent shall be cleared of to an undetectable range before the effluent being discharged into the storm drains. The installation and operation of the wastewater treatment unit shall be licensed and subject to the effluent monitoring as required under the <i>Waste Disposal Ordinance</i></p> <p>Biopiles after formation and during rain shall be covered by anchored impermeable geotextiles to prevent contaminated runoff. The exposed biopile section at any time shall not be more than 5m in length.</p> <p><u>Thermal Desorption</u></p> <p>The storage bin for the dioxin-contaminated soils shall be sheltered and bottom lined to prevent generation of contaminated runoff. The storage bin shall be equipped with leachate sump to collect any leachate from the soil stack and subsequently the leachate will be treated in the centralised wastewater treatment unit before discharging. Concrete bund and adequately sized sump shall be constructed at the perimeter of thermal desorption plant to collect any runoff within the plant to cater occasionally very heavy downpour during the remediation period. The runoff from the desorption plant of the first 30 minutes of a rainstorm is considered to be contaminated and shall be collected and treated in the centralised wastewater</p>							
S7.91		Soil treatment at TKW	Contractor				✓	EIAO-TM, WDO

EIA Ref#	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	Slo/ Dem	Exc	Tre	
	<p>treatment unit. The wastewater treatment work shall contain sedimentation, filters, coagulation/ flocculation unit and activated carbon adsorption. The treatment plant will be subject to the effluent monitoring requirement under the <i>Waste Disposal Ordinance</i>.</p> <p>All non-aqueous condensates from the thermal desorption processes shall be stored in sealable, leak-proof containers for off-site disposal. The aqueous phase of the condensate shall be used to quench the thermally-treated soil and rehumidify it to reach a specified moisture content. Excessive aqueous product shall be treated in the wastewater treatment unit before discharged. No direct discharge of excessive aqueous product into the local drains or drainage channel shall be allowed.</p> <p><u>Solidification</u></p> <p>The solidification facility shall be sheltered and area of soil unloading/ loading shall be provided with shed to avoid contaminated runoff. Excessive addition of water during the process shall be avoided during the process.</p> <p>As an additional measure, Any pit used for solidification area shall be shallower than the water table to minimize the leaching of the contaminated soils. And a impermeable membrane/sheet shall be placed at the bottom of any solidification pit during the solidification process..</p>							
S7.92 – S7.93		Soil treatment at TKW	Contractor				✓	EIAO-TM

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

\* Des - Design, Slo/Dem – Slope Improvement and Building Demolition, Exc – Soil Excavation, and Tre – Soil Treatment

Table A.4 Implementation Schedule for Waste Management

EIA Ref#	Environmental Measures	Protection Measures	Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
						Des	Slo/Dem	Exc	Tre	
S6.76	<ul style="list-style-type: none"> <li>• Recommendations for good site practice during the decommissioning and demolition activities:                             <ul style="list-style-type: none"> <li>- Use waste haulier authorised or licensed to collect specific category of waste;</li> <li>- Obtain the necessary registration and licences under the <i>Waste Disposal Ordinance</i> and the <i>Waste Disposal (Chemical Waste) (General) Regulation</i> from the Environmental Protection Department;</li> <li>- Nomination of an approved person, such as a site manager, to be responsible for good site practice, arrangements for collection and effective disposal to an appropriate facility, of all wastes generated at the site;</li> <li>- training of site personnel in proper waste management and chemical waste handling procedures;</li> <li>- provision of sufficient waste disposal points and regular collection for disposal;</li> <li>- appropriate measures to minimise windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers;</li> <li>- separation of chemical wastes for special handling and appropriate treatment at a licensed facility;</li> <li>- regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors;</li> <li>- a recording system for the amount of wastes generated, recycled and disposed of (including the disposal sites);</li> </ul> </li> </ul>			CLS, slope behind CLS and TKW / During building demolition, slope improvement, soil excavation and soil treatment	Contractor	✓	✓	✓	✓	Waste Disposal Ordinance (Cap. 54)

EIA Ref#	Environmental Measures	Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
					Des	Slo/ Dem	Exc	Tre	
S6.77	<ul style="list-style-type: none"> <li>- In order to monitor the disposal of C&amp;D material and solid wastes at public filling facilities and landfills, and control fly-tipping, a trip-ticket system shall be included as one of the contractual requirements and implemented by the Environmental Team. One may make reference to WBTC No. 5/99 for details; and</li> <li>- A Waste Management Plan (WMP) shall be prepared and this WMP shall be submitted to the Engineer for approval. One may make reference to WBTC No. 29/2000 for details.</li> </ul>	<ul style="list-style-type: none"> <li>• The following measures shall be implemented where applicable:                             <ul style="list-style-type: none"> <li>- segregation and storage of different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal;</li> <li>- to encourage collection of aluminium cans, paper waste and plastic bottles by individual collectors, separate labelled bins shall be provided to segregate this wastes from other general refuse generated by the work force;</li> <li>- any unused chemicals or those with remaining functional capacity shall be recycled;</li> <li>- use of reusable non-timber formwork to reduce the amount of C&amp;D material;</li> <li>- prior to disposal of C&amp;D waste, it is recommended that wood, steel and other metals shall be separated for re-use and / or recycling to minimise the quantity of waste to be disposed of to landfill;</li> <li>- proper storage and site practices to minimise the potential for damage or contamination of</li> </ul> </li> </ul>	CLS, slope behind CLS and TKW / During building demolition, slope improvement, soil excavation and soil treatment	Contractor	✓	✓	✓	Waste Disposal Ordinance (Cap. 54)	



EIA Ref#	Environmental Measures	Protection Measures / Mitigation	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
					Des	Slo/ Dem	Exc	Tre	
	<ul style="list-style-type: none"> <li>construction materials; and</li> <li>plan and stock construction materials carefully to minimise the amount of waste generated and avoid unnecessary generation of waste.</li> </ul>								
S6.79	<p><u>Waste Recycling</u></p> <ul style="list-style-type: none"> <li>To minimise the amount of waste disposal to landfill, the general refuse (not contaminated) shall be reused and recycled as much as practical. Waste sorting and segregation shall be carried out in accordance with the following categories for recycling: <ul style="list-style-type: none"> <li>Plastic (i.e. plastic bag, plastic bottle, plastic packaging, etc.)</li> <li>Rubber;</li> <li>Paper;</li> <li>Wood/ timber;</li> <li>Glass;</li> <li>Textile; and</li> <li>Metal (i.e. aluminium can, steel metal, ferrous metal, and non-ferrous metal).</li> </ul> </li> </ul>		CLS, slope behind CLS and TKW / During building demolition, slope improvement, soil excavation and soil treatment	Contractor	✓	✓	✓	-	
S6.37 S6.38, S6.81 S6.85	<p><u>Chemical Waste</u></p> <ul style="list-style-type: none"> <li>The Contractor shall register with EPD as chemical waste producer.</li> <li>To maximise the opportunity for recycling/ reuse, during the decommissioning stage, recoverable chemical wastes (in particular oil, paint and solvent) shall be separated from the rest and collected by licensed collector for recovery at licensed plant.</li> <li>The chemical waste, including asbestos wastes, shall be separated from non-chemical waste. Workers involved</li> </ul>		CLS, slope behind CLS and TKW / During building demolition, slope improvement, soil excavation and soil treatment	Contractor	✓	✓	✓	Waste Disposal Ordinance and Waste Disposal (Chemical Waste) (General) Regulation.	

EIA Ref#	Environmental Measures	Protection Measures	Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
						Des	Slo/ Dem	Exc	Tre	
	<p>in the handling of chemical waste shall be suitably trained and shall wear appropriate protective masks and clothing when handling such materials. Chemical wastes shall be handled according to the <i>Code of Practice</i> on the Packaging, Labelling and Storage of Chemical Wastes. Spent chemicals shall be stored and collected by an approved operator for disposal at a licensed facility in accordance with the <i>Chemical Waste (General) Regulation</i>.</p> <ul style="list-style-type: none"> <li>• Containers used for storage of chemical waste shall: <ul style="list-style-type: none"> <li>- Be suitable for the substance they are holding, resistant to corrosion, maintained in good condition, and securely closed.</li> <li>- Have a capacity of less than 450 litres unless the specifications have been approved by the EPD.</li> <li>- Display a label in English and Chinese in accordance with instructions prescribed in Schedule 2 of the Regulations.</li> </ul> </li> <li>• The storage area for chemical waste shall: <ul style="list-style-type: none"> <li>- Be clearly labelled and used solely for the storage of chemical waste.</li> <li>- Be enclosed on at least 3 sides.</li> <li>- Have an impermeable floor and bunding, of capacity to accommodate 100% of the volume of the largest container or 20% by volume of the chemical waste stored in that area, whichever is the greatest.</li> <li>- Have adequate ventilation.</li> <li>- Be covered to prevent rainfall entering (water collected within the bund must be tested and disposal as chemical waste if necessary).</li> <li>- Be arranged so that incompatible materials are adequately separated.</li> </ul> </li> <li>• Disposal of chemical waste shall:</li> </ul>									

EIA Ref#	Environmental Measures	Protection Measures	Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
						Des	Slo/Dem	Exc	Tre	
S6.86	<ul style="list-style-type: none"> <li>- Be via a licensed waste collector.</li> <li>- Be at a facility licensed to receive chemical waste, such as CWTC which offers a chemical waste collection service and can supply the necessary storage containers.</li> <li>- Be a recycler of the waste, with waste disposal licence from the EPD.</li> </ul> <p><u>C&amp;D Material</u></p> <ul style="list-style-type: none"> <li>• The Contractor shall separate the C&amp;D material including steel, timber and scrap metals from other wastes, as far as practical, and shall arrange for recycling and reuse on site to the extent possible. All C&amp;D materials arising from demolition work shall be sorted on-site and be separated into different groups for disposal at landfills, PFAs, or recycling as appropriate in accordance with <i>WBTC No. 5/98</i>. Due to limited space at landfills, disposal at reclamation sites or PFAs would be the preferred option. A trip-ticket system for disposal of C&amp;D material as detailed in <i>WBTC No. 5/99</i> shall be followed. Finally, a method statement for the sorting, processing and disposal of C&amp;D materials arising from demolition work shall be submitted by the Contractor to the Engineer for his approval.</li> </ul>			CLS, slope behind CLS and TKW / During building demolition, slope improvement, soil excavation and soil treatment	Contractor	✓	✓	✓	Waste Disposal Ordinance (Cap. 354); New Disposal Arrangements For Construction Waste (1992); WBTC No. 5/98, On Site Sorting Of Construction Waste On Demolition Sites.	
S6.87 S6.89	<p><u>Contaminated Residues</u></p> <ul style="list-style-type: none"> <li>• Building sampling shall be carried out prior to demolition to characterise the contaminants present on the building surfaces and identify suitable reagents for decontamination. After contaminants characterisation, a Decommissioning Plan shall be prepared by the</li> </ul>			At CLS site / During building demolition	Contractor	✓			Waste Disposal Ordinance (Cap. 354)	

EIA Ref#	Environmental Measures	Protection Measures	Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
						Des	Slo/Dem	Exc	Tre	
S6.90 S6.91	<p>specialist Contractor recommending the indoor remediation protocols as well as the demolition method for the Engineer's approval. Scabbling is the preferred method of cleaning.</p> <ul style="list-style-type: none"> <li>Adequate on-site supervision by competent personnel is required.</li> <li>After completion of building decontamination, the material can be discarded as normal C&amp;D waste. The chemical deposits or residues from scabbling will be disposed of to CWTC.</li> </ul> <p><u>General Refuse</u></p> <ul style="list-style-type: none"> <li>General refuse shall be stored in enclosed bins or compaction units separated from C&amp;D material and chemical wastes. No open stockpile of general refuse is allowed on site to minimise environmental impacts. A reputable waste collector shall be employed by the contractor to remove general refuse from the site, separately from C&amp;D material and chemical wastes, on a daily or every second day basis to minimise odour, pest and litter impacts.</li> <li>Aluminium cans, paper waste and plastic bottles are often recovered from the waste stream by individual collectors if they are segregated or easily accessible, so separate labelled bins for their deposit shall be provided if feasible. Site office waste can be reduced through recycling of paper if volumes are large enough to warrant collection. Participation in a local collection scheme shall be considered if one is available.</li> </ul>			CLS, slope behind CLS and TKW / During building demolition, slope improvement, soil excavation and soil treatment	Contractor	✓	✓	✓	Waste Disposal Ordinance (Cap. 354); New Disposal Arrangements For Construction Waste (1992); WBTC No. 5/98, On Site Sorting Of Construction Waste On Demolition Sites.	

EIA Ref#	Environmental Measures	Protection	Measures / Mitigation	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
						Des	Slo/Dem	Exc	Tre	
S6.92 S6.93	<p><u>Slope Works behind CLS</u></p> <ul style="list-style-type: none"> <li>The excavated soil and rock shall be disposed of to PFAs. In addition, a Waste Management Plan shall be prepared by the Contractor in order to keep waste arising to a minimum and to ensure that waste is handled, transported and disposed of in a suitable manner.</li> <li>The design of slope work shall be planned carefully to maximise the preservation of existing profiles with stabilisation as necessary to minimise cutting.</li> </ul>			At slope behind CLS/ during slope improvement	Contractor	✓				-
S6.94	<p><u>Land Formation</u></p> <ul style="list-style-type: none"> <li>The C&amp;D material generated from this Project shall be reused/ recycled as far as practicable in the land formation works within CLS site so as to minimise the amount of C&amp;D material to be disposed of at PFAs.</li> </ul>			CLS, slope behind CLS and TKW / During building demolition, slope improvement	Contractor	✓				-
S6.95 S6.96	<p><u>Soil Excavation at CLS</u></p> <ul style="list-style-type: none"> <li>The buried chemical wastes shall be handled in compliance with the provisions of <i>Chemical Waste Regulations</i>. The site contractors, workers and operatives shall also be required to follow appropriate procedures on handling chemical wastes according to the <i>Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes</i> and with the <i>Code of Practice on the Handling, Transportation and Disposal of Asbestos Waste</i> for asbestos wastes.</li> </ul>			At CLS site / During soil excavation	Contractor		✓			Waste Disposal (Chemical Waste) (General) Regulation (Cap 354); Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes, Code of Practice on the Handling, Transportation and Disposal of Asbestos Waste
S6.98	<p><u>Collection and Transportation of Wastes</u></p>			From CLS to TKW site / During soil	Contractor		✓		✓	-

EIA Ref#	Environmental Measures	Protection Measures	Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
						Des	Slo/Dem	Exc	Tre	
	<ul style="list-style-type: none"> <li>• Dump trucks will be extensively used for the transit of waste, other than material contaminated with dioxin which will be transported by roll-off trucks between the excavation area and TKW. The following precautionary measures shall be taken to avoid spillage, wind erosion and incident in transit.                             <ul style="list-style-type: none"> <li>- Transportation of contaminated soil shall be escorted to improve road safety;</li> <li>- The haul road shall be properly illuminated if there are any night works.</li> <li>- Strict speed limit (50km/hr.) shall be imposed on the whole length of the haul road;</li> <li>- Never overload the dump truck to prevent spillage of contaminated soil;</li> <li>- Dioxin-contaminated material shall be transported in roll-off trucks with sealable top;</li> <li>- Always cover the payload on each dump truck with strong and impermeable sheeting to withstand wind and rain while the truck is travelling;</li> <li>- Adequately but not excessively wet the payload to check the dust generation.</li> </ul> </li> </ul>			excavation and soil treatment						
S6.99 S6.101	<ul style="list-style-type: none"> <li>• As dioxin-contaminated soil is classified as chemical waste, the trucks shall be labelled, handled and transported in accordance with the <i>Waste Disposal Ordinance</i> and the <i>Waste Disposal (Chemical Waste) (General) Regulation</i>. When the trucks approach the TKW Site, they will approach from west well clear of the east side of the site thereby avoid disturbance to the area where the group of egrets was sighted.</li> <li>• Dioxin condensate (oily residue) generated from the thermal desorption plant shall be transported in heavy</li> </ul>			From CLS to TKW site / During soil excavation and soil treatment	Contractor		✓		✓	-

EIA Ref#	Environmental Measures	Protection Measures	Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
						Des	Slo/Dem	Exc	Tre	
S6.103 S6.106		<p>duty and sealable drums, which will then be collected by CWT's own fleets which are designed and licensed for the collection of hazardous and chemical wastes.</p> <ul style="list-style-type: none"> <li>A contingency plan shall be prepared by the Contractor to spell out the necessary procedures to be taken in case of accident and/or emergency when transporting the contaminated soil to off-site location(s). All responsible parties and/or persons and their contact numbers shall be listed in the plan.</li> </ul> <p><u>Material Handling and Transportation</u></p> <ul style="list-style-type: none"> <li>The general contaminated material in the trucks shall be covered with impermeable sheeting (i.e. HDPE) to prevent ingress of rainwater during transportation. Movements by sea of material contaminated with heavy metals, PAH and TPH could use self-propelled barges.</li> <li>For material contaminated with dioxin, roll-off trucks (with sealable top) are recommended to minimise the risk of material loss during material handling and transportation, particularly in the event of an incident. Direct loading of material into containers at the point of excavation is recommended to minimise double handling and any associated losses.</li> </ul>		From CLS to TKW site / During soil excavation and soil treatment	Contractor		✓	✓	-	
S6.107 S6.116		<p><u>Storage</u></p> <ul style="list-style-type: none"> <li>The stockpile shall be formed on a paved area. To reduce air quality impact, the storage area shall be roofed. The roof structure shall be in place prior to the deposition, storage or removal of material from the storage building.</li> <li>For the bulk storage of general contaminated material</li> </ul>		At TKW site/ During soil treatment	Contractor			✓	-	

EIA Ref#	Environmental Measures	Protection Measures	Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
						Des	Slo/Dem	Exc	Tre	
S6.117	for solidification only, a stockpile is proposed for storage up to an overall height of 5 metres over a net storage area of 1.0ha. Material stored to the design height shall be covered using a impermeable sheeting.			At TKW site / During soil treatment	Contractor				✓	Waste Disposal (Chemical Waste) (General) Regulation (Cap 354)
S6.118 S6.119	<u>Off-Site Decontamination Works</u>			At TKW site / During soil treatment	Contractor				✓	Waste Disposal (Chemical Waste) (General) Regulation (Cap 354)
S6.120				At TKW site /	Contractor				✓	-



EIA Ref#	Environmental Measures	Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
					Des	Slc/Dem	Exc	Tre	
S6.121	<ul style="list-style-type: none"> <li>A batch of the oily condensate will be sent to CWTC for a performance test and treatment shall begin only after performance tests have been passed.</li> <li>Treatment of condensate shall be in batches with a campaign every week or every two weeks.</li> </ul> <p><u>Precautionary Measures during Wet and Typhoon Seasons</u></p> <ul style="list-style-type: none"> <li>Surface runoff from the treatment site shall be directed into storm drains via adequately designed sand/ silt removal facilities such as sand traps, silt traps and sediment basins. Channels, earth bunds or sand bag barriers shall be provided on site to properly direct stormwater to such site removal facilities.</li> <li>Catch-pits and perimeter channels shall be constructed in advance of site preparation works.</li> <li>Open stockpiles on site shall be covered with tarpaulin during rainstorms. Measures shall be taken to prevent the washing away of soil into any drainage system.</li> <li>The storage area for excavated soil from CLS shall be roofed and covered. In addition, run-on/ run-off control elements shall be constructed. Finally, the floor shall be concrete paved.</li> <li>A dedicated wastewater treatment unit shall be constructed for the treatment of contaminated run-off, leachate collected and decontamination water</li> </ul>	<p>During treatment soil</p> <p>At TKW site / During treatment soil</p>	Contractor				✓	-	
S6.122 6.125	<p><u>Equipment Decontamination Requirement</u></p> <ul style="list-style-type: none"> <li>For excavation and transport equipment at the CLS or treatment site, if it stays within the contaminated zone, such as excavation and stockpiling areas, it shall be</li> </ul>	<p>From CLS to TKW site / During soil excavation and soil treatment</p>	Contractor				✓	Waste Disposal (Chemical Waste) (General) Regulation (Cap 354)	

EIA Ref#	Environmental Measures	Protection Measures / Mitigation	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
					Des	Slo/ Dem	Exc	Tre	
	<p>decontaminated (typically steam cleaning) prior to leaving the contaminated zone. The contaminated zone shall need to be clearly defined with fencing. The exit of the contaminated zone shall have a decontamination pad for cleaning of the equipment before it leaves the zone. The decontamination water shall be collected and disposed of at the on-site wastewater treatment unit. Care shall be exercised by the Contractor to prevent contamination of areas outside the contaminated zone.</p> <ul style="list-style-type: none"> <li>In treatment area, particularly for a large-scale ongoing operation, separate equipment shall be employed for transport of treated materials to prevent any potential for recontamination. A "contaminated" loader shall load only the contaminated soils into the decontamination system, and a "clean" loader shall be assigned to remove the treated soils from the stockpile at the outlets of the decontamination systems.</li> <li>Lining of trucks with plastic is recommended to prevent spills and leakage during transport. Besides, draping of plastic over the sides of trucks can minimise the amount of soil accumulates on the outside of the body. For transport within the contaminated zone, the cover fabrics/ plastic sheeting can be reused depending on the truck and cover configuration, otherwise they shall be dumped into landfill.</li> <li>No water discharge is allowed prior to on-site treatment.</li> </ul>								
6.131	<p><u>Licensing</u></p> <ul style="list-style-type: none"> <li>The Contractor shall be responsible for the application of the following registration/ licence/ approval/ permit/ notification from the relevant authorities:                      - Waste Producer Registration;</li> </ul>	At CLS and TKW sites/ During design, building demolition, slope improvement,	Contractor	✓	✓	✓	✓	Waste Disposal (Chemical Waste) (General) Regulation (Cap 354)	

EIA Ref#	Environmental Measures	Protection Measures	Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
						Des	Slo/ Dem	Exc	Tre	
	<ul style="list-style-type: none"> <li>- Waste Collection Licence;</li> <li>- Waste Disposal Licence;</li> <li>- Part A Notification;</li> <li>- Approval for Using Large Container; and</li> <li>- Noise Permit.</li> </ul>			soil excavation and soil treatment						Waste Disposal Ordinance (Cap. 354) Noise Control Ordinance

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

\* Des - Design, Slo/Dem – Slope Improvement and Building Demolition, Exc – Soil Excavation, and Tre – Soil Treatment

**Table A.5 Implementation Schedule for Ecological Impact**

EIA Ref#	Environmental Measures	Protection	Measures / Mitigation	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
						Des	Slo/ Dem	Exc	Tre	
S8.78- S8.94 S8.135- S8.139	Impacts to restricted / protected plant species		<ul style="list-style-type: none"> <li>Where possible, restricted/protected plant species are to be preserved <i>in situ</i>. Areas supporting the highest concentrations of restricted or protected species have been fenced off to prevent tipping, vehicle movement and encroachment of personnel into these areas.</li> <li>Plants directly affected by the proposed works will be transplanted to suitable receptor sites that have been identified at Tai Tam Country Park. To maximize the transplantation success, seeds will be collected prior to transplantation and kept in specialist storage facilities. In case the transplantation is unsuccessful, the stored seeds will be germinated and cultivated, and reintroduced to the receptor sites. A 3-year post-transplantation monitoring will be undertaken to ensure successful establishment of the plants concerned.</li> </ul>	Behind CLS and near MTHS / During building demolition, slope improvement and soil excavation	Contractor	✓	✓			Forests and Countryside Ordinance (cap. 96) Animals and Plants (Protection of Endangered Species) Ordinance (Cap. 187) Country Parks Ordinance (Cap. 208)
S8.95- S8.115.	Impacts to MTHS and Rice Fish population		<ul style="list-style-type: none"> <li>The lower course of MTHS will be affected by the proposed works at Cheoy Lee. Mitigation measures will focus on re-creating a suitable habitat of the Rice Fish further upstream of MTHS, where impacts arising from construction works to the re-created habitat is minimal. More detailed surveys of the Rice Fish will be carried out prior to the commencement of fill works.</li> <li>If Rice Fish are found in future surveys, they shall be temporarily relocated to holding aquaria. A recreated habitat suitable for the fish shall then be constructed at MTHS, and the fish returned to the habitat. Maintenance of the holding facilities and care for the captive fish will</li> </ul>	At MTHS / During building demolition, and soil excavation	Contractor	✓				-

EIA Ref#	Environmental Measures	Protection Measures	Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines					
						Des	Slo/ Dem	Exc	Tre						
S8.118	<p>be undertaken prior to relocation to the re-created habitat.</p> <ul style="list-style-type: none"> <li>If no Rice Fish are found in future surveys, it may be possible to source a captive population, and re-introduce the fish to a re-created habitat at MTHS. Post relocation monitoring of the Rice Fish in the re-created habitat will be undertaken.</li> <li>Incorporation of environmentally friendly design of the future drainage channel to encourage recolonisation of the lower stream fauna.</li> </ul> <p>The following measures will be implemented to reduce disturbance to the coastal area of TKW in view of the previous incidental sighting of a small population of ardeids:</p> <ul style="list-style-type: none"> <li>The construction of biopiles (where high levels of activity may disturb the birds) shall take place from October-February, outside of the Ardeid breeding season;</li> <li>Thermal Desorbers shall be placed at the west of the site, as far from potential nesting sites as possible</li> </ul>						At TKW site / During treatment	Contractor				✓			
S8.117	<p><u>Other Mitigation Measures</u></p> <ul style="list-style-type: none"> <li>All potentially harmful contaminants from CLS shall be handled, treated and disposed of in an appropriate manner; to minimise risks to human health and flora and fauna.</li> </ul>			At CLS site / During decommissioning	Contractor					✓					

EIA Ref#	Environmental Measures	Protection Measures	Mitigation Measures /	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
						Des	Slo/Dem	Exc	Tre	
S8.119- S8.121	<p><u>Fill / Slope works</u></p> <ul style="list-style-type: none"> <li>Shotcrete shall not be used for the slope works. The design of slope works shall make reference to the GEO Publication No. 1/2000 "Technical Guidelines on Landscape Treatment and Bioengineering for Man-made Slopes and Retaining Walls".</li> <li>Works on slopes supporting natural vegetation shall be minimised as far as slope safety standards allow.</li> <li>Hydroseeding and planting of trees and shrubs including native species will be undertaken on newly created slopes.</li> </ul>			At slope behind CLS / During slope improvement	Contractor	✓				Technical Guidelines on Treatment and Bioengineering for Man-made Slopes and Retaining Walls.
S8.122- S8.130	<p><u>General Mitigation Measures</u></p> <ul style="list-style-type: none"> <li>Before commencement of works, staff shall be informed by the Site Engineer of the conservation significance of restricted/protected plant species directly impacted by the development.</li> <li>Placement of equipment or stockpile in the work areas and access routes shall be selected on existing disturbed land to minimise disturbance to natural habitats.</li> <li>Construction activities shall be restricted to the work areas that shall be clearly demarcated.</li> <li>The work areas shall be reinstated immediately after completion of the works.</li> <li>Waste skips shall be provided to collect general refuse and construction wastes. The wastes shall be disposed of timely and properly off-site.</li> <li>Drainage arrangements shall include sediment traps to collect and control construction run-off.</li> <li>Open burning shall be strictly prohibited.</li> </ul>			All works sites / During all work phases	Contractor	✓	✓	✓	-	

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

\* Des - Design, Slo/Dem - Slope Improvement and Building Demolition, Exc - Soil Excavation, and Tre - Soil Treatment

**Table A.6 Implementation Schedule for Cultural Heritage Impact**

EIA Ref#	Environmental Protection Measures / Mitigation	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	Slo/Dem	Exc	Tre	
S9.23 S9.28	<ul style="list-style-type: none"> <li>Impermeable sheeting shall be used to cover the archaeological potential site for areas which are not subject to rescue excavation.</li> <li>Detailed design of filling work or ground level adjustment work shall consider diversion of site runoff to prevent any waterlogged conditions.</li> </ul>	At CLS site / during design and building demolition	CED, Contractor	✓	✓			-
S9.23- S9.28	<p>The impacted area shall be mitigated by rescue excavation prior to decontamination works. The rescue excavation team shall adopt the following procedures to ensure the safe and healthful work environment.</p> <ul style="list-style-type: none"> <li>Smoking, open flames and the carrying of matches and lighters is not allowed in the rescue areas;</li> <li>Personal protective clothing shall be worn by the team members at all time;</li> <li>Respirator and gloves for vapour exposure protection shall be worn during excavation;</li> <li>Impermeable liners shall be placed at the bottom of the stockpile to prevent leachate from contaminating the underlying soil/groundwater;</li> <li>Inactive excavated area shall be covered with low permeable sheet;</li> <li>Any material shall be backfilled on site after completion of the rescue work;</li> <li>Temporary stockpiles beside excavation areas shall be covered by tarpaulin or impermeable sheet to prevent dust emission and contaminated runoff.</li> </ul>	At CLS site / During building demolition	AMO	✓				-
S9.23	<ul style="list-style-type: none"> <li>On-site monitoring</li> </ul>	At CLS/ During building demolition and site excavation	AMO		✓		✓	

# All recommendations and requirements resulted during the course of EIA/EA Process, including ACE and / or accepted public comment to the proposed project.  
\* Des - Design, Slo/Dem - Slope Improvement and Building Demolition, Exc - Soil Excavation, and Tre - Soil Treatment

**Appendix B Sample Data Sheets for Air Quality Monitoring**

Monitoring Location		
Details of Location		
Sampler Identification		
Date & Time of Sampling		
Elapsed-time Meter Reading	Start (min.)	
	Stop (min.)	
Total Sampling Time (min.)		
Weather Conditions		
Initial Flow Rate, Qsi	Pi (mmHg)	
	Ti (°C)	
	Hi (in.)	
	Qsi (Std. m <sup>3</sup> )	
Final Flow Rate, Qsf	Pf (mmHg)	
	Tf (°C)	
	Hf (in.)	
	Qsf (Std. m <sup>3</sup> )	
Average Flow Rate (Std. m <sup>3</sup> )		
Total Volume (Std. m <sup>3</sup> )		
Filter / PUF Cartridge Identification No.		
<u>For TSP determination</u>		
Initial Wt. of Filter (g)		
Final Wt. of Filter (g)		
Measured TSP Level (µg/m <sup>3</sup> )		
<u>For Dioxin determination</u>		
Wt. of Dioxin on PUF Cartridge (pg I-TEQ)		
Measured Dioxin Level (pg I-TEQ/m <sup>3</sup> )		

	<u>Name &amp; Designation</u>	<u>Signature</u>	<u>Date</u>
Field Operator	:	_____	_____
Laboratory Staff	:	_____	_____
Checked by	:	_____	_____



**Appendix C Sample Template for the Interim Notification**

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

**Location Plan**

Prepared by : \_\_\_\_\_

Designation : \_\_\_\_\_

Signature : \_\_\_\_\_

Date : \_\_\_\_\_

