




## Updated Environmental Monitoring & Audit Manual

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## **1. INTRODUCTION**

### **1.1. Purpose of the Manual**

1.1.1. The purpose of this Environmental Monitoring and Audit (EM&A) Manual (hereafter referred to “Manual”) is to guide the setting up of an EM&A programme to ensure compliance with the recommendations of the Environmental Impact Assessment (EIA) Study and to assess the effectiveness of the recommended mitigation measures as well as to identify any further need for additional mitigation measures or remedial action. This Manual outlines the monitoring and audit programme for the construction and operation phase of the Integrated Waste Management Facilities (IWMF). It aims to provide systematic procedures for monitoring, auditing and minimizing environmental impacts associated with the construction works and operational activities of the IWMF.

1.1.2. 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).

1.1.3. This Manual contains the following information:

- responsibilities of the Contractor, the Supervising Officer’s Representative (SO), the Independent Consultants (IC), Environmental Team (ET), the Independent Environmental Checker (IEC), EIAO Authority of Environmental Protection Department (EPD) with respect to the environmental monitoring and audit requirements during the course of the Project;
- project organization 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 impacts;
- details of the methodologies to be adopted, including all field laboratories and analytical procedures and details on quality assurance and quality control programme;
- 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.

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

## **1.2. Project Description**

### 1.2.1. Introduction

The Project is to construct and operate a modern IW MF for managing municipal solid waste (MSW) under a design-build-operate (DBO) contract arrangement. The IW MF comprises: (a) an advanced thermal incineration plant with design capacity of 3,000 tonnes per day (tpd) and (b) a mechanical sorting and recycling plant with design capacity of 200 tpd. The non-recyclables sorted from the mechanical plant will be sent to the thermal incineration plant for further treatment. Under any conditions, the total MSW feeding to the thermal incineration plant and the mechanical plant will not exceed 3,000 tpd.

### 1.2.2. Project Location

The project site has been decided for the development of the IW MF in an artificial island near Shek Kwu Chau (SKC) and the location is shown in **Figure 1.1**.

## **1.3. Scope of Project**

### Project Facilities

1.3.1. The infrastructure for this Project would comprise an incineration plant, a mechanical sorting and recycling plant, and ancillary & supporting facilities. The details of these components as listed below:

#### Incineration Plant

- MSW receiving, storage and feeding system
- Moving grate incineration furnaces
- Waste heat recovery and power generation system
- Boiler feedwater treatment system
- Flue gas treatment system
- Flue gas discharge system with stack



- Ash storage and handling system
- Reagent reception and storage system
- Odour control system
- Process control and monitoring system

#### Mechanical Treatment (MT) Plant

- MSW receiving, storage and feeding system
- Mechanical treatment system including shredding and sorting facilities
- Products and by-products storage and handling system
- Odour control system
- Process control and monitoring system

#### Ancillary & Supporting Facilities

- Weighbridge
- Site security
- Administration building / environmental education centre
- Vehicle washing facilities
- Maintenance workshop
- Fuel storage tanks
- Water treatment plant
- Wastewater treatment plant
- Electricity supply and export system
- Utilities
- Berthing area for marine vessels and storage of refuse containers

1.3.2. Design-Build-Operate (DBO) contract arrangement would be adopted for the Project and the operation period would be 15 years. Under this contract arrangement, a DBO contractor would be engaged to conduct the detailed design, construction and operation of the IWMF.

1.3.3. The preliminary layouts showing the IWMF facilities at the artificial island near SKC are presented in **Figure 1.2**.

#### Construction of the IWMF

1.3.4. The scope of works in construction and operation phase of the Project for the Artificial Island near Shek Kwu Chau is described as below:

- 1.3.5. Reclamation will be needed to form about 11.8 hectares of land for the IWMF. Due to occasionally rough sea condition in the vicinity of the artificial island near SKC, breakwater will be provided to ensure safe loading and unloading operation at the berth area.
- 1.3.6. The reclamation will be formed with filling materials supported on the insitu marine deposits with suitable geotechnical ground treatment (such as surcharge loading, installation of vertical band drains, etc.) at a finished ground level of about +5mPD high. Seawalls will be constructed to confine the reclamation area and breakwaters will be provided to protect the water basin. To minimize dredging and filling activities and the associated environmental impacts, vertical cellular structure consisting of circular cells instead of sloping gravity structure is proposed to be adopted for the construction of the seawalls and breakwaters. The cellular breakwater protecting the reclamation area and the water basin would be about +9mPD high for resisting waves with significant heights.
- 1.3.7. The berth area, which will be extended from the seawall at the northwest side of the reclaimed area, will be formed by a piled deck structure with precast slab. Tubular piles are proposed to form the foundation of the berth. Non-percussive bore piling method would be adopted for the installation of tubular piles.
- 1.3.8. The construction of the IWMF will mainly include the following stages:-
- Construction of precast concrete cassion surrounding the reclamation area;
  - Site filling for reclamation;
  - Surcharge loading for reclamation area;
  - Construction of breakwater;
  - Pilling for berth area;
  - Site drainage;
  - Foundation (spread footing);
  - Civil and building works;
  - Mechanical & electrical plant installation;
  - Roads, utilities, services and landscaping; and
  - Ancillary instrumentation and control works.

#### Operation of the IWMF

- 1.3.9. The IWMF will be operated on a 24-hour basis daily, while the reception of MSW would be limited from 8 am to 8 pm.

1.3.10. About 3,000 tpd MSW would be delivered by marine vessels from the existing refuse transfer stations, including Island East Transfer Station, Island West Transfer Station and West Kowloon Transfer Station.

#### 1.4. Construction Programme

1.4.1. The project specific construction programmes for the artificial island near SKC are shown in **Table 1.1** and illustrated in **Appendix 1.1**.

Table 1.1 Construction Programme of IW MF at the Artificial Island near SKC

Description	Date
Award of Contract	22 Nov 2017
Phase I – Construction of Perimeter Seawalls	10 Jan 2018 – 21 Sep 2018
Seawall at DCM Area	29 Jun 2018 – 21 Sep 2019
Seawall at Dredging Area	22 Aug 2018 – 09 Sep 2019
Phase II – Reclamation, Breakwater and Berth Construction	22 Sep 2019 – 27 Jun 2021
Reclamation	22 Sep 2019 – 27 Jun 2021
Breakwater	22 Sep 2019 – 07 Mar 2021
Foundation Works	12 Apr 2021 – 13 May 2022
Superstructure Works	12 Aug 2021 – 12 Jan 2023
Architectural Builders Works and Finishes	07 Nov 2021 – 09 Sep 2023
Building Services Installation	20 Feb 2022 – 20 Oct 2023
Process Equipment Installation	27 Jan 2022 – 04 Nov 2023
Landscape, External Road and Drains Works	07 Nov 2021 – 26 Apr 2024
Testing and Commissioning	04 Jan 2023 – 27 Jul 2024

#### 1.5. Project Organization

##### 1.5.1. Introduction

The roles and responsibilities of the various parties involved in the construction and operation phases of the EM&A process and the implementation of the EM&A programme are outlined below. The proposed project organization and lines of communication during construction and operation phase with respect to environmental protection works are shown in **Figure 1.3** and **Figure 1.4** respectively.

## 1.5.2. Construction Phase

### Supervising Officer's Representative

1.5.2.1 The term “Supervising Office's Representative (SO)” refers to the organization responsible for overseeing the construction works of the Project undertaken by the Contractor, and for ensuring that they are undertaken by the Contractor in accordance with the specification and contractual requirements. The responsibilities of the SO include the followings:-

- Monitor the Contractor's compliance with contract specifications, including the implementation and operation of the environmental mitigation measures and ensure their effectiveness, and other aspects of the EM&A programme;
- Monitor the Contractor's, the ET's and the IEC's compliance and ensure that the requirements in the Environmental Permit (EP) and EM&A Manual are fully complied with;
- Provide assistance to the ET as necessary in the implementation of the EM&A programme;
- Participate in joint site inspection undertaken by the ET and the IEC;
- Comply with the agreed Event / Action Plan in the event of any exceedance; and
- Adhere to the procedures for carrying out complaint investigation.

### Contractor

1.5.2.2 The term “Contractor” should be taken to mean all construction contractors and sub-contractors, working on site at any one time. Besides reporting to the SO, the Contractor should also be responsible for the following tasks:

- Work within the scope of the relevant contract and other tender conditions;
- Provide assistance to the ET in carrying out monitoring;
- Participate in the site inspections undertaken by the ET as required, and undertake any corrective actions;
- Provide information / advice to the ET regarding works activities which may contribute, or be continuing to the generation of adverse environmental conditions;
- Submit proposals on mitigation measures in case of exceedances of action or limit levels in accordance with the event / action plans;
- Implement measures to reduce impact where action or limit levels are exceeded; and
- Adhere to the procedures for carrying out complaint investigation.

### Independent Environmental Checker (IEC)

1.5.2.3 The Independent Environmental Checker (IEC) should not be in any way an associated body

of the Contractor for the Project. The responsibilities of the IEC should include the followings:-

- Advise the SO on environmental issues related to the project, independent from the management of construction works, but empowered to audit the environmental performance of construction of the IWMF;
- Provide proactive advice to the SO and the Employer of the Project on environmental matters;
- Review and audit all aspects of the EM&A programme, including the implementation of environmental mitigation measures, submission relating to the EP and EM&A, and any other submission required under the EP and EM&A Manual;
- Review and verify the monitoring data and all submissions relating to or under the EP and EM&A Manual submitted by the ET, including but not limited to the EM&A reports;
- Monitor the implementation of the EM&A programme and the overall level of environmental performance being achieved;
- Arrange and conduct regular, at least monthly site inspections of the works during construction phase, and ad hoc inspections if significant environmental problems are identified;
- Comply with the agreed event / action plan in the event of any exceedance;
- Check and ensure the procedures for carrying out complaint investigation being followed and check the effectiveness of corrective measures;
- Feedback audit results to ET by signing off relevant EM&A proforma;
- Ensure the impact monitoring is conducted at the correct locations at the frequency identified in the EM&A Manual;
- Check that the mitigation measures are effectively implemented; and  
Report the works conducted, the findings, recommendation and improvement of the site inspections, the findings, recommendation, and improvement after reviewing the ET's and the Contractor's works, and any advices to the SO and the Employer of the Project on a monthly basis.

#### Environmental Team

1.5.2.4 The ET shall not be in any way an associated body of the Contractor, and shall be responsible to conduct the EM&A programme. The ET should be managed by the ET Leader. The ET Leader shall be a person who has at least 7 years' experience in EM&A and have relevant professional qualifications. Suitably qualified staff should be included in the ET, and resources for the implementation of the EM&A programme should be allocated in time under the Contract, to enable fulfilment of the Project's EM&A requirements as specified in the EM&A Manual during construction of the Project. The ET shall report to the SO and the duties of ET shall include the followings:-

- Monitor and audit various environmental parameters as required in this 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 mitigation measures implemented and the validity of the EIA predictions and to identify any adverse environmental impacts arising;
- Carry out regular site inspection to investigate and audit the Contractor's site practice, equipment and work methodologies with respect to pollution control and environmental mitigation, and effect proactive action to pre-empt problems;
- Monitor compliance with conditions in the EP, environmental protection, pollution prevention and control regulations and contract specifications;
- Audit environmental monitoring data and site environmental conditions;
- Report on the environmental monitoring and audit results to EPD, the SO, the IEC and Contractor or their delegated representative;
- Recommend suitable mitigation measures to the Contractor in the case of exceedance of action or limit levels in accordance with the event and action plans;
- Liaise with the IEC on all environmental performance matters and timely submit all relevant EM&A proforma for approval by the IEC;
- Advise the Contractor on environmental improvement, awareness, enhancement matters, etc. on site;
- Adhere to the procedures for carrying out complaint investigation; and
- Timely submit the EM&A Reports to EPD.

1.5.2.5 Sufficient and suitably qualified professional and technical staff should be employed to ensure full compliance with their duties and responsibilities, as required under the EM&A programme during the construction phase of the Project.

### 1.5.3. Operation Phase

1.5.3.1 Under the DBO contract, the Contractor will be responsible for the operation of the IWMF. The Contractor will ensure compliance of the conditions of the Environmental Permit and continue to appoint the ET and IEC to carry out the monitoring works and audit works respectively during the operation phase in accordance to this EM&A Manual. The responsibilities of the IEC shall be the same as the construction phase.

1.5.3.2 The responsibilities of the ET during the operation phase shall include the follows:-

- Monitor various environmental parameters as required in this EM&A Manual;
- Report on the environmental monitoring results to the Contractor, the SO and the IEC;
- Analyze monitoring results collected from the monitoring works;

- Prepare monitoring reports to provide the impact evaluation results to the Contractor, the SO and the IEC; and
- Recommend suitable actions to the Contractor and SO in case of exceedance of any assessment criteria.

## **1.6. Structure of this Manual**

1.6.1. Following this introductory section, the structure of the EM&A Manual is set out below:-

- Section 2 details the requirement for impact monitoring for dust during the construction phase and for air emission from IWWMF and odour during the operation phase at IWWMF.
- Section 3 details the requirement for impact monitoring for construction noise at IWWMF.
- Section 4 details the requirements for baseline and impact monitoring for water quality during the construction phase at IWWMF respectively.
- Section 5 details the audit requirements with regard to waste management issues as well as the waste control and mitigation measures recommended in the EIA at IWWMF.
- Section 6 details the requirements for monitoring and audit of the ecological impacts during the construction and operation phases at IWWMF.
- Section 7 details the requirements for monitoring and audit of the fisheries impacts during the construction and operation phases at IWWMF.
- Section 8 details the monitoring requirements with regard to human health risk as recommended in the EIA at IWWMF.
- Section 9 details the requirements with regard to landscape and visual issues at IWWMF.
- Section 10 details the requirements for monitoring and audit of the cultural heritage impact during the construction and operation phases at IWWMF.
- Section 11 details the requirements on site environmental audit and the environmental complaints handling procedure.
- Section 12 details the EM&A reporting requirements

## **2. AIR QUALITY IMPACT**

### **2.1. Introduction**

2.1.1. This section presents the requirements, methodology, equipment, criteria and protocols for the monitoring and audit of air quality impacts during the construction and operation phases of the Project.

2.1.2. The objectives of the air quality monitoring include the following:-

- to identify the extent of construction dust and operational odour impacts;
- to determine the effectiveness of mitigation measures to control dust emission from activities during construction phase and odour control measures during operation phase;
- 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 levels for air quality as defined in this Manual.

2.1.3. During the construction phase of the Project, the dust impact would be the major air quality impact. While during operation phase of the Project, stack emissions would be the key environmental issue. Apart from the stack emission, odour emission arising from the operation of the IWMF and its on-site wastewater treatment plant, the waste reception halls, the waste storage area, and the mechanical treatment plant would be another key environmental issue.

### **2.2. Monitoring during Construction Phase**

2.2.1. With the implementation of practicable dust suppression measures stipulated in the Air Pollution Control (Construction Dust) Regulation, adverse construction dust impact at Air Sensitive Receivers (ASRs) is not expected during construction of the Project. In view of the large separation distance of the nearby ASRs from the Project Site, no dust monitoring is considered necessary. Yet, regular site environmental audits during the construction phase of the Project as described in **Section 11** of this Manual should be conducted to ensure that the recommended dust suppression measures are implemented properly.

2.2.2. Mitigation measures for dust control have been recommended in the EIA Report and are listed below:-



- Use of regular watering, with complete coverage, to reduce dust emissions from exposed site surfaces and unpaved roads, particularly during dry weather;
- Use of frequent watering for particularly dusty construction areas and areas close to ASRs;
- Side enclosure and covering of any aggregate or dusty material storage piles to reduce emissions. Where this is not practicable owing to frequent usage, watering shall be applied to aggregate fines;
- Open stockpiles shall be avoided or covered. Where possible, prevent placing dusty material storage piles near ASRs;
- Tarpaulin covering of all dusty vehicle loads transported to, from and between site locations;
- Establishment and use of vehicle wheel and body washing facilities at the exit points of the site;
- Provision of wind shield and dust extraction units or similar dust mitigation measures at the loading points, and use of water sprinklers at the loading area where dust generation is likely during the loading process of loose material, particularly in dry seasons / periods;
- Imposition of speed controls for vehicles on unpaved site roads. Ten kilometres per hour is the recommended limit;
- Where possible, routing of vehicles and positioning of construction plant should be at the maximum possible distance from ASRs; and
- Instigation of an environmental auditing program to monitor the construction process in order to enforce controls and modify method of work if dusty conditions arise.

2.2.3. The Contractor shall be responsible for the design and implementation of these measures.

### **2.3. Monitoring during Operation Phase**

#### 2.3.1. Stack Monitoring

2.3.1.1 Monitoring of air quality parameters of concern due to stack emissions has to be conducted during operation phase of the Project in accordance with the requirements similar to those stipulated in the “A Guidance Note on the Best Practicable Means for Incinerators (Municipal Waste Incineration) BPM 12/1”.

2.3.1.2 The parameters for measurement and the analytical methods are listed in **Table 2.1**. It should be noted that the proposed sampling methods below are for reference only and should be subject to the approval of EPD.

Table 2.1 Analytical Parameters and Methodology

<b>Parameters</b>	<b>Method</b>
<b>Dioxin and Furans</b>	USEPA Method 23
<b>HCl and HF</b>	USEPA Method 26 A USEPA Method 13B sampling train
<b>Heavy Metals</b> Cd, Tl, Hg, Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V – particulate and gaseous form	USEPA Method 29
<b>Gaseous and vaporous organic substances</b>	USEPA Method 18 USEPA Method 0031
<b>Combustion Gases</b>	
Carbon Dioxide	Fyrite analyser, Combustion analyser
Carbon Monoxide	Combustion Gas Analyser
NO <sub>x</sub> /NO	USEPA Reference methods USEPA Method 7 and associated methods,
Oxygen	Combustion Gas Analyser (chemical cell and paramagnetic)
Sulphur dioxide and Sulphuric Acid Mist	USEPA Method 8
<b>Particulate</b>	ISO 9096, ASTM D3685-98, USEPA Method 17
<b>Velocity and Volumetric Flow</b>	ISO 10780 and ISO 9096

2.3.1.3 Necessary monitoring equipment and techniques should be provided and used to demonstrate that the process is properly operated and the emissions can be minimized to meet the air pollution control requirements. The scope, manner and frequency of the monitoring should be sufficient for this purpose and will be determined by EPD. Monitoring results should be recorded in such manner specified by EPD. The record should be retained at the premises for a minimum of two years, or other period specified by EPD, after the date of last entry and be made available for examination as and when required by EPD.

2.3.1.4 On-line monitoring and periodic measurement shall be carried out and the results shall be properly recorded. Evidence should be provided to demonstrate quality assurance procedures are in place to ensure all monitoring results are sufficiently accurate and reliable. Calibration on the monitoring equipment has to be done by means of parallel measurements with the reference methods as agreed by EPD. The requirements of the on-line monitoring and periodic

measurement are provided in the following sections.

### 2.3.2. On-line Monitoring

2.3.2.1 Continuous monitoring of the in-stack exhaust gas and the process shall be carried out. The continuous monitoring data should be transmitted instantaneously to EPD by telemetry system in such manner and format agreed with EPD. The parameters to be continuously monitored are listed below:-

#### In-stack Exhaust Gas Continuous Monitoring

- nitrogen oxides
- hydrogen chloride
- hydrogen fluoride
- sulphur dioxide
- opacity
- gaseous and vaporous organic substances
- carbon monoxide
- oxygen
- pressure
- temperature
- water vapour content (The continuous measurement of the water vapour content should not be required if the sampled exhaust gas is dried before the emissions are analysed.)

### 2.3.3. Process Continuous Monitoring

2.3.2.1 Temperature and oxygen content of the gas at the appropriate location(s) in the combustion chamber to demonstrate the compliance of the requirements set out in paragraphs 4.3.1 to 4.3.4 of EPD's Guidance Note on the Best Practicable Means for Incinerators (Municipal Waste Incineration) BPM 12/1

2.3.2.2 Temperature of the gas at the appropriate location(s) in the chimney to demonstrate that the exit temperature of the exhaust gas from the chimney of the incineration process is not less than 80°C at full load condition

2.3.2.3 Other essential operating parameter(s) which may affect the performance of air pollution control measures

#### 2.3.4. Periodic Measurement

2.3.4.1 To confirm that the levels of dioxin and heavy metals are being adequately controlled, periodic measurements shall be made.

2.3.4.2 The sampling frequency will be determined by EPD. All measurement results should be recorded, processed and presented in a summary report as agreed by EPD. The report should be submitted to EPD without delay after the source sampling(s) as required is/are completed.

#### 2.3.5. Odour Monitoring

2.3.5.1 To determine the effectiveness of the proposed odour mitigation measures and to ensure the odour impacts arising from the operation of the IW MF and the waste reception halls, the waste storage area and mechanical treatment plant meeting the air pollution control requirements, odour monitoring shall be conducted. Odour monitoring involves odour patrols conducted by an odour patrol team. The odour patrol team will patrol and sniff along an odour patrol route along the IW MF site boundary. The implementation of the odour monitoring shall be subject to the prevailing weather forecast condition and no odour monitoring should be carried out during rainy day.

2.3.5.2 The odour patrol team shall be comprised of at least two independent trained personnel / competent persons, who should pass a set of screening tests and fulfil the following requirements:-

- have their individual odour threshold of n-butanol in nitrogen gas in the range of 20 to 80 ppb/v required by the European Standard Method (EN 13725);
- be at least 16 years of age and willing and able to follow instructions;
- be free from any respiratory illnesses;
- not allowed to smoke, eat, drink (except water) or use chewing gum or sweets 30 min before and during odour patrol;
- take great care not to cause any interference with their own perception or that of others by lack of personal hygiene or the use of perfumes, deodorants, body lotions or cosmetics; and
- not communicate with each other about the results of their choices.

2.3.5.3 The independent trained personnel / competent persons should use their noses (olfactory sensors) to sniff odours at different locations. The main odour emission sources and the areas to be affected by the odour nuisance shall be identified. During the patrol, the sequence should generally start from less odorous locations to stronger odorous locations.

2.3.5.4 The perceived odour intensity is divided into 5 levels. **Table 2.2** describes the odour intensity for different levels.

Table 2.2 Odour Intensity Level

Level	Odour Intensity
0	Not detected. No odour perceived or an odour so weak that it cannot be easily characterised or described
1	Slight identifiable odour, and slight chance to have odour nuisance
2	Moderate identifiable odour, and moderate chance to have odour nuisance
3	Strong identifiable, likely to have odour nuisance
4	Extreme severe odour, and unacceptable odour level

2.3.5.5 The independent trained personnel / competent person shall record the findings including date and time, weather condition (e.g. sunny, fine, cloudy, and rainy), odour intensity, odour nature and possible odour sources, local wind speed, and wind direction at each location. In addition, some relevant meteorological data such as daily average temperature, and daily average humidity on the day of odour patrol shall be obtained from the nearest Hong Kong Observatory station for reference.

2.3.5.6 Odour patrols will be conducted in summer (i.e. from July to September). In the first 2 operational years of the IWMF, monthly odour patrols shall be conducted. Odour patrols shall be carried out during daytime and evening / night time when the IWMF and its waste reception halls, the waste storage area and the mechanical treatment plant are operated under normal operating condition.

2.3.5.7 The need to continue the odour patrol after the end of the 2-year monitoring period would depend on the monitoring results and should be agreed with EPD. If the level of odour intensity at any sniffing location is higher than 1 due to potential odour emission from the IWMF and its waste reception halls, the waste storage area and the mechanical treatment plant in two consecutive months, the odour patrol programme would be extended until the level of odour intensity (that is determined to be due to potential odour emission from the IWMF or the associated facilities) at all the sniffing locations have dropped to 0 in three consecutive months.

2.3.5.8 **Table 2.3** shows the action level and limit level to be used for odour patrol. Should any exceedance of the action and limit levels occurs, actions in accordance with the event and action plan in **Table 2.4** should be carried out.

Table 2.3 Action and Limit Levels for Odour Nuisance

Parameter	Action Level	Limit Level
Odour Nuisance (from odour patrol)	When one documented complaint is received <sup>(1)</sup> , or Odour Intensity of 2 is measured from odour patrol.	Two or more documented complaints are received <sup>(1)</sup> within a week; or Odour intensity of 3 or above is measured from odour patrol.

Note: Once the complaint is received by the Project Proponent (EPD), the Project Proponent shall investigate and verify the complaint whether it is related to the potential odour emission from the IWMF and associated facilities.

Table 2.4 Event and Action Plan for Odour Monitoring

EVENT	ACTION	
	Person-in-charge of Odour Monitoring	Project Proponent
<b>ACTION LEVEL</b>		
Exceedance of action level (Odour Patrol)	<ol style="list-style-type: none"> <li>1. Identify source/reason of exceedance;</li> <li>2. Repeat odour patrol to confirm finding.</li> </ol>	<ol style="list-style-type: none"> <li>1. Carry out investigation to identify the source/reason of exceedance. Investigation should be completed within 2 week;</li> <li>2. Rectify any unacceptable practice;</li> <li>3. Implement more mitigation measures if necessary;</li> <li>4. Inform EPD.</li> </ol>
Exceedance of action level (Odour Complaints)	<ol style="list-style-type: none"> <li>1. Identify source/reason of exceedance;</li> <li>2. Carry out odour patrol to determinate odour intensity.</li> </ol>	<ol style="list-style-type: none"> <li>1. Carry out investigation and verify the complaint whether it is related to potential odour emission from the IWMF;</li> <li>2. Carry out investigation to identify the source/reason of exceedance. Investigation should be completed within 2 week;</li> <li>3. Rectify any unacceptable practice;</li> <li>4. Implement more mitigation measures if necessary;</li> <li>5. Inform EPD.</li> </ol>

EVENT	ACTION	
	Person-in-charge of Odour Monitoring	Project Proponent
<b>LIMIT LEVEL</b>		
Exceedance of Limit level	<ol style="list-style-type: none"> <li>1. Identify source/reason of exceedance;</li> <li>2. Inform EPD;</li> <li>3. Repeat odour patrol to confirm findings;</li> <li>4. Increase odour patrol frequency to bi-weekly;</li> <li>5. Assess effectiveness of remedial action and keep EPD informed of the results;</li> <li>6. If exceedance stops, cease additional odour patrol.</li> </ol>	<ol style="list-style-type: none"> <li>1. Carry out investigation to identify the source/reason of exceedance. Investigation should be completed within 2 week;</li> <li>2. Rectify any unacceptable practice;</li> <li>3. Formulate remedial actions;</li> <li>4. Ensure remedial actions properly implemented;</li> <li>5. If exceedance continues, consider what more/enhanced mitigation measures should be implemented;</li> <li>6. Inform EPD.</li> </ol>

2.3.5.9 In the event when an odour complaint is received, Project Proponent should liaise with the complainant and register the complaint. The complaint register is to record detailed information regarding the odour complaint so as to facilitate the investigation work. The registration should contain, but not be limited to the following information:-

- Location of where the odour nuisance occurred;
- Date and time of the complaint and the nuisance event;
- Description of the complaint, i.e. the type and characteristics of the odour; and an indication of the odour strength (highly offensive/offensive/slightly offensive/just continuously detectable /intermittently detectable);
- Meteorological conditions from the nearest HK Observatory station at the time of complaint; and
- Name and contact information of the complainant.

### **3. NOISE IMPACT**

#### **3.1. Introduction**

3.1.1. In this section, the requirements, methodology, equipment, monitoring locations, criteria and protocols for the monitoring and audit of noise impacts during the construction phase of the Project are presented. The proposed mitigation measures during construction and operation phases of the Project are also described in this section.

3.1.2. Construction noise impacts from this Project are predicted at the identified Noise Sensitive Receivers (NSRs). Noise mitigation measures would be required to reduce noise levels to the stipulated standard. A noise monitoring programme shall be undertaken to ensure such mitigation measures would be implemented properly.

#### **3.2. Noise Parameters**

##### **3.2.1. Construction Phase**

3.2.1.1 The construction noise level shall be measured in terms of the A-weighted equivalent continuous sound pressure level (Leq). Leq (30 minutes) shall be used as the monitoring parameter for the time period between 0700 and 1900 hours on normal weekdays. For all other time periods, Leq (5 minutes) shall be employed for comparison with the Noise Control Ordinance (NCO) criteria.

3.2.1.2 Supplementary information for data auditing, statistical results such as L10 and L90 shall also be obtained for reference. A sample data record sheet based on the one presented in the EM&A Guidelines for Development Projects in Hong Kong is shown in **Appendix 3.1**. The ET Leader may modify the data record sheet for this EM&A programme, of which the format should be agreed by the SOR and the IEC.

##### Monitoring Equipment

3.2.1.3 As referred in the Technical Memorandum (TM) issued under the NCO, sound level meters in compliance with the International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1) specifications shall be used for carrying out the noise monitoring. Immediately prior to and following each noise measurement, the accuracy of the sound level meter shall be checked using an acoustic calibrator generating a known sound pressure level at a known frequency. Measurements may be accepted as valid only if the calibration levels



from before and after the noise measurement agree to within 1.0 dB

3.2.1.4 Noise measurements shall not be made in fog, rain, wind with a steady speed exceeding 5m/s or wind with gusts exceeding 10 m/s. The wind speed shall be checked with a portable wind speed meter capable of measuring the wind speed in m/s.

3.2.1.5 The ET is responsible for the provision of the monitoring equipment. He shall ensure that sufficient noise measuring equipment and associated instrumentation are available for carrying out the baseline monitoring, regular impact monitoring and ad hoc monitoring. All the equipment and associated instrumentation shall be clearly labelled.

#### Monitoring Locations

3.2.1.6 The locations of construction noise monitoring stations are summarized in **Table 3.1** and shown in **Figure 3.1**. These locations represent the worst affected sensitive receivers during construction phase of the Project.

Table 3.1 The Locations of Construction Noise Monitoring Station

<b>Station</b>	<b>NSR ID in EIA Report</b>	<b>Noise Monitoring Location</b>
M1	N_S1	Shek Kwu Chau Treatment & Rehabilitation Centre Hostel 1
M2	N_S2	Shek Kwu Chau Treatment & Rehabilitation Centre Hostel 2
M3	N_S3	Shek Kwu Chau Treatment & Rehabilitation Centre Hostel 3

3.2.1.7 The status and locations of noise sensitive receivers may change after issuing this Manual. If such case exists, the ET Leader shall propose updated monitoring locations and seek approval from EPD and agreement from the SOR and the IEC before baseline monitoring commences.

3.2.1.8 When alternative monitoring locations are proposed, the monitoring locations shall be chosen based on the following criteria:

- Monitoring at sensitive receivers close to the major site activities which are likely to have noise impacts;
- Monitoring at the noise sensitive receivers as defined in the Technical Memorandum; and
- Assurance of minimal disturbance to the occupants during monitoring.

3.2.1.9 The monitoring station shall normally be at a point 1 m from the exterior of the sensitive receiver building facade and be at a position 1.2 m above the ground. If there is problem with access to the normal monitoring position, an alternative position may be chosen, and a correction to the measurements shall be made. For reference, a correction of +3 dB(A) shall be made to the free field measurements. The ET shall agree with the IEC on the monitoring position and the corrections adopted. Once the positions for the monitoring stations are chosen, the baseline monitoring and the impact monitoring shall be carried out at the same positions.

### **3.3. Baseline Monitoring**

#### **3.3.1. Construction Phase**

3.3.1.1 The ET shall carry out baseline noise monitoring prior to the commencement of the construction works. The baseline monitoring shall be carried out daily for a period of at least two weeks. Before commencing the baseline monitoring, the ET shall develop and submit to the IEC the baseline monitoring programme such that the IEC can conduct on-site audit to ensure accuracy of the baseline monitoring results.

3.3.1.2 There shall not be any construction activities in the vicinity of the stations during the baseline monitoring.

3.3.1.3 In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET Leader shall liaise with the SOR, EPD and IEC to agree on an appropriate set of data to be used as a baseline reference and submit to the SO and IEC for agreement and EPD for approval.

### **3.4. Impact Monitoring**

#### **3.4.1. Construction Phase**

3.4.1.1 Noise monitoring shall be carried out at all the designated monitoring stations. The monitoring frequency shall depend on the scale of the construction activities. The following is an initial guide on the regular monitoring frequency for each station on a weekly basis when noise generating activities are underway:

- One set of measurements between 0700 and 1900 hours on normal weekdays.

3.4.1.2 If construction works are extended to include works during the hours of 1900 – 0700 as well as

public holidays and Sundays, additional weekly impact monitoring shall be carried out during respective restricted hours periods. Applicable permits under NCO shall be obtained by the Contractor.

3.4.1.3 If a school exists near the construction activity, noise monitoring shall be carried out at the monitoring stations for the schools during the school examination periods. The ET Leader shall liaise with the school’s personnel and the Examination Authority to ascertain the exact dates and times of all examination periods during the course of the contract.

3.4.1.4 In case of non-compliance with the construction noise criteria, more frequent monitoring as specified in the Action Plan shall be carried out. This additional monitoring shall be continued until the recorded noise levels are rectified or demonstrated to be unrelated to the construction activities.

### 3.5. Event and Action Plan

#### 3.5.1. Construction Phase

3.5.1.1 The Action and Limit levels for construction noise are defined in **Table 3.2**. Should non-compliance of the criteria occur, action in accordance with the Event and Action Plan in **Table 3.3** shall be implemented.

Table 3.2 Action and Limit Levels for Construction Noise

<b>Time Period</b>	<b>Action Level</b>	<b>Limit Level</b>
0700 – 1900 hours on normal weekdays	When one documented complaint is received	75 dB(A)

Notes: If works are to be carried out during restricted hours, the conditions stipulated in the Construction Noise Permit (CNP) issued by the Noise Control Authority have to be followed.

### 3.6. Mitigation Measure

#### 3.6.1. Construction Phase

3.6.1.1 To alleviate the construction noise impact on the affected NSRs, movable noise barriers and acoustic mats are proposed to be provided for particular items of plant and construction works. It is anticipated that a movable noise barrier with a cantilevered upper portion located within 5m from any static or mobile plant can provide 5 dB(A) noise reduction for mobile plant and 10 dB(A) noise reduction for static plant. The barrier material shall have a surface mass of

not less than 14 kg/m<sup>2</sup> on skid footing with 25 mm thick internal sound absorptive lining to achieve the maximum screening effect.

3.6.1.2 In addition, the good site practices listed below shall be adopted by all the Contractors to further ameliorate the noise impacts.

- Only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction program.
- Silencers or mufflers on construction equipment should be utilised and should be properly maintained during the construction program.
- Mobile plant, if any, should be sited as far away from NSRs as possible.
- Machines and plant (such as trucks) that may be in intermittent use should be shut down between works periods or should be throttled down to a minimum.
- Plant known to emit noise strongly in one direction should, wherever possible, be orientated so that the noise is directed away from the nearby NSRs.
- Material stockpiles and other structures should be effectively utilised, wherever practicable, in screening noise from on-site construction activities.

3.6.1.3 If the above measures are not sufficient to restore the construction noise quality to acceptable levels upon the advice of ET Leader, the contractor shall liaise with the ET Leader to identify further mitigation measures. They shall be proposed to SOR for approval, and the contractor shall then implement these additional mitigation measures.

### 3.6.2. Operation Phase

3.6.2.1 The Contractor should carry out a noise commissioning test for all fixed noise sources before operation of the Project, in order to ensure compliance of the operational airborne noise levels with the TM's stipulated noise standard.

Table 3.3 Event and Action Plan for Construction Noise

Event	Actions to be taken by Environmental Team as immediate as practicable	Actions to be taken by Independent Environmental Checker as immediate as practicable	Actions to be taken by Supervising Officer's Representative as immediate as practicable	Actions to be taken by Contractor as immediate as practicable
Action Level being exceeded	<ol style="list-style-type: none"> <li>1. Notify IEC and Contractor;</li> <li>2. Carry out investigation;</li> <li>3. Report the results of investigation to the IEC, SO and Contractor;</li> <li>4. Discuss with the IEC and Contractor on remedial measures required;</li> <li>5. Increase monitoring frequency to check mitigation effectiveness. (The above actions should be taken within 2 working days after the exceedance is identified)</li> </ol>	<ol style="list-style-type: none"> <li>1. Review the investigation results submitted by the ET;</li> <li>2. Review the proposed remedial measures by the Contractor and advise the SO accordingly; Advise the SO on the effectiveness of the proposed remedial measures. (The above actions should be taken within 2 working days after the exceedance is identified).</li> <li>3. proposed remedial measures. (The above actions should be taken within 2 working days after the exceedance is identified).</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure 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. Supervise the implementation of remedial measures. (The above actions should be taken within 2 working days after the exceedance is identified).</li> </ol>	<ol style="list-style-type: none"> <li>1. Submit noise mitigation proposals to IEC and SO; Implement noise mitigation proposals. (The above actions should be taken within 2 working days after the exceedance is identified)</li> <li>2. mitigation proposals. (The above actions should be taken within 2 working days after the exceedance is identified)</li> </ol>
Limit Level being exceeded	<ol style="list-style-type: none"> <li>1. Inform IEC, SO, Contractor and EPD;</li> <li>2. Repeat measurements to confirm findings; Increase monitoring frequency;</li> <li>3. Identify source and investigate the cause of exceedance;</li> <li>4. Carry out analysis of Contractor's working procedures;</li> <li>5. Discuss with the IEC, Contractor and SO on remedial measures required;</li> <li>6. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and SO informed of the results;</li> <li>7. If exceedance stops, cease additional monitoring. (The above actions should be taken within 2 working days after the exceedance is identified)</li> <li>8. monitoring. (The above actions should be taken within 2 working days after the exceedance is identified)</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss amongst SO, ET, and Contractor on the potential remedial actions;</li> <li>2. Review Contractors remedial actions whenever necessary to assure their effectiveness and advise the SO accordingly; (The above actions should be taken within 2 working days after the exceedance is identified)</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure 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. Supervise the implementation of remedial measures;</li> <li>5. If exceedance continues, consider stopping the Contractor to continue working on that portion of work which causes the exceedance until the exceedance is abated. (The above actions should be taken within 2 working days after the exceedance is identified)</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 and SO within 3 working days of notification;</li> <li>3. Implement the agreed proposals; Submit further proposal if problem still not under control;</li> <li>4. Stop the relevant portion of works as instructed by the SO until the exceedance is abated. (The above actions should be taken within 2 working days after the exceedance is identified)</li> <li>5. Stop the relevant portion of works as instructed by the SO until the exceedance is abated. (The above actions should be taken within 2 working days after the exceedance is identified)</li> </ol>

## **4. WATER QUALITY IMPACT**

### **4.1. Introduction**

- 4.1.1. This section describes the requirements for the monitoring and audit of water quality impacts from the Project.
- 4.1.2 The water quality assessment undertaken in the EIA Study has identified that suspended solids would be the most critical water quality parameter during the construction stage. Marine water quality monitoring for suspended solids / turbidity and dissolved oxygen is therefore recommended to be carried out at the nearby water sensitive receivers (WSRs). The monitoring should include baseline and impact monitoring. The impact monitoring should be carried out during the proposed reclamation and breakwater construction. Monitoring programme to be implemented for protection of the coral communities are provided in **Section 6**.
- 4.1.3 Regular site inspections were recommended to be undertaken to inspect the construction activities and works areas and also the status on the implementation of the recommended mitigation measures. Discharges of drainage water from the construction works areas would be required to comply with the terms and conditions of a discharge licence, issued by EPD, under the Water Pollution Control Ordinance (WPCO). It may be a stipulation of the WPCO licence to require the Contractor to monitor the quality / quantity of the discharge to show compliance with the conditions of the licence. Such monitoring would not form part of the EM&A programme.
- 4.1.4 As measure to control the dispersion of filling material from the reclamation area, a silt curtain system would be applied at the marine access opening during the reclamation work. A pilot test should be carried out at the early stage of reclamation to verify the silt-removal efficiency of the silt curtain at marine access opening.
- 4.1.5 During the operation phase of the Project, all generated wastewater will be discharged into an on-site wastewater treatment plant. The treated effluent from the wastewater treatment plant will be reused for washdown and landscape irrigation in the IWMF site. A ‘net zero discharge’ scheme will be adopted during the operation of the IWMF. Saline water would be discharged from the proposed desalination plant. Monitoring of the change in salinity would be required during the commissioning period of the IWMF.

## 4.2. Water Quality Parameters

4.2.1 Dissolved oxygen (DO), salinity, turbidity and suspended solids (SS) levels shall be monitored at designated marine water quality monitoring stations before, during and after the marine construction works. The levels of DO, pH, salinity, temperature and turbidity should be measured in situ whereas SS should be determined by laboratory.

## 4.3. Monitoring Locations

4.3.1 The proposed water quality monitoring stations for construction phase impact assessment are shown in **Table 4.1** and **Figure 4.1**. The status and locations of water sensitive receivers and the marine activities may change after issuing this Manual. If such case exists, the ET Leader shall propose updated monitoring locations and seek approval from the IEC and EPD.

4.3.2 Marine water quality monitoring stations have been proposed at different water quality sensitive receivers to monitor the water quality impact due to the proposed marine works under this Project. Monitoring stations B1 to B4 would be located at 4 beaches respectively at the southern shore of Lantau Island. Monitoring station H1 is located at the horseshoe crab habitat at northern SKC, while CR1 and CR2 are located at the coral communities at southwestern shore of SKC. Monitoring station F1 is located at the Cheung Sha Wan Fish Culture Zone while monitoring station M1 is located at Tung Wan at Cheung Chau. Water quality monitoring at the northern landing site, midway and southern landing site of the proposed submarine cable is proposed at monitoring stations S1, S2 and S3 for monitoring the SS impact due to the laying of submarine cable. Control stations C1 and C2 have been proposed at far field location for comparison. Under the further FEP-01/429/2012/A, the construction works of submarine cable has been surrendered on 17 January 2020. Therefore, no monitoring will be carried out at monitoring stations S1-S3. As existing monitoring locations C1 and C2 are situated at fairway and F1 is located inside Cheung Sha Wan fish culture zone, marine safety concern and concerns from other stakeholders have been raised. In order to clear up stakeholders' worries, it is thus proposed to relocate C1, C2 and F1 water monitoring location to new locations named as C1A, C2A and F1A as shown in **Table 4.1** and **Figure 4.2**. Those new proposed locations C1A are equivalent to the original monitoring stations C1, C2 and F1 respectively, furthermore, those updated locations are verified by IEC and approved by EPD accordingly.

Table 4.1 Proposed Marine Water Quality Stations for Baseline and Impact Monitoring during Construction Phase

Station	Description	Easting	Northing
B1	Beach - Cheung Sha Lower	813342	810316
B2	Beach - Pui O	815340	811025
B3	Beach - Yi Long Wan	817210	808395
B4	Beach - Tai Long Wan	817784	808682
H1	Horseshoe Crab - Shek Kwu Chau	816477	806953
C1A <sup>#</sup>	Control Station	812823	806300
C2A <sup>#</sup>	Control Station	818869	806808
F1A <sup>#</sup>	Cheung Sha Wan Fish Culture Zone	819109	810924
S1*	Submarine Cable Landing Site	814245	810335
S2A* <sup>#</sup>	Submarine Cable	814808	808515
S3*	Submarine Cable Landing Site	816420	805621
CR1	Coral	817144	805597
CR2	Coral	816512	805882
M1	Tung Wan	821572	807799

Note:\* Under the further FEP-01/429/2012/A, the construction works of submarine cable has been surrendered on 17 January 2020. Therefore, no monitoring will be carried out at monitoring stations S1-S3.

<sup>#</sup> The monitoring stations were relocated from the original locations to address stakeholder concerns.

4.3.3 The proposed water quality monitoring stations for operational phase impact assessment are shown in **Table 4.2** and **Figure 4.2**. The monitoring stations proposed in this section are indicative only and may be subjected to further review before commencement of the water quality monitoring works. The locations of brine water outfall may change after issuing this Manual. If such case exists, the ET Leader shall propose updated monitoring locations and seek approval from the IEC and EPD.

4.3.4 Marine water quality monitoring stations have been proposed near the saline water outfall to monitor the water quality impact due to the proposed saline water discharge. Monitoring stations Z1 to Z3 would be located near the eastern, southern and western edge of the zone of



initial mixing based on the results of modelling work conducted under this EIA. Control stations C3 and C4 have been proposed at far field location for comparison.

Table 4.2 Proposed Marine Water Quality Stations for Baseline and Impact Monitoring during Operational Phase

Station	Description	Easting	Northing
Z1	Near the Edge of ZID** (east of the brine water outfall)	816883	805424
Z2	Near the Edge of ZID (south of the brine water outfall)	816772	805317
Z3	Near the Edge of ZID (west of the brine water outfall)	816685	805429
C3	Control Station	817065	805416
C4	Control Station	816484	805416

Note: \*\*ZID refers to “Zone of Initial Mixing”

4.3.5 Sampling for baseline and impact monitoring shall be taken at three water depths, namely, 1m below water surface, mid-depth and 1m above seabed, except at where the water depth is less than 6m, in which case the mid-depth station may be omitted. Shall the water depth be less than 3m, only the mid-depth station will be monitored.

#### 4.4. Baseline Monitoring

##### 4.4.1 Construction Phase

4.4.1.1 Baseline conditions for marine water quality should be established and agreed with EPD prior to the commencement of marine works. The purpose of the baseline monitoring is to establish ambient conditions prior to the commencement of the marine works and to demonstrate the suitability of the proposed monitoring stations.

4.4.1.2 The baseline conditions should be established by measuring suspended solids (SS), salinity, turbidity and dissolved oxygen (DO) levels at the selected monitoring stations as shown in **Table 4.3**. The baseline monitoring schedule should be submitted to EPD at least 4 weeks before commencement of monitoring for agreement. EPD should also be notified immediately for any changes in schedule.

4.4.1.3 The measurements should be taken at all designated monitoring stations, 3 days per week, at

mid-flood and mid-ebb tides, for at least 4 weeks prior to the commencement of marine works. There should not be any marine construction activities in the vicinity of the stations during the baseline monitoring. The interval between 2 sets of monitoring should not be less than 36 hours. Duplicate in-situ measurements and water sampling should be carried out in each sampling event.

4.4.1.4 To study the potential variations in the water quality within a year due to natural fluctuations, baseline monitoring shall be conducted for both dry season (October – March) and wet season (April – September).

4.4.1.5 The baseline monitoring report should be submitted to EPD at least 4 weeks before the commencement of the marine works for agreement. The baseline monitoring report should be certified by the ET Leader and verified by IEC before submission to EPD.

#### 4.4.2 Operational Phase

4.4.2.1 Baseline conditions for marine water quality should be established and agreed with EPD prior to the commission of the brine water discharge. The purpose of the baseline monitoring is to establish ambient conditions prior to the commission of the brine water discharge.

4.4.2.2 The baseline conditions should be established by measuring salinity at the selected monitoring stations as shown in **Table 4.4**. The baseline monitoring schedule should be submitted to EPD at least 4 weeks before commencement of monitoring for agreement. EPD should also be notified immediately for any changes in schedule.

4.4.2.3 The measurements should be taken at all designated monitoring stations, 3 days per week, at mid-flood and mid-ebb tides, for at least 4 weeks prior to the commission of the brine water discharge. There should not be any marine construction activities in the vicinity of the stations during the baseline monitoring. The interval between 2 sets of monitoring should not be less than 36 hours. Duplicate *in-situ* measurements should be carried out in each sampling event.

4.4.2.4 The baseline monitoring report should be submitted to EPD at least 4 weeks before the commission of the brine water discharge for agreement. The baseline monitoring report should be certified by the IEC before submission to EPD.

## 4.5 Impact Monitoring

### 4.5.1 Construction Phase

4.5.1.1 During the period of marine construction, monitoring should be undertaken three days per week, at mid-flood and mid-ebb tides, with sampling / measurement at the designated monitoring stations as shown in **Table 4.1**. Upon completion of the marine works, the monitoring exercise at the designated monitoring locations should be continued for four weeks in the same manner as the baseline monitoring.

4.5.1.2 The interval between two sets of monitoring should not be less than 36 hours except where there are exceedances of Action and/or Limit Levels, in which case the monitoring frequency will be increased. **Table 4.3** shows the proposed monitoring frequency and water quality parameters. Duplicate in-situ measurements and water sampling should be carried out in each sampling event. The monitoring probes should be retrieved out of water after the first measurement and then redeployed for the second measurement. Where the difference in value between the first and second readings of DO or turbidity is more than 25% of the value of the first reading, the reading should be discarded and further readings should be taken.

4.5.1.3 The proposed water quality monitoring schedule should be submitted to EPD at least 1 week before the first day of the monitoring month. EPD should also be notified immediately for any changes in schedule. If the monitoring data collected at the designated stations indicate that the Action or Limit Levels as shown in **Table 4.6** are exceeded, appropriate actions should be taken in accordance with the Event and Action Plan in **Table 4.7**.

Table 4.3 Proposed Marine Water Quality Monitoring Frequency and Parameters for Construction Phase Impact Monitoring

Activities	Monitoring Frequency	Key Parameters <sup>Note 1</sup>	Monitoring Stations
During the 4-week baseline monitoring period	Three days per week, at mid-flood and mid-ebb tides	Suspended Solids (SS), Turbidity and Dissolved Oxygen (DO)	B1, B2, B3, B4, H1, C1A, C2A, F1A, S1, S2A, S3, CR1, CR2, M1
During marine works for proposed reclamation / breakwater construction	Three days per week, at mid-flood and mid-ebb tides	Suspended Solids (SS), Turbidity and Dissolved Oxygen (DO)	B1, B2, B3, B4, H1, C1A, C2A, F1A, CR1, CR2, M1
During a 4-week period after completion of marine works	Three days per week, at mid-flood and mid-ebb tides	Suspended Solids (SS), Turbidity and Dissolved Oxygen (DO)	B1, B2, B3, B4, H1, C1A, C2A, F1A, CR1, CR2, M1

Note: 1. DO and turbidity should be measured in-situ whereas SS should be determined by laboratory analysis.

#### 4.5.2 Operational Phase

4.5.2.1 When the discharge of brine water from the desalination plant start, monitoring should be undertaken three days per week, at mid-flood and mid-ebb tides, with measurement at the designated monitoring stations as shown in **Table 4.2**. The monitoring exercise at the designated monitoring locations should be continued for at least four weeks.

4.5.2.2 The interval between two sets of monitoring should not be less than 36 hours except where there are exceedances of Action and/or Limit Levels, in which case the monitoring frequency will be increased. **Table 4.4** shows the proposed monitoring frequency and water quality parameters. Duplicate *in-situ* measurements should be carried out in each sampling event. The monitoring probes should be retrieved out of water after the first measurement and then redeployed for the second measurement. Where the difference in value between the first and second readings of salinity is more than 25% of the value of the first reading, the reading should be discarded and further readings should be taken.

Table 4.4 Proposed Marine Water Quality Monitoring Frequency and Parameters for Operational Phase Impact Monitoring

<b>Activities</b>	<b>Monitoring Frequency</b>	<b>Key Parameters</b> <sup>Note 1</sup>	<b>Monitoring Stations</b>
During the 4-week baseline monitoring period	Three days per week, at mid-flood and mid-ebb tides	Salinity	Z1, Z2, Z3, C3, C4
During the first 4 weeks of the commission of brine water discharge	Three days per week, at mid-flood and mid-ebb tides	Salinity	Z1, Z2, Z3, C3, C4

Note: 1. Salinity should be measured in situ.

4.5.2.3 The proposed water quality monitoring schedule should be submitted to EPD at least 1 week before the first day of monitoring. EPD should also be notified immediately for any changes in schedule. If the monitoring data collected at the designated stations indicate that the Action or Limit Levels as shown in **Table 4.6** are exceeded, appropriate actions should be taken in accordance with the Event and Action Plan in **Table 4.8**.

#### **4.6 Efficiency of Silt Curtain at Marine Access Opening**

- 4.6.1 The ET shall be responsible for conducting tests to confirm that the silt curtain systems to be adopted at marine access opening for reclamation filling work would achieve the silt removal efficiency stated in the EIA Report.
- 4.6.2 A method statement shall be submitted by the ET Leader to seek approval from the IEC and EPD.
- 4.6.3 During the initial period of filling works for reclamation at the SKC site, the silt-removal efficiency of the silt-curtains shall be verified by examining the results of water quality monitoring points. The water quality monitoring points to be selected for the pilot test shall be those close to the marine access opening for the reclamation filling works. The details for the pilot study shall be agreed by EPD.
- 4.6.4 Pilot tests should be carried out during the early stage of reclamation to confirm whether the silt removal efficiency of the silt curtain systems at marine access opening can achieve at least 80% silt removal efficiency for reclamation filling. The pilot test shall include basic measurements such as turbidity and suspended solids as well as current speed and direction.

4.6.5 Regardless of the measured efficiency of the silt curtain system, the event and action plan shall only be based on the monitoring results at the designed monitoring stations.

#### **4.7 Site Audits**

4.7.1 Implementation of regular site audits is to ensure that the recommended mitigation measures are to be properly undertaken during proposed construction works. It can also provide an effective control of any malpractices and therefore achieve continual improvement of environmental performance on site.

4.7.2 Site audits shall be carried out by the ET and shall be based on the mitigation measures for water pollution control recommended in the implementation schedule as presented in **Appendix 11.1**. In the event that the recommended mitigation measures are not fully or properly implemented, deficiency shall be recorded and reported to the site management. Suitable actions are to be carried out to:

- investigate the problems and the causes;
- issue action notes to the Contractor who is responsible for the works;
- implement remedial and corrective actions immediately;
- re-inspect the site conditions upon completion of the remedial and corrective actions; and
- record the event and discuss with the Contractor for preventive actions.

4.7.3 Daily site audit including full-time on-site monitoring by the ET is required during the dredging for anti-scouring protection layer for checking the compliance with the permitted maximum daily dredging rate and its respective distance from the nearest non-translocatable coral community by the dredging contractor as specified in S.2.18 of the Further Environmental Permit (no.:FEP-01/429/2012/A).

#### **4.8 Field Log**

4.8.1 Other relevant data should also be recorded, including monitoring location / position, time, water depth, sampling depth, pH, salinity, DO saturation, water temperature, tidal stages, weather conditions and any special phenomena or work underway nearby.

4.8.2 A sample data record sheet is shown in **Appendix 4.1** for reference.

## **4.9 Monitoring Equipment**

### Dissolved Oxygen and Temperature Measuring Equipment

4.9.1 The instrument should be a portable and weatherproof DO measuring instrument complete with cable and sensor, and use a DC power source. The equipment should be capable of measuring:

- A DO level in the range of 0 - 20 mg/L and 0 - 200% saturation; and
- Temperature of 0 - 45 degree Celsius.

### Turbidity Measurement Instrument

4.9.2 The instrument should be a portable and weatherproof turbidity-measuring instrument using a DC power source. It should have a photoelectric sensor capable of measuring turbidity between 0 - 1000 NTU (for example, Hach model 2100P or an approved similar instrument).

### pH Measurement Instrument

4.9.3 The instrument should consist of a potentiometer, a glass electrode, a reference electrode and a temperature-compensating device. It should be readable to pH in a range of 0 to 14. Standard buffer solutions of at least pH 7 and pH 10 should be used for calibration of the instrument before and after use.

### Sampler

4.9.4 A water sampler is required. It should comprise a transparent PVC cylinder, with a capacity of not less than 2 litres, which can be effectively sealed with latex cups at both ends. The sampler should have a positive latching system to keep it open and prevent premature closure until released by a messenger when the sampler is at the selected water depth (for example, Kahlsico Water Sampler or an approved similar instrument).

### Water Depth Detector

4.9.5 A portable, battery-operated echo sounder should be used for the determination of water depth at each designated monitoring station. This unit can either be hand held or affixed to the bottom of the work boat, if the same vessel is to be used throughout the monitoring programme.

### Salinity

- 4.9.6 A portable salinometer capable of measuring salinity in the range of 0-40 parts per thousand (ppt) shall be provided for measuring salinity of the water at each monitoring location.

### Sample Containers and Storage

- 4.9.7 Water samples for SS should be stored in high density polythene bottles with no preservative added, packed in ice (cooled to 4°C without being frozen) and delivered to the laboratory and analysed as soon as possible after collection. Sufficient volume of samples should be collected to achieve the detection limit stated in **Section 4.10**.

### Monitoring Position Equipment

- 4.9.8 A hand-held or boat-fixed type digital Differential Global Positioning System (DGPS) with way point bearing indication and Radio Technical Commission for maritime (RTCM) Type 16 error message ‘screen pop-up’ facilities (for real-time auto-display of error messages and DGPS corrections from the Hong Kong Hydrographic Office), or other equipment instruments of similar accuracy, should be provided and used to ensure that the water sampling locations are correct during the water quality monitoring work.

### Calibration of In-Situ Instruments

- 4.9.9 The DO meter and turbidimeter should be checked and calibrated before use. DO meter and turbidimeter should be certified by a laboratory accredited under HOKLAS or any other international accreditation scheme, and subsequently re-calibrated at three monthly intervals throughout all stages of the water quality monitoring. Responses of sensors and electrodes should be checked with certified standard solutions before each use. Wet bulb calibration for a DO meter should be carried out before and after all measurements on each monitoring day which is considered adequate for the type of DO meter employed.
- 4.9.10 Sufficient stocks of spare parts should be maintained for replacements when necessary. Backup monitoring equipment should also be made available so that monitoring can proceed uninterrupted even when some equipment is under maintenance, calibration, etc.

## **4.10 Laboratory Measurement / Analysis**

- 4.10.1 Analysis of suspended solids (SS) should be carried out in a HOKLAS or other international



accredited laboratory. Sufficient water samples should be collected at the monitoring stations for carrying out the laboratory determinations. The determination work should start within 24 hours after collection of the water samples. The analyses should follow the American Public Health Association (APHA) Standard Methods for the Examination of Water and Wastewater or an equivalent method subject to the approval of EPD. The suggested testing method and lowest detection limit are provided in **Table 4.5**.

Table 4.5 Analytical Methods to be Applied to Marine Water Quality Samples

Determinant	Standard Method	Detection Limit
Suspended Solids (mg/L)	APHA 2540D*	1 mg/L

Note: \* APHA American Public Health Association Standard Methods for the Examination of Water and Wastewater

- 4.10.2 The testing of SS should be HOKLAS accredited (or if not, approved by EPD) and comprehensive quality assurance and control procedures in place in order to ensure quality and consistency in results.
- 4.10.3 Detailed testing methods, pre-treatment procedures, instruments use, Quality Assurance / Quality Control (QA/QC) details (such as blank, number of duplicate samples per batch, etc.), detection limit and accuracy shall be submitted to EPD for approval prior to the commencement of monitoring programme. EPD may also request the laboratory to carry out analysis of known standards provided by EPD for quality assurance. The QA/QC shall be in accordance with the requirements of HOKLAS or international accredited scheme. The QA/QC results shall be reported. The testing methods and related proposal should be checked and certified by IEC before submission to EPD for approval.
- 4.10.4 Additional duplicate samples may be required by EPD for inter laboratory calibration. Remaining samples after analysis should be kept by the laboratory for 3 months in case repeat analysis is required. If in-house or non-standard methods are proposed, details of the method verification may also be required by EPD. In any circumstance, the sample testing should have comprehensive quality assurance and quality control programmes. The laboratory should prepare to demonstrate the programmes to EPD or EPD’s representatives when requested.

**4.11 Event and Action Plan**

- 4.11.1 The water quality assessment criteria, namely Action and Limit levels are shown in **Table 4.7**. If the monitoring results of the water quality parameters at any designated monitoring stations indicate that the water quality assessment criteria are exceeded during the construction phase,

the actions in accordance with the Event and Action Plan in **Table 4.7** should be carried out.

4.11.2 The ET Leader should assess the potential impacts on the water sensitive receivers based on the monitoring data. The performance of the environmental management system (i.e. of the overall EM&A programme) should be reviewed by the ET Leader on a quarterly basis. The findings of this review should be included in the quarterly EM&A summary reports, together with any recommendations to improve the performance of the EM&A programme.

4.11.3 The ET Leader should keep track on the elevation in salinity at the monitoring stations during the commission stage of the desalination plant to ensure the saline water discharge would not result in adverse water quality impact at the nearby water sensitive receivers.

Table 4.6 Action and Limit Levels for Marine Water Quality

Parameters	Action	Limit
<b>Construction Phase Impact Monitoring</b>		
DO in mg/L	≥ 5 %-ile of baseline data	≥ 4 mg/L
SS in mg/L	≥ 95 %-ile of baseline data or 120% of control station's SS at the same tide of the same day of measurement whichever it is higher.	≥ 99 %-ile of baseline or 130% of control station's SS at the same tide of the same day of measurement whichever it is higher.
Turbidity in NTU	≥ 95 %-ile of baseline data or 120% of control station's turbidity at the same tide of the same day of measurement whichever it is higher.	≥ 99 %-ile of baseline or 130% of control station's turbidity at the same tide of the same day of measurement whichever it is higher.
<b>Operational Phase Impact Monitoring</b>		
Salinity in ppm	≥ 95 %-ile of baseline data or 105% of control station's salinity at the same tide of the same day of measurement whichever it is higher.	≥ 99 %-ile of baseline data or 109% of control station's salinity at the same tide of the same day of measurement whichever it is higher.

Note:

1. For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
2. For SS and turbidity, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.

4.11.4 If monitoring results indicate that the construction works have caused an adverse impact on water quality at the water sensitive receivers, an additional mitigation measures should be

recommended to rectify the non-compliance or the construction programme / design should be carefully reviewed.

4.11.5 If monitoring results indicate that the concentrated saline discharge during the operation phase has caused a significant elevation in salinity beyond the edge of zone of initial mixing, actions should be taken as stated in **Table 4.8**.

4.11.6 Where necessary, EPD routine marine water quality monitoring data at the relevant station(s), dry and wet seasons inclusive, could also be referenced to establish the baseline water quality.

#### **4.12 Mitigation Measures**

4.12.1 Mitigation measures for water quality control have been recommended in the EIA Report. The Contractor should be responsible for the design and implementation of these measures.

4.12.2 Recommended mitigation measures to minimize the adverse impacts on water quality are listed in the implementation schedule given in **Appendix 11.1**.

Table 4.7 Event and Action Plan for Construction Phase Marine Water Quality

Event	Action			
	ET	IEC	SO	Contractor
Action level being exceeded by one sampling day	Repeat in-situ measurement to confirm findings; Identify source(s) of impact; Inform IEC and Contractor; Check monitoring data, all plant, equipment and Contractor's working methods; Discuss mitigation measures with IEC and Contractor; Repeat measurement on next day of exceedance. (The above actions should be taken within 1 working day after the exceedance is identified)	Discuss with ET and Contractor on the mitigation measures; Review proposals on mitigation measures submitted by Contractor and advise the SO accordingly; Assess the effectiveness of the implemented mitigation measures. (The above actions should be taken within 1 working day after the exceedance is identified)	Discuss with IEC on the proposed mitigation measures; Make agreement on the mitigation measures to be implemented. (The above actions should be taken within 1 working day after the exceedance is identified)	Inform the SO and confirm notification of the non-compliance in writing; Rectify unacceptable practice; Check all plant and equipment; Consider changes of working methods; Discuss with ET and IEC and propose mitigation measures to IEC and SO within 3 working days; Implement the agreed mitigation measures. (The above actions should be taken within 1 working day after the exceedance is identified)

Event	Action			
	ET	IEC	SO	Contractor
Action level being exceeded by more than one consecutive sampling days	Identify source(s) of impact; Inform IEC and Contractor; Check monitoring data, all plant, equipment and Contractor’s working methods; Discuss mitigation measures with IEC and Contractor; Ensure mitigation measures are implemented; Prepare to increase the monitoring frequency to daily; Repeat measurement on next working day of exceedance. (The above actions should be taken within 1 working day after Action Level being exceeded by two consecutive sampling days)	Discuss with ET and Contractor on the mitigation measures; Review proposals on mitigation measures submitted by Contractor and advise the SO accordingly; Assess the effectiveness of the implemented mitigation measures. (The above actions should be taken within 1 working day after Action Level being exceeded by two consecutive sampling days)	Discuss with IEC on the proposed mitigation measures; Make agreement on the mitigation measures to be implemented. Assess the effectiveness of the implemented mitigation measures. (The above actions should be taken within 1 working day after Action Level being exceeded by two consecutive sampling days)	Inform the SO and confirm notification of the non-compliance in writing; Rectify unacceptable practice; Check all plant and equipment; Consider changes of working methods; Discuss with ET and IEC and propose mitigation measures to IEC and SO within 3 working days; Implement the agreed mitigation measures. (The above actions should be taken within 1 working day after Action Level being exceeded by two consecutive sampling days)

Event	Action			
	ET	IEC	SO	Contractor
Limit level being exceeded by one sampling day	<p>Inform the SO and confirm notification of the non-compliance in writing;</p> <p>Rectify unacceptable practice;</p> <p>Check all plant and equipment;</p> <p>Consider changes of working methods;</p> <p>Discuss with Contractor, IEC and SO and propose mitigation measures to IEC and SO within 3 working days;</p> <p>Implement the agreed mitigation measures.</p> <p>(The above actions should be taken within 1 working day after the exceedance is identified)</p>	<p>Discuss with ET and Contractor on the mitigation measures;</p> <p>Review proposals on mitigation measures submitted by Contractor and advise the SO accordingly;</p> <p>Assess the effectiveness of the implemented mitigation measures.</p> <p>(The above actions should be taken within 1 working day after the exceedance is identified)</p>	<p>Discuss with IEC, ET and Contractor on the proposed mitigation measures;</p> <p>Request Contractor to critically review the working methods;</p> <p>Make agreement on the mitigation measures to be implemented.</p> <p>Assess the effectiveness of the implemented measures.</p> <p>(The above actions should be taken within 1 working day after the exceedance is identified)</p>	<p>Inform the SO and confirm notification of the non-compliance in writing;</p> <p>Rectify unacceptable practice;</p> <p>Check all plant and equipment;</p> <p>Consider changes of working methods;</p> <p>Discuss with ET, IEC and SO and propose mitigation measures to IEC and SO within 3 working days;</p> <p>Implement the agreed mitigation measures.</p> <p>(The above actions should be taken within 1 working day after the exceedance is identified)</p>

Event	Action			
	ET	IEC	SO	Contractor
Limit level being exceeded by more than one consecutive sampling days	Identify source(s) of impact; Inform IEC, Contractor and EPD; Check monitoring data, all plant, equipment and Contractor’s working methods. Discuss mitigation measures with IEC, SO and Contractor. Ensure mitigation measures are implemented; Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days. (The above actions should be taken within 1 working day after Limit Level being exceeded by two consecutive sampling days)	Discuss with ET and Contractor on the mitigation measures; Review proposals on mitigation measures submitted by Contractor and advise the SO accordingly; Assess the effectiveness of the implemented mitigation measures. (The above actions should be taken within 1 working day after Limit Level being exceeded by two consecutive sampling days)	Discuss with IEC, ET and Contractor on the proposed mitigation measures; Request Contractor to critically review the working methods; Make agreement on the mitigation measures to be implemented. Assess the effectiveness of the implemented measures. Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the marine work until no exceedance of Limit level. (The above actions should be taken within 1 working day after Limit Level being exceeded by two consecutive sampling days)	Inform the SO and confirm notification of the non-compliance in writing; Rectify unacceptable practice; Check all plant and equipment; Consider changes of working methods; Discuss with ET, IEC and SO and propose mitigation measures to IEC and SO within 3 working days; Implement the agreed mitigation measures; As directed by the SO, to slow down or to stop all or part of the marine work or construction activities. (The above actions should be taken within 1 working day after Limit Level being exceeded by two consecutive sampling days)

Table 4.8 Event and Action Plan for Operational Phase Marine Water Quality

Event	Action			
	ET	IEC	SO	Contractor
Action level being exceeded by one sampling day	Repeat in-situ measurement to confirm findings; Check the salinity of the effluent from the desalination plant; Inform IEC and Contractor; Check monitoring data, all plant and equipment; Discuss mitigation measures with IEC and Contractor; (The above actions should be taken within 1 working day after the exceedance is identified) Repeat measurement on next day of exceedance.	Discuss with ET and Contractor on the mitigation measures; Review proposals on mitigation measures submitted by Contractor and advise the SO accordingly; Assess the effectiveness of the implemented mitigation measures. (The above actions should be taken within 1 working day after the exceedance is identified)	Discuss with IEC on the proposed mitigation measures; Make agreement on the mitigation measures to be implemented. (The above actions should be taken within 1 working day after the exceedance is identified)	Inform the SO and confirm notification of the non-compliance in writing; Rectify unacceptable practice; Check all plant and equipment; Discuss with ET and IEC and propose mitigation measures to IEC and SO within 3 working days; Implement the agreed mitigation measures. (The above actions should be taken within 1 working day after the exceedance is identified)



Event	Action			
	ET	IEC	SO	Contractor
Action level being exceeded by more than one consecutive sampling days	Identify source(s) of impact; Inform IEC and Contractor; Check monitoring data, all plant, equipment and Contractor’s working methods; Discuss mitigation measures with IEC and Contractor; Ensure mitigation measures are implemented; Prepare to increase the monitoring frequency to daily. (The above actions should be taken within 1 working day after Action Level being exceeded by two consecutive sampling days) Repeat measurement on next working day of exceedance.	Discuss with ET and Contractor on the mitigation measures; Review proposals on mitigation measures submitted by Contractor and advise the SO accordingly; Assess the effectiveness of the implemented mitigation measures. (The above actions should be taken within 1 working day after Action Level being exceeded by two consecutive sampling days)	Discuss with IEC on the proposed mitigation measures; Make agreement on the mitigation measures to be implemented. Assess the effectiveness of the implemented mitigation measures. (The above actions should be taken within 1 working day after Action Level being exceeded by two consecutive sampling days)	Inform the SO and confirm notification of the non-compliance in writing; Rectify unacceptable practice; Check all plant and equipment; Consider changes of working methods; Discuss with ET and IEC and propose mitigation measures to IEC and SO within 3 working days; Implement the agreed mitigation measures. (The above actions should be taken within 1 working day after Action Level being exceeded by two consecutive sampling days)

Event	Action			
	ET	IEC	SO	Contractor
Limit level being exceeded by one sampling day	<p>Inform the SO and confirm notification of the non-compliance in writing;</p> <p>Check the salinity of the effluent from the desalination plant;</p> <p>Rectify unacceptable practice;</p> <p>Check all plant and equipment;</p> <p>Discuss with Contractor, IEC and SO and propose mitigation measures to IEC and SO within 3 working days;</p> <p>Implement the agreed mitigation measures.</p> <p>(The above actions should be taken within 1 working day after the exceedance is identified)</p>	<p>Discuss with ET and Contractor on the mitigation measures;</p> <p>Review proposals on mitigation measures submitted by Contractor and advise the SO accordingly;</p> <p>Assess the effectiveness of the implemented mitigation measures.</p> <p>(The above actions should be taken within 1 working day after the exceedance is identified)</p>	<p>Discuss with IEC, ET and Contractor on the proposed mitigation measures;</p> <p>Make agreement on the mitigation measures to be implemented;</p> <p>Assess the effectiveness of the implemented mitigation measures.</p> <p>(The above actions should be taken within 1 working day after the exceedance is identified)</p>	<p>Inform the SO and confirm notification of the non-compliance in writing;</p> <p>Rectify unacceptable practice;</p> <p>Check all plant and equipment;</p> <p>Discuss with ET , IEC and SO and propose mitigation measures to IEC and SO within 3 working days;</p> <p>Implement the agreed mitigation measures.</p> <p>(The above actions should be taken within 1 working day after the exceedance is identified)</p>

Event	Action			
	ET	IEC	SO	Contractor
Limit level being exceeded by more than one consecutive sampling days	Identify source(s) of impact; Inform IEC, contractor and EPD; Check the salinity of the effluent from the desalination plant; Check monitoring data, all plant and equipment; Discuss mitigation measures with IEC, SO and Contractor; Ensure mitigation measures are implemented; Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days. (The above actions should be taken within 1 working day after Limit Level being exceeded by two consecutive sampling days)	Discuss with ET and Contractor on the mitigation measures; Review proposals on mitigation measures submitted by Contractor and advise the SO accordingly; Assess the effectiveness of the implemented mitigation measures. (The above actions should be taken within 1 working day after Limit Level being exceeded by two consecutive sampling days)	Discuss with IEC, ET and Contractor on the proposed mitigation measures; Make agreement on the mitigation measures to be implemented; Assess the effectiveness of the implemented mitigation measures; Consider, if necessary, other source of fresh water for normal operation of the facilities and instruct the contractor to tune down the production volume of the desalination plant until no exceedance of Limit level for two consecutive days. (The above actions should be taken within 1 working day after Limit Level being exceeded by two consecutive sampling days)	Inform the SO and confirm notification of the non-compliance in writing; Rectify unacceptable practice; Check all plant and equipment; Discuss with ET , IEC and SO and propose mitigation measures to IEC and SO within 3 working days; Implement the agreed mitigation measures; As directed by the SO, to tune down the production volume of the desalination plant. (The above actions should be taken within 1 working day after Limit Level being exceeded by two consecutive sampling days)

#### **4.13 Marine Water Quality Monitoring for Deep Cement Mixing Works**

4.13.1 Monitoring and audit on water aspect for deep cement mixing (DCM) should be carried out before, during and after the DCM field trial and any full-scale DCM works. In-situ measurements of turbidity, water temperature, dissolved oxygen and pH as well as water sampling (for subsequent laboratory analysis of SS and alkalinity) should be taken at both upstream and downstream of any DCM works. Current velocity or direction should also be taken near the proposed DCM works to determine the appropriate upstream and downstream monitoring locations. If the measurements and water sampling results indicate that the DCM works have caused significant changes in water conditions at the downstream station, appropriate actions should be taken to stop the works and mitigation measures such as slowing down the DCM process, or rescheduling of works would be implemented to reduce the impacts. In-situ measurements and water sampling on water aspect for the concerned parameters should be collected at selected WSRs before, during and after the DCM works to confirm the impact on water aspect. Before the commencement of any DCM works for the Project, a detailed plan on DCM will be submitted to the EPD for approval. The detailed plan on DCM will include the work programme, layout, monitoring programme on water aspect (including monitoring parameters, locations, frequency, duration and event & action plan) of the DCM works, and mitigation measures to be taken to avoid adverse impacts on water aspect.

## **5 WASTE MANAGEMENT IMPLICATIONS**

### **5.1 Introduction**

- 5.1.1 Waste management would be the Contractor's responsibility to ensure that all wastes produced during the construction of the Project are handled, stored and disposed of in accordance with the recommended good waste management practices and EPD's regulations and requirements.
- 5.1.2 Waste materials generated from construction activities, such as dredged marine sediment, construction and demolition (C&D) materials, chemical waste and general refuse, are recommended to be audited at regular intervals (at least once per week as part of the regular site inspections described in this EM&A Manual) to ensure that proper storage, transportation and disposal practices are being implemented. The Contractor would be responsible for the implementation of the mitigation measures to minimize waste or redress problems arising from the waste materials.
- 5.1.3 Besides, during operation phase of the Project, the EIA Report recommended that the incineration by-products should be tested in accordance with the requirements of the proposed Incineration Residue Pollution Control Limits as recommended in the EIA Report prior to disposal to landfill. A number of the land contamination preventive measures are also recommended in the EIA Report for the operation of the Project.
- 5.1.4 Biogas generation (under the scenario that dredging is not required for the reclamation of the artificial island near SKC) is assessed in the EIA study. Gas protection measures are recommended to be incorporated in the building design. These recommended mitigation measures to prevent the ingress and/or accumulation of any methane gas emissions to potentially dangerous concentrations are described in **Section 6** of the EIA Study. Precautionary measures to be taken prior to entry into any below ground services or confined space within the reclamation site are also recommended. The EIA Report recommended that gas monitoring be undertaken in the immediate post-reclamation period to measure methane concentrations in the fill and to determine actual rates of methane gas emissions. The recommended monitoring requirements are detailed below.

### **5.2 Waste Management and Control**

#### **5.2.1 Construction Phase**

- 5.2.1.1 Mitigation measures for waste management as recommended in the EIA Report are summarised

below. With proper handling, storage and disposal of waste arisings during the construction phase of the Project, the potential to cause adverse environmental impacts would be minimized.

### Good Site Practices

5.2.1.2 Adverse environmental impacts in relation to waste management are not expected, provided that good site practices are strictly followed. Recommendations for good site practices during the construction activities would include:

- Obtain relevant waste disposal permits from appropriate authorities, in accordance with the Waste Disposal Ordinance (Cap. 354) and subsidiary Regulations and the Land (Miscellaneous Provisions) Ordinance (Cap. 28);
- Provide staff training for proper waste management and chemical handling procedures;
- Provide sufficient waste disposal points and regular waste collection;
- Provide appropriate measures to minimise windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers;
- Carry out regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors;
- Separate chemical wastes for special handling and disposed of to licensed facility for treatment; and
- Employ licensed waste collector to collect waste.

### Waste Reduction Measures

5.2.1.3 Good management and control can prevent the generation of a 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 practices. Recommendations to achieve waste reduction include:

- Design foundation works that could minimise the amount of excavated material to be generated;
- Provide training to workers on the importance of site cleanliness and appropriate waste management procedures, including waste reduction, reuse and recycling;
- Sort out demolition debris and excavated materials from demolition works to recover reusable/recyclable portions (i.e. soil, broken concrete, metal, etc.);
- Segregate and store different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal;
- Encourage the collection of aluminium cans by providing separate labelled bins to enable this waste to be segregated from other general refuse generated by the work force;
- 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 amount of waste to be generated and to avoid unnecessary generation of waste.

5.2.1.4 In addition to the above measures, specific mitigation measures are recommended below for the identified waste so as to minimize environmental impacts during handling, transportation and disposal of the waste.

#### Dredged Sediments

5.2.1.5 The basic requirements and procedures for dredged sediment disposal specified under ETWB TCW 34/2002 shall be followed. According to the ETWB TCW 34/2002, the Marine Fill Committee (MFC) is responsible for managing the disposal facilities in Hong Kong for the dredged sediment, while EPD is the authority of issuing marine dumping permit under the DASO.

5.2.1.6 The project proponent should agree in advance with MFC of CEDD on the site allocation. The project proponent or contractor for the dredging works shall then apply for the site allocations of marine sediment disposal based on the prior agreement with MFC/CEDD. The project proponent or contractor should also be responsible for the application of all necessary permits from relevant authorities, including the dumping permit as required under DASO from EPD, for the disposal of dredged sediment prior to the commencement of the dredging works.

5.2.1.7 As part of **Section 5.2.1.6** above, the project proponent or contractor will need to satisfy the appropriate authorities that the quality of the marine sediment to be dredged has been identified according to the requirements of ETWB TCW 34/2002. This should be completed well before the dredging works and would include at least the submission of a formal Sediment Quality Report under Tier I of ETWB TCW No. 34/2002 to DEP for approval. Subject to advice from DEP, it is possible that further marine SI in accordance with ETWB TCW 34/2002 might be necessary for the application of dumping permit under DASO. In such case, a sediment sampling and testing proposal shall be submitted to and approved by DEP before the additional marine SI works.

5.2.1.8 The dredged marine sediments would be loaded onto barges, transported to and disposed of at the designated disposal sites (subject to agreement with MFC and given Type 1 sediment were identified, the disposal sites are typically South Cheung Chau and/or East of Ninepin as open sea disposal). In addition to the mitigation measures as discussed in the EIA report, the barge transporting the sediments to the designated disposal sites should be equipped with tight fitting seals to prevent leakage and should not be filled to a level that would cause overflow of materials or laden water during loading or transportation. In addition, monitoring of the barge

loading shall be conducted to ensure that loss of material does not take place during transportation. Transport barges or vessels shall be equipped with automatic self-monitoring devices as specified by the DEP.

### Construction and Demolition Materials

5.2.1.9 In order to minimize the impact resulting from collection and transportation of C&D materials for off-site disposal, the excavated material arising from site formation and foundation works should be reused on-site as backfilling material and for landscaping works as far as practicable. Other mitigation requirements are listed below:

- A Waste Management Plan (WMP), which becomes part of the Environmental Management Plan (EMP), should be prepared in accordance with ETWB TCW No.19/2005;
- A recording system for the amount of wastes generated, recycled and disposed (including the disposal sites) should be adopted for easy tracking; and
- In order to monitor the disposal of C&D materials at public filling facilities and landfills and to control fly-tipping, a trip-ticket system should be adopted (refer to ETWB TCW No. 31/2004).

5.2.1.10 The Contractor should prepare and implement an EMP in accordance with ETWB TCW No.19/2005, which describes the arrangements for avoidance, reuse, recovery, recycling, storage, collection, treatment and disposal of different categories of waste to be generated from construction activities. Such a management plan should incorporate site specific factors, such as the designation of areas for segregation and temporary storage of reusable and recyclable materials. The EMP should be submitted to the ER for approval. The Contractor should implement waste management practices in the EMP throughout the construction stage of the Project. The EMP should be reviewed regularly and updated by the Contractor, preferably on a monthly basis.

5.2.1.11 All surplus C&D materials arising from or in connection with construction works should become the property of the Contractor when it is removed unless otherwise stated. The Contractor would be responsible for devising a system to work for on-site sorting of C&D materials and promptly removing all sorted and process materials arising from the construction activities to minimize temporary stockpiling on-site. The system should be included in the EMP identifying the source of generation, estimated quantity, arrangement for on-site sorting, collection, temporary storage areas and frequency of collection by recycling Contractors or frequency of removal off-site.



### Chemical Wastes

5.2.1.12 Should chemical wastes be produced at the construction site, the Contractor would be required to register with EPD as a Chemical Waste Producer and to follow the guidelines stated in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes. Good quality containers compatible with the chemical wastes should be used, and incompatible chemicals should be stored separately. Appropriate labels should be securely attached on each chemical waste container indicating the corresponding chemical characteristics of the chemical waste (such as explosive, flammable, oxidizing, irritant, toxic, harmful, or corrosive). The Contractor should employ a licensed collector to transport and dispose of the chemical wastes, to either the Chemical Waste Treatment Centre at Tsing Yi, or another licensed facility, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.

### General Refuse

5.2.1.13 General refuse should be stored in enclosed bins or compaction units separate from C&D materials. A licensed waste collector should be employed by the Contractor to remove general refuse from the site, separately from C&D materials. Preferably an enclosed and covered area should be provided to reduce the occurrence of 'wind blown' light material.

## 5.2.2 Operational Phase

### Good Site Practices

5.2.2.1 It is recommended that the following good operational practices should be adopted to minimize waste management impacts:

- Obtain the necessary waste disposal permits from the appropriate authorities, in accordance with the Waste Disposal Ordinance (Cap. 354) and Waste Disposal (Chemical Waste) (General) Regulation;
- Nomination of an approved person to be responsible for good site practice, arrangements for collection and effective disposal to an appropriate facility of all wastes generated at the site;
- Use of a waste haulier licensed to collect specific category of waste;
- A trip-ticket system should be included as one of the contractual requirements and implemented by the Environmental Team to monitor the disposal of solid wastes at landfills, and to control fly tipping. Reference should be made to ETWB TCW No. 31/2004;
- Training of site personnel in proper waste management and chemical waste handling procedures;

- Separation of chemical wastes for special handling and appropriate treatment at a licensed facility;
- Routine cleaning and maintenance programme for drainage systems, sumps and oil interceptors;
- Provision of sufficient waste disposal points and regular collection for disposal;
- Adoption of appropriate measures to minimize windblown litter and dust during transportation of waste, such as covering trucks or transporting wastes in enclosed containers; and
- Implementation of a recording system for the amount of wastes generated, recycled and disposed of (including the disposal sites).

### Waste Reduction Measures

5.2.2.2 Good management and control can prevent the generation of significant amounts of waste. It is recommended that the following good operational practices should be adopted to ensure waste reduction:

- 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;
- Encourage collection of aluminium cans, plastic bottles and packaging material (e.g. carton boxes) and office paper by individual collectors. Separate labelled bins should be provided to help segregate this waste from other general refuse generated by the work force; and
- Any unused chemicals or those with remaining functional capacity should be reused as far as practicable.

### Storage, Handling, Treatment, Collection and Disposal of Incineration By-Products

5.2.2.3 The following measures are recommended for the storage, handling and collection of the incineration by-products:

- Ash should be stored in storage silos;
- Ash should be handled and conveyed in closed systems fully segregated from the ambient environment;
- Ash should be wetted with water to control fugitive dust, where necessary;
- All fly ash and air pollution control (APC) residues should be treated, e.g. by cement solidification or chemical stabilization, for compliance with the proposed Incineration Residue Pollution Control Limits and leachability criteria prior to disposal;
- The ash should be transported in covered trucks or containers to the designated landfill site.

5.2.2.4 The Contractor should provide EPD with chemical analysis results of the bottom ash, and treated fly ash and APC residues to confirm that the ash/residue can comply with the proposed Incineration Residue Pollution Control Limits before disposal.

### **5.3 Monitoring Requirements for Biogas Generation**

5.3.1 If the biogas monitoring is required, monitoring should be undertaken via purposely installed monitoring wells within boreholes drilled into the fill material. The boreholes should be drilled down to the level of the groundwater (mean sea water level) and standard landfill gas-type monitoring wells installed. These should be fitted with a removable cap and gas monitoring valve so that gas concentrations as well as flow rates may be measured from the open well. During the drilling of boreholes, the safety and working procedures described in the Landfill Gas Hazard Assessment Guidance Note, EPD (1997) should be followed.

5.3.2 Concentrations of methane gas should be measured using portable gas monitoring instruments, as described in **Section 5.3.4**. Fluxes should also be measured if the emission velocities are not too low. It is recommended that monitoring be undertaken bi-weekly for a period of at least 3 months (preferably 6 months or more) prior to the commencement of construction works on the reclamation. The results of the gas monitoring should be reviewed to determine whether the length of the monitoring period should be extended. It is also recommended that gas flow rates from the wells be monitored under different meteorological conditions and to include some occasions when atmospheric pressure is falling quite quickly (e.g. immediately preceding a typhoon).

5.3.3 Where possible, it is recommended that monitoring wells be located in areas designated for open space as it may be possible to continue monitoring at these locations throughout the construction period. Monitoring wells should be located away from the areas dredged for the permanent stormwater culvert and the temporary channel/culvert construction.

5.3.4 Monitoring shall be carried out using intrinsically safe, portable gas monitoring instruments. The gas monitoring instrument shall:

- Be capable of continuous monitoring of methane;
- Be capable of continuous barometric pressure and gas pressure measurements;
- Be capable of monitoring temperature of the gas;
- Where possible, comply with BS6020 and be approved by BASEEFA as intrinsically safe, suitable for use in a Zone 2 area to BS5345;

- Normally operate in diffusion mode unless required for spot sampling, when it should be capable of operating by means of an aspirator or pump;
- Display any parameters monitored by clear unambiguous readings given on an alpha numeric display LCD screen with wide angle viewing;
- Have low battery, fault and over range indication incorporated;
- Store monitoring date, and shall be capable of being down-loaded directly to a PC;
- Measure in the following ranges:

Methane	0-100% LEL & 0-100% v/v
Barometric pressure	mBar (absolute)
Gas pressure (relative to atmospheric)	Pascals atmospheric
temperature	0-100°C
- Have removable and rechargeable batteries with more than 12 hours continuous operating life;
- Have back-up batteries; and
- Have an oxygen sensor with a life of not less than twelve months and other sensors shall have a life of more than two years before deterioration in performance of the sensor.

5.3.5 To measure the gas flow rates from the open monitoring wells, very sensitive techniques (such as micro-anemometer) will need to be used to measure the anticipated very low flow rates.

5.3.6 The gas monitoring equipment shall be calibrated and maintained in accordance with the manufacturer's recommendations for calibration and maintenance.

5.3.7 Prior to entry of any below ground service voids, chambers or any confined environment, the atmosphere within the chamber should be checked for oxygen, methane and carbon dioxide concentrations. The chamber may then only be entered if oxygen is greater than 18% by volume, methane is less than 10% of the Lower Explosive Limit (LEL), which is equivalent to 0.5% by volume (approximately), and carbon dioxide is less than 0.5% by volume. If either carbon dioxide or methane is higher, or oxygen lower than the values given above, then entry to the chamber should be prohibited and expert advice sought. Even if conditions are safe for entry, no worker should be permitted to enter the chamber without having another worker present at the surface. The worker who enters the chamber should wear an appropriate safety/recovery harness and, preferably, should carry a portable methane, carbon dioxide and oxygen meter.

In general, when work is being undertaken in confined spaces sufficient approved resuscitation equipment, breathing apparatus and safety torches should be available. Persons involved in or supervising such work should be trained and practiced in the use of such equipment. A permit-

to-work system for entry into confined spaces should be developed by an appropriately qualified person and consistently employed.

## **5.4 Approach to Prevent Land Contamination**

### **5.4.1 Fuel Oil Spillage Prevention**

Precautionary measures to prevent fuel oil spillage are presented below.

#### **5.4.1.1 Fuel Oil Tank Construction and Test**

- The fuel tank to be installed should be of specified durability.
- Double skin tanks are preferred.
- Underground fuel storage tank should be placed within a concrete pit.
- The concrete pit shall be accessible to allow regular tank integrity tests to be carried out at regular intervals.
- Tank integrity tests should be conducted by an independent qualified surveyor or structural engineer.
- Any potential problems identified in the test should be rectified as soon as possible.

#### **5.4.1.2 Fuel Oil Pipeline Construction and Test**

- Installation of aboveground fuel oil pipelines is preferable; if underground pipelines are unavoidable, concrete lined trenches should be constructed to contain the pipelines.
- Double skin pipelines are preferred.
- Distance between the fuel oil refuelling points and the fuel oil storage tank shall be minimized.
- Integrity tests for the pipelines should be conducted by an independent qualified surveyor or structural engineer at regular intervals.
- Any potential problems identified in the test should be rectified as soon as possible.

#### **5.4.1.3 Fuel Oil Leakage Detection**

- Installation of leak detection device at storage tank and pipelines.
- Installation and use of pressure gauges (e.g. at the two ends of a filling line) in fuel filling, which allows unexpected pressure drop or difference and sign of leakage to be detected.

#### 5.4.1.4 Fuel Oil Storage Tank Refuelling

- Storage tank refuelling (from road tanker) should only be conducted by authorized staff of the oil company using the company's standard procedures.

#### 5.4.1.5 Fuel Oil Spillage Response

- An Oil Spill Response Plan should be prepared by the operator to document the appropriate response procedures for oil spillage incidents in detail. General procedures to be taken in case of fuel oil spillage are presented below.

##### ➤ Training

Training on oil spill response actions should be given to relevant staff. The training shall cover the followings:

- Tools & resources to combat oil spillage and fire, e.g. locations of oil spill handling equipment and firefighting equipment;
- General methods to deal with oil spillage and fire incidents;
- Procedures for emergency drills in the event of oil spills and fire; and
- Regular drills shall be carried out.

##### ➤ Communication

Establish communication channel with the Fire Services Department (FSD) and EPD to report any oil spillage incident so that necessary assistance from relevant department can be quickly sought.

##### ➤ Response Procedures

Any fuel oil spillage within the IWMF site should be immediately reported to the Plant Manager with necessary details including location, source, possible cause and extent of the spillage.

Plant Manager should immediately attend to the spillage and initiate any appropriate action to confine and clean up the spillage. The response procedures shall include the following:

- Identify and isolate the source of spillage as soon as possible.
- Contain the oil spillage and avoid infiltration into soil/ groundwater and discharge to storm water channels.
- Remove the oil spillage.
- Clean up the contaminated area.
- If the oil spillage occurs during storage tank refuelling, the refueling operation

should immediately be stopped.

- Recovered contaminated fuel oil and the associated material to remove the spilled oil should be considered as chemical waste. The handling and disposal procedures for chemical wastes are discussed in the following paragraphs.

#### 5.4.2 Chemicals and Chemical Wastes Handling & Spillage Prevention

The precautionary measures to prevent improper handling/ use of chemicals and chemical waste spillage are presented below.

##### 5.4.2.1 Chemicals and Chemical Wastes Handling & Storage

- Chemicals and chemical wastes should only be stored in suitable containers in purpose-built areas.
- The storage of chemical wastes should comply with the requirements of the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes.
- The storage areas for chemicals and chemical wastes shall have an impermeable floor or surface. The impermeable floor/ surface shall possess the following properties:
  - Not liable to chemically react with the materials and their containers to be stored.
  - Able to withstand normal loading and physical damage caused by container handling.
  - The integrity and condition of the impermeable floor or surface should be inspected at regular intervals to ensure that it is satisfactorily maintained.
- For liquid chemicals and chemical wastes storage, the storage area should be bunded to contain at least 110% of the storage capacity of the largest containers or 20% of the total quantity of the chemicals/chemical wastes stored, whichever is the greater.
- Storage containers shall be checked at regular intervals for their structural integrity and to ensure that the caps or fill points are tightly closed.
- Chemical handling shall be conducted by trained workers under supervision.

##### 5.4.2.2 Chemicals and Chemical Wastes Spillage Response

- A Chemicals and/ or Chemical Wastes Spillage Response Plan shall be prepared by the operator to document in detail the appropriate response procedures for chemicals or chemical wastes spillage incidents. General procedures to be undertaken in case of chemicals/ chemical waste spillages are presented below.

➤ Training

Training on spill response actions should be given to relevant staff. The training shall cover the followings:

- Tools & resources to handle spillage, e.g. locations of spill handling equipment;
- General methods to deal with spillage; and
- Procedures for emergency drills in the event of spills.

➤ Communication

Establish communication channel with FSD and EPD to report the spillage incident so that necessary assistance from relevant department can be quickly sought.

➤ Response Procedures

Any spillage within the IWMF site should be reported to the Plant Manager. Plant Manager shall attend to the spillage and initiate any appropriate actions needed to confine and clean up the spillage. The response procedures shall include the followings:

- Identify and isolate the source of spillage as soon as possible;
- Contain the spillage and avoid infiltration into soil/ groundwater and discharge to storm water channels (in case the spillage occurs at locations out of the designated storage areas);
- Remove the spillage; the removal method/ procedures documented in the Material Safety Data Sheet (MSDS) of the chemicals spilled should be observed;
- Clean up the contaminated area (in case the spillage occurs at locations out of the designated storage areas); and
- The waste arising from the cleanup operation should be considered as chemical wastes.

#### 5.4.3 Preventive Measures for Incineration By-products Handling

5.4.3.1 The recommended measures listed below can minimize the potential contamination to the surrounding environment due to the incineration by-products:

- Ash should be stored in storage silos;
- Ash should be handled and conveyed in closed systems fully segregated from the ambient environment;
- Ash should be wetted with water to control fugitive dust, where necessary;



- All fly ash and APC residues should be treated, e.g. by cement solidification or chemical stabilization, for compliance with the proposed Incineration Residue Pollution Control Limits and leachability criteria prior to disposal;
- The ash should be transported in covered trucks or containers to the designated landfill site.

#### 5.4.4 Incident Record

5.4.4.1 After any spillage, an incident report should be prepared by the Plant Manager. The incident report should contain details of the incident including the cause of the incident, the material spilled and estimated spillage amount, and also the response actions undertaken. The incident record should be kept carefully and able to be retrieved when necessary.

5.4.4.2 The incident report should provide sufficient details for the evaluation of any environmental impacts due to the spillage and assessment of the effectiveness of measures taken.

5.4.4.3 In case any spillage or accidents results in significant land contamination, EPD should be informed immediately and the Contractor should be responsible for the cleanup of the affected area. The responses procedures described in **Section 5.4.2.2** above should be followed accordingly together with the land contamination assessment and remediation guidelines stipulated in the Guidance Manual for Use of Risk-based Remediation Goals for Contaminated Land Management and the Guidance Note for Contaminated Land and Remediation.

## **6 ECOLOGICAL IMPACT**

### **6.1 Introduction**

- 6.1.1 The EIA report has identified the proposed Project Site as an important habitat for Finless Porpoise. The shoreline within the study area was also identified to be supporting 15 coral species (8 hard corals and 7 octocorals). An active nest of White-bellied Sea Eagle (WBSE) had been previously recorded at the southwest of Shek Kwu Chau within hillside shrubland. Adverse impacts on the habitats of Finless Porpoise, coral communities, and the nest of WBSE have been predicted due to the proposed Project.
- 6.1.2 Specific mitigation measures have been recommended for Finless Porpoise, corals, and WBSE in the EIA report, with the aim to minimize potential direct and indirect impacts. With the implementation of the recommended measures, adverse impacts from the construction and operation of the proposed Project on the concerned fauna groups should be minimized.
- 6.1.3 This section describes the specific mitigation measures and the requirements for monitoring and auditing recommended for Finless Porpoise, corals, and WBSE.

### **6.2 Ecological Mitigation Measures**

- 6.2.1 Specific Measures to Minimize Disturbance on Finless Porpoise

#### Minimisation of habitat loss for Finless Porpoise

- 6.2.1.1 In order to minimize the potential loss of important habitat for Finless Porpoise, substantial revision has been made on the layout plan of the breakwater. The revised layout of the breakwater has greatly reduced the size of the embayment area. Moreover, the newly proposed breakwater form (circular cells) has also reduced the size of the footprint. As a result, the total habitat loss (including reclamation and embayment) for Finless Porpoise has reduced from ~50 ha, down to ~31 ha.

#### Avoidance of peak season for Finless Porpoise occurrence

- 6.2.1.2 In order to minimize potential acoustic disturbance from construction activities on Finless Porpoise, construction works that may produce underwater acoustic disturbance should be scheduled outside the months with peak Finless Porpoise occurrence (December to May), including:

- sheet piling works for construction of cofferdam surrounding the reclamation area (Phase 1);
- sheet piling works for construction of the shorter section of breakwater (Phase 1);
- sheet piling works for construction of the remaining section of breakwater (Phase 3);
- bored piling works for berth area (Phase 3); and

6.2.1.3 Such works should be restricted within June to November. This approach would not only avoid the peak season for Finless Porpoise occurrence, the magnitude of impacts arise from acoustic disturbance would also be minimized.

#### Opt for quieter construction methods and plants

6.2.1.4 In order to minimize underwater acoustic disturbance on Finless Porpoise, quieter construction methods and plants should be adopted:

- Considering the sensitivity of marine mammals to underwater acoustic disturbance, instead of the previously proposed conventional breakwater and reclamation peripheral structure, which requires noisy piling works, the current circular cells structure for breakwater and reclamation peripheral structure is proposed. A quieter sheet piling method using vibratory hammer or hydraulic impact hammer, would be adopted for the installation of circular cells for cellular cofferdam and northern breakwater during Phase 1, and southern breakwater Phase 3;
- Non-percussive bore piling method would be adopted for the installation of tubular piles for the berth construction during Phase 3.

#### Monitored exclusion zones

6.2.1.5 A monitored exclusion zone of 250m radius from silt curtain or from the boundary of a work area should be implemented under the following situations (where applicable, Marine Mammal Watching Plan shall be conducted at the meantime) :

- i. 30 minutes before the commencement of installation / re-installation / relocation works of floating type silt curtain at marine access; and
- ii. MMEZ monitoring during installation / re-installation / relocation of floating types silt curtain when opening and closing at marine access area; and
- iii. After the enclosure of floating type silt curtain at marine access area for reclamation works to implement visual inspection as detailed in Marine Mammal Watching Plan.

6.2.1.6 If a marine mammal is noted within the exclusion zone, all marine works should stop immediately and remain idle for 30 minutes, or until the exclusion zone is free from marine mammals.

6.2.1.7 The experienced marine mammal observer should be well trained to detect marine mammals. Binoculars should be used to search the exclusion zone from an elevated platform with unobstructed visibility. The observer should also be independent from the project proponent and has the power to call-off construction activities.

6.2.1.8 In addition, as marine mammals cannot be effectively monitored within the proposed monitored exclusion zone at night, or during adverse weather conditions (i.e. Beaufort 5 or above, visibility of 300 meters or below), marine works should be avoided under weather conditions with low visibility.

#### Marine mammal watching plan

6.2.1.9 Upon the completion of silt curtain installation / re-installation / relocation, the marine works would be conducted within an enclosed environment within the silt curtain. Subsequently, the plan would include Visual Inspection of the Waters Surrounded by Silt Curtains (Section 2.1, MMWP) and Regular Inspection of the Deployed Silt Curtain (Section 2.1, MMWP) inspection under Marine Mammal Watching Plan (MMWP) would be implemented (where applicable, Marine Mammal Exclusion Zone shall be conducted at the meantime). Special attention would be paid to Phase 2 (reclamation) where the floating type still curtain would be opened occasionally for vessel access, leaving a temporary 50 m opening. An action plan should be devised to cope with any unpredicted incidents such as the case when marine mammals are found within the waters surrounded by the silt curtains.

#### Small openings at silt curtains

6.2.1.10 In order to avoid the entrance of marine mammals into the works area through the opening at silt curtains for vessel access, and the subsequent potential impacts including increase in stress level in marine mammals due to underwater noise and chance of collision with working vessels, the openings for vessel access at the silt curtains should be as small as possible to minimize the risk of accidental entrance.

#### Adoption of regular travel route

6.2.1.11 In order to minimize the disruption on marine mammal's behavioural pattern during construction and operation phases, captains of all vessels should adopt regular travel route, in order to minimize the chance of vessel collision with marine mammals, which may otherwise result in damage to health or mortality.

6.2.1.12 The regular travel route should avoid areas with high sighting density of Finless Porpoise as much as possible, as indicated in the latest Monitoring of Marine Mammals in Hong Kong Waters (AFCD, 2010a). With the adoption of regular travel route, potential alteration in behavioural pattern of marine mammals due to increase in marine traffic is considered to be acceptable.

#### Vessel speed limit

6.2.1.13 In order to minimize potential injury and mortality of marine mammals due to collision with vessels during construction (working vessels) and operation phase (4 round trips/day for MSW vessel, and 12 round trips/day for visitor/staff shuttle ferry), a speed limit of ten knots should be strictly enforced within areas with high density of Finless Porpoise, as identified in the latest Monitoring of Marine Mammals in Hong Kong Waters (AFCD, 2017). The recommend area where speed limit should be adopted include the grids Q30, Q31, and R31 (Figure 6.2).

6.2.1.14 The same speed limit has been enforced within the Sha Chau and Lung Kwu Chau marine park, and adopted under the EIA-172/2009 Hong Kong - Zhuhai - Macao Bridge Hong Kong Link Road (HyD, 2009a), where density of Chinese White Dolphin is high. Limitation on vessel speed limit has appeared to be effective in protecting dolphins from vessel collision, as well as minimizing underwater acoustic disturbance. With the adoption of these mitigation measures, the potential impact marine mammals due to injury and mortality from vessel collision would be minimized to acceptable level.

6.2.1.15 Passive acoustic monitoring and land-based theodolite monitoring surveys should be adopted to verify the predicted impacts and effectiveness of the proposed mitigation measures.

#### Training of staff

6.2.1.16 In order to ensure that all staff, including captains of vessels, are aware of the guidelines for safe vessel operations in the presence of cetaceans during construction and operation phases, adequate trainings should be provided.

#### Designation of Marine Park

6.2.1.17 Loss of 31 ha of marine habitat would be permanently resulted from the reclamation and breakwater construction at the southwestern waters of Shek Kwu Chau. The proposed works area is of high ecological value, as it is identified as an important habitat for Finless Porpoise; hence high level of adverse impact is predicted. As minimization measures are exhausted, compensatory measure is therefore required.

6.2.1.18 According to the Finless Porpoise data recorded between 2016 to 2017 (AFCD, 2017), the waters between Shek Kwu Chau and Soko Islands is the nearest area to the proposed Project that has high sighting concentration of Finless Porpoise than the rest of the nearby waters. In addition, the extent of Finless Porpoise habitat is the most continuous and connected to other nearby important habitats of marine mammals, i.e. Soko Islands, which has records of both Finless Porpoise and Chinese White Dolphin.

6.2.1.19 The Project Proponent has made a firm commitment to seek to designate an approximate area of 700 ha in the waters between Soko Islands and Shek Kwu Chau as a marine park, in accordance with the statutory process stipulated in the Marine Parks Ordinance, as a compensation measure for the habitat loss arising from the construction of the IWMF at an artificial island near SKC.

6.2.1.20 The firm commitment to seek to designate the marine park, where incompatible activities would be regulated and proper management regime imposed in accordance with the Marine Park Ordinance, would significantly help conserve Finless Porpoise, and hence serve as an effective compensation measure for the permanent loss of Finless Porpoise habitat arising from the project. The Project Proponent shall seek to complete the designation by 2018 to tie in with the operation of the IWMF at an artificial island near SKC.

6.2.1.21 A further study should be carried out to review relevant previous studies and collate available information on the ecological characters of the proposed area for marine park designation; and review available survey data for Finless Porpoise, water quality, fisheries, marine traffic and planned development projects in the vicinity. Based on the findings, ecological profiles of the proposed area for marine park designation should be established, and the extent and location of the proposed marine park be determined. The adequacy of enhancement measures should also be reviewed.

6.2.1.22 In addition, a management plan for the proposed marine park should be proposed, covering information on the responsible departments for operation and management (O&M) of the marine park, as well as the O&M duties of each of the departments involved. Consultation with relevant government departments and stakeholders should be conducted under the study. The study should be submitted to Director of Environmental Protection (DEP) for approval before the commencement of construction works.

6.2.1.23 The Project Proponent should provide assistance to AFCD during the process of the marine park designation.

## 6.2.2 Specific Measures to Minimize Impact on Corals

### Coral translocation

6.2.2.1 According to the results of the existing REA surveys, all 198 coral colonies to be directly affected by the proposed Project were attached to movable rocks, which are less than 50 cm in diameter. Translocation of the potentially affected corals is technically feasible to avoid direct loss. With the implementation of coral translocation prior to the construction works, no loss of coral colonies would be expected. Coral translocation should be carried out during the winter season (November to March) in order to avoid the spawning season of corals (July to October) (Lam, 2000; Storlazzi, 2004). The health status of translocated corals should be regularly monitored after the translocation works.

6.2.2.2 Prior to coral translocation, a more detailed baseline survey, including a coral mapping survey, is recommended to further confirm the exact number and location of coral colonies within the potentially affected area. A more detailed Coral Translocation Plan, including selection of suitable recipient site, plan for coral translocation, and event / action plan for coral monitoring had been submitted upon approval of this Project, prior to commencement of construction works. Advice from relevant governmental departments (e.g. AFCD) and professionals were sought after, in order to identify a desirable location for the relocation of coral communities. Post-translocation monitoring on the translocated corals should also be considered.

6.2.2.3 The selection of recipient site suitable for the affected corals is important. To increase the survival rate of the translocated corals, the following criteria for selecting a suitable coral recipient site are recommended:

- Presence of same coral species with similar coral community as the donor site;
- Similar environmental conditions such as light intensity, salinity, hydrographic condition and bathymetry as the donor site;
- Presence of suitable substratum to allow the translocated boulders/rocks to be permanently stabilised; and
- Presence of protection from storm/typhoon damage.

6.2.2.4 The translocation work should be led by qualified coral specialist(s) who preferably have coral translocation experience.

### Coral monitoring programme

6.2.2.5 A coral monitoring programme is recommended to assess any adverse and unacceptable impacts

to the coral communities at the coasts of Shek Kwu Chau during construction of the Project.

### 6.2.3 Specific Measures to Minimize Disturbance on Breeding White-bellied Sea Eagle

#### Avoidance of noisy works during the breeding season of White-bellied Sea Eagle

6.2.3.1 In order to minimize potential construction noise disturbance on White-bellied Sea Eagle (WBSE) to acceptable level, noisy construction works should be scheduled outside their breeding season (December to May) to minimize potential degradation in breeding ground quality and breeding activities. Works that are recommended to adopt such measure include:

- sheet piling works for construction of cofferdam surrounding the reclamation area (Phase 1);
- sheet piling works for construction of the shorter section of breakwater (Phase 1);
- sheet piling works for construction of the remaining section of breakwater (Phase 3); and
- bored piling works for berth area (Phase 3).

#### Opt for quieter construction methods and plants

6.2.3.2 In order to minimize potential construction noise disturbance on WBSE, quieter construction methods and plants should be adopted. The recommended noise mitigation measures in should be implemented to minimize potential noise disturbance to acceptable levels.

#### Restriction on vessel access near the nest of White-bellied Sea Eagle

6.2.3.3 During construction and operation, in order to minimize disturbance on the existing WBSE nest, a pre-defined practical route to restrict vessel access near the nest should be adopted to keep vessels and boats as far away from the nest as possible. As mentioned previously, WBSE are known to be sensitive to human disturbance during the breeding season, and may even desert a nest if disturbed. As an additional precautionary measure to minimize disturbance on their nestling stage, the vessel travel route should be adjusted to avoid the foraging ground of the breeding adult birds identified during WBSE monitoring programme. If avoidance of foraging ground is not feasible, vessel frequency and speed within their foraging ground near the construction area should be reduced to minimize any potential impacts.

#### White-bellied Sea Eagle monitoring programme

6.2.3.4 A WBSE monitoring programme is recommended to assess any adverse and unacceptable impacts to the breeding activities of WBSE during construction and operation of the Project. Monitoring surveys for WBSE would include pre-construction phase, construction phase and operation phase. More details on monitoring for WBSE are presented in **Section 6.5**.



### Education of staff

6.2.3.5 Staff, including captains of all vessels during construction and operation phased, should be aware of the ecological importance of WBSE. Awareness should be raised among staff to minimize any intentional or unintentional disturbance to the nest.

### Minimisation of Glare Disturbance

6.2.3.6 To minimize glare disturbance on WBSE, which may cause disorientation of birds by interfering with their magnetic compass, and disruption in behavioural patterns such as reproduction, fat storage and foraging pattern, any un-necessary outdoor lighting should be avoided, and in-ward and down-ward pointing of lights should be adopted.

## **6.3 Marine Mammal Monitoring**

### 6.3.1 Introduction

6.3.1.1 The marine mammal monitoring programme would focus on Finless Porpoise, as the study area has been identified as a hotspot for this species. The monitoring would verify the predicted impacts, and examine whether the mitigation measures recommended in the EIA report have been effectively implemented to protect marine mammals from negative impacts from construction activities.

### 6.3.2 Vessel-based Line-transect Survey

6.3.2.1 The survey methodology should remain the same as that adopted during the EIA study to allow fair comparison of marine mammal line transect surveys (Figure 6.1), as well as the proposed marine park for the compensation of loss of important habitat for Finless Porpoise. The marine mammal monitoring programme should cover pre-construction phase, construction phase and operation phase.

6.3.2.2 To determine the baseline condition of Finless Porpoise occurrence in the study area, pre-construction phase monitoring of Finless Porpoise should be conducted twice a month for the duration of three months (any three months within the peak season for Finless Porpoise occurrence – December to May) before the commencement of works. Throughout the construction phase involving marine construction works, monitoring of Finless Porpoise should be conducted twice per month during the peak season for Finless Porpoise, and once per month during the off-peak season. For operation phase, monitoring of Finless Porpoise should last for 1 year, following the survey frequency adopted during construction phase.

- 6.3.2.3 For construction and operation phase monitoring, surveys for all 4 seasons should be covered, in order to take natural fluctuation and seasonal variations into account for data analysis of distribution, encounter rate, density and habitat use of both porpoises and dolphins (if any). After analysis of the data, the results would allow the detection of any changes of their usage of habitat, in response to the proposed construction works.
- 6.3.2.4 The line-transect monitoring survey should be led by suitably qualified persons with recognizable experience in marine mammal monitoring survey. The methodology for marine mammal monitoring should be consulted with the Agriculture, Fisheries and Conservation Department (AFCD) before the commencement of the monitoring programme.
- 6.3.2.5 Two experienced observers, a data recorder and a primary observer, should make up the on-effort survey team. The survey vessel should transit different transect lines at a constant speed of 13-15 km per hour. The data recorder should search for signs of marine mammals with unaided eye and fills out the datasheets; and the primary observer should search continuously through a pair of marine binoculars. Both observers should search the sea ahead of the vessel, between 270° and 90° (in relation to the bow, which is defined as 0°).
- 6.3.2.6 During on-effort survey periods, the survey team should record effort data including time, position (latitude and longitude), weather conditions (Beaufort sea state and visibility) and distance travelled in each series (a continuous period of search effort), with the assistance of a professional GPS. Two additional experienced observers should be available on the boat to work in shift (i.e. rotate every 30 minutes), in order to minimize fatigue of the survey team members.
- 6.3.2.7 When marine mammals are sighted, the survey team should end the survey effort, and immediately record the initial sighting distance and angle of the dolphin group from the survey vessel, as well as sighting time and position. The research vessel should then divert from its course to approach the animals for species identification, group size estimation, group composition assessment, behavioural observations, and collection of identification photos. The perpendicular distances (PSD) of the dolphin groups to the transect line should be calculated from the initial sighting distance and angle.
- 6.3.3 Passive Acoustic Monitoring
- 6.3.3.1 Passive acoustic monitoring aims to study the 24-hour usage of an area by Finless Porpoise by using automated static porpoise detectors (C-PODs) which will be deployed at different locations to detect the unique ultra-high frequency sounds produced by the porpoises. One

porpoise detector will be placed within the Project Area, while other two porpoise detectors would be placed outside the Project Area as control sites. The locations of the two control sites (i.e. within Pui O Wan and to the south of Tai A Chau) were specifically chosen, as these control sites were regularly visited by the porpoises based on past AFCD long-term monitoring data, and were also confirmed by the professional team on the feasibility for deployment and retrieval of the C-POD units. These three detectors will be left on-site to carry out 24-hours monitoring over the 30-day monitoring period during the peak occurrence period of Finless Porpoise (December to May) during pre-construction, construction and operation phase so as to obtain an overview on utilization of the Project Area by the porpoises and to identify any difference between work stages.

6.3.3.2 The final number, position, and duration of the porpoise detector deployment should be agreed with AFCD.

#### 6.3.4 Active Acoustic Monitoring

6.3.4.1 Active acoustic monitoring aims to study the acoustic behaviour of Finless Porpoise in relation to the presence and absence of vessels, and their associated underwater acoustic disturbance. Hydrophones should be deployed from stationary boat to record noise data from vessels and Finless Porpoise.

6.3.4.2 With the recorded data, analysis on whether presence of, and distance from vessel traffic would cause acoustic behavioural changes in Finless Porpoise, or changes in use off frequency range etc. could be determined. The results should be used to verify the predicted impacts and the effectiveness of the proposed mitigation measures.

6.3.4.3 Approximately 30 days of field work should be carried out during the peak occurrence period of Finless Porpoise (December to May), with the main focus on operation phase where traffic of MSW vessels and visitor/staff shuttle ferry is regular. Details of the active acoustic monitoring methodology and frequency should be agreed with AFCD.

#### 6.3.5 Land-based Theodolite Tracking

6.3.5.1 Land-based Theodolite Tracking will be carried out for 30 days on site during the peak occurrence period of Finless Porpoise (December to May). The survey should cover pre-construction phase, construction and operation phases. Six hours of theodolite tracking should be conducted for each day of the baseline field survey in which the theodolite station should be set up at the south of SKC from an un-obstructed vantage point at a height above the monitoring

area. Our monitoring team consists of one experienced theodolite operator and at least two field observers for assistance. To conduct theodolite tracking, our observers will search systematically for Finless Porpoise using the unaided eye and 7 x 50 handheld binoculars on each survey day throughout the study area. When an individual or group of porpoises is located, a theodolite tracking session will be initiated and focal follow methods will be used to track the porpoise(s). Behavioural state data (i.e. resting, milling, travelling, feeding and socializing) will also be recorded every 5 minutes for the focal individual or group. Positions of porpoises and boats will be measured using a digital theodolite connected to a laptop computer to provide information on the target's distance from shore, depth of water, distance from anthropogenic activities, and relative speeds and orientations; as well as measurements of leg (one point to other) speeds, re-orientations, distance made-good over time, and other movement related parameters.

### 6.3.6 Land-based Monitoring of Channel between the IWMF and Shek Kwu Chau

6.3.6.1 Although the trapping of marine mammals within the channel was predicted to be unlikely in the EIA report; however in view of their conservation importance, precautionary landbased monitoring of channel for potential trapping of marine mammals by site staff during operation phase should be adopted to verify the impact predication. The monitoring frequency should be once per week for duration of one year during operation phase.

6.3.6.2 Should any trapping occurs, the site staff must contact responsible parties immediately, i.e. AFCD or specialist, for rescue

### 6.3.7 Marine Mammal Exclusion Zone (MMEZ)

6.3.7.1 A monitored exclusion zone of 250m radius from silt curtain or from the boundary of a work area should be implemented under the following situations (where applicable, Marine Mammal Watching Plan shall be conducted at the meantime) :

- i. 30 minutes before commencement of and during silt curtain installation / re-installation / relocation, deep cement mixing injection works or noisy construction works (as stipulated in FEP Clause 2.25 and 2.27);
- ii. MMEZ monitoring during installation / re-installation / relocation of floating types silt curtain when opening and closing at marine access area; and
- iii. After the enclosure of floating type silt curtain at marine access area for reclamation works to implement visual inspection as detailed in paragraphs below.

The MMEZ will be carried out in order to avoid the accidental entrance and entrapment of marine mammals within the silt curtains or works area and minimize underwater acoustic

disturbance, so as for precautionary purpose for DCM works. If a marine mammal is noted within the exclusion zone, all marine works should stop immediately and remain idle for 30 minutes, or until the exclusion zone is free from marine mammals.

6.3.7.2 The experienced marine mammal observer should be well trained to detect marine mammals. Binoculars should be used to search the exclusion zone from an elevated platform with unobstructed visibility. The observer should also be independent from the project proponent and has the power to call-off construction activities.

6.3.7.3 In addition, as marine mammals cannot be effectively monitored within the proposed monitored exclusion zone at night, or during adverse weather conditions (i.e. Beaufort 5 or above, visibility of 300 meters or below), marine works should be avoided under weather conditions with low visibility.

#### 6.3.8 Marine Mammal Watching Plan (MMWP)

6.3.8.1 Upon the completion of silt curtain installation / re-installation / relocation, the marine works would be conducted within an enclosed environment within the silt curtain. Subsequently, the plan would include Visual Inspection of the Waters Surrounded by Silt Curtains (Section 2.1, MMWP) and Regular Inspection of the Deployed Silt Curtain (Section 2.1, MMWP) inspection under Marine Mammal Watching Plan (MMWP) would be implemented (where applicable, Marine Mammal Exclusion Zone shall be conducted at the meantime). Special attention would be paid to Phase 2 (reclamation) where the floating type still curtain would be opened occasionally for vessel access, leaving a temporary 50 m opening. An action plan should be devised to cope with any unpredicted incidents such as the case when marine mammals are found within the waters surrounded by the silt curtains.

#### 6.3.9 Assessment and Evaluation of Monitoring Results

6.3.9.1 A final marine mammal monitoring report should be submitted to AFCD for comments upon completion of the monitoring survey. The report should contain a summary of the survey findings during the entire monitoring programme, and assessment on the effectiveness of the mitigation measures implemented.

6.3.9.2 Evaluation of results should take natural fluctuations and accidental human-induced events (e.g. oil spill) into account. The monitoring results between the EIA study, AFCD's long term marine mammal monitoring programme, and the construction phase, should be compared. Any significant difference should be identified and evaluated.

## **6.4 Coral Monitoring Programme**

### 6.4.1 Introduction

6.4.1.1 A coral monitoring programme is recommended to verify the predicted impacts, and examine whether the mitigation measures recommended in the EIA report have been effectively implemented to protect the corals along the shore of Shek Kwu Chau from negative impacts from construction activities.

### 6.4.2 Coral Monitoring Survey

6.4.2.1 The coral monitoring programme should comprise 3 phases: pre-construction phase, construction phase, and operation phase (one year after the completion of construction works).

6.4.2.2 To monitor the health condition of corals during different phases, corals located within areas likely to be affected by the Project, and corals located at control sites (areas unlikely to be affected by the Project) should be chosen, in order to identify any adverse indirect impact from the marine works. The size, percentage cover and health condition of corals (i.e. any sign of abnormal appearance, such as layer of mucus, bleaching, partial mortality etc.) at representative transects should be recorded during each monitoring.

6.4.2.3 All monitoring should be led by suitably qualified persons with recognizable experience in coral monitoring survey. The survey methodology should remain the same during different phases, in order to allow direct comparison of coral monitoring results among different phases.

6.4.2.4 The methodology for coral monitoring programme should be consulted with the Agriculture, Fisheries and Conservation Department (AFCD) before the commencement of the monitoring programme. A more detailed coral monitoring plan, including which coral species and colonies to be monitored, methodology, monitoring frequency, and Event and Action Plan for coral monitoring should be submitted upon approval of this Project, prior to commencement of construction works.

#### Coral Survey (Donor site)

6.4.2.5 Since the visibility at SKC was very low (less than 0.5 m most of the time). An active search survey shall be conducted at the donor site at SKC as part of the detailed coral survey to locate all translocatable coral colonies.

6.4.2.6 The location of any corals shall be identified to species level as far as practicable and their locations were recorded. A specific code was assigned to each recorded coral colony.

- 6.4.2.7 The results shall be presented as a map showing the estimated locations of all coral colonies within the survey areas. The total number of coral colonies, their sizes and species shall be provided. The health condition (including percentage cover of bleaching, mortality, the degree of sedimentation) of the corals shall also be recorded and the feasibility of translocation of corals of conservation importance should be assessed.
- 6.4.2.8 Coral colonies (i.e. those attached to movable boulders with diameter <50 cm, in good health condition, and feasible for translocation) proposed to undertake translocation should be identified and mapped during the survey.
- 6.4.2.9 Upon completion of the surveys, the requirement for translocation and the required dimensions of the recipient site were identified. Based on the results of the donor site, all corals attached to movable boulders with diameter <50 cm would be considered feasible for translocation.

#### Coral Survey (Potential Recipient Sites)

- 6.4.2.10 Spot-check dive surveys covering the potential recipient sites shall be conducted. The surveys are to check the presence of coral species similar to the donor site and the presence of suitable substratum to allow the translocated boulders/rocks to be permanently stabilized. The spot-check dive surveys required suitably trained and qualified SCUBA divers and marine ecologists swimming in a search pattern, at random depths within the spot-check dive area. Subtidal substrata (hard substratum seabed) within the proposed spot-check dive area should be surveyed for the presence of coral communities. Target species parameters including estimated number of species, coral cover, partial mortality and the presence of any rare corals will also be recorded during the spot-check dive. The divers also paid attention to the presence of non-typical reef structures, unusual coral species associations, unique or peculiar assemblages of the local reef formations, and reefs that are almost completely dominated by one particular species. Data should be recorded during the dives on water proof paper in preparation for a later consolidation and analysis.
- 6.4.2.11 During the spot-check dive, the general environmental conditions of the potential recipient site should also observe (e.g. presence of healthy coral community with similar coral species as the donor site, presence of suitable substratum to allow the translocated boulders/rocks to be permanently stabilized, sufficient space to receive the newly translocated coral colonies, etc.). If the preliminary survey findings reveal that the potential recipient site is not suitable, alternative recipient site(s) should be searched.

### 6.4.3 Post-translocation Coral Monitoring Survey

- 6.4.3.1 Following coral translocation in the recipient site, the trans-located coral colonies as well as the tagged natural coral colonies at the recipient site will be monitored quarterly for one year (i.e. a total of four post-translocation monitoring). Monitoring will record the following parameters; the size, presence, survival, health conditions (percentage of mortality/bleaching) and percentage of sediment of each trans-located coral colony and each tagged natural colony. The general environmental conditions including weather, sea, and tidal conditions of the coral recipient site will also be monitored.
- 6.4.3.2 Photographic records of the trans-located and natural coral colonies will be taken as far as possible maintaining the same aspect and orientation as photographs taken for the pre-translocation surveys. All the tags for marking the trans-located and natural coral colonies will be removed / retrieved once the monitoring programme is completed.
- 6.4.3.3 If observations of any die-off / abnormal conditions of the translocated corals are made during the post-translocation monitoring, the ET should inform the Contractor, Independent Environmental Checker (IEC) and AFCD, and liaise with AFCD to investigate any mitigation measures needed.
- 6.4.3.4 Post-translocation monitoring results will be evaluated against Action and Limit Levels. Evaluation will be based on recorded changes in percentage of partial mortality of the corals. Action and Limit Levels are defined in **Table 6.1**. If defined Action Level or Limit Level for coral monitoring is exceeded, the actions as set out in **Table 6.2** will be implemented.
- 6.4.3.5 Translocated coral colonies and the tagged natural coral colonies at the recipient site will be monitored quarterly for one year.
- 6.4.3.6 The results of the post-translocation monitoring surveys should be reviewed with reference to findings of the baseline survey and the data from original colonies at the recipient site. Further monitoring of the translocated coral colonies during Construction Phase is not proposed.
- 6.4.3.7 Findings from Post-Translocation Monitoring will be presented in the Monitoring Results Section under monthly EM&A Report of the respective reporting month and submitted to EPD and AFCD after completion of each quarterly survey.



Table 6.1 Action and Limit Levels for Post-Translocation Coral Monitoring

<b>Parameter</b>	<b>Action Level Definition</b>	<b>Limit Level Definition</b>
Mortality	If during Impact Monitoring a 15% increase in the percentage of partial mortality on the corals occurs at more than 20% of the translocated coral colonies that are not recorded on the original corals at the receptor site, then the Action Level is exceeded.	If during Impact Monitoring a 25% increase in the percentage of partial mortality on the corals occurs at more than 20% of the translocated coral colonies that are not recorded on the original corals at the receptor site, then the Limit Level is exceeded.

Note: If the defined Action Level or Limit Level for coral monitoring as listed in Table 6.1 is exceeded, the actions as set out in Table 6.2 will be implemented.

Table 6.2 Event and Action Plan for Post-Translocation Monitoring

Event	Action			
	ET Leader	IEC	SO	Contractor
Action Level Exceedance	1. Check monitoring data 2. Inform the IEC, SOR ,and Contractor of the findings; 3. Increase the monitoring to at least once a month to confirm findings; 4. Propose mitigation measures for consideration	1. Discuss monitoring with the ET and the Contractor; 2. Review proposals for additional monitoring and any other measures submitted by the Contractor and advise the SOR accordingly.	1. Discuss with the IEC additional monitoring requirements and any other measures proposed by the ET; 2. Make the agreement on the measures to be implemented.	1. Inform the SOR and confirm notification of the non-compliance in writing; 2. Discuss with the ET and the IEC and propose measures to the IEC and the SOR; 3. Implement the agreed measures.
Limit Level Exceedance	1. Undertake Steps 1-4 as in the Action Level Exceedance. If further exceedance of Limit Level, propose enhancement measures for consideration.	1. Discuss monitoring with the ET and the Contractor; 2. Review proposals for additional monitoring and any other measures submitted by the Contractor and advise the SOR accordingly.	1. Discuss with the IEC additional monitoring requirements and any other measures proposed by the ET; 2. Make the agreement on the measures to be implemented.	1. Inform the SOR and confirm notification of the non-compliance in writing; 2. Discuss with the ET and the IEC and propose measures to the IEC and the SOR; 3. Implement the agreed measures.

#### 6.4.4 Coral Monitoring Methodology

##### Pre-construction Phase Monitoring

6.4.4.1 A pre-construction monitoring should be conducted before commencement of construction works, in order to confirm the locations of coral communities identified during the EIA study. Spot check dive surveys should be qualitatively conducted at the sites where corals were previously identified during the EIA study.

6.4.4.2 If corals are identified, mitigation measures for adverse water quality impact should be proposed and their effectiveness evaluated. Other than adoption of silt curtains and closed grab dredger, the possibility of coral translocation should also be considered to further minimize the adverse impacts on coral communities.

6.4.4.3 A detailed Coral Translocation Plan and coral translocation site had been approved by AFCD prior to the commencement of works.

##### Construction Phase Monitoring

6.4.4.4 Tagged coral colonies will be monitored weekly for the first month and followed by monthly monitoring for three months. Quarterly monitoring will be carried out until completion of the marine works. Bi-annual monitoring will be carried until the end of the construction phase. The proposed Control Site is located at Siu A Chau of Soko Islands about 7 km away from the project area. The detailed survey of the Control Site and Impact Site will be done before the commencement of the Construction Phase.

6.4.4.5 Monitoring will record the following parameters (using the same methodology adopted during the pre-translocation survey); the size, presence, health conditions (percentage of mortality/bleaching) and percentage of sediment of each trans-located coral colony. The general environmental conditions including weather, sea, and tidal conditions of both impact and control sites will also be monitored. Action and Limit Levels are defined in **Table 6.3**. If defined Action Level or Limit Level for coral monitoring is exceeded, the actions as set out in **Table 6.4** will be implemented.

Table 6.3 Action and Limit Levels Coral Monitoring at Construction Phase

<b>Parameter</b>	<b>Action Level Definition</b>	<b>Limit Level Definition</b>
Mortality	If during Impact Monitoring a 15% increase in the percentage of partial mortality on the corals occurs at more than 20% of the Impact Site coral colonies that are not recorded on the original corals at the Control Site, then the Action Level is exceeded.	If during Impact Monitoring a 25% increase in the percentage of partial mortality on the corals occurs at more than 20% of the Impact Site coral colonies that are not recorded on the original corals at the Control site, then the Limit Level is exceeded.

Note: If the defined Action Level or Limit Level for coral monitoring as listed in Table 6.3 is exceeded, the actions as set out in Table 6.4 will be implemented.

Operation Phase Monitoring

6.4.4.6 Upon completion of construction works, monitoring of the corals at impact site and control site should be conducted for a duration of one year after the completion of construction works. The monitoring works for corals at impact site would be conducted at bi-annual basis.

6.4.4.7 A final coral monitoring report with photos should be submitted to AFCD for comments upon completion of the post-project monitoring survey. The report should contain a summary of the activities, assessment of health conditions of the corals during the entire monitoring programme, and assessment on the effectiveness of the mitigation measures implemented.

Table 6.4 Event and Action Plan for Coral Monitoring at Construction Phase

Event	Action			
	ET Leader	IEC	SO	Contractor
Action Level Exceedance	<ol style="list-style-type: none"> <li>1. Check monitoring data</li> <li>2. Inform the IEC, SO ,and Contractor of the findings;</li> <li>3. Increase the monitoring to at least once a month to confirm findings;</li> <li>4. Propose mitigation measures for consideration</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss monitoring with the ET and the Contractor;</li> <li>2. Review proposals for additional monitoring and any other measures submitted by the Contractor and advise the SO accordingly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with the IEC additional monitoring requirements and any other measures proposed by the ET;</li> <li>2. Make the agreement on the measures to be implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the SO and confirm notification of the non-compliance in writing;</li> <li>2. Discuss with the ET and the IEC and propose measures to the IEC and the SO;</li> <li>3. Implement the agreed measures.</li> </ol>
Limit Level Exceedance	<ol style="list-style-type: none"> <li>1. Undertake Steps 1-4 as in the Action Level Exceedance. If further exceedance of Limit Level, propose enhancement measures for consideration.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss monitoring with the ET and the Contractor;</li> <li>2. Review proposals for additional monitoring and any other measures submitted by the Contractor and advise the SO accordingly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with the IEC additional monitoring requirements and any other measures proposed by the ET;</li> <li>2. Make the agreement on the measures to be implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the SO and confirm notification of the non-compliance in writing;</li> <li>2. Discuss with the ET and the IEC and propose measures to the IEC and the SO;</li> <li>3. Implement the agreed measures.</li> </ol>

## **6.5 White-bellied Sea Eagle Monitoring Programme**

- 6.5.1 Noting the recordable breeding success of the WBSE nest at Shek Kwu Chau since 2006, and the current undisturbed nature of the location of the nest; with the implementation of the proposed mitigation measures during construction and operation phase, the possibility of WBSE nest abandonment still remains.
- 6.5.2 A WBSE monitoring programme should be carried out to assess any adverse and unacceptable indirect impacts from the Project, especially for the nest of WBSE located about 60 m above ground within a hillside shrubland habitat, 130 m in-land from shore, and about 550 m away from the proposed reclaimed land, with no human access. The monitoring programme should comprise 3 phases: pre-construction phase, construction phase, and operation phase.
- 6.5.3 Reference is made to the completed monitoring programme for WBSE under EIA-041/2000 Construction of an International Theme Park in Penny's Bay of North Lantau together with its Essential Associated Infrastructures - Environmental Impact Assessment (CED, 2000).

### Pre-construction Phase Monitoring

- 6.5.4 The main objective of the pre-construction monitoring should be to verify the presence of WBSE in the Shek Kwu Chau area, as well as to confirm their breeding status and how the area is utilized by the potential breeding pair. For pre-construction phase, field surveys should be conducted once per week for a duration of three months during their breeding season (between December and May) immediately before the commencement of works. The monitoring frequency should be increased to daily during the first week of nestling period in order to collect information about their utilisation of the proposed construction site as a foraging ground.
- 6.5.5 Information to be collected should include feeding, perching/roosting, preening, soaring, flying, nesting and territorial guarding and the time spent on each activity. Other disturbances such as weather condition, or invasion by other fauna species should also be recorded.

### Construction Phase Monitoring

- 6.5.6 The objective of the construction phase monitoring should be to verify the utilisation of the area by WBSE, their responses to construction disturbance, as well as the effectiveness of the proposed mitigation measures. Throughout the construction phase, field surveys should be conducted twice per month during their core breeding season (from December to May), and once per month outside their core breeding season (from June to November). The monitoring frequency should be increased to weekly during the incubation period of each year. In order to confirm their foraging ground near the construction site, it is necessary to conduct daily monitoring during the first week of nestling period in each year.
- 6.5.7 Information to be collected should include feeding, perching/roosting, preening, soaring, flying, nesting and territorial guarding and the time spent on each activity. The responses and reactions to any disturbance to the WBSEs should also be recorded and examined in conjunction with the construction noise and/or other events in the vicinity. Other disturbances such as weather condition, or invasion by other fauna species should also be recorded.
- 6.5.8 Should the WBSE be absent for a whole day during the monitoring, an Event and Action Plan is recommended in **Table 6.5**. As the presence and breeding status of the recorded pair is to be verified during baseline monitoring, the proposed Event and Action is based on an assumption that the WBSE utilise the survey area on regular basis, and is rarely absent from their territory at Shek Kwu Chau. Nevertheless, if the assumption is proved to be different during baseline monitoring, the proposed Event and Action plan should be revised accordingly.

Table 6.5 Event and Action Plan for WBSE Monitoring during Construction Phase

Event	Action		
	Environmental Team	Audit Team	Contractor
Absence of White-bellied Sea Eagle during a whole day of monitoring.	Inform audit team.  Increase monitoring frequency to daily.	Inform site engineer and contractor.  If the absence remains: <ul style="list-style-type: none"> <li>• Review construction activities and noise monitoring records of the associated period;</li> <li>• Identify potential causes of the absence;</li> <li>• Propose remedial measures, such as change of construction method and sequence;</li> <li>• Confirm the feasibility of the proposed remedial measures with site engineer and contractor;</li> <li>• Discuss with environmental team about the effectiveness of the proposed remedial measures.</li> </ul>	Implement the agreed remedial measures.

6.5.9 To minimize disturbance on nestling stage of WSBE, restriction on vessel travel within the foraging ground during nestling period would be adopted. The foraging ground utilized by WBSE during nestling period should also be identified in the monitoring.

Operation Phase Monitoring

6.5.10 During operation phase, field surveys should be conducted twice per month during their core breeding season (from December to May), and once per month outside their core breeding season (June to November), for a duration of two years. The objective of the operation phase monitoring should be to verify the utilisation of the area by WBSE, their responses to operation disturbance, as well as the effectiveness of the proposed mitigation measures.

6.5.11 Information to be collected should include behaviour (e.g. foraging, territory fending), breeding activity, and any observable response to disturbances. Any observable responses to disturbances



should be assessed, taking into account of the human induced activities occurring at the time, as well as other disturbances such as weather condition, or invasion by other fauna species.

6.5.12 Should the WBSE be absent for a whole day during the monitoring, an Event and Action Plan is recommended in **Table 6.6**. As the presence and breeding status of the recorded pair is to be verified during baseline monitoring, the proposed Event and Action is based on an assumption that the WBSE often utilise the survey area, and is rarely absent from their territory at Shek Kwu Chau. Nevertheless, if the assumption is proved to be different during baseline monitoring, and that if any specific scenario occurs during construction phase (e.g. abandonment of Shek Kwu Chau nest), the proposed Event and Action plan should be revised accordingly.

Table 6.6 Event and Action Plan for WBSE Monitoring during Operation Phase

Event	Action	
	Environmental Team	Project Proponent
Absence of White-bellied Sea Eagle during a whole day of monitoring.	<p>Inform Project Proponent and the IWMF Operator</p> <p>Increase monitoring frequency to daily.</p> <p>If the absence remains:</p> <ul style="list-style-type: none"> <li>• Identify potential causes for the absence;</li> <li>• Propose remedial measures, such as alteration in travel route of vessels;</li> <li>• Confirm the feasibility of the proposed remedial measures with Project Proponent and the IWMF Operator;</li> </ul> <p>Upon the implementation of the proposed remedial measures, report to Project Proponent and the IWMF Operator on sighting of WBSE.</p>	<p>Initiate increase of monitoring frequency by Environmental Team.</p> <p>If the absence remains:</p> <ul style="list-style-type: none"> <li>• Review the IWMF operation, attempt to identify sources and causes of disturbance;</li> <li>• Discuss and confirm on the feasibility of the proposed remedial measures from Environmental Team;</li> <li>• Implement the proposed remedial measures with the IWMF Operator;</li> </ul> <p>Follow up on the effectiveness of the implemented remedial measures with Environmental Team.</p>

6.5.13 A more detailed WBSE monitoring programme, including confirmation of location and status of breeding nest, commencement dates for monitoring, and detailed survey methodology in relation to the latest location of breeding nest etc., should be submitted upon approval of this Project, prior to commencement of construction works. Advice from relevant governmental departments (i.e. AFCD) and professionals would be sought after, in order to identify an effective practice for monitoring of WBSE.

## 6.6 Reference

- 6.6.1 AFCD (2017). Monitoring of Marine Mammals in Hong Kong Waters (2016-2017), Final Report. Agriculture, Fisheries and Conservation Department, Hong Kong
- 6.6.2 AFCD (2010a). Monitoring of Marine Mammals in Hong Kong Waters – Data Collection (2009-2010), Final Report. Agriculture, Fisheries and Conservation Department, Hong Kong.
- 6.6.3 AFCD (2010b). Breeding Ecology of White-bellied Sea Eagle (*Haliaeetus leucogaster*) in Hong Kong – A review and Update. Hong Kong Biodiversity – Agriculture, Fisheries and Conservation Department Newsletter, Issue No. 18, February 2010. Agriculture, Fisheries and Conservation Department, Hong Kong.
- 6.6.4 CED (2000). Construction of an International Theme Park in Penny's Bay of North Lantau together with its Essential Associated Infrastructures - Environmental Impact Assessment. Civil Engineering Department, Hong Kong.
- 6.6.5 HyD (2009). EIA-172/2009 Hong Kong - Zhuhai - Macao Bridge Hong Kong Link Road. Highways Department, Hong Kong.
- 6.6.6 Lam, K.K.Y. (2000). Sexual reproduction of a low-temperature tolerant coral *Oulastrea crispata* (Scleractinia, Faviidae) in Hong Kong, China. Marine Ecology Progress Series vol.205: 101-111.
- 6.6.7 Storlazzi, Curt D. Michael E. Field, Andrea S. Ogston, Joshua B. Logan, M. Kathy .Presto and Dave G. Gonzales 2004. Coastal Circulation and Sediment Dynamics along West Maui, Hawaii Part III: Flow and Particulate Dynamics during the 2003 Summer Coral Spawning Season.

## **7 FISHERIES IMPACT**

During construction phase, permanent loss of about 30 ha of fishing ground, and 15.5 ha of fisheries spawning and nursery ground is expected to arise under the Project. Indirect impact on fisheries due to elevation in suspended solids level would be temporary and localized. Mitigation measures including adoption of silt curtain and phasing of marine works have been recommended to minimize adverse impact on water quality as well as to protect fisheries resources.

During operation phase, potential impact from impingement and entrainment of fisheries resources through a water intake point would be minimized, by provision of screen at the seawater intake, in order to minimize the uptake of fisheries resources.

With the proper implementation of the recommended mitigation measures, potential impact on fisheries due to Project is considered to be minimized and acceptable. As mentioned in the EIA report, no further monitoring and audit for fisheries are required.

## **8 HEALTH IMPACT**

The predicted health risk levels for the Project as presented in the EIA Report complied with the proposed criteria at all receptors. No adverse human health risk impact is expected. Therefore no monitoring and audit programme on health risk would be required.

## 9 LANDSCAPE AND VISUAL IMPACT

### 9.1 Introduction

9.1.1 EM&A for landscape and visual resources shall be undertaken by the contractor during the design and construction and operation phases of the Project. This section presents the requirements of the baseline review, and the monitoring of the design, implementation and maintenance of the landscape and visual mitigation measures during the design, construction and operation phases of the Project.

### 9.2 Mitigation Measures

9.2.1 The landscape and visual impact assessment of the EIA Study recommended a series of mitigation measures to ameliorate the landscape and visual impacts of the Project. The measures for the construction and operation phases as recommended in the EIA Report are summarized in **Table 9.1**.

Table 9.1 Recommended Landscape and Visual Mitigation Measures

ID. No.	Landscape and Visual Mitigation Measure
During Construction Phase	
Mitigation for both Landscape & Visual Impacts	
MLVC-01	Grass-hydroseeded bare soil surface and stock pile area.
MLVC-02	Landscape Design 1) Early planting using fast grow trees and tall shrubs at strategic locations within site as buffer to block view corridors to the site from the VSRs, and to locally screen haul roads, excavation works and site preparation works. 2) Use of tree species of dense tree crown to serve as visual barrier. 3) Hard and soft landscape treatment (e.g. trees and shrubs) of open areas within development to provide a background for the outdoor containers from open view, shade and shelter, and a green appearance from surrounding viewpoints. 4) Planting strip along the periphery of the project site. 5) Selected tree species suitable for the coastal condition.
MLVC-03	Adoption of Natural Features of the Existing Shoreline 1) Use of boulders in different sizes and with the similar textures of the existing rocky shores for the construction of breakwater and artificial shoreline in order to blend into the existing natural shoreline.

	2) Use of cellular cofferdam together with the natural boulders to form a curvature shoreline for the reclamation area to echo with the natural shoreline of SKC.
MLVC-04	<p>Greening Design (Rooftop &amp; Vertical Greening)</p> <p>1) Implementation of rooftop and vertical greening (vertical building envelope) along the periphery of each building block to increase the amenity value of the work, moderate temperature extremes and enhance building energy performance. The greening appearance of the building shall enhance its visual harmony with the natural surroundings as well as reduce the apparent visual mass of the structure.</p> <p>2) Sufficient space between concrete enclosure and stack to minimize heat transfer.</p> <p>3) Introduction of landscape decks at the stack to further enhance the overall natural and green concept unique for this site.</p>
Mitigation for Visual Impacts	
MVC-01	<p>Visual Mitigation and Aesthetic Design</p> <p>1) Use of natural materials with recessive color to minimize the bulkiness of the building.</p> <p>2) Adoption of innovative aesthetic design to the chimney to minimize or visually mitigate the massing of the chimney so as to reduce its visual impact to the surroundings.</p> <p>3) Color of the chimney in a gradual changing manner to match with the color of the sky.</p> <p>4) Provision of observation deck for public enjoyment at the top of the chimney to diminish the feeling of chimney.</p> <p>5) Provision of sky gardens between the two stacks to allow additional greening for enhancing the aesthetic quality. Maintenance access (elevator and staircase) from the ground floor to the sky gardens will be provided to allow maintenance of the sky gardens.</p> <p>6) Integration of the visitor’s walkway with different material façade design of incinerator plant to enhance the aesthetic quality.</p>
MVC-02	Security floodlight for construction areas shall be controlled at night to avoid excessive glare to the surrounding receiver.
MVC-03	The construction sequence and construction programme shall be optimized in order to minimize the duration of impact.
MVC-04	The backfilling materials for site formation & construction materials / wastes on site shall be stored at a maximum height of 2m and covered with an impermeable material of visually un-obtrusive material (in

	earth tone).
MVC-05	The number of construction traffic to / from the project site shall be maintained to practical minimum.
During Operation Phase	
Mitigation for both Landscape & Visual Impacts	
MLVC-01	<u>Planting Maintenance</u> Provision of proper planting maintenance and replacement of defective plant species on the new planting areas to enhance aesthetic and landscape quality.
Mitigation for Visual Impacts	
MVO-01	<u>Environmental Education Centre</u> Development of an Environmental Education Center, in which regular exhibitions and lectures to promote environmental awareness and waste reduction concept would be provided, as a part of the IWMF for the general public to alleviate negative public perceptions of the development.
MVO-02	<u>Control of Light</u> Control the numbers of lights and their intensity to a level that is good enough to meet the safety requirements at night but not excessive.
MVO-03	<u>Control of Operation Time</u> Minimization of the frequency of waste transportation to practical minimum (e.g. limit the reception of MSW from 8 am to 8 pm)

9.2.2 The mitigation measures during construction shall be implemented from the commencement of the works and shall be applied for the whole duration of the construction period. The mitigation measures during operation will be included in the detailed design and shall be constructed or built up during the construction. Management and maintenance for all mitigation measures shall follow ETWB TCW No. 2/2004 Maintenance of Vegetation and Hard Landscape Features. The mitigation measures during operation will be included in the detailed design and shall be constructed or built up during the construction.

### 9.3 Baseline Review

9.3.1 A baseline review shall be undertaken by the Contractor prior to the commencement of the construction works. The purposes of the review are as follows:-



- To check the status and any changes of the baseline Landscape Resources, Landscape Character areas and Visually Sensitive Receivers (VSRs) within and immediately adjacent to the works areas;
- To determine whether amendments in the design of the landscape and visual mitigation measures are required; and
- To recommend any necessary amendments to the design of the landscape and visual mitigation measures due to the above changes, if any.

9.3.2 Any changes to the mitigation measures that may be recommended as a result of the baseline review shall be taken into account.

#### **9.4 Design Phase Audit**

9.4.1 The contractor shall incorporate the recommended mitigation measures in the detailed design and shall ensure the potential conflicts of the mitigation measures with the works under the Project and other interfacing projects are resolved prior to construction.

9.4.2 Audits of the detailed design against the recommendations of the landscape and visual impact assessments within the EIA should be undertaken by a Registered Landscape Architect (RLA), who should ensure the fulfilment of the intentions of landscape mitigation measures, and a Registered Architect (RA), who should ensure the fulfilment of the intentions of visual mitigation measures.

#### **9.5 Construction and Operation Phase Audit**

9.5.1 A specialist Landscape Sub-Contractor (on the approved Government list) shall be employed by the contractor for the implementation of landscape establishment works and the compensatory planting, as well as the subsequent maintenance operations during the one-year maintenance period which will be the first operational year of the Project.

9.5.2 All landscape measures undertaken by both the Contractor and the specialist Landscape Sub-Contractor during the construction phase and the first year of the operation phase shall be audited by a Registered Landscape Architect on a regular basis to ensure compliance with the intended aims of the measures and the effectiveness of the mitigation measures. Site inspections should be undertaken at least once every two weeks throughout the construction period, and once every month during the first operational year. After the one-year maintenance period, the landscape maintenance and monitoring shall be carried out by the Contractor.

- 9.5.3 All visual measures undertaken by the contractor and the specialist Landscape Sub- Contractor during the construction phase and the first year of the operation phase shall be audited by a Registered Architect on a regular basis to ensure compliance with the intended aims of the measures and the effectiveness of the mitigation measures. Site inspections should be undertaken at least once every two weeks throughout the construction period, and once every month during the first operational year.
- 9.5.4 If there is repeated non-compliance of the landscape and visual mitigation measures, EPD shall be notified as necessary.

## **10 IMPACT ON CULTURAL HERITAGE**

Based on the results of the desktop review and survey, no archaeological site was identified within the study area. No adverse archaeological impact is expected.

With regards to built heritage, one grade 3 and four other built heritage structures with no grading are identified in the area. However, due to large separation between the built heritages and the IWMF, no adverse impacts during the construction and operation phases are anticipated.

Therefore, no monitoring and audit programme on cultural heritage would be required.

## **11 SITE ENVIRONMENTAL AUDIT & ENVIRONMENTAL COMPLAINTS**

### **11.1 Site Inspection**

11.1.1 Site inspection provides a direct means to initiate and enforce specified environmental protection and pollution control measures. These should be undertaken routinely to inspect construction activities in order to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented. The site inspection is one of the most effective tools to enforce the environmental protection requirements at the works area.

11.1.2 The ET Leader should be responsible for formulating the environmental site inspection, the deficiency and action reporting system, and for carrying out the site inspection works. He / she should submit a proposal for site inspection and deficiency and action reporting procedures to the Contractor for agreement, and to the SO for approval. The ET's proposal for rectification would be made known to the IEC.

11.1.3 Regular site inspections should be carried out at least once per week. The areas of inspection should not be limited to the environmental situation, pollution control and mitigation measures within the site, the site inspections should also review the environmental situation outside the works area which is likely to be affected, directly or indirectly, by the site activities. The ET Leader should make reference to the following information in conducting the inspection:-

- The EIA and EM&A recommendations on environmental protection and pollution control mitigation measures (including e.g. dust control measures and good site practice measures for ecological impact);
- Ongoing results of the EM&A programme;
- Work progress and programme;
- Individual work methodology proposals (which shall include proposal on associated pollution control measures);
- Contract specifications on environmental protection;
- Relevant environmental protection and pollution control laws; and
- Previous site inspection results undertaken by the ET and others.

11.1.4 The Contractor should keep the ET Leader updated with all relevant information on the construction contract necessary for him / her to carry out the site inspections. Inspection results and associated recommendations for improvements to the environmental protection and pollution control works should be submitted to the IEC and the Contractor within 24 hours for reference and for taking immediate action. The Contractor should follow the procedures and

time-frame as stipulated in the deficiency and action reporting system formulated by the ET Leader to report on any remedial measures subsequent to the site inspections.

- 11.1.5 The ET should also carry out ad hoc site inspections if significant environmental problems are identified. Inspections may also be required subsequent to receipt of environmental complaint, or as part of the investigation work, as specified in the Action Plan for environmental monitoring and audit.
- 11.1.6 As per the Further Environmental Permit (FEP) requirements under Clause 2.21A, when carrying out the dredging works, the ET shall conduct daily site audit and monitoring. The following mitigation measures shall be strictly followed. As per the FEP Clause 2.18, dredging shall only be carried out by closed grab dredger(s), each with grab size of not more than 2m<sup>3</sup>. For area between 16m and 50m away from the nearest non-translocatable coral community, the maximum daily dredging rate shall not exceed 60 m<sup>3</sup>; for area between 50m and 100m away from the nearest non-translocatable coral community, the maximum daily dredging rate shall not exceed 380 m<sup>3</sup>. The dredging rate shall also refer to the approved Supporting Document for Reviewing Dredging Rate and Filling Rate in which combinations of on-site construction works and arrangement of deploying silt curtain for coral protection would be taken into consideration for adjusting the dredging rate. Each grab shall be enclosed by silt curtain. No dredging shall be carried out within 16m to the nearest non-translocatable coral colony/ colonies. As per Environmental Impact Assessment Report Section 5b.7.3.29, daily site audit including on-site monitoring by the ET is recommended during the dredging for anti-scouring layer protection for checking the compliance with the permitted number of grab to be performed per hour by the dredging contractor. All barges for transporting dredged/ waste materials shall be fitted with tight bottom seals to prevent leakage of materials during loading and transportation. If any of these measures are not complied with, ET shall give instructions to the Contractor to stop the Works and perform remedial actions.

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

- 11.2.1 There are contractual environmental protection and pollution control requirements as well as environmental protection and pollution control laws in Hong Kong with which construction activities must comply.
- 11.2.2 In order to ensure that the works are undertaken in compliance with the contractual requirements on environmental aspects, all works method statements submitted by the Contractor to the SO for approval should be sent to the ET Leader for vetting to see whether sufficient environmental protection and pollution control measures have been included. The

implementation schedule of mitigation measures is summarised in **Appendix 11.1**

- 11.2.3 The ET Leader should also 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 laws could be prevented.
- 11.2.4 The Contractor should regularly copy relevant documents to the ET Leader so that works checking could be carried out. The document should at least include the updated Works Progress Reports, updated Works Programme, any application letters for different licences / permits under the environmental protection laws, and copies of all valid licences/ permits. The site diary should also be available for the ET Leader's inspection upon his / her request.
- 11.2.5 After reviewing the documentation, the ET Leader should advise the IEC and the Contractor of any non-compliance with contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the ET Leader's review concludes that the current status on licence / permit application and any environmental protection and pollution control preparation works may result in potential violation of environmental protection and pollution control requirements, he / she should also advise the Contractor and the SO accordingly.
- 11.2.6 Upon receipt of the advice, the Contractor should undertake immediate action to correct the situation. The SO should follow up to ensure that appropriate action has been taken to satisfy contractual and legal requirements.

### **11.3 Environmental Complaint**

- 11.3.1 Complaints should be referred to the ET Leader for action. The ET Leader should undertake the following procedures upon receipt of any complaint:
- log complaint and date of receipt onto the complaint database and inform the IEC immediately;
  - investigate the complaint to determine its validity, and assess whether the source of the problem is due to works activities;
  - identify mitigation measures in consultation with the IEC if a complaint is valid and due to works;
  - advise the Contractor if mitigation measures are required;
  - review the Contractor's response on the identified mitigation measure(s) and the updated situation;

- if the complaint is transferred from the EPD, submit interim report to the EPD on status of the complaint investigation and follow-up action within the time frame assigned by the EPD;
- undertake additional monitoring and audit to verify the situation if necessary, and review that circumstances leading to the complaint do not recur;
- report investigation results and subsequent actions to complainant (if the source of complaint is EPD, the results should be reported within the timeframe assigned by the EPD); and
- record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports.

11.3.2 A flowchart indicating the complaint handling procedures is presented in **Figure 12.1**.

## **12 REPORTING**

### **12.1 General**

12.1.1 The EM&A reporting shall be carried out in paper based plus electronic submission upon agreeing the format with the SO and EPD. All the monitoring data (baseline and impact) shall also be submitted in CD-ROM.

12.1.2 Types of reports that the ET Leader should 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 should be made available to the Director of Environmental Protection.

### **12.2 Baseline Monitoring Report**

12.2.1 The ET Leader should 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 should be submitted to the Contractor, the IEC, the SO and the EPD. The ET Leader should liaise with the relevant parties on the exact number of copies they require. The report format and baseline monitoring data format should be agreed with the EPD prior to submission.

12.2.2 The baseline monitoring report should include at least the followings:

- up to half a page executive summary;
- brief project background information;
- drawings showing locations of the baseline monitoring stations;
- monitoring results (in both hard and soft copies) together with the following information:
  - monitoring methodology;
  - types of equipment used and calibration details;
  - parameters monitored;
  - monitoring locations;
  - monitoring date, time, frequency and duration; and
  - quality assurance (QA) / quality control (QC) results and detection limits
- details 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;
- determination of the action and limit levels for each monitoring parameter and statistical analysis of the baseline data, the analysis should conclude if there is any significant difference between control and impact stations for the parameters monitored;
- revisions for inclusion in the EM&A Manual; and
- comments, recommendations and conclusions.

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

### 12.3.1 Introduction

12.3.1.1 The results and findings of all EM&A work required in the Manual should be recorded in the monthly EM&A reports prepared by the ET Leader. The EM&A report should 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 should be submitted to the following parties: the Contractor, the IEC, the SO and the EPD. Before submission of the first EM&A report, the ET Leader should liaise with the parties on the required number of copies and format of the monthly reports in both hard copy and electronic medium.

12.3.1.2 The ET leader should 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.

### 12.3.2 First Monthly EM&A Report

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

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

- environmental status:
  - works undertaken during the month with illustrations (such as location of works); 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).
- 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 Final Report; and
  - environmental requirements in contract documents.
- implementation status:
  - advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA Final Report.
  - monitoring results (in both hard and soft copies) together with the following information:
    - monitoring methodology;
    - name of 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.
- 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.

- 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 Monthly EM&A Reports

#### 12.3.2.2 Subsequent monthly EM&A reports should include the following:

- executive summary (1 - 2 pages):
  - breaches of Action and Limit levels;
  - complaints log;
  - notifications of any summons and successful prosecutions;
  - reporting changes; and
  - future key issues.
- environmental status:
  - works undertaken during the month with illustrations (such as location of works etc.); and
  - drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.
- implementation status:
  - advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA.
- monitoring results (in both hard and soft copies) together with the following information:
  - monitoring methodology;
  - name of 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.
- 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.
- 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.
  - 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:
      - major activities being carried out on site during the period;
      - weather conditions during the period; and
      - 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.

## 12.4 Quarterly EM&A Summary Reports

12.4.1 A quarterly EM&A summary report of around five pages should be produced and should contain at least the following information.

- up to half a page executive summary;
- basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of works undertaken during the quarter;
- 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;

- 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;
- drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- 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;
  
- advice on the solid and liquid waste management status;
- a summary of non-compliance (exceedances) of the environmental quality performance limits (action and limit levels);
- a brief review of the reasons for and the implications of any non-compliance, including a review of pollution sources and working procedures;
- a summary description of actions taken in the event of non-compliance and any follow-up procedures related to any earlier non-compliance;
- a summarised record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- comments (for examples, a review of the effectiveness and efficiency of the mitigation measures); recommendations (for example, any improvement in the EM&A programme) and conclusions for the quarter; and
- proponents' contacts and any hotline telephone number for the public to make enquiries.

## **12.5 Final EM&A Review Report**

12.5.1 The final EM&A report should include, inter alia, the following information:

- an executive summary;
- drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- basic project information including a synopsis of the project organisation, contacts of key management, and a synopsis of work undertaken during the entire construction period;
- 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;
- Event-Action Plans.
- 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;
- graphical plots of the trends of monitored parameters over the construction period for representative monitoring stations, including the post-project monitoring 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.
- a summary of non-compliance (exceedances) of the environmental quality performance limits (action and limit levels);
- a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate;
- a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;
- a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- a summary record of notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, locations and nature of the breaches, investigation, follow-up actions taken and results;
- a review of the validity of EIA predictions and identification of shortcomings in EIA recommendations;
- 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); and
- 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 mitigation action when necessary).

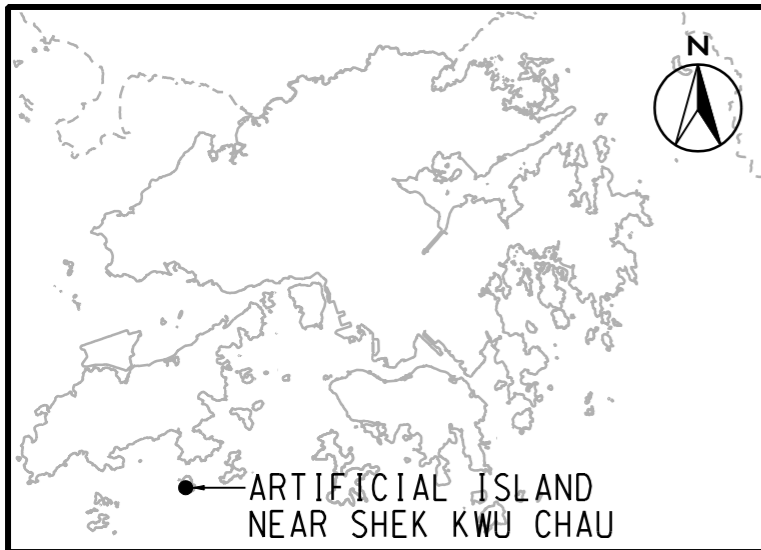
## **12.6 Data Keeping**

12.6.1 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 should be well kept by the ET Leader and be ready for inspection upon request. All relevant information should be clearly and systematically recorded in the document. Monitoring data should also be recorded in magnetic media form, and the software copy must be available upon request. Data format should be agreed with EPD. All documents and data

should be kept for at least one year following completion of the construction contract.

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

12.7.1 With reference to the Event and Action Plan, when the environmental quality performance limits are exceeded, the ET Leader should immediately notify the IEC and EPD, as appropriate. The notification should 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 12.1**.



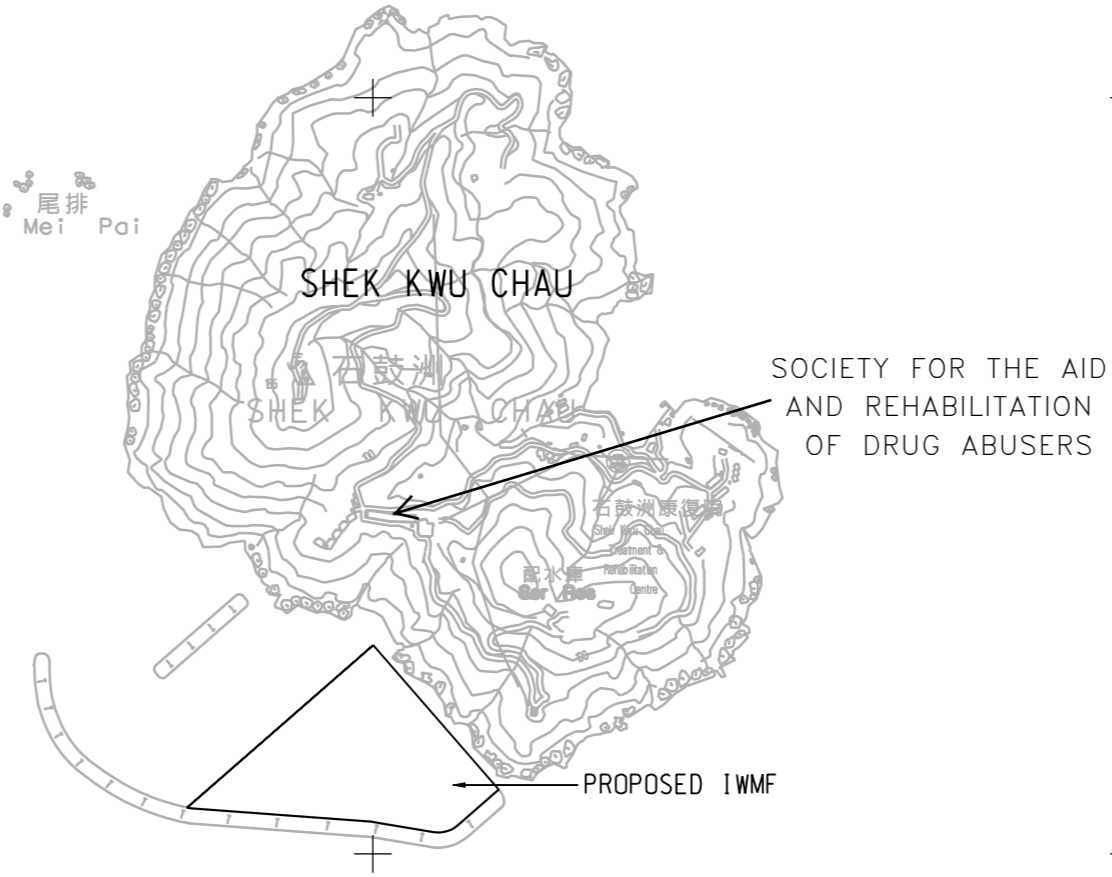
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SOCIETY FOR THE AID  
AND REHABILITATION  
OF DRUG ABUSERS

PROPOSED IWMF

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
























AGREEMENT NO. CE 29/2008 (EP)  
ENGINEERING INVESTIGATION AND ENVIRONMENTAL STUDIES FOR INTEGRATED WASTE MANAGEMENT FACILITIES PHASE 1 - FEASIBILITY STUDY

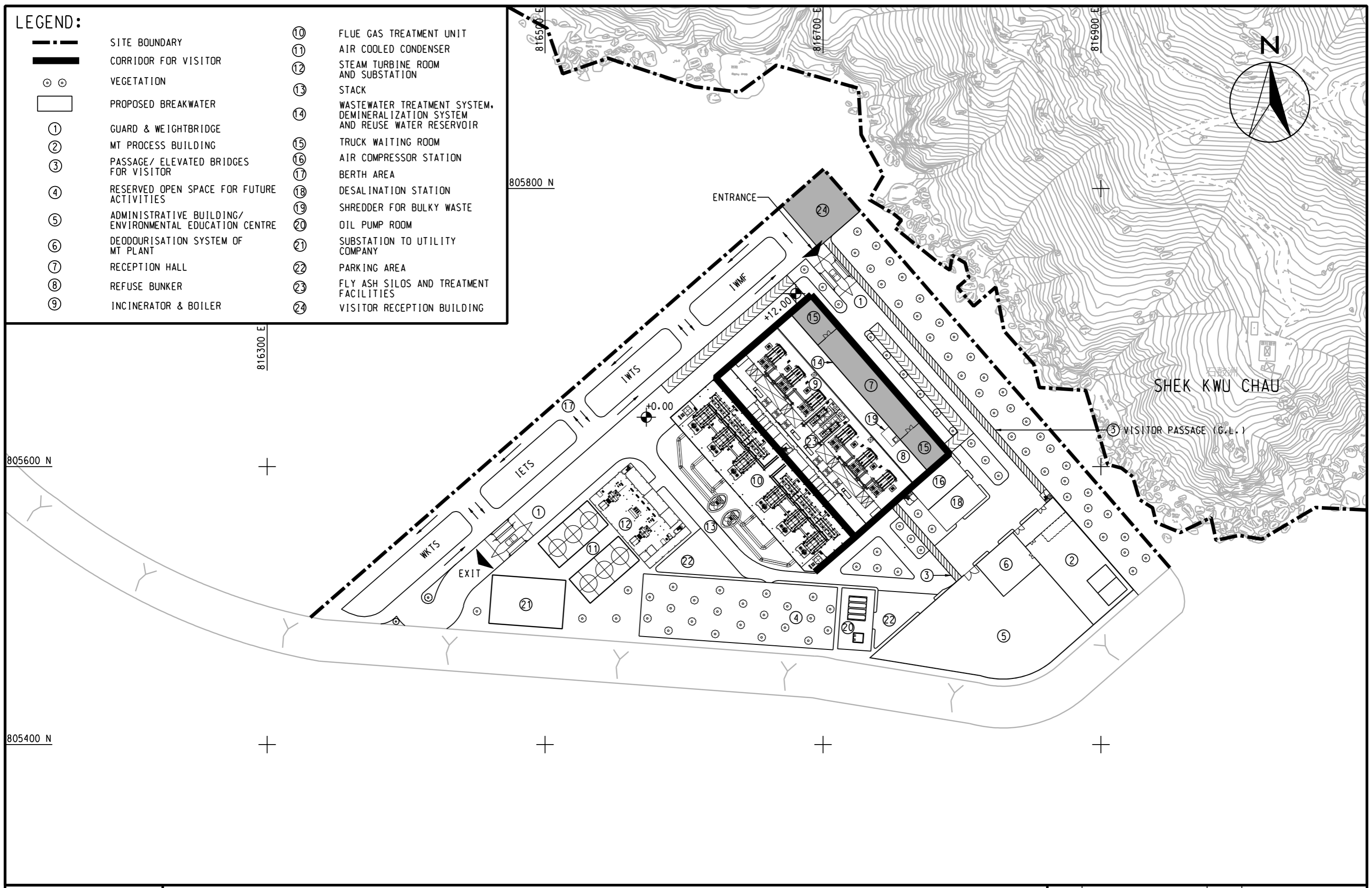
LOCATION OF THE IWMF AT THE ARTIFICIAL ISLAND NEAR SHEK KWU CHAU

SCALE	A3 1 : 15000	DATE	JAN. 2011
CHECK	-	DRAWN	GHX
JOB No.	60051148	DRAWING No.	FIGURE 1.1
		REV	-



**LEGEND:**

-  SITE BOUNDARY
-  CORRIDOR FOR VISITOR
-  VEGETATION
-  PROPOSED BREAKWATER
-  ① GUARD & WEIGHTBRIDGE
-  ② MT PROCESS BUILDING
-  ③ PASSAGE/ ELEVATED BRIDGES FOR VISITOR
-  ④ RESERVED OPEN SPACE FOR FUTURE ACTIVITIES
-  ⑤ ADMINISTRATIVE BUILDING/ ENVIRONMENTAL EDUCATION CENTRE
-  ⑥ DEODOURISATION SYSTEM OF MT PLANT
-  ⑦ RECEPTION HALL
-  ⑧ REFUSE BUNKER
-  ⑨ INCINERATOR & BOILER
-  ⑩ FLUE GAS TREATMENT UNIT
-  ⑪ AIR COOLED CONDENSER
-  ⑫ STEAM TURBINE ROOM AND SUBSTATION
-  ⑬ STACK
-  ⑭ WASTEWATER TREATMENT SYSTEM, DEMINERALIZATION SYSTEM AND REUSE WATER RESERVOIR
-  ⑮ TRUCK WAITING ROOM
-  ⑯ AIR COMPRESSOR STATION
-  ⑰ BERTH AREA
-  ⑱ DESALINATION STATION
-  ⑲ SHREDDER FOR BULKY WASTE
-  ⑳ OIL PUMP ROOM
-  ㉑ SUBSTATION TO UTILITY COMPANY
-  ㉒ PARKING AREA
-  ㉓ FLY ASH SILOS AND TREATMENT FACILITIES
-  ㉔ VISITOR RECEPTION BUILDING

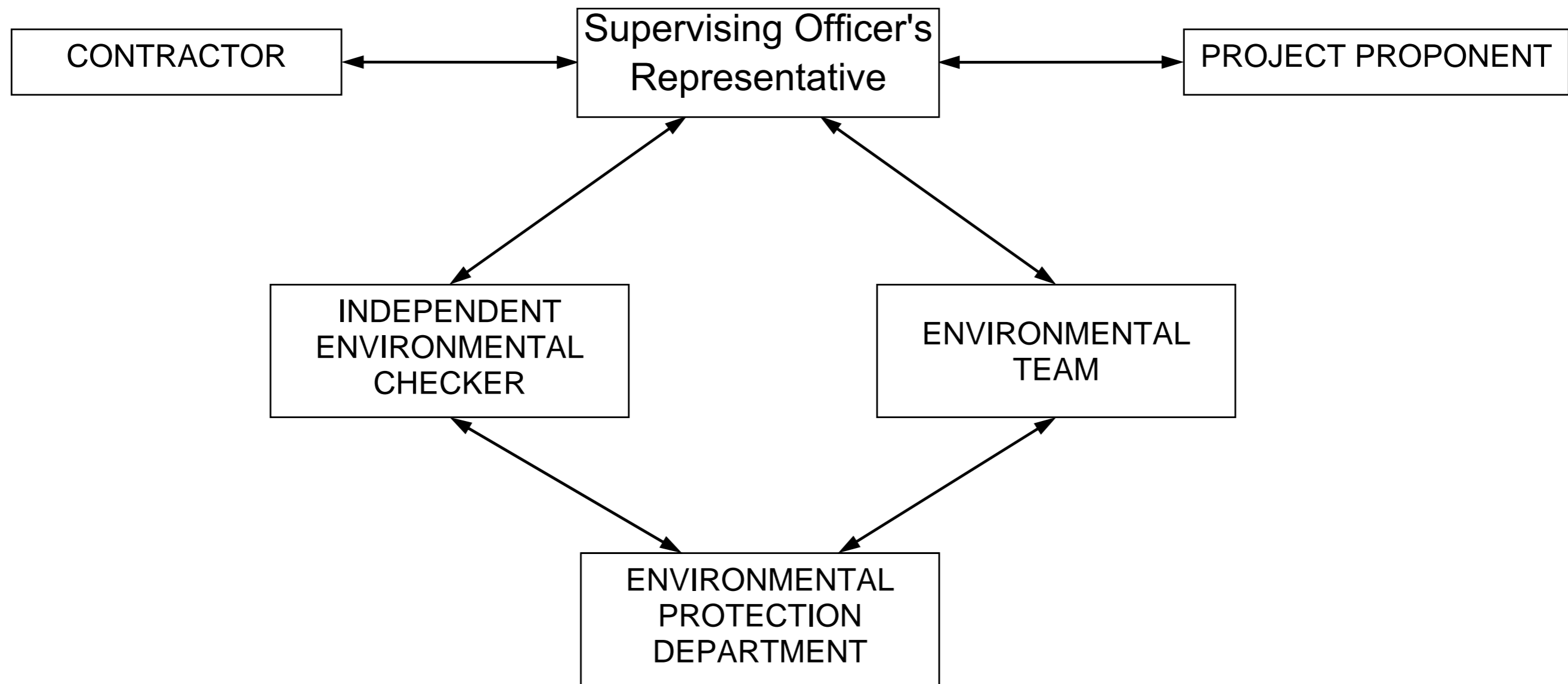


DATE: 2011-1-25 wux3



AGREEMENT NO. CE 29/2008 (EP)  
 ENGINEERING INVESTIGATION AND ENVIRONMENTAL STUDIES FOR INTEGRATED WASTE MANAGEMENT FACILITIES PHASE 1 - FEASIBILITY STUDY  
**GENERAL LAYOUT OF THE IWMF AT THE ARTIFICIAL ISLAND NEAR SHEK KWU CHAU**

SCALE	A3 1 : 2500	DATE	JAN. 2011
CHECK	-	DRAWN	LJP
JOB No.	60051148	DRAWING No.	FIGURE 1.2
		REV	-

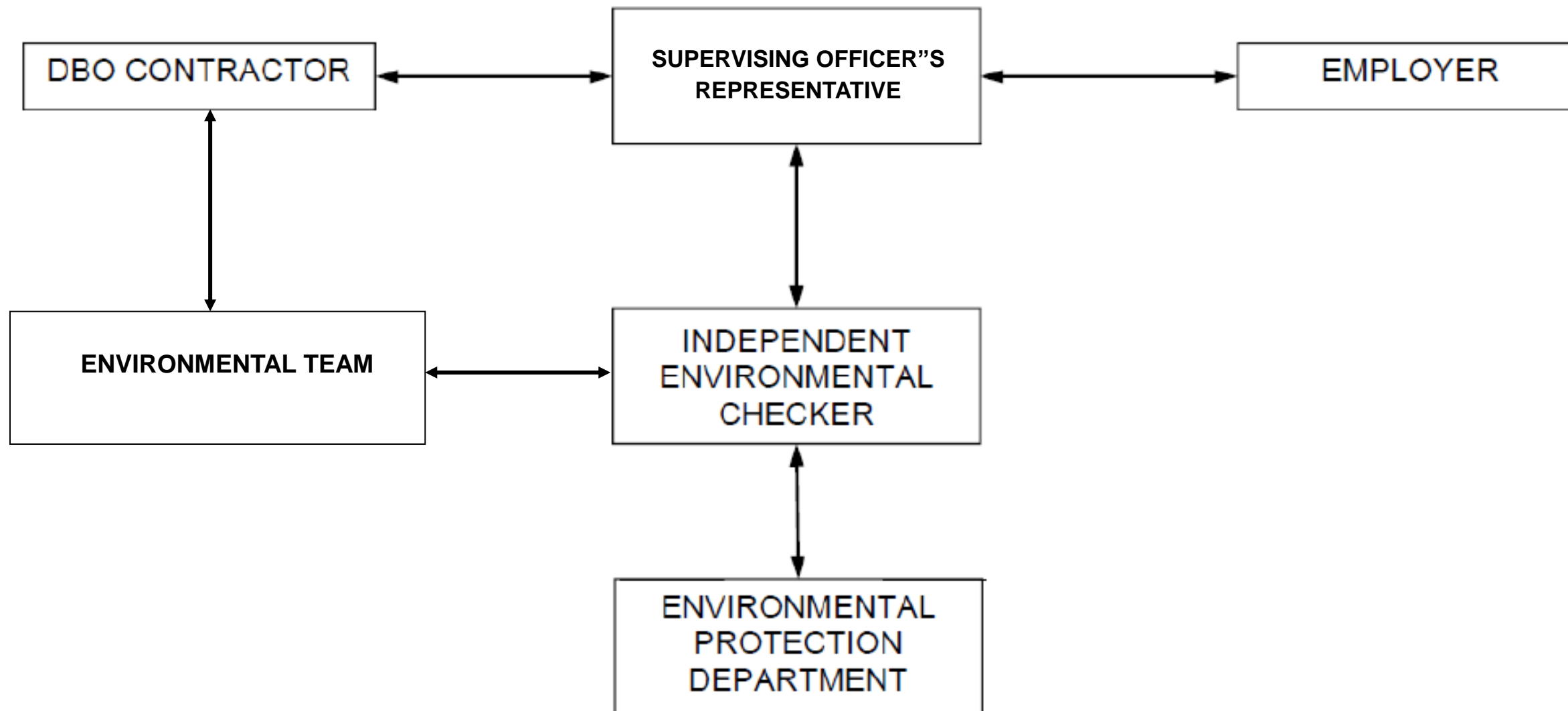


**LEGEND:**  
 ↔ LINE OF COMMUNICATION



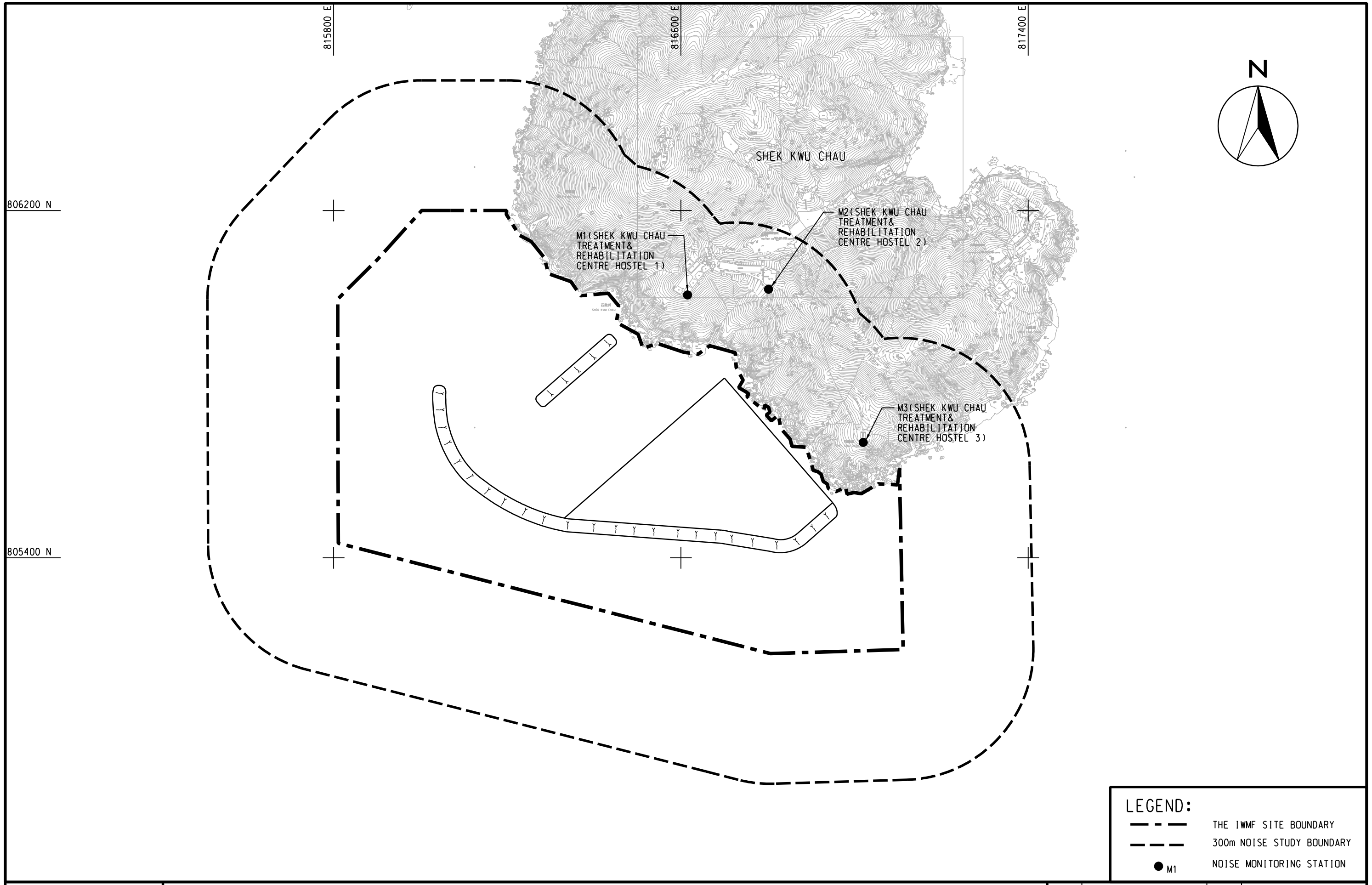
Agreement No. CE 29/2008 (EP)  
 Engineering Investigation and Environmental Studies for IW MF  
 Phase 1 - Feasibility Study  
**Project Organization - EM&A Programme For Construction Phase**

SCALE	N.T.S.	DATE	JAN 11
CHECK	SWCW	DRAWN	ILPY
JOB No.	60051148	DRAWING NO.	REV.
		FIGURE 1.3	-



**LEGEND:**

↔ LINE OF COMMUNICATION



**LEGEND:**

	THE IWMF SITE BOUNDARY
	300m NOISE STUDY BOUNDARY
	M1 NOISE MONITORING STATION

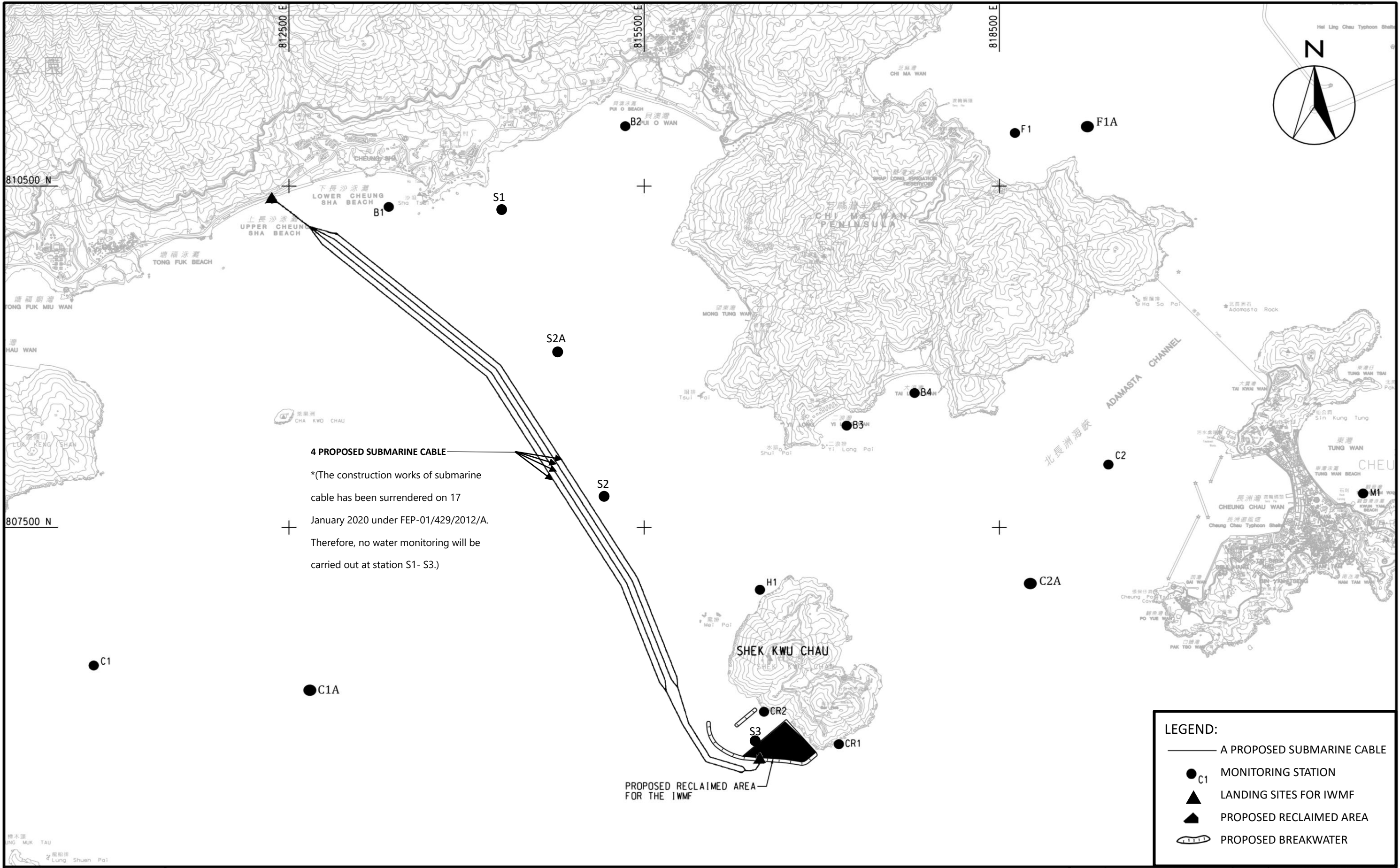
ENGINEERING INVESTIGATION AND ENVIRONMENTAL STUDIES FOR INTEGRATED WASTE MANAGEMENT FACILITIES PHASE I - FEASIBILITY STUDY

THE LOCATIONS OF CONSTRUCTION NOISE MONITORING STATIONS

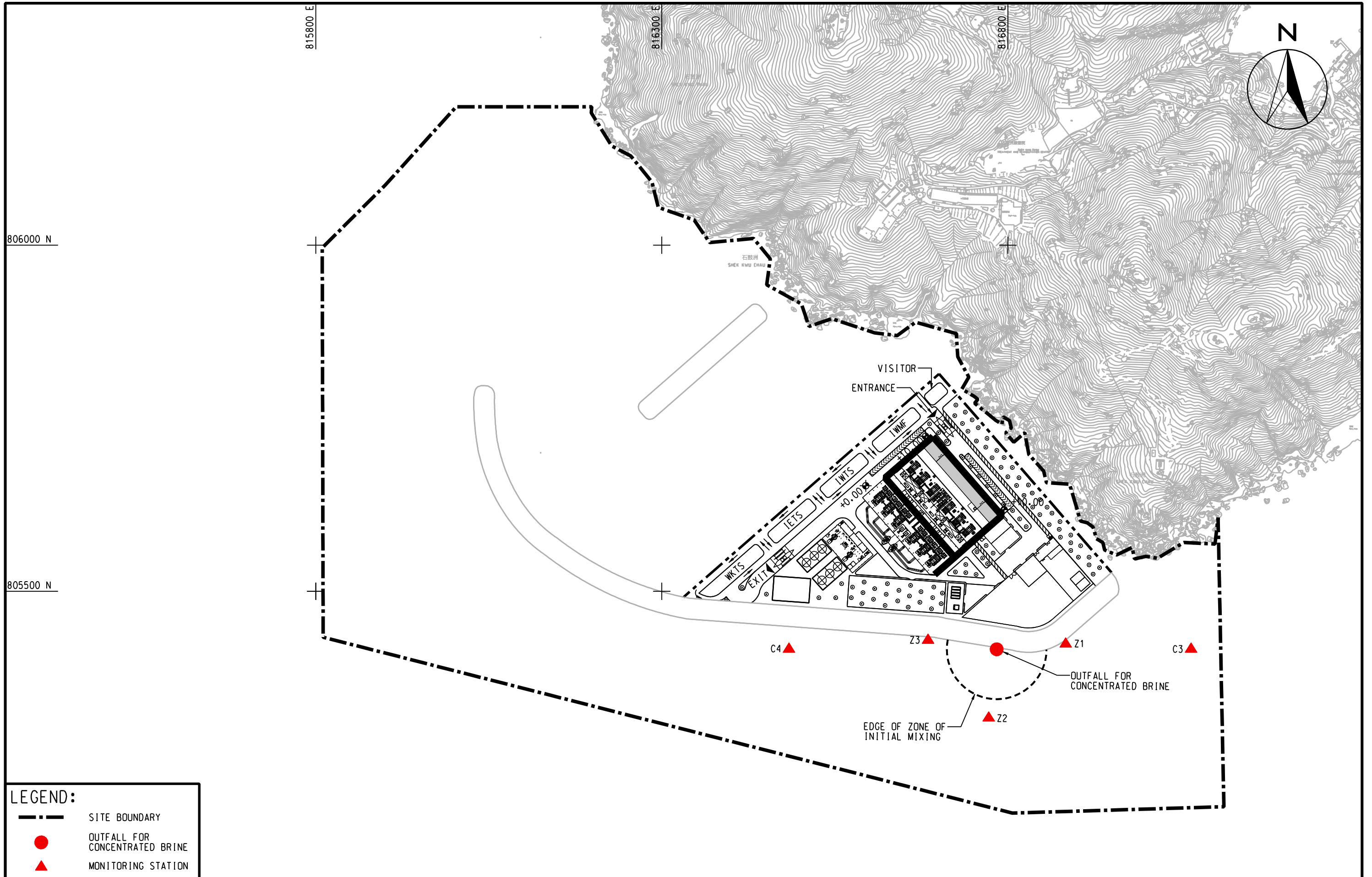
SCALE	A3 1:8000	DATE	FEB. 2010
CHECK	-	DRAWN	XCF
JOB No.	60051148	DRAWING No.	FIGURE 3.1
		REV	-

DATE: 2011-1-12 DAIXL





SCALE	A3 1:30000	DATE	DEC 2020
CHECK	-	DRAWN	CYG
JOB No.	60051148	DRAWING No.	FIGURE 4.1
		REV	-

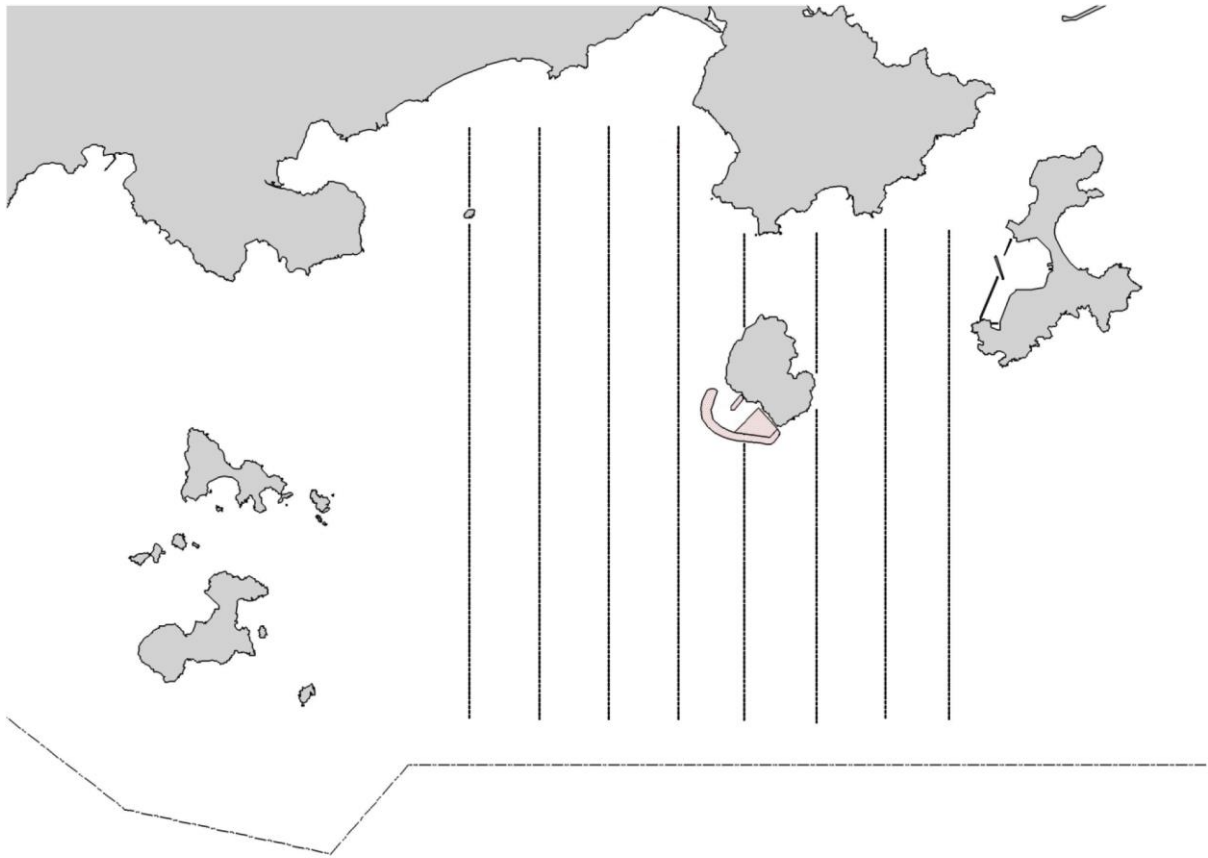


ENGINEERING INVESTIGATION AND ENVIRONMENTAL STUDIES FOR INTEGRATED WASTE MANAGEMENT FACILITIES PHASE I - FEASIBILITY STUDY

**LOCATIONS OF WATER QUALITY MONITORING STATIONS FOR OPERATIONAL PHASE IMPACT MONITORING**

SCALE	A3 1 : 5000	DATE	SEP. 2009
CHECK	-	DRAWN	ZQQ
JOB No.	60051148	DRAWING No.	FIGURE 4.2
		REV	-

DATE: 2010-12-2 DAIXL



**Figure 6.1** Marine Mammal Line Transect Surveys

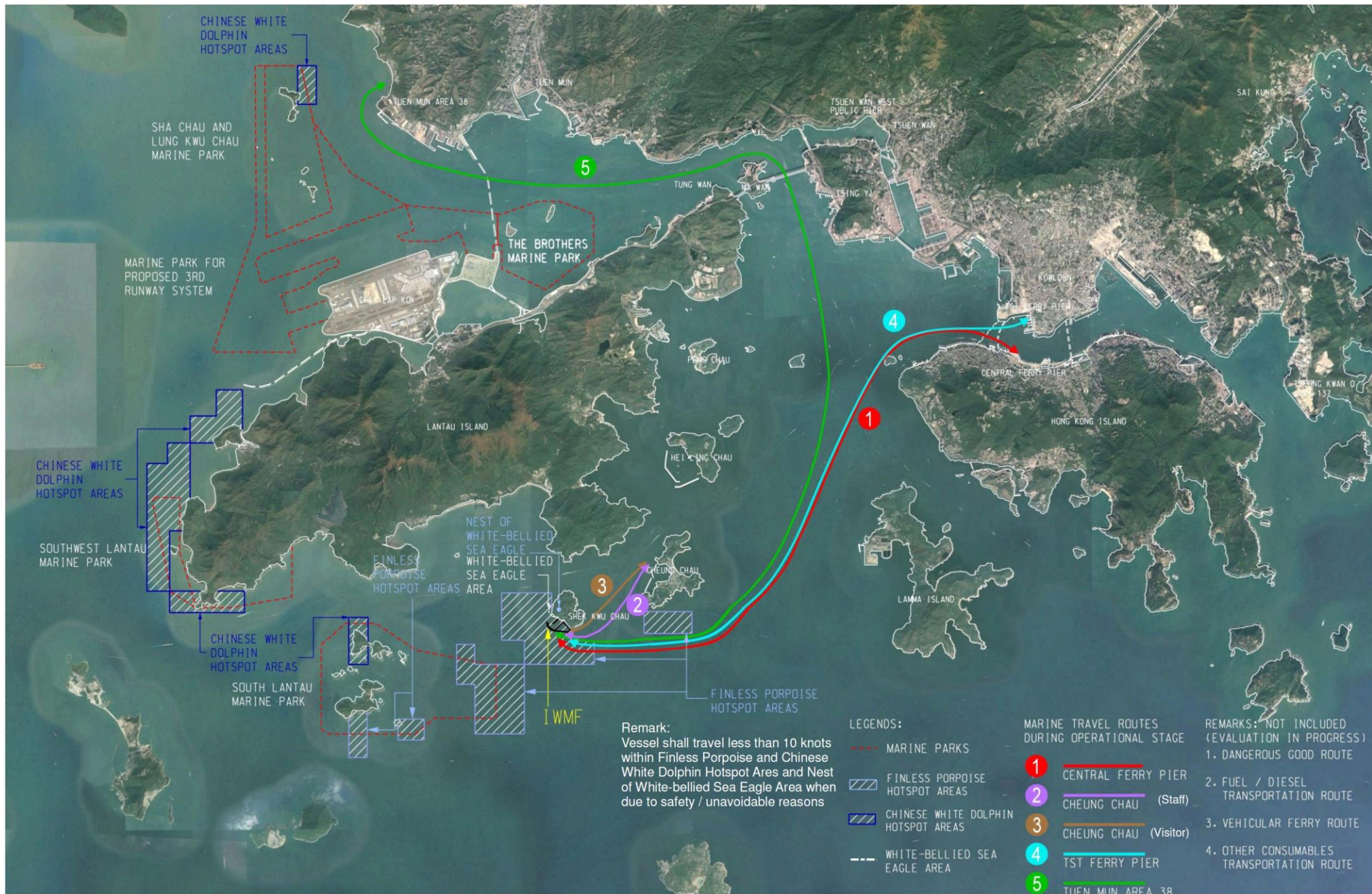
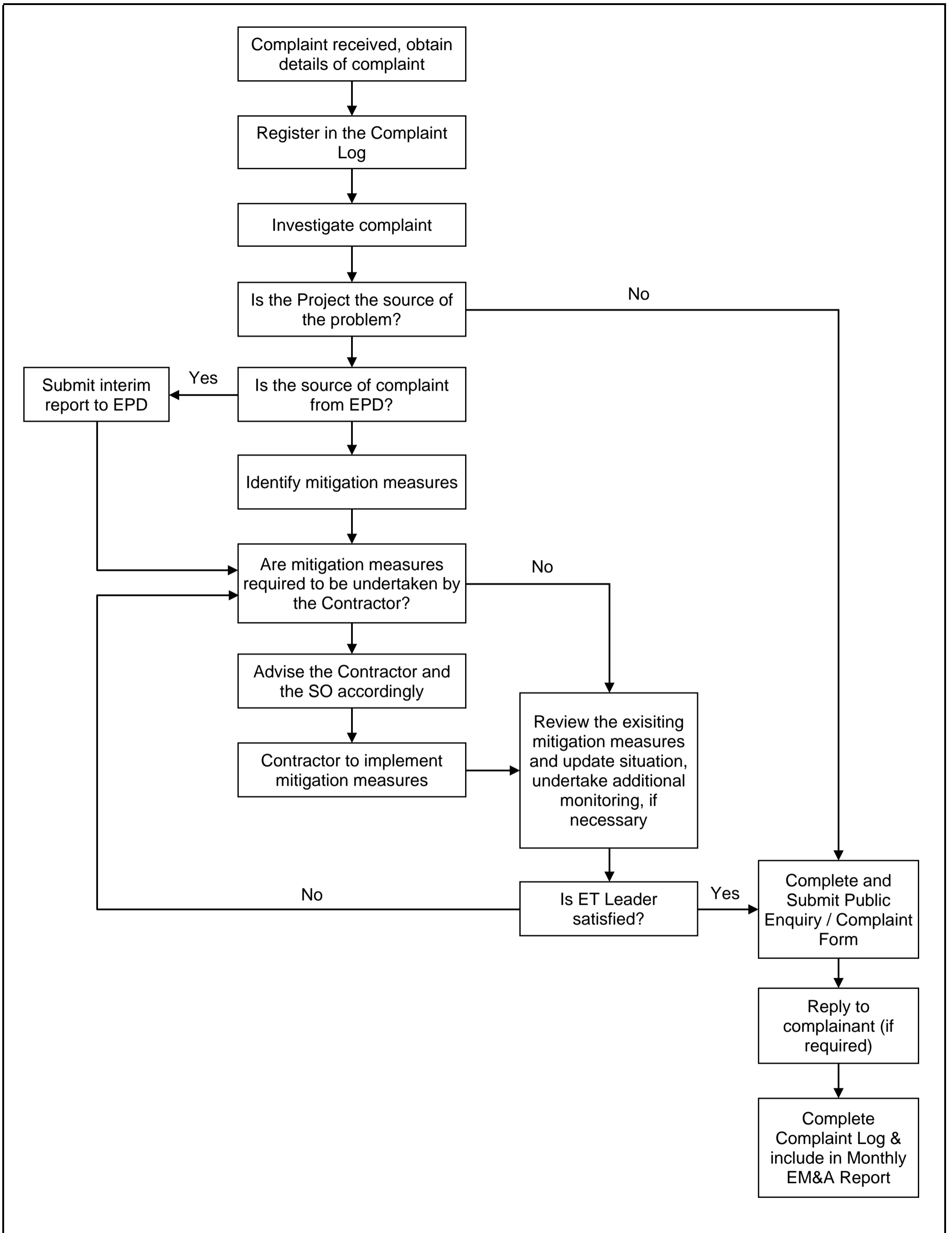


Figure 6.2 Indicative Travel Route for the IWMF Vessels





SCALE	N.T.S.	DATE	1-Feb-09	
CHECK	SWCW	DRAWN	SWKY	
JOB NO.	60051148	FIG NO.	12.1	Rev 0

Activity ID	Activity Name	Remaining Duration	Start	Finish	2018												2019												2020												2021												2022												2023												2024												2025																																																											
					N	D	J	F	M	A	M	J	J	A	S	O	N	D	N	D	J	F	M	A	M	J	J	A	S	O	N	D	N	D	J	F	M	A	M	J	J	A	S	O	N	D	N	D	J	F	M	A	M	J	J	A	S	O	N	D	N	D	J	F	M	A	M	J	J	A	S	O	N	D	N	D	J	F	M	A	M	J	J	A	S	O	N	D	N	D	J	F	M	A	M	J	J	A	S	O	N	D	N	D	J	F	M	A	M	J	J	A	S	O	N	D																																
EP_SP_66_12-WP-2-M0	<b>Programme for Design and Construction Works</b>	2835	22-Nov-17 A	26-Aug-25	[Gantt bars for 2018-2025]																																																																																																																																															
EP_SP_66_12-WP-2-M0.01	<b>Key Dates</b>	2496	22-Nov-17	21-Sep-24	[Gantt bars for 2018-2025]																																																																																																																																															
EP_SP_66_12-WP-2-M0.02	<b>Contract Preliminaries</b>	2807	19-Dec-17	26-Aug-25	[Gantt bars for 2018-2025]																																																																																																																																															
EP_SP_66_12-WP-2-M0.03	<b>Licence/Permit Applications</b>	2252	15-Dec-17	13-Feb-24	[Gantt bars for 2018-2025]																																																																																																																																															
EP_SP_66_12-WP-2-M0.04	<b>General Submissions</b>	1320	22-Nov-17	03-Jul-21	[Gantt bars for 2018-2025]																																																																																																																																															
EP_SP_66_12-WP-2-M0.05	<b>Design Submissions</b>	1724	22-Nov-17 A	11-Aug-22	[Gantt bars for 2018-2025]																																																																																																																																															
EP_SP_66_12-WP-2-M0.06	<b>Procurement of Major Equipment</b>	1903	13-Sep-18	28-Nov-23	[Gantt bars for 2018-2025]																																																																																																																																															
EP_SP_66_12-WP-2-M0.07	<b>Environmental Works</b>	1708	05-Jan-18	09-Sep-22	[Gantt bars for 2018-2025]																																																																																																																																															
EP_SP_66_12-WP-2-M0.08	<b>Maritime Works</b>	1277	29-Dec-17	27-Jun-21	[Gantt bars for 2018-2025]																																																																																																																																															
EP_SP_66_12-WP-2-M0.08.3	<b>Submissions</b>	196	29-Dec-17	12-Jul-18	[Gantt bars for 2018-2025]																																																																																																																																															
EP_SP_66_12-WP-2-M0.08.1	<b>Marine Construction</b>	1265	10-Jan-18	27-Jun-21	[Gantt bars for 2018-2025]																																																																																																																																															
EP_SP_66_12-WP-2-M0.08.1.1	<b>Phase I - Construction of Perimeter Seawalls</b>	740	10-Jan-18	19-Jan-20	[Gantt bars for 2018-2025]																																																																																																																																															
EP_SP_66_12-WP-2-M0.08.1.1.3	<b>Marine Works Preparations</b>	274	10-Jan-18	10-Oct-18	[Gantt bars for 2018-2025]																																																																																																																																															
08-0900	Carry out hydrographic survey	14	10-Jan-18	23-Jan-18	[Gantt bars for 2018-2025]																																																																																																																																															
08-1005	Ground Investigation for DCM Design	180	13-Feb-18	11-Aug-18	[Gantt bars for 2018-2025]																																																																																																																																															
08-1010	Mobilization of DCM Barge for Load Test	30	14-May-18	12-Jun-18	[Gantt bars for 2018-2025]																																																																																																																																															
08-1020	Mobilization of Remaining DCM Barge for Construction	30	11-Sep-18	10-Oct-18	[Gantt bars for 2018-2025]																																																																																																																																															
08-1340(2)	Sediment Sample collection and testing Dumping Permit Application	21	05-Sep-18*	25-Sep-18	[Gantt bars for 2018-2025]																																																																																																																																															
EP_SP_66_12-WP-2-M0.08.1.1.1	<b>Seawall and Berth at DCM Area</b>	676	15-Mar-18	19-Jan-20	[Gantt bars for 2018-2025]																																																																																																																																															
08-1030	DCM Mix Trial (incl. Bench-scale testing and Lab Tests)	106	15-Mar-18	28-Jun-18	[Gantt bars for 2018-2025]																																																																																																																																															
08-1040	DCM Pre-construction Site Trial and testing	43	29-Jun-18	10-Aug-18	[Gantt bars for 2018-2025]																																																																																																																																															
08-1050	Static Load Test Preparation	31	11-Aug-18	10-Sep-18	[Gantt bars for 2018-2025]																																																																																																																																															
08-1060	Carry out static loading test	22	11-Sep-18	02-Oct-18	[Gantt bars for 2018-2025]																																																																																																																																															
08-1065(2)	Static load test report submission	8	03-Oct-18	10-Oct-18	[Gantt bars for 2018-2025]																																																																																																																																															
08-1070	Geotextile Laying	60	11-Aug-18	09-Oct-18	[Gantt bars for 2018-2025]																																																																																																																																															
08-1075(2)	Sand Blanket Laying	60	11-Aug-18	09-Oct-18	[Gantt bars for 2018-2025]																																																																																																																																															
08-1080	DCM Injection Works (575,000m3, approx 6300 nr.)	120	11-Oct-18	07-Feb-19	[Gantt bars for 2018-2025]																																																																																																																																															
08-1090	DCM Final Completion Tests	180	10-Nov-18	08-May-19	[Gantt bars for 2018-2025]																																																																																																																																															
08-1100	Rubble Mound Laying (100,000m3 approx. @550m3/d)	180	09-Jan-19	07-Jul-19	[Gantt bars for 2018-2025]																																																																																																																																															
08-1105(1)	Prefabrication for Caisson	282	24-Nov-18	01-Sep-19	[Gantt bars for 2018-2025]																																																																																																																																															
08-1110	Caisson Laying (Total 50nrs, @2 nrs/week)	182	24-Mar-19	21-Sep-19	[Gantt bars for 2018-2025]																																																																																																																																															
08-1120	Wave Wall Construction	120	22-Sep-19	19-Jan-20	[Gantt bars for 2018-2025]																																																																																																																																															
EP_SP_66_12-WP-2-M0.08.1.1.2	<b>Seawall at Dredging Area</b>	295	25-Dec-18	15-Oct-19	[Gantt bars for 2018-2025]																																																																																																																																															
08-1130	Dredging Works (26,000m3 @ 285m3/d avg. to comply EP Conditions 2.18)	110	25-Dec-18	13-Apr-19	[Gantt bars for 2018-2025]																																																																																																																																															
08-1140	Lay Rock & Sand Fill	50	15-Mar-19	03-May-19	[Gantt bars for 2018-2025]																																																																																																																																															
08-1150	Place Rubble Mound (35,000m3 approx., @550m3/d)	88	30-Mar-19	25-Jun-19	[Gantt bars for 2018-2025]																																																																																																																																															
08-1155(2)	Fabrication and delivery of Precast Seawall Blocks (12,000nr. approx)	90	15-Mar-19	12-Jun-19	[Gantt bars for 2018-2025]																																																																																																																																															
08-1160	Lay Concrete Block Walls (300m length approx. @4m/d)	80	29-Apr-19	17-Jul-19	[Gantt bars for 2018-2025]																																																																																																																																															
08-1170	In situ Concrete Wall Construction	90	18-Jul-19	15-Oct-19	[Gantt bars for 2018-2025]																																																																																																																																															
EP_SP_66_12-WP-2-M0.08.1.2	<b>Phase II - Reclamation, Breakwater and Berth Construction</b>	999	03-Oct-18	27-Jun-21	[Gantt bars for 2018-2025]																																																																																																																																															
EP_SP_66_12-WP-2-M0.08.1.2.1	<b>Reclamation</b>	999	03-Oct-18	27-Jun-21	[Gantt bars for 2018-2025]																																																																																																																																															
08-1180	Geotextile Laying	100	03-Oct-18	10-Jan-19	[Gantt bars for 2018-2025]																																																																																																																																															
08-1185(2)	Sand Blanket Laying	100	03-Oct-18	10-Jan-19	[Gantt bars for 2018-2025]																																																																																																																																															
08-1190	Install Vertical Band Drain by Barge	160	10-Feb-19	19-Jul-19	[Gantt bars for 2018-2025]																																																																																																																																															
08-1200	Reclamation fill up to +2.5mPD	375	22-Sep-19	30-Sep-20	[Gantt bars for 2018-2025]																																																																																																																																															
08-1210	Reclamation fill from +2.5 to Formation Level	120	03-Jul-20	30-Oct-20	[Gantt bars for 2018-2025]																																																																																																																																															
08-1220	Lay Surcharge	80	11-Sep-20	29-Nov-20	[Gantt bars for 2018-2025]																																																																																																																																															
08-1230	Surcharge Period	180	30-Nov-20	28-May-21	[Gantt bars for 2018-2025]																																																																																																																																															
08-1240	Remove Surcharge	85	04-Apr-21	27-Jun-21	[Gantt bars for 2018-2025]																																																																																																																																															
EP_SP_66_12-WP-2-M0.08.1.2.2	<b>Breakwater</b>	583	02-Sep-19	06-Apr-21	[Gantt bars for 2018-2025]																																																																																																																																															
08-1250	Geotextile and Sand Blanket Laying	45	22-Sep-19	05-Nov-19	[Gantt bars for 2018-2025]																																																																																																																																															
08-1260	DCM Injection Works (290,000m3, approx 3200 nr.)	65	06-Nov-19	09-Jan-20	[Gantt bars for 2018-2025]																																																																																																																																															
08-1270	DCM Final Completion Test	71	05-Jan-20	15-Mar-20	[Gantt bars for 2018-2025]																																																																																																																																															
08-1280	Rubble Mound Laying (100,000m3 approx. @550m3/d)	188	05-Mar-20	08-Sep-20	[Gantt bars for 2018-2025]																																																																																																																																															
08-1285(1)	Prefabrication for Caisson	411	02-Sep-19	16-Oct-20	[Gantt bars for 2018-2025]																																																																																																																																															
08-1290	Caisson Laying (Total 43nrs, @2 nrs/week)	150	11-Jul-20	07-Dec-20	[Gantt bars for 2018-2025]																																																																																																																																															
08-1300	Wave Wall Construction	120	08-Dec-20	06-Apr-21	[Gantt bars for 2018-2025]																																																																																																																																															
EP_SP_66_12-WP-2-M0.08.1.2.3	<b>Seawall and Berth at Marine Access</b>	150	03-Jul-20	29-Nov-20	[Gantt bars for 2018-2025]																																																																																																																																															
08-1310(2)	Prefabrication for Caisson (4nrs)	90	03-Jul-20	30-Sep-20	[Gantt bars for 2018-2025]																																																																																																																																															
08-1320(2)	Caisson Laying (4nrs)	30	01-Oct-20	30-Oct-20	[Gantt bars for 2018-2025]																																																																																																																																															
08-1330(2)	Wave Wall Construction	30	31-Oct-20	29-Nov-20	[Gantt bars for 2018-2025]																																																																																																																																															
EP_SP_66_12-WP-2-M0.09	<b>Foundation Works</b>	397	12-Apr-21	13-May-22	[Gantt bars for 2018-2025]																																																																																																																																															
EP_SP_66_12-WP-2-M0.09.0	<b>Site Investigation and Preliminary Pile</b>	46	12-Apr-21	27-May-21	[Gantt bars for 2018-2025]																																																																																																																																															
EP_SP_66_12-WP-2-M0.09.1	<b>Administration Bld Foundation</b>	138	25-Nov-21	11-Apr-22	[Gantt bars for 2018-2025]																																																																																																																																															
EP_SP_66_12-WP-2-M0.09.2	<b>Waste Bunker &amp; Tipping Hall Bld Foundation</b>	203	13-May-21	01-Dec-21	[Gantt bars for 2018-2025]																																																																																																																																															
EP_SP_66_12-WP-2-M0.09.3	<b>Boiler &amp; Flue Gas Bld Foundation</b>	331	12-Apr-21	08-Mar-22	[Gantt bars for 2018-2025]																																																																																																																																															
EP_SP_66_12-WP-2-M0.09.4	<b>ACC Area Foundation</b>	129	20-Sep-21	26-Jan-22	[Gantt bars for 2018-2025]																																																																																																																																															
EP_SP_66_12-WP-2-M0.09.5	<b>Turbine Hall Bld Foundation</b>	142	28-Jun-21	16-Nov-21	[Gantt bars for 2018-2025]																																																																																																																																															
EP_SP_66_12-WP-2-M0.09.6	<b>Air Compressor Bld Foundation</b>	28	17-Nov-21	14-Dec-21	[Gantt bars for 2018-2025]																																																																																																																																															

**Programme for Design and Construction Works**  
**Summary Programme**

Date	Revision	Checked	Approved
04-Dec-17	Rev.0 - 1st Issue		
16-Jul-18	Rev.1 - Revised to SO's comments		
03-Sep-18	Rev.2 - Revised to SO's comments		



**APPENDIX 3.1 Construction Noise Monitoring Field Record Sheet**

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

	<u>Name &amp; Designation</u>	<u>Signature</u>	<u>Date</u>
Recorded by:	_____	_____	_____
Checked by:	_____	_____	_____

**APPENDIX 4.1 Water Quality Monitoring Data Record Sheet**

Monitoring Station		
Date		
Weather Condition		
Sea Condition		
Tide Mode		
Start Time (hh:mm)		
Water Depth which sample is collected (m)		
pH		
Temperature (°C)		
Salinity (ppt)		
Turbidity (NTU)		
Sample Identification		
Suspended Solids (mg/l)		
DO (mg/l)		
DO Saturation (%)		
Remarks / Other Observations		

Name & Designation

Signature

Date

Recorded by:

Checked by:

Laboratory Staff:

Notes:

1 The SS results are to be entered once they are available from the laboratory.

2 *In-situ* measurements shall be deployed at the designated location twice. The difference between the two consecutive measurements shall be within the range of 25%. If the difference is larger than 25%, the measurement shall be carried out again until the two consecutive readings agree to within 25%.

**Appendix 11.1**

**Table 11.1 Implementation Schedule for Air Quality Measures for the IWMF at the artificial island near SKC**

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
S3b.8.1	<p><u>Air Pollution Control (Construction Dust) Regulation &amp; Good Site Practices</u></p> <ul style="list-style-type: none"> <li>• Use of regular watering, with complete coverage, to reduce dust emissions from exposed site surfaces and unpaved roads, particularly during dry weather.</li> <li>• Use of frequent watering for particularly dusty construction areas and areas close to ASRs.</li> <li>• Side enclosure and covering of any aggregate or dusty material storage piles to reduce emissions. Where this is not practicable owing to frequent usage, watering shall be applied to aggregate fines.</li> <li>• Open stockpiles shall be avoided or covered. Where possible, prevent placing dusty material storage piles near ASRs.</li> <li>• Tarpaulin covering of all dusty vehicle loads transported to, from and between site locations.</li> <li>• Establishment and use of vehicle wheel and body washing facilities at the exit points of the site.</li> <li>• Provision of wind shield and dust extraction units or similar dust mitigation measures at the loading points, and use of water sprinklers at the loading area where dust generation is likely during the loading process of loose material, particularly in dry seasons/ periods.</li> <li>• Imposition of speed controls for vehicles on unpaved site roads. Ten kilometers per hour is the recommended limit.</li> <li>• Where possible, routing of vehicles and positioning of construction plant should be at the maximum possible</li> </ul>	Work site / During the construction period	Contractor		✓			Air Pollution Control (Construction Dust) Regulation

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	distance from ASRs. <ul style="list-style-type: none"> <li>Instigation of an environmental monitoring and auditing program to monitor the construction process in order to enforce controls and modify method of work if dusty conditions arise.</li> </ul>							
S3b.6.3	<u>Odour Removal by Deodorizers</u> <ul style="list-style-type: none"> <li>Deodorizers with 95% odour removal efficiency would be installed for the air ventilated from the mechanical treatment plant before discharge to the atmosphere</li> </ul>	Waste reception halls, the waste storage area, the mechanical treatment plant / During design & operation phase	IWMF Operator	✓		✓		EIAO-TM
S3b.8.2	<u>Air Pollution Control and Stack Monitoring</u> <ul style="list-style-type: none"> <li>Air pollution control and stack monitoring system will be installed for the IWMF to ensure that the emissions from the IWMF stack will meet the proposed target emission limits.</li> <li>Voluntary Enhancement Measures in Flue Gas Cleaning and Emission Monitoring:                             <ol style="list-style-type: none"> <li>Two-stage bag filter system with reagent recirculation;</li> <li>In addition to SCR, provide SNCR for removal of NOx; tighten emission limit for half-hourly and daily NOx to 160 mg/m<sup>3</sup> and 80 mg/m<sup>3</sup> respectively;</li> <li>Well-mixed feed waste: to minimize the fluctuation of pollutant loading on the flue gas treatment system;</li> <li>Two more AQMSs would be set up at South Lantau and Shek Kwu Chau respectively;</li> <li>Limit levels will be set under the IWMF DBO contract to require that waste feed shall cease if any of the air pollutant has exceeded 95% of the</li> </ol> </li> </ul>	IWMF stack emissions / During design & operation phase	IWMF Operator	✓		✓		EIAO-TM, Supporting Document for Application for Variation of Environmental Permit (EP-429/2012)

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	<p>emission concentration limit as stipulated in the Special Process license; and</p> <p>6. Each incineration chamber shall be fitted with auxiliary burners to ensure complete burn out of the combustion gases.</p>							
-	<p><u>Treated Fly Ash and Air Pollution Control Residues:</u></p> <ul style="list-style-type: none"> <li>During testing and commissioning, the Contractor shall sample and test every container of treated fly ash and air pollution control residues for conformance to the Incineration Residue Pollution Control Limits and leachability criteria shown in Table 2 of the Environmental Permit. If a test result confirms that any one of the samples does not conform to the limits and the criteria, the Contractor shall be required to sample and test every container of treated fly ash and air pollution control residues for conformance to the Incineration Residue Pollution Control Limits and leachability criteria for the next six months.</li> <li>During the first six months of operation, if the requirements in (a) could be fully conformed with, the Contractor shall sample and test every shipload of treated fly ash and air pollution control residues for conformance to the Incineration Residue Pollution Control Limits and leachability criteria shown in Table 2 of the Environmental Permit. The Contractor shall take two samples from each shipload for testing and the Contractor shall not dispose of any of that shipload of treated fly ash and air pollution control residues until the test results confirm that the two samples conform to the limits and the criteria. If a test result confirms that any one of the two samples does not conform to the limits and the criteria, the Contractor shall be required to sample and test every shipload of treated fly ash and air pollution control</li> </ul>	IWMF stack emissions / During design & operation phase	IWMF Operator	✓		✓		Supporting Document for Application for Variation of Environmental Permit (EP-429/2012)



EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	<p>residues for conformance to the Incineration Residue Pollution Control Limits and leachability criteria for the next six months. The Contractor shall make due allowance in the Design and the Operation for the time to sample and test treated fly ash and air pollution control residues before disposal.</p> <ul style="list-style-type: none"> <li>• Provided that there is no non-conformance to the Incineration Residue Pollution Control Limits and leachability criteria shown in Table 2 of the Environmental Permit throughout a continuous sixmonth period in the Operation Period, the testing frequency shall be reduced to monthly interval. Two samples from one shipload of treated fly ash and air pollution control residues shall be collected and tested for conformance to the Incineration Residue Pollution Control Limits and leachability criteria. The Contractor shall not dispose of any of the treated fly ash and air pollution control residues in the shipload which the samples are taken until the test results confirm that the samples conform to the limits and the criteria. If the test result confirm that any one of the samples does not conform to the limits and the criteria, the Contractor shall be required to sample and test every shipload of treated fly ash and air pollution control residues for conformance to the Incineration Residue Pollution Control Limits and leachability criteria shown in Table 2 of the Environmental Permit for the next six months.</li> </ul>							
-	<p><u>Bottom Ash:</u></p> <ul style="list-style-type: none"> <li>• During testing and commissioning, the Contractor shall sample and test every container of bottom ash for conformance to the leachability criteria shown in Table 2 of the Environmental Permit. If a test result confirms that any one of the samples does not conform to the criteria, the Contractor shall be</li> </ul>	IWMF stack emissions / During design & operation phase	IWMF Operator	✓		✓		Supporting Document for Application for Variation of Environmental Permit (EP-429/2012)

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	<p>required to sample and test every container of bottom ash for conformance to the leachability criteria for the next six months.</p> <ul style="list-style-type: none"> <li>• During the first six months of operation, if the requirements in (d) could be fully conformed with, the Contractor shall sample and test one shipload of bottom ash each month for conformance to the leachability criteria shown in Table 2 of the Environmental Permit. The Contractor shall take two samples from the shipload for testing and the Contractor shall not dispose of any of that shipload of bottom ash until the test results confirm that the two samples conform to the criteria. If a test result confirms that any one of the two samples does not conform to the criteria, the Contractor shall be required to sample and test each shipload of bottom ash for conformance to the leachability criteria for the next six months. The Contractor shall make due allowance in the Design and the Operation for the time to sample and test bottom ash before disposal.</li> <li>• Provided that there is no non-conformance to the leachability criteria shown in Table 2 of the Environmental Permit throughout a continuous sixmonth period in the Operation Period, the Contractor shall be allowed to take two samples from any one shipload of bottom ash once every six months for conformance to the leachability criteria. The Contractor shall not dispose of any of the bottom ash in the shipload which the samples are taken until the test results confirm that the samples conform to the criteria. If the test result confirm that any one of the samples does not conform to the criteria, the Contractor shall be required to sample and test one shipload of bottom ash each month for conformance to the leachability criteria shown in</li> </ul>							

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EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	Table 2 of the Environmental Permit for the next six months as stipulated above.							

\* Des - Design, C - Construction, O – Operation, and Dec - Decommissioning

**Table 11.2 Implementation Schedule for Noise Impact Measures for the IWMF at the artificial island near SKC**

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
S4b.8	Good site practices to limit noise emissions at source and use of quiet plant and working methods, whenever practicable.	Work Sites / Construction Period	EPD and its contractors		✓			EIAO-TM
S4b.6 & S4b.8	All the ventilation fans installed in the below will be provided with silencers or acoustics treatment. (i) Stack of the incinerator (ii) Ventilation systems within the IWMF Enclosure and discharge silencer or other acoustic treatment equipment should be installed in the air-cooled chillers  Other than provision of silencer or other acoustic treatment equipment for the stack of the incinerator and ventilation system, the detailed design should incorporate the following good practice in order to minimise the nuisance on the neighbouring NSRs. (i) The exhaust of the ventilation system and any opening of the building should be located facing away from any NSRs; and (ii) Louver or other acoustic treatment equipment could also be applied to the exhaust of the ventilation system.	Within IWMF area / Construction Period	EPD and its contractors	✓		✓		EIAO-TM
-	<u>Voluntary Enhancement Measure</u>  • Provision of air-conditioner and double glazed windows to nearby NSR at Shek Kwu Chau (i.e. SARDA) as precautionary measures.	IWMF site	Design team, contractor, IWMF operator	✓	✓			Supporting Document for Application for Variation of Environmental Permit (EP-429/2012)

\* Des - Design, C - Construction, O – Operation, and Dec - Decommissioning

**Table 11.3 Implementation Schedule for Water Quality Measures for the Artificial Island near SKC**

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
S5b.8.1.1	<p><u>Drainage and Construction Site Runoff</u></p> <p>The site practices outlined in ProPECC PN 1/94 “Construction Site Drainage” should be followed as far as practicable in order to minimise surface runoff and the chance of erosion. These practices include the following items:</p> <ul style="list-style-type: none"> <li>At the start of site establishment, perimeter cut-off drains to direct off-site water around the site should be constructed with internal drainage works and erosion and sedimentation control facilities implemented. Channels (both temporary and permanent drainage pipes and culverts), earth bunds or sand bag barriers should be provided on site to direct storm water to silt removal facilities. The design of the temporary on-site drainage system will be undertaken by the contractor prior to the commencement of construction.</li> <li>Boundaries of earthworks should be surrounded by dykes or embankments for flood protection, as necessary.</li> <li>Sand/silt removal facilities such as sand/silt traps and sediment basins should be provided to remove sand/silt particles from runoff to meet the requirements of the TM-DSS. The design of efficient silt removal facilities should be based on the guidelines in Appendix A1 of ProPECC PN 1/94, which states that the retention time for silt/sand traps should be 5 minutes under maximum flow conditions. The detailed design of the sand/silt traps shall be undertaken by the contractor prior to the commencement of construction.</li> <li>Water pumped out from foundation piles must be discharged into silt removal facilities.</li> <li>Measures should be taken to minimize the ingress of site</li> </ul>	Work site / During the construction period	Contractor		✓			EIAO-TM; ProPECC PN 1/94; WPCO

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	<ul style="list-style-type: none"> <li>Runoff and drainage into excavations. Drainage water pumped out from excavations should be discharged into storm drains via silt removal facilities.</li> <li>During rainstorms, exposed slope/soil surfaces should be covered by a tarpaulin or other means, as far as practicable. Other measures that need to be implemented before, during and after rainstorms are summarized in ProPECC PN 1/94.</li> <li>Exposed soil areas should be minimized to reduce potential for increased siltation and contamination of runoff.</li> <li>Earthwork final surfaces should be well compacted and subsequent permanent work or surface protection should be immediately performed.</li> <li>Open stockpiles of construction materials or construction wastes on-site should be covered with tarpaulin or similar fabric during rainstorms.</li> </ul>							
S5b.8.1.2	<p><u>General Construction Activities</u></p> <p>Construction solid waste should be collected, handled and disposed of properly to avoid entering to the nearby watercourses and public drainage system. Rubbish and litter from construction sites should also be collected to prevent spreading of rubbish and litter from the site area. It is recommended to clean the construction sites on a regular basis.</p>	Work site / During the construction period	Contractor		✓			EIAO-TM; ProPECC PN 1/94; WPCO
S5b.8.1.3	<p>There is a need to apply to EPD for a discharge licence for discharge of effluent from the construction site under the WPCO. The discharge quality must meet the requirements specified in the discharge licence. All the run-off and wastewater generated from the works areas should be treated so that it satisfies all the standards listed in the TM-DSS. The</p> <p>beneficial uses of the treated effluent for other on-site activities such as dust suppression and general cleaning etc.,</p>	Work site / During the construction period	Contractor		✓			EIAO-TM; ProPECC PN 1/94; WPCO

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	can minimise water consumption and reduce the effluent discharge volume. If monitoring of the treated effluent quality from the works areas is required during the construction phase of the Project, the monitoring should be carried out in accordance with the relevant WPCO licence which is under the ambit of regional office of EPD.							
S5b.8.1.4	<u>Accidental Spillage</u> Contractor must register as a chemical waste producer if chemical wastes would be produced from construction activities. The Waste Disposal Ordinance (Cap 354) and its subsidiary regulations in particular the Waste Disposal (Chemical Waste) (General) Regulation should be observed and complied with for control of chemical wastes.	Work site / During the construction period	Contractor		✓			EIAO-TM; ProPECC PN 1/94; WPCO; WDO
S5b.8.1.5	Maintenance of vehicles and equipments involving activities with potential for leakage and spillage should only be undertaken within the areas which appropriately equipped to control these discharges.	Work site / During the construction period	Contractor		✓			EIAO-TM; ProPECC PN 1/94; WPCO; WDO
S5b.8.1.6	Oils and fuels should only be used and stored in designated areas which have pollution prevention facilities. All fuel tanks and storage areas should be sited on sealed areas in order to prevent spillage of fuels and solvents to the nearby watercourses. All waste oils and fuels should be collected in designated tanks prior to disposal.	Work site / During the construction period	Contractor		✓			EIAO-TM; ProPECC PN 1/94; WPCO; WDO
S5b.8.1.7	Disposal of chemical wastes should be carried out in compliance with the Waste Disposal Ordinance. The Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes published under the Waste Disposal Ordinance details the requirements to deal with chemical wastes. General requirements are given as follows: <ul style="list-style-type: none"> <li>Suitable containers should be used to hold the chemical wastes to avoid leakage or spillage during storage, handling and transport.</li> <li>Chemical waste containers should be suitably labelled, to notify and warn the personnel who are handling the wastes, to avoid accidents.</li> </ul>	Work site / During the construction period	Contractor		✓			EIAO-TM; ProPECC PN 1/94; WPCO; WDO

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	<ul style="list-style-type: none"> <li>Storage area should be selected at a safe location on site and adequate space should be allocated to the storage area.</li> </ul>							
S5b.8.1.8	<p><u>Sewage Effluent</u></p> <p>Temporary sanitary facilities, such as portable chemical toilets, should be employed on-site where necessary to handle sewage from the workforce. A licensed contractor would be responsible for appropriate disposal and maintenance of these facilities.</p>	Work site / During the construction period	Contractor		✓			EIAO-TM; ProPECC PN 1/94; WPCO
S5b.8.1.9	<p><u>Reclamation and Construction of Breakwaters</u></p> <ul style="list-style-type: none"> <li>The proposed dredging and reclamation should be commenced in phases. The breakwaters and seawalls should be constructed and the reclamation should be started within the enclosed breakwaters after the completion of the breakwater. Silt curtain should be applied around caissons / blockwork during the filling of the cell to prevent the loss of fine in the filling material.</li> <li>The maximum production rate for dredging for the anti-scouring protection layer shall not exceed the permitted maximum daily dredging rate and carried out within its respective distance from the nearest non-translocatable coral community by the dredging contractor as specified in S.2.18 of the Further Environmental Permit (no.:FEP-01/429/2012/A). It is recommended to employ closed grab with small capacity of 2 m<sup>3</sup> to control the dredging rate.</li> <li>Any gap that may need to be provided for marine access will be located at the middle of the North Western seawall, away from the identified coral communities and will be shielded by silt curtains systems to control sediment plume dispersion.</li> <li>The silt curtain system at marine access opening should be closed as soon as the barges passes through the marine access opening in order to minimize the period of curtain</li> </ul>	Work site / During the marine construction period	Contractor		✓			EIAO-TM; WPCO, Supporting Document for Application for Variation of Environmental Permit (EP-429/2012) Further Environmental Permit No. FEP-01/429/2012/A



EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	<p>opening. Filling should only be carried out behind the silt curtain when the silt curtain is completely closed.</p> <ul style="list-style-type: none"> <li>To enhance the effectiveness of the silt curtain at the marine access, the northern breakwater would be built before the commencement of the reclamation to reduce the current velocity towards the marine access opening.</li> <li>The silt curtain system at marine access opening should be regularly checked and maintained to ensure proper functioning.</li> <li>Where public fill is proposed for filling below +2.5mPD, the fine content in the public fill will be controlled to 25% which is in line with the CEDD's General Specification;</li> <li>The filling for reclamation should be carried out behind the seawall. The filling material should only consist of public fill, rock and sand. The filling composition and filling rates at each filling area should follow those delineated in Table 1 of the FEP-01/429/2012/A. The filling above high watermark is not restricted;</li> <li>No dredging should be carried out within 16 m to the nearest non-translocatable coral community;</li> <li>Daily site audit including full-time on-site monitoring by the ET is recommended during the dredging for anti-scouring protection layer for checking the compliance with the permitted no. of grab;</li> <li>Closed grab dredger should be used to minimize the loss of sediment during the raising of the loaded grabs through the water column;</li> <li>Frame-type silt curtains should be deployed around the dredging operations;</li> <li>Floating-type silt curtains should be used to surround the circular cell during the sheetpiling work;</li> </ul>							

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	<ul style="list-style-type: none"> <li>The descent speed of grabs should be controlled to minimize the seabed impact speed;</li> <li>Barges should be loaded carefully to avoid splashing of material;</li> <li>All barges used for the transport of dredged materials should be fitted with tight bottom seals in order to prevent leakage of material during loading and transport;</li> <li>All barges should be filled to a level which ensures that material does not spill over during loading and transport to the disposal site and that adequate freeboard is maintained to ensure that the decks are not washed by wave action.</li> <li>No DCM works should be carried out within 100m to the nearest non-translocatable coral colony / colonies.</li> <li>Silt curtains should be employed to enclose DCM field trial and any full scale DCM work to minimize the potential impacts on water aspect.</li> <li>A sand blanket to be placed on top of the marine deposit using tremie pipes prior to the DCM ground treatment to avoid seabed sediment disturbance.</li> </ul>							
S5b.8.2.3	<p><u>Operational Phase Discharges</u></p> <p>A pipeline drainage system will serve the development area collecting surface runoff from paved areas, roof, etc. Sustainable drainage principle would be adopted in the drainage system design to minimize peak surface runoff, maximize permeable surface and maximize beneficial use of rainwater.</p>	Within IWMF site / During the operational phase	IWMF Operator	✓		✓		WPCO
S5b.8.2.4	Oil interceptors should be provided in the drainage system of any potentially contaminated areas (such as truck parking area and maintenance workshop) and regularly cleaned to prevent the release of oil products into the storm water drainage system in case of accidental spillages. Accidental spillage should be cleaned up as soon as practicable and all	Within IWMF site / During the operational phase	IWMF Operator	✓		✓		WPCO; WDO

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	waste oils and fuels should be collected and handled in compliance with the Waste Disposal Ordinance.							
S5b.8.2.5	<u>Refuse Entrapment</u> Collection and removal of floating refuse should be performed at regular intervals for keeping the water within the Project site boundary and the neighbouring water free from rubbish.	Within the Project site / During the operational phase	IWMF Operator			✓		WPCO
S5b.8.2.6	<u>Transportation of bottom ash, fly ash and APC residues to WENT Landfill for disposal</u> Covered container should be used in the shipping of the incineration waste to limit the contact between the incineration waste and the marine water. A comprehensive emergency response plan for any accidental spillage should be submitted by the operation contractor to the EPD for agreement before the operation of the facilities. Salvage and cleanup action to recover the spilled incineration waste containers following the spillage should be carried out according to the emergency response plan to mitigate the environmental impact in case of spillage.	Transportation of Incineration Ash / During the operational phase	IWMF Operator			✓		

\* Des - Design, C - Construction, O – Operation, and Dec - Decommissioning

**Table 11.4 Implementation Schedule for Waste Quality Measures for the IWMF at the artificial island near SKC**

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
6b.5.1.2	<p><u>Good Site Practices</u></p> <p>Adverse environmental impacts in relation to waste management are not expected, provided that good site practices are strictly followed. Recommendations for good site practices during the construction activities would include:</p> <ul style="list-style-type: none"> <li>• Obtain relevant waste disposal permits from appropriate authorities, in accordance with the Waste Disposal Ordinance (Cap. 354) and subsidiary Regulations and the Land (Miscellaneous Provisions) Ordinance (Cap. 28);</li> <li>• Provide staff training for proper waste management and chemical handling procedures;</li> <li>• Provide sufficient waste disposal points and regular waste collection;</li> <li>• Provide appropriate measures to minimise windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers; and</li> <li>• Carry out regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors;</li> <li>• Separate chemical wastes for special handling and disposed of to licensed facility for treatment; and</li> <li>• Employ licensed waste collector to collect waste.</li> </ul>	Work Site/ During Construction Period	Contractor		✓			WDO; LDO; ETWB TCW No. 19/2005; EIAO-TM
6b.5.1.3	<p><u>Waste Reduction Measures</u></p> <p>Good management and control can prevent the generation of a 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 practices.</p>	Work Site/ During Design & Construction Period	Contractor	✓	✓			

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	<p>Recommendations to achieve waste reduction include:</p> <ul style="list-style-type: none"> <li>• Design foundation works that could minimise the amount of excavated material to be generated.</li> <li>• Provide training to workers on the importance of site cleanliness and appropriate waste management procedures, including waste reduction, reuse and recycling;</li> <li>• Sort out demolition debris and excavated materials from demolition works to recover reusable/recyclable portions (i.e. soil, broken concrete, metal etc.);</li> <li>• Segregate and store different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal;</li> <li>• Encourage the collection of aluminium cans by providing separate labelled bins to enable this waste to be segregated from other general refuse generated by the work force;</li> <li>• Proper storage and site practices to minimise the potential for damage or contamination of construction materials; and</li> <li>• Plan and stock construction materials carefully to minimise amount of waste to be generated and to avoid unnecessary generation of waste.</li> </ul>							
6b.5.1.7	<p><u>Dredged Sediment – Application of Dumping Permit</u></p> <p>The project proponent should agree in advance with MFC of CEDD on the site allocation. The project proponent or contractor for the dredging works shall then apply for the site allocations of marine sediment disposal based on the prior agreement with MFC/CEDD. The project proponent or</p>	Seawall and Reclamation site / Construction Period	EPD and its contractor	✓	✓			DASO ETWB TCW 34/2002

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	contractor should also be responsible for the application of all necessary permits from relevant authorities, including the dumping permit as required under DASO from EPD, for the disposal of dredged sediment prior to the commencement of the dredging works.							
6b.5.1.8	<p><u>Dredged Sediment – Sediment Quality Report</u></p> <p>The project proponent or contractor will need to satisfy the appropriate authorities that the quality of the marine sediment to be dredged has been identified according to the requirements of ETWB TCW 34/2002. This should be completed well before the dredging works and would include at least the submission of a formal Sediment Quality Report under Tier I of ETWB TCW No. 34/2002 to DEP for approval. Subject to advice from DEP, it is possible that further marine SI in accordance with ETWB TCW 34/2002 might be necessary for the application of dumping permit under DASO. In such case, a sediment sampling and testing proposal shall be submitted to and approved by DEP before the additional marine SI works.</p>	Seawall and Reclamation site / Construction Period	EPD and its contractor	✓				DASO ETWB TCW 34/2002
6b.5.1.9	<p><u>Dredged Sediment – Sediment Transportation</u></p> <p>The barge transporting the sediments to the designated disposal sites should be equipped with tight fitting seals to prevent leakage and should not be filled to a level that would cause overflow of materials or laden water during loading or transportation. In addition, monitoring of the barge loading shall be conducted to ensure that loss of material does not take place during transportation. Transport barges or vessels shall be equipped with automatic self-monitoring devices as specified by the DEP.</p>	Seawall and Reclamation site / Construction Period	EPD and its contractor		✓			DASO ETWB TCW 34/2002

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
6b.5.1.10	<p><u>Construction and Demolition Materials</u></p> <p>In order to minimise the impact resulting from collection and transportation of C&amp;D materials for off-site disposal, the excavated material arising from site formation and foundation works should be reused on-site as backfilling material and for landscaping works as far as practicable. Other mitigation requirements are listed below:</p> <ul style="list-style-type: none"> <li>• A Waste Management Plan (WMP), which becomes part of the Environmental Management Plan (EMP), should be prepared in accordance with ETWB TCW No.19/2005;</li> <li>• A recording system for the amount of wastes generated, recycled and disposed (including the disposal sites) should be adopted for easy tracking; and</li> <li>• In order to monitor the disposal of C&amp;D materials at public filling facilities and landfills and to control fly-tipping, a trip-ticket system should be adopted (refer to <i>ETWB TCW No. 31/2004</i>).</li> </ul>	Work Site/ During Design & Construction Period	Contractor	✓	✓			ETWB TCW No. 19/2005
6b.5.1.11 – 6b.5.1.12	<p>The Contactor should prepare and implement an EMP in accordance with ETWB TCW No.19/2005, which describes the arrangements for avoidance, reuse, recovery, recycling, storage, collection, treatment and disposal of different categories of waste to be generated from construction activities. Such a management plan should incorporate site specific factors, such as the designation of areas for segregation and temporary storage of reusable and recyclable materials. The EMP should be submitted to the Engineer for approval. The Contractor should implement waste management practices in the EMP throughout the construction stage of the Project. The EMP should be reviewed regularly and updated by the Contractor, preferably on a monthly basis.</p> <p>All surplus C&amp;D materials arising from or in connection with</p>	Work Site/ During Design & Construction Period	Contractor	✓	✓			ETWB TCW No. 19/2005

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
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	construction works should become the property of the Contractor when it is removed unless otherwise stated. The Contractor would be responsible for devising a system to work for on-site sorting of C&D materials and promptly removing all sorted and process materials arising from the construction activities to minimize temporary stockpiling on-site. The system should be included in the EMP identifying the source of generation, estimated quantity, arrangement for on-site sorting, collection, temporary storage areas and frequency of collection by recycling Contractors or frequency of removal off-site.							
6b.5.1.13	<p><u>Chemical Wastes</u></p> <p>Should chemical wastes be produced at the construction site, the Contractor would be required to register with EPD as a Chemical Waste Producer and to follow the guidelines stated in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes. Good quality containers compatible with the chemical wastes should be used, and incompatible chemicals should be stored separately. Appropriate labels should be securely attached on each chemical waste container indicating the corresponding chemical characteristics of the chemical waste (such as explosive, flammable, oxidizing, irritant, toxic, harmful, or corrosive). The Contractor should employ a licensed collector to transport and dispose of the chemical wastes, to either the Chemical Waste Treatment Centre at Tsing Yi, or another licensed facility, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.</p>	Work Site/ During Construction Period	Contractor		✓			Waste Disposal (Chemical Waste) (General) Regulation
6b.5.1.14	<p><u>General Refuse</u></p> <p>General refuse should be stored in enclosed bins or compaction units separate from C&amp;D materials. A licensed</p>	Work Site/ During Construction Period	Contractor		✓			Public Health and Municipal Services Ordinance



EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	waste collector should be employed by the Contractor to remove general refuse from the site, separately from C&D materials. Preferably an enclosed and covered area should be provided to reduce the occurrence of 'wind blown' light material.							
6b.5.1.16 – 6b.5.1.33	<p><u>Biogas Generation</u></p> <p>The Contractor shall review the data and analysis results, and the data from further Site Investigation, if any. Subject to the review findings, the following gas protection measures may be considered if necessary:</p> <ul style="list-style-type: none"> <li>- gas monitoring after reclamation;</li> <li>- passive ventilation;</li> <li>- gas impermeable membrane;</li> <li>- ventilation with "at risk" rooms;</li> <li>- protection of utilities or below ground services;</li> <li>- precautions during construction works;</li> <li>- precautions prior to entry of belowground services</li> </ul>	Reclamation site (if dredging at the reclamation site is not required) / Design & Construction Period	Designer and/or contractor	✓	✓			EPD/TR8/97
6b.5.2.1	<p><u>Good Site Practices</u></p> <p>It is recommended that the following good operational practices should be adopted to minimise waste management impacts:</p> <ul style="list-style-type: none"> <li>• Obtain the necessary waste disposal permits from the appropriate authorities, in accordance with the Waste Disposal Ordinance (Cap. 354) and Waste Disposal</li> </ul>	IWMF Site/During Operation Period	IWMF Operator			✓		Waste Disposal Ordinance (Cap. 354); Waste Disposal (Chemical Waste) (General) Regulation; ETWB TCW No. 1/2004

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	<p>(Chemical Waste) (General) Regulation;</p> <ul style="list-style-type: none"> <li>Nomination of an approved person 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>Use of a waste haulier licensed to collect specific category of waste;</li> <li>A trip-ticket system should be included as one of the contractual requirements and implemented by the Environmental Team to monitor the disposal of solid wastes at landfills, and to control fly tipping. Reference should be made to ETWB TCW No. 31/2004.</li> <li>Training of site personnel in proper waste management and chemical waste handling procedures;</li> <li>Separation of chemical wastes for special handling and appropriate treatment at a licensed facility;</li> <li>Routine cleaning and maintenance programme for drainage systems, sumps and oil interceptors;</li> <li>Provision of sufficient waste disposal points and regular collection for disposal;</li> <li>Adoption of appropriate measures to minimize windblown litter and dust during transportation of waste, such as covering trucks or transporting wastes in enclosed containers; and</li> <li>Implementation of a recording system for the amount of wastes generated, recycled and disposed of (including the disposal sites).</li> </ul>							
6b.5.2.2	<p><u>Waste Reduction Measures</u></p> <p>Good management and control can prevent the generation of</p>	IWMF Site/ During Operation Period	IWMF Operator			✓		

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
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	<p>significant amounts of waste. It is recommended that the following good operational practices should be adopted to ensure waste reduction:</p> <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>• Encourage collection of aluminium cans, plastic bottles and packaging material (e.g. carton boxes) and office paper by individual collectors. Separate labelled bins should be provided to help segregate this waste from other general refuse generated by the work force; and</li> <li>• Any unused chemicals or those with remaining functional capacity should be reused as far as practicable.</li> </ul>							
6b.5.2.3	<p><u>Storage, Handling, Treatment, Collection and Disposal of Incineration By-Products</u></p> <p>The following measures are recommended for the storage, handling and collection of the incineration by-products:</p> <ul style="list-style-type: none"> <li>• Ash should be stored in storage silos;</li> <li>• Ash should be handled and conveyed in closed systems fully segregated from the ambient environment;</li> <li>• Ash should be wetted with water to control fugitive dust, where necessary;</li> <li>• All fly ash and APC residues should be treated, e.g. by cement solidification or chemical stabilization, for compliance with the proposed Incineration Residue</li> </ul>	IWMF Site/ During Operation Period	IWMF Operator			✓		Incineration Residue Pollution Control Limits

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
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	<p>Pollution Control Limits and leachability criteria prior to disposal;</p> <ul style="list-style-type: none"> <li>The ash should be transported in covered trucks or containers to the designated landfill site.</li> </ul> <p>The Contractor should provide EPD with chemical analysis results of the bottom ash, and treated fly ash and APC residues to confirm that the ash/residue can comply with the proposed Incineration Residue Pollution Control Limits before disposal.</p>							
6b.6.3.1	<p><u>Fuel Oil Tank Construction and Test</u></p> <ul style="list-style-type: none"> <li>The fuel tank to be installed should be of specified durability.</li> <li>Double skin tanks are preferred.</li> <li>Underground fuel storage tank should be placed within a concrete pit.</li> <li>The concrete pit shall be accessible to allow regular tank integrity tests to be carried out at regular intervals.</li> <li>Tank integrity tests should be conducted by an independent qualified surveyor or structural engineer.</li> <li>Any potential problems identified in the test should be rectified as soon as possible.</li> </ul>	Fuel Oil Storage Tank/ During Design, Construction and Operation Periods	IWMF Contractor	✓	✓	✓		
6b.6.3.1	<p><u>Fuel Oil Pipeline Construction and Test</u></p> <ul style="list-style-type: none"> <li>Installation of aboveground fuel oil pipelines is preferable; if underground pipelines are unavoidable, concrete lined trenches should be constructed to contain the pipelines.</li> </ul>	Fuel Oil Pipelines/ During Design, Construction and Operation Periods	IWMF Contractor	✓	✓	✓		

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	<ul style="list-style-type: none"> <li>Double skin pipelines are preferred.</li> <li>Distance between the fuel oil refuelling points and the fuel oil storage tank shall be minimized.</li> <li>Integrity tests for the pipelines should be conducted by an independent qualified surveyor or structural engineer at regular intervals.</li> <li>Any potential problems identified in the test should be rectified as soon as possible.</li> </ul>							
6b.6.3.1	<p><u>Fuel Oil Leakage Detection</u></p> <ul style="list-style-type: none"> <li>Installation of leak detection device at storage tank and pipelines.</li> <li>Installation and use of pressure gauges (e.g. at the two ends of a filling line) in fuel filling, which allows unexpected pressure drop or difference and sign of leakage to be detected.</li> </ul>	Fuel Oil Storage Tank and Pipelines/ During Design, Construction and Operation Periods	IWMF Contractor	✓	✓	✓		
6b.6.3.1	<p><u>Fuel Oil Storage Tank Refuelling</u></p> <ul style="list-style-type: none"> <li>Storage tank refuelling (from road tanker) should only be conducted by authorized staff of the oil company using the company's standard procedures.</li> </ul>	Fuel Oil Refuelling Point/ During Operation Period	IWMF Operator			✓		
6b.6.3.1	<p><u>Fuel Oil Spillage Response</u></p> <p>An Oil Spill Response Plan should be prepared by the operator to document the appropriate response procedures for oil spillage incidents in detail. General procedures to be taken in case of fuel oil spillage are presented below.</p> <ul style="list-style-type: none"> <li>Training                             <ul style="list-style-type: none"> <li>- Training on oil spill response actions should be given to relevant staff. The training shall cover the</li> </ul> </li> </ul>	IWMF Site/ During Operation Period	IWMF Operator			✓		

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
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	<p>followings:</p> <ul style="list-style-type: none"> <li>➤ Tools &amp; resources to combat oil spillage and fire, e.g. locations of oil spill handling equipment and fire fighting equipment;</li> <li>➤ General methods to deal with oil spillage and fire incidents;</li> <li>➤ Procedures for emergency drills in the event of oil spills and fire; and</li> <li>➤ Regular drills shall be carried out.</li> </ul> <ul style="list-style-type: none"> <li>• Communication                             <ul style="list-style-type: none"> <li>- Establish communication channel with the Fire Services Department (FSD) and EPD to report any oil spillage incident so that necessary assistance from relevant department can be quickly sought.</li> </ul> </li> <li>• Response Procedures                             <ul style="list-style-type: none"> <li>- Any fuel oil spillage within the IW MF site should be immediately reported to the Plant Manager with necessary details including location, source, possible cause and extent of the spillage.</li> <li>- Plant Manager should immediately attend to the spillage and initiate any appropriate action to confine and clean up the spillage. The response procedures shall include the following:                                     <ul style="list-style-type: none"> <li>➤ Identify and isolate the source of spillage as soon as possible.</li> <li>➤ Contain the oil spillage and avoid infiltration into soil/ groundwater and discharge to storm water channels.</li> </ul> </li> </ul> </li> </ul>							

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	<ul style="list-style-type: none"> <li>➤ Remove the oil spillage.</li> <li>➤ Clean up the contaminated area.</li> <li>➤ If the oil spillage occurs during storage tank refuelling, the refueling operation should immediately be stopped.</li> <li>➤ Recovered contaminated fuel oil and the associated material to remove the spilled oil should be considered as chemical waste. The handling and disposal procedures for chemical wastes are discussed in the following paragraphs.</li> </ul>							
6b.6.3.2	<p><u>Chemicals and Chemical Wastes Handling &amp; Storage</u></p> <ul style="list-style-type: none"> <li>• Chemicals and chemical wastes should only be stored in suitable containers in purpose-built areas.</li> <li>• The storage of chemical wastes should comply with the requirements of the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes.</li> <li>• The storage areas for chemicals and chemical wastes shall have an impermeable floor or surface. The impermeable floor/ surface shall possess the following properties:                             <ul style="list-style-type: none"> <li>- Not liable to chemically react with the materials and their containers to be stored.</li> <li>- Able to withstand normal loading and physical damage caused by container handling</li> <li>- The integrity and condition of the impermeable floor or surface should be inspected at regular intervals to ensure that it is satisfactorily maintained</li> </ul> </li> </ul>	Chemicals and Chemical Wastes Storage Area / During Operation Period	IWMF Operator			✓		

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
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	<ul style="list-style-type: none"> <li>➤ For liquid chemicals and chemical wastes storage, the storage area should be bunded to contain at least 110% of the storage capacity of the largest containers or 20% of the total quantity of the chemicals/chemical wastes stored, whichever is the greater.</li> <li>➤ Storage containers shall be checked at regular intervals for their structural integrity and to ensure that the caps or fill points are tightly closed.</li> <li>➤ Chemical handling shall be conducted by trained workers under supervision.</li> </ul>							
6b.6.3.2	<p><u>Chemicals and Chemical Wastes Spillage Response</u></p> <p>A Chemicals and/ or Chemical Wastes Spillage Response Plan shall be prepared by the operator to document in detail the appropriate response procedures for chemicals or chemical wastes spillage incidents. General procedures to be undertaken in case of chemicals/ chemical waste spillages are presented below.</p> <ul style="list-style-type: none"> <li>• Training                             <ul style="list-style-type: none"> <li>- Training on spill response actions should be given to relevant staff. The training shall cover the followings:                                     <ul style="list-style-type: none"> <li>➤ Tools &amp; resources to handle spillage, e.g. locations of spill handling equipment;</li> <li>➤ General methods to deal with spillage; and</li> <li>➤ Procedures for emergency drills in the event of spills.</li> </ul> </li> </ul> </li> <li>• Communication</li> </ul>	IWMF Site/ During Operation Period	IWMF Operator			✓		



EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	<ul style="list-style-type: none"> <li>- Establish communication channel with FSD and EPD to report the spillage incident so that necessary assistance from relevant department can be quickly sought.</li> <li>• Response Procedures                             <ul style="list-style-type: none"> <li>- Any spillage within the IWMF site should be reported to the Plant Manager.</li> <li>- Plant Manager shall attend to the spillage and initiate any appropriate actions needed to confine and clean up the spillage. The response procedures shall include the followings:                                     <ul style="list-style-type: none"> <li>➢ Identify and isolate the source of spillage as soon as possible;</li> <li>➢ Contain the spillage and avoid infiltration into soil/ groundwater and discharge to storm water channels (in case the spillage occurs at locations out of the designated storage areas);</li> <li>➢ Remove the spillage; the removal method/ procedures documented in the Material Safety Data Sheet (MSDS) of the chemicals spilled should be observed;</li> <li>➢ Clean up the contaminated area (in case the spillage occurs at locations out of the designated storage areas); and</li> <li>➢ The waste arising from the cleanup operation should be considered as chemical wastes.</li> </ul> </li> </ul> </li> </ul>							
6b.6.3.3	<p><u>Preventive Measures for Incineration By-products Handling</u></p> <p>The recommended measures listed below can minimize the potential contamination to the surrounding environment due</p>	Storage, Handling & Collection of Incineration Ash at IWMF/ During	IWMF Operator			✓		

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	<p>to the incineration by-products:</p> <ul style="list-style-type: none"> <li>Ash should be stored in storage silos;</li> <li>Ash should be handled and conveyed in closed systems fully segregated from the ambient environment;</li> <li>Ash should be wetted with water to control fugitive dust, where necessary;</li> <li>All fly ash and APC residues should be treated, e.g. by cement solidification or chemical stabilization, for compliance with the proposed Incineration Residue Pollution Control Limits and leachability criteria prior to disposal;</li> <li>The ash should be transported in covered trucks or containers to the designated landfill site.</li> </ul>	Operation Period						
6b.6.3.4 - 6b.6.3.6	<p><u>Incident Record</u></p> <p>After any spillage, an incident report should be prepared by the Plant Manager. The incident report should contain details of the incident including the cause of the incident, the material spilled and estimated spillage amount, and also the response actions undertaken. The incident record should be kept carefully and able to be retrieved when necessary.</p> <p>The incident report should provide sufficient details for the evaluation of any environmental impacts due to the spillage and assessment of the effectiveness of measures taken.</p> <p>In case any spillage or accidents results in significant land contamination, EPD should be informed immediately and the IWMF operator should be responsible for the cleanup of the affected area. The responses procedures described in <b>Section 6b.6.3.1</b> and <b>Section 6b.6.3.2</b> of EIA report should</p>	IWMF Site/ During Operation Period	IWMF Operator			✓		Guidance Manual for Use of Risk-based Remediation Goals for Contaminated Land Management and the Guidance Note for Contaminated Land and Remediation.

Contract No. EP/SP/66/12

Construction for development of  
Integrated Waste Management Facilities Phase 1

Environmental Monitoring & Audit Manual

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	be followed accordingly together with the land contamination assessment and remediation guidelines stipulated in the <i>Guidance Manual for Use of Risk-based Remediation Goals for Contaminated Land Management and the Guidance Note for Contaminated Land and Remediation</i> .							

\* Des - Design, C - Construction, O – Operation, and Dec - Decommissioning

**Table 11.5 Implementation Schedule for Ecological Quality Measures for the IWMF at the artificial island near SKC**

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
7b.8.2.1	<p><u>Measures to avoid direct loss of intertidal habitat</u></p> <ul style="list-style-type: none"> <li>The site boundary has been proposed to avoid direct contact with the intertidal natural rocky shore of Shek Kwu Chau. It avoids direct loss of intertidal communities and the existing natural rocky shore habitat, where Reef Egret and White-bellied Sea Eagle have been recorded within and in the vicinity of this habitat.</li> </ul>	IWMF site	Design team	✓				EIAO-TM
7b.8.2.2	<p><u>Measures to minimise loss of coastal subtidal habitat</u></p> <ul style="list-style-type: none"> <li>Extensive coral colonies were recorded at the coastal hard bottom habitat at Shek Kwu Chau. To avoid and minimise the extensive direct impact on the coral colonies, the proposed reclamation area has been moved further offshore to minimise loss of subtidal habitat near shore.</li> </ul>	IWMF site	Design team	✓				EIAO-TM
7b.8.2.3	<p><u>Zero Discharge Scheme</u></p> <ul style="list-style-type: none"> <li>The design scheme of the Project has avoided discharge of wastewater into the marine environment. A zero discharge scheme would be adopted during the operation of the Project. An on-site wastewater treatment plant would be provided to treat the wastewater generated from the IWMF (mainly human sewage). The treated effluent would be re-used in the incineration plant and mechanical treatment plant, or for onsite washdown and landscape.</li> </ul>	IWMF site	Design team, IWMF operator	✓		✓		WPCO
7b.8.2.4	<p><u>Measures to avoid loss of plant species of conservation importance</u></p> <ul style="list-style-type: none"> <li>Landing portal construction works would not cause direct loss to the recorded individual of protected plant species,</li> <li><i>Aquilaria sinensis</i>, at the coastal shrubland habitat at Cheung Sha. As a precautionary measure, the plant</li> </ul>	Cheung Sha landing portal	Design team, Contractor	✓	✓		✓	EIAO-TM

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	should be tagged with eye-catching tape and fenced off prior to works, in order to avoid any damage by workers.							
7b.8.3.1-7b.8.3.15	<p><u>Measures to minimise water quality impact</u></p> <ul style="list-style-type: none"> <li>Measures for water quality as recommended in <b>Section 5b</b> of the EIA Report should be implemented.</li> </ul>	Work site	Design team, contractor, IWMF operator	✓	✓	✓	✓	EIAO-TM; ProPECC PN 1/94; WPCO
7b.8.3.16 - 7b.8.3.30	<p><u>Measures to minimise disturbance on Finless Porpoise</u></p> <p><i>Minimisation of Habitat Loss for Finless Porpoise</i></p> <ul style="list-style-type: none"> <li>Substantial revision has been made on the layout plan and form of the breakwater, in order to minimise the potential loss of important habitat for Finless Porpoise. The revision has greatly reduced the size of the embayment area, as well as the Project footprint. As a result, the size of habitat loss for Finless Porpoise has reduced from the original ~50 ha, down to ~31 ha.</li> </ul> <p><i>Avoidance of peak season for finless porpoise occurrence</i></p> <ul style="list-style-type: none"> <li>To minimise potential acoustic disturbance from construction activities on Finless Porpoise, construction works that may produce underwater acoustic disturbance should be scheduled outside the months with peak Finless Porpoise occurrence (December to May), including:                             <ul style="list-style-type: none"> <li>sheet piling works for construction of cofferdam surrounding the reclamation area (Phase 1);</li> <li>sheet piling works for construction of the shorter section of breakwater (Phase 1);</li> <li>sheet piling works for construction of the remaining</li> </ul> </li> </ul>	IWMF site, work site, marine traffic route	Design team, contractor, IWMF operator	✓	✓	✓	✓	EIAO-TM, Supporting Document for Application for Variation of the Environmental Permit (EP-429/2012)

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
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	<p>section of breakwater (Phase 3);</p> <ul style="list-style-type: none"> <li>- bored piling works for berth area (Phase 3); and</li> </ul> <p>Such works should be restricted within June to November. This approach would not only avoid the peak season for Finless Porpoise occurrence, the magnitude of impacts arise from acoustic disturbance would also be minimised.</p> <ul style="list-style-type: none"> <li>• Since the DCM ground treatment and the installation of precast seawalls and breakwaters should generate no underwater acoustic disturbance to Finless Porpoise, no specific mitigation measures are required.</li> </ul> <p><i>Opt for quieter construction methods and plants</i></p> <ul style="list-style-type: none"> <li>• Considering the sensitivity of marine mammals to underwater acoustic disturbance, instead of the previously proposed conventional breakwater and reclamation peripheral structure, which requires noisy piling works, the current circular cells structure for breakwater and reclamation peripheral structure is proposed. A quieter sheet piling method using vibratory hammer or hydraulic impact hammer, should be adopted for the installation of circular cells for cellular cofferdam and northern breakwater during Phase 1, and southern breakwater Phase 3;</li> <li>• Non-percussive bore piling method would be adopted for the installation of tubular piles for the berth construction during Phase 3.</li> </ul>							

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	<p><i>Monitored exclusion zones</i></p> <ul style="list-style-type: none"> <li>• During the installation/re-installation/relocation process of floating type silt curtains, in order to avoid the accidental entrance and entrapment of marine mammals within the silt curtains, a monitored exclusion zone of 250 m radius from silt curtain should be implemented. The exclusion zone should be closely monitored by an experienced marine mammal observer at least 30 minutes before the start of installation/re-installation/relocation process. If a marine mammal is noted within the exclusion zone, all marine works should stop immediately and remain idle for 30 minutes, or until the exclusion zone is free from marine mammals.</li> <li>• The experienced marine mammal observer should be well trained to detect marine mammals. Binoculars should be used to search the exclusion zone from an elevated platform with unobstructed visibility. The observer should also be independent from the project proponent and has the power to call-off construction activities.</li> <li>• In addition, as marine mammals cannot be effectively monitored within the proposed monitored exclusion zone at night, or during adverse weather conditions (i.e. Beaufort 5 or above, visibility of 300 meters or below), marine works should be avoided under weather conditions with low visibility.</li> </ul> <p><i>Marine mammal watching plan</i></p>							

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	<ul style="list-style-type: none"> <li>Upon the completion of the installation/re-installation/relocation of floating type silt curtain, all marine works would be conducted within a fully enclosed environment within the silt curtain, hence exclusion zone monitoring would no longer be required. Subsequently, a marine mammal watching plan should be implemented.</li> </ul> <p>The plan should include regular inspection of silt curtains, and visual inspection of the waters surrounded by the curtains. Special attention should be paid to Phase 2 (reclamation) where the floating type still curtain would be opened occasionally for vessel access, leaving a temporary 50 m opening. An action plan should be devised to cope with any unpredicted incidents such as the case when marine mammals are found within the waters surrounded by the silt curtains.</p> <p><i>Small openings at silt curtains</i></p> <ul style="list-style-type: none"> <li>The openings for vessel access at the silt curtains should be as small as possible to minimise the risk of accidental entrance.</li> </ul> <p><i>Adoption of regular travel route</i></p> <ul style="list-style-type: none"> <li>During construction and operation, captains of all vessels should adopt regular travel route, in order to minimize the chance of vessel collision with marine mammals, which may otherwise result in damage to health or mortality. The regular travel route should avoid areas with high sighting density of Finless Porpoise as much as possible.</li> </ul>							



EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	<p><i>Vessel speed limit</i></p> <ul style="list-style-type: none"> <li>The frequent vessel traffic in the vicinity of works area may increase the chance of mammal mammals being killed or seriously injured by vessel collision. A speed limit of ten knots should be strictly enforced within areas with high density of Finless Porpoise.</li> <li>Passive acoustic monitoring and land-based theodolite monitoring surveys should be adopted to verify the predicted impacts and effectiveness of the proposed mitigation measures.</li> </ul> <p><i>Training of Staff</i></p> <ul style="list-style-type: none"> <li>Staff, including captains of vessels, should be aware of the guidelines for safe vessel operations in the presence of cetaceans during construction and operation phases. Adequate trainings should be provided</li> </ul>							
7b.8.3.31 - 7b.8.3.34	<p><u>Measures to minimise impact on corals</u></p> <p><i>Coral translocation</i></p> <ul style="list-style-type: none"> <li>Coral communities within and in proximity to the proposed dredging sites would be disturbed by the Project due to the dredging operations. In order to minimise direct loss of coral communities, translocation of corals that are attached to movable rocks with diameter less than 50 cm are recommended. In order to avoid disturbance to corals during the spawning period, the spawning season of corals</li> </ul>	IWMF site	Design team, contractor, IWMF operator	✓	✓	✓	✓	EIAO-TM

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	<p>(June to August) should be avoided; and that translocation should be carried out during the winter season (November- March).</p> <ul style="list-style-type: none"> <li>The REA survey results suggest that the 198 directly affected coral colonies were attached to movable rocks (less than 50 cm in diameter). It is technically feasible to translocate them to avoid direct loss.</li> <li>Prior to coral translocation, a more detailed baseline survey, including a coral mapping survey, is recommended to further confirm the exact number and location of coral colonies within the potentially affected area. A more detailed coral translocation plan, including selection of suitable recipient site, plan for coral translocation, and event / action plan for coral monitoring should be submitted upon approval of this Project, prior to commencement of construction works. Advice from relevant governmental departments (i.e. AFCD) and professionals would be sought after, in order to identify a desirable location for the relocation of coral communities. Post-translocation monitoring on the translocated corals should also be considered.</li> </ul> <p><i>Coral monitoring programme</i></p> <ul style="list-style-type: none"> <li>A coral monitoring programme is recommended to assess any adverse and unacceptable impacts to the coral communities at the coasts of Shek Kwu Chau during construction of the Project.</li> </ul> <p><i>Phasing of Works</i></p>							

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	<ul style="list-style-type: none"> <li>To minimize environmental impacts, the proposed phasing of construction works has been carefully designed to reduce the amount of concurrent works, hence minimise SS elevation and the associated impacts on corals.</li> </ul>							
7b.8.3.35 - 7b.8.3.41	<p><u>Specific measures to minimise disturbance on breeding White-bellied Sea Eagle</u></p> <p><i>Avoidance of noisy works during the breeding season of White-bellied Sea Eagle</i></p> <ul style="list-style-type: none"> <li>To minimise potential noise disturbance from construction activities on WBSE, noisy construction works should be scheduled outside their breeding season (December to May) to minimise potential degradation in breeding ground quality and breeding activities, including:                             <ul style="list-style-type: none"> <li>sheet piling works for construction of cofferdam surrounding the reclamation area (Phase 1);</li> <li>sheet piling works for construction of the shorter section of breakwater (Phase 1);</li> <li>sheet piling works for construction of the remaining section of breakwater (Phase 3); and</li> <li>bored piling works for berth area (Phase 3).</li> </ul> </li> </ul> <p><i>Opt for quieter construction methods and plants</i></p> <ul style="list-style-type: none"> <li>To minimise potential construction noise disturbance on WBSE, quieter construction methods and plants should be adopted. The recommended noise mitigation measures in the <b>Noise</b> chapter (<b>Section 4b.8</b> of the EIA Report)</li> </ul>	IWMF site, marine traffic route	Design Team, Contractor, IWMF operator	✓	✓	✓	✓	EIAO-TM

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	<p>should be implemented to minimise potential noise disturbance to acceptable levels.</p> <p><i>Restriction on vessel access near the nest of White-bellied Sea Eagle</i></p> <ul style="list-style-type: none"> <li>• During construction and operation, in order to minimise disturbance on the existing WBSE nest, a pre-defined practical route to restrict vessel access near the nest should be adopted to keep vessels and boats as far away from the nest as possible.</li> </ul> <p><i>White-bellied Sea Eagle monitoring programme</i></p> <ul style="list-style-type: none"> <li>• A WBSE monitoring programme is recommended to assess any adverse and unacceptable impacts to the breeding activities of WBSE during construction and operation of the Project. Monitoring surveys for WBSE would include pre-construction phase (twice per month for duration of three months during their breeding season - between December and May, immediately before the commencement of works), construction phase, and operation phase (two years after the completion of construction works).</li> <li>• Surveys should be conducted twice per month during their breeding season (from December to May); and once per month outside breeding season (June to November). More details on monitoring for WBSE are presented in the EM&amp;A Manual.</li> </ul> <p><i>Education of staff</i></p>							

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	<ul style="list-style-type: none"> <li>Staff, including captains of all vessels during construction and operation phases, should be aware of the ecological importance of WBSE. Awareness should be raised among staff to minimise any intentional or unintentional disturbance to the nest.</li> </ul> <p><i>Minimisation of Glare Disturbance</i></p> <ul style="list-style-type: none"> <li>To minimise glare disturbance on WBSE, which may cause disorientation of birds by interfering with their magnetic compass, and disruption in behavioural patterns such as reproduction, fat storage and foraging pattern, any un-necessary outdoor lighting should be avoided, and in-ward and down-ward pointing of lights should be adopted.</li> </ul>							
-	<p><u>Construction of Seawall/Breakwaters</u></p> <ul style="list-style-type: none"> <li>To widen the open channel between the Artificial Island and Shek Kwu Chau.</li> <li>To design the precast concrete seawall with environmental friendly features.</li> </ul>	IWMF site	Design team, contractor, IWMF operator	✓	✓			Supporting Document for Application for Variation of Environmental Permit (EP-429/2012)
7b.8.3.42	<p><u>Opt for Quieter Construction Methods and Plants</u></p> <ul style="list-style-type: none"> <li>Quieter construction methods and plants should be used to minimise disturbance to the nearby terrestrial habitat and the associated wildlife.</li> </ul>	Work site	Design team, contractor, IWMF operator	✓	✓	✓	✓	EIAO-TM
7b.8.3.43	<p><u>Measures to minimise impacts from artificial lighting</u></p>	IWMF site	Design team, contractor, IWMF operator	✓	✓	✓		EIAO-TM

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	<ul style="list-style-type: none"> <li>Unnecessary lighting should be avoided, and shielding of lights should be provided to minimise disturbance from light pollution on fauna groups.</li> </ul>							
7b.8.3.44 - 7b.8.3.45	<p><u>Measures to minimise accidental spillage</u></p> <ul style="list-style-type: none"> <li>Regular maintenance of vessels, vehicles and equipments that may cause leakage and spillage should only be undertaken within pre-designated areas, which are appropriately equipped to control the associated discharges.</li> <li>Oils, fuels and chemicals should be contained in suitable containers, and only be used and stored in designated areas which have pollution prevention facilities. All fuel tanks and storage areas should be sited on sealed areas in order to prevent spillage of fuels and solvents to the nearby watercourses. All waste oils and fuels should be collected in designated tanks prior to disposal.</li> </ul>	Work site	Contractor, IW MF operator		✓	✓	✓	EIAO-TM
7b.8.3.46	<p><u>Measures to minimise sewage effluent</u></p> <ul style="list-style-type: none"> <li>Temporary sanitary facilities, such as portable chemical toilets, should be employed on-site where necessary to handle sewage from the workforce.</li> </ul>	Work site	Contractor		✓			EIAO-TM
7b.8.3.47	<p><u>Measures to minimise drainage and construction runoff</u></p> <ul style="list-style-type: none"> <li>Potential ecological impacts resulted from potential degradation of water quality due to unmitigated surface runoff could be minimised via the detailed mitigation measures in <b>Section 5b.8</b> of the EIA Report. The following presents some of the mitigation measures:</li> </ul>	Work site	Contractor		✓		✓	EIAO-TM

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	<ul style="list-style-type: none"> <li>- On-site drainage system with implemented sedimentation control facilities.</li> <li>- Channels, earth bunds or sand bag barriers should be provided on site to direct storm water to silt removal facilities.</li> <li>- Provision of embankment at boundaries of earthworks for flood protection.</li> <li>- Water pumped out from foundation piles must be discharged into silt removal facilities.</li> <li>- During rainstorms, exposed slope/soil surfaces should be covered by tarpaulin or other means, as far as practicable.</li> <li>- Exposed soil surface should be minimized to reduce siltation and runoff.</li> <li>- Earthwork final surfaces should be well compacted. Subsequent permanent surface protection should be immediately performed.</li> <li>- Open stockpiles of construction materials, and construction wastes on-site should be covered with tarpaulin or similar fabric during rainstorms.</li> </ul>							
7b.8.3.48	<p><u>Measures to minimise impacts from general construction activities</u></p> <ul style="list-style-type: none"> <li>• To avoid the entering of construction solid waste into the nearby habitats, construction solid waste should be collected, handled and disposed of properly to avoid entering to the nearby habitats. It is recommended to clean the construction sites on a regular basis.</li> </ul>	Work site	Contractor		✓			EIAO-TM
7b.8.3.49	<u>Pest Control</u>	IWMF site	IWMF operator			✓		

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	<p>Good waste management practices should be adopted at the IWMF in order to minimise the risk of introduction of pest to the island:</p> <ul style="list-style-type: none"> <li>- Transportation of wastes in enclosed containers</li> <li>- Waste storage area should be well maintained and cleaned</li> <li>- Waste should only be disposed of at designated areas</li> <li>- Timely removal of the newly arrived waste</li> <li>- Removal of items that are capable of retaining water</li> <li>- Rapid clean up of any waste spillages</li> <li>- Maintenance of a tidy and clean site environment</li> <li>- Regular application of pest control</li> <li>- Education of staff the importance of site cleanliness</li> </ul>							
7b.8.3.50	<p><u>Control of Marine Habitat Quality during Operation Phase</u></p> <ul style="list-style-type: none"> <li>• Depending on the seabed condition of the approach channel for marine vessels during operation phase of the IWMF, maintenance dredging may be required to ensure safe access. In order to avoid degradation in water quality due to elevation in SS and dispersion of sediment plume due to dredging works, it is recommended that any future maintenance dredging works should not be carried out within 100 m from the shore, similar to that of the dredging for anti-scouring protection layer during construction phase. All maintenance dredging works should be carried out with the implementation of silt curtain to control the dispersion of SS. The production rate should comply with the permit dredging rate and number of grab per hour.</li> </ul>	IWMF site	IWMF operator			✓		EIAO-TM; WPCO



EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
7b.8.4.1 – 7b.8.4.8	<p><u>Compensation of loss of important habitat of Finless Porpoise</u></p> <p><i>Designation of Marine Park</i></p> <ul style="list-style-type: none"> <li>The Project Proponent has made a firm commitment to seek to designate a marine park of approximately 700 ha in the waters between Soko Islands and Shek Kwu Chau, in accordance with the statutory process stipulated in the Marine Parks Ordinance, as a compensation measure for the habitat loss arising from the construction of the IWMF at the artificial island near SKC.</li> <li>The Project Proponent shall seek to complete the designation by 2018 to tie in with the operation of the IWMF at the artificial island near SKC.</li> <li>A further study should be carried out to review relevant previous studies and collate available information on the ecological characters of the proposed area for marine park designation; and review available survey data for Finless Porpoise, water quality, fisheries, marine traffic and planned development projects in the vicinity. Based on the findings, ecological profiles of the proposed area for marine park designation should be established, and the extent and location of the proposed marine park be determined. The adequacy of enhancement measures should also be reviewed.</li> <li>In addition, a management plan for the proposed marine park should be proposed, covering information on the responsible departments for operation and management</li> </ul>	Waters between Shek Kwu Chau and Soko Islands	Project Proponent	✓		✓		EIAO-TM

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	<p>(O&amp;M) of the marine park, as well as the O&amp;M duties of each of the departments involved. Consultation with relevant government departments and stakeholders should be conducted under the study. The study should be submitted to Director of Environmental Protection (DEP) for approval before the commencement of construction works.</p> <ul style="list-style-type: none"> <li>The Project Proponent should provide assistance to AFCD during the process of the marine park designation.</li> </ul>							
7b.8.5.1 – 7b.8.5.4	<p><u>Additional Enhancement or Precautionary Measures</u> <i>Deployment of Artificial Reefs</i></p> <ul style="list-style-type: none"> <li>Deployment of artificial reefs (ARs) is an enhancement measure for the marine habitats. ARs are proposed to be deployed within the proposed marine park under this Project. The exact location, dimension and type of ARs to be deployed are to be further investigated along with the further study of the proposed marine park under this Project. The proposed ARs would be deployed at the same time as the complete designation of marine park.</li> </ul> <p><i>Release of Fish Fry at Artificial Reefs and Marine Park</i></p> <ul style="list-style-type: none"> <li>Release of fish fry at the proposed ARs, as well as the proposed marine park under this study, should enhance the fish resources in the nearby waters, and subsequently food sources for Finless Porpoise. The proposed ARs with various micro-habitats would have the potential to provide shelter and nursery ground for the released fish fry. The frequency and quantity of fry to be released should be agreed by AFCD.</li> </ul>	Within the proposed marine park under this study	Project Proponent	✓		✓		EIAO-TM

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\* Des - Design, C - Construction, O – Operation, and Dec - Decommissioning

**Table 11.6 Implementation Schedule for Fisheries Measures for the IWMF at the artificial island near SKC**

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
8b.8.1.2	<u>Measure to minimise loss of and disturbance on fisheries resources</u> <ul style="list-style-type: none"> <li>Alteration to the phasing of works, construction method, and layout plan of the IWMF at the artificial island near SKC has been made. The total fishing ground to be permanently lost due to the project has been significantly reduced from ~50 ha to ~31 ha. By adopting the current circular cells instead of the conventional seawall construction method, SS elevation would be greatly reduced, minimising adverse impact on the health of fisheries resources.</li> </ul>	IWMF site	Design team, contractor	✓	✓		✓	EIAO-TM
8b.8.1.3	<u>Measure to minimise impingement and entrainment</u> <ul style="list-style-type: none"> <li>Provision of a screen at the water intake point for desalination plant would be essential to minimise the risk of impingement and entrainment of fisheries resources (including fish, larvae and egg) through the intake point.</li> </ul>	IWMF site	Design team, contractor, IWMF operator	✓	✓	✓		EIAO-TM
8b.8.1.4- 8b.8.1.6	<u>Measures to control water quality</u> <ul style="list-style-type: none"> <li>No wastewater effluent, anti-fouling agent, heavy metals and other contaminants would be released during operation phase of the Project.</li> <li>Mitigation measures recommended in the water quality impact assessment during construction and operation would serve to protect fisheries resources from indirect impacts resulted from the Project</li> </ul>	Work site, IWMF site	Design team, contractor, IWMF operator	✓	✓	✓	✓	EIAO-TM
8b.8.1.7 – 8b.8.1.8	<u>Additional Enhancement / Precautionary Measures</u>	Within the proposed marine park in the waters between	Project Proponent	✓		✓		EIAO-TM

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EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
	<ul style="list-style-type: none"> <li>Artificial Reefs (ARs) are proposed to be deployed within the proposed marine park under this Project as an enhancement measure for the marine habitats. This enhancement feature would bring positive impacts to the previously identified important spawning and nursery ground for fisheries resources.</li> </ul> <p><i>Release of Fish Fry at Artificial Reefs</i></p> <ul style="list-style-type: none"> <li>Release of fish fry has been proposed under this Project. The proposed deployment of ARs within the proposed marine park would provide shelter and nursery ground for the released fish fry. The frequency and quantity of fry to be released should be agreed by AFCD.</li> </ul>	Soko Islands and Shek Kwu Chau						

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**Table 11.7 Implementation Schedule for Landscape and Visual Measures for the IWMF at the artificial island near SKC**

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
S10b.10 MLVC- 01	Grass-hydroseeded bare soil surface and stock pile area	Work site / During construction phase	Contractor		✓			
S10b.10 MLVC-02	<u>Landscape Design</u> 1) Early planting using fast grow trees and tall shrubs at strategic locations within site as buffer to block view corridors to the site from the VSRs, and to locally screen haul roads, excavation works and site preparation works. 2) Use of tree species of dense tree crown to serve as visual barrier. 3) Hard and soft landscape treatment (e.g. trees and shrubs) of open areas within development to provide a background for the outdoor containers from open view, shade and shelter, and a green appearance from surrounding viewpoints. 4) Planting strip along the periphery of the project site. 5) Selected tree species suitable for the coastal condition.	Work site / During design & construction phases	Contractor	✓	✓			
S10b.10 MLVC-03	<u>Adoption of Natural Features of the Existing Shoreline</u> 1) Use of boulders in different sizes and with the similar textures of the existing rocky shores for the construction of breakwater and artificial shoreline in order to blend into the existing natural shoreline. 2) Use of cellular cofferdam together with the natural boulders to form a curvature shoreline for the reclamation area to echo with the natural shoreline of SKC.	Work site / During construction phase	Contractor		✓			

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
S10b.10 MLVC-04	<p><u>Greening Design (Rooftop &amp; Vertical Greening)</u></p> <ol style="list-style-type: none"> <li>1) Implementation of rooftop and vertical greening (vertical building envelope) along the periphery of each building block to increase the amenity value of the work, moderate temperature extremes and enhance building energy performance. The greening appearance of the building shall enhance its visual harmony with the natural surroundings as well as reduce the apparent visual mass of the structure.</li> <li>2) Sufficient space between concrete enclosure and stack to minimize heat transfer.</li> <li>3) Introduction of landscape decks at the stack to further enhance the overall natural and green concept unique for this site.</li> </ol>	Work site / During design & construction phases	Contractor	✓	✓			
S10b.10 MVC-01	<p><u>Visual Mitigation and Aesthetic Design</u></p> <ol style="list-style-type: none"> <li>1) Use of natural materials with recessive color to minimize the bulkiness of the building.</li> <li>2) Adoption of innovative aesthetic design to the chimney to minimize or visually mitigate the massing of the chimney so as to reduce its visual impact to the surroundings.</li> <li>3) Color of the chimney in a gradual changing manner to match with the color of the sky.</li> <li>4) Provision of observation deck for public enjoyment at the top of the chimney to diminish the feeling of chimney.</li> <li>5) Provision of sky gardens between the two stacks to allow additional greening for enhancing the aesthetic quality. Maintenance access (elevator and staircase) from the ground floor to the sky gardens will be provided to allow maintenance of the sky gardens.</li> <li>6) Integration of the visitor's walkway with different material façade design of incinerator plant to enhance the aesthetic quality.</li> </ol>	Structures in IWMF / During design & construction phases	Contractor	✓	✓			

EIA Ref	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*				Relevant Legislation and Guidelines
				Des	C	O	Dec	
S10b.10 MVC-02	Control of the security floodlight for construction areas at night to avoid excessive glare to the surrounding receiver.	Work site / During construction phase	Contractor		✓			
S10b.10 MVC-03	Optimization of the construction sequence and construction programme to minimize the duration of impact.	Work site / During design & construction phases	Contractor	✓	✓			
S10b.10 MVC-04	Storage of the backfilling materials for site formation & construction materials / wastes on site at a maximum height of 2m, covered with an impermeable material of visually unobtrusive material (in earth tone).	Work site / During construction phase	Contractor		✓			
S10b.10 MVC-05	Reduction of the number of construction traffic at the site to practical minimum.	Work site / During construction phase	Contractor		✓			
S10b.10 MLVO-01	<u>Planting Maintenance</u> Provision of proper planting maintenance and replacement of defective plant species on the new planting areas to enhance aesthetic and landscape quality.	Project site / During Operation phase	Contractor			✓		
S10b.10 MVO-01	<u>Environmental Education Centre</u> Development of an Environmental Education Center, in which regular exhibitions and lectures to promote environmental awareness and waste reduction concept would be provided, as a part of the IWMF for the general public to alleviate negative public perceptions of the development.	Project site / During Operation phase	Contractor			✓		
S10b.10 MVO-02	<u>Control of Light</u> Control the numbers of lights and their intensity to a level that is good enough to meet the safety requirements at night but not excessive.	Project site / During Operation phase	Contractor			✓		
S10b.10 MVO-03	<u>Control of Operation Time</u> Minimization of the frequency of waste transportation to practical minimum (e.g. limit the reception of MSW from 8 am to 8 pm)	Project site / During Operation phase	Contractor			✓		

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**Appendix 12.1**

**Incident Report on Action Level or Limit Level Non-compliance**

Project	
Date	
Time	
Monitoring Location	
Parameter	
Action & Limit Levels	
Measurement Level	
Possible reason for Action or Limit Level Noncompliance	
Actions taken / to be taken	
Remarks	

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

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

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

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