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1 Introduction

1.1 Purpose of the Manual

This Environmental Monitoring and Audit (EM&A) Manual ("the Manual") has been prepared by Black & Veatch Hong Kong Limited (B&V) in collaboration with Environmental Resources Management (ERM) on behalf of Drainage Services Department (DSD). The Manual is a supplementary document of the Environmental Impact Assessment (EIA) Study of the Project under Public Works Programme Item No. 4331DS – "Outlying Islands Sewerage Stage 2 – South Lantau Sewerage Works" which involves construction and operation of a sewerage system for proper collection, treatment and disposal of the sewage arising from South Lantau covering the areas in Shui Hau, Tong Fuk, Cheung Sha, San Shek Wan, Pui O and Ham Tin (hereafter referred to as the Project).

The Manual has been prepared in accordance with the *EIA Study Brief* (No. ESB-209/2009) and the *Technical Memorandum of the Environmental Impact Assessment Process* (*EIAO-TM*). The purpose of the Manual is to provide information, guidance and instruction to personnel charged with environmental duties and those responsible for undertaking EM&A work during construction and operation. It provides systematic procedures for monitoring and auditing of potential environmental impacts that may arise from the works.

This Manual contains the following information:

- Responsibilities of the Contractor(s), Environmental Team (ET), and the Independent Environmental Checker (IEC) with respect to the environmental monitoring and audit requirements during the course of the project;
- Project organisation;
- Requirements with respect to the construction and operational programme schedule and the necessary environmental monitoring and audit programme to track the varying environmental impact;
- Details of the methodologies to be adopted including field, laboratory and analytical procedures, and details on quality assurance and quality control programme;
- Preliminary 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 exceedances of applicable criteria and/or receive of 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.

For the purpose of this Manual, the ET Leader (ETL), who will be responsible for and in charge of the ET, will refer to the person delegated the role of executing the EM&A requirements.

This Manual is considered to be a working document and should be reviewed periodically and updated if necessary during the course of implementing the Project.

1.2 Project Description

1.2.1 Project Scope

The proposed sewerage works will collect the sewage generated from the unsewered areas of Shui Hau, Tong Fuk, Cheung Sha, San Shek Wan, Pui O and Ham Tin in South Lantau (i.e. within the Project Catchment Area) and convey it to a proposed sewage treatment works at San Shek Wan for treatment and disposal into outer bay of Pui O/ Chi Ma Wan via a submarine outfall. After implementation of the Project, a significant reduction of pollutant load is expected thus improving water quality along South Lantau coast. No additional pollutant load will be produced to the Southern Water Control Zone taking into consideration the anticipated increase in population growth and developments in the South Lantau area up to 2031.

The following elements of the Project are classified as Designated Projects under the *Environmental Impact Assessment Ordinance* (*Cap. 499*) (EIAO) and are addressed in this EIA Report:

- A dredging operation which is less than 500 m from the nearest boundary of an existing or planned coastal protection area (*Item C.12 of Part I of Schedule 2 of EIAO*);
- Sewage treatment works with an installed capacity of more than 5,000 m^3 per day and a boundary of which is less than 200 m from the nearest boundary of an existing or planned residential area, site of special scientific interest, site of culture heritage, bathing beaches, etc. (*Item F.2 of Part I of Schedule 2 of EIAO*);
- Sewage pumping stations with an installed capacity of more than 2,000 m^3 per day and a boundary of which is less than 150 m from an existing or planned residential area, site of special scientific interest, site of culture heritage, bathing beaches, etc. (*Item F.3 of Part I of Schedule 2 of EIAO*);
- An activity for the reuse of treated sewage effluent from a treatment plant (*Item F.4 of Part I of Schedule 2 of EIAO*); and
- A submarine sewage outfall (*Item F.6 of Part I of Schedule 2 of EIAO*).

1.2.2 Site Location

The catchment of the Project is hereinafter referred to as the Project Catchment Area and is shown in *Figure 1.1*. It is located in the southern coast of Lantau Island and surrounded by the Lantau South Country Park.

The Project Catchment Area covers the unsewered areas of South Lantau including traditional villages (Shui Hau, Tong Fuk, Cheung Sha Lower Village, Cheung Sha Upper Village, San Shek Wan, Pui O Lo Uk Tsuen, Pui O San Wai, Pui O Lo Wai and Ham Tin), residential developments, individual village houses, tourist spots and recreational facilities (bathing beaches, BBQ and camp sites, water sports centres, hiking trails, guesthouses, hostels and executive holiday houses), a correctional institution (Tong Fuk Correction Institution), schools, government institutions and utility facilities. South Lantau Road is the major access road of the Project Catchment Area.

1.3 Objective of the EM&A

The broad objective of this EM&A Manual is to define the procedures of the EM&A programme for monitoring the environmental performance of the Project during design, construction and operation. The construction and operational impacts arising from the implementation of the Project are specified in the EIA Report. The EIA Report also specifies mitigation measures and construction practices that may be needed to confirm compliance with the environmental criteria. These mitigation measures and their implementation requirements are presented in the Implementation Schedule of Mitigation Measures (Annex A).

The main objectives of the EM&A programme are to:

- provide a database of environmental parameters against which to determine any short term or long term environmental impacts;
- provide an early indication should any of the environmental control measures or practices fail to achieve the acceptable standards;
- confirm that the mitigation measures recommended in the EIA are included in the design of the Project;
- clarify and identify potential sources of pollution, impact and nuisance arising from the works for the responsible parties;
- confirm compliance with regulatory requirements, contract specifications and EIA study recommendations;
- confirm compliance of environmental designs during the design phase of the Project with the specifications stated in the EIA Report and the Environmental Permit (EP);
- monitor performance of the mitigation measures and to assess their effectiveness;
- take remedial action if unexpected issues or unacceptable impacts arise;
- verify the environmental impacts predicted in the EIA; and
- audit environmental performance.

EM&A procedures are required during the design, construction and operational phases of the project implementation and a summary of the requirements for each of the environmental parameters is detailed in *Table 1.1*.

Table 1.1 Summary of EM&A Requirements

Parameters	EM&A Phase		
	Design Phase [(1) (2)]	**Construction Phase**	**Operation Phase**
Air Quality	-	✓ (SI)	✓
Noise	-	✓ (SI)	✓
Water Quality	-	✓ (SI)	✓
Waste	-	✓ (SI)	✓
Ecology (Terrestrial & Aquatic)	✓	✓ (SI)	-
Fisheries	-	-	-
Landscape & Visual	✓	✓ (SI)	✓ (SI)
Cultural Heritage	✓	✓ (SI)	-

Notes:
" (SI) "= Site Inspection forms the main checking method; " — " = no EM&A required
(1) Pre-construction monitoring may overlap the design phase
(2) EM&A requirements in the design phase shall include confirmation on the compliance for environmental design which was specified in the EIA Report and the EP for all parameters.

1.4 The Scope of the EM&A Programme

The scope of this EM&A programme is to:

- establish baseline noise and water quality levels at specified locations and implement monitoring requirements for noise and water quality monitoring programme;
- implement inspection and audit requirements for air quality;
- implement inspection and audit requirements for waste management;
- implement inspection and audit requirements for ecological mitigation measures;
- implement inspection and audit requirements for landscape and visual mitigation measures;
- implement inspection and audit requirements for cultural heritage mitigation measures;
- liaise with, and provide environmental advice (as requested or when otherwise necessary) to construction site staff on the significance and implications of the environmental monitoring data;
- identify and resolve environmental issues and other functions as they may arise from the works;
- check and quantify the Contractor(s)'s overall environmental performance, implementation of Event and Action Plans (EAPs), and remedial actions taken to mitigate adverse environmental effects as they may arise from the works;
- conduct monthly reviews of monitored impact data as the basis for assessing compliance with the defined criteria and to verify that necessary mitigation measures are identified and implemented, and to undertake additional *ad hoc* monitoring and auditing as required by special circumstances;
- evaluate and interpret environmental monitoring data to provide an early indication should any of the environmental control measures or practices fail to achieve the acceptable standards, and to verify the environmental impacts predicted in the EIA;
- manage and liaise with other individuals or parties concerning other environmental issues deemed to be relevant to the construction process;
- conduct regular site inspections and audits of a formal or informal nature to assess:

- the level of the Contractor(s)'s general environmental awareness;
- the Contractor(s)'s implementation of the recommendations in the EIA and their contractual obligations;
- the Contractor(s)'s performance as measured by the EM&A;
- the need for specific mitigation measures to be implemented or the continued usage of those previously agreed;
- to advise the site staff of any identified potential environmental issues; and

- produce monthly EM&A reports which summarise project monitoring and auditing data, with full interpretation illustrating the acceptability or otherwise of any environmental impacts and identification or assessment of the implementation status of agreed mitigation measures.

1.5 Works Programme & Works Locations

The preliminary construction programme is given in *Figure 1.2*. The locations of works are shown in *Figure 1.1*.

1.6 Organization & Structure of the EM&A

The proposed organisation of the personnel involved in the EM&A process is illustrated in *Figure 1.3*.

The roles and responsibilities of the various parties are summarised below:

- **Drainage Services Department (DSD)** is the project proponent and works department, and hence will assume overall responsibility of the Project.

- **Environmental Protection Department (EPD)** is the statutory enforcement body for environmental protection matters in Hong Kong.

- The **Engineer's Representative (ER)** shall appoint an appropriate member of the resident site staff, who shall:

  (i) Monitor the Contractor's compliance with the contract specifications, including the EM&A programme, and the effective implementation and operation of environmental mitigation measures in a timely manner;

  (ii) Ensure that impact monitoring is conducted at the correct locations at the correct frequency as identified in the EM&A programme;

  (iii) Instruct the Contractor to follow the agreed protocols or those In the Contract Specifications in the event of exceedances or complaints;

  (iv) Review the programme of works with a view to identifying any potential environmental impacts before they arise;

  (v) Check that mitigation measures that have been recommended in the EIA Report, this document and contract documents, or as required, are correctly implemented in a timely manner, when necessary;

(vi) Report the findings of site audits and other environmental performance reviews to DSD;

(vii) Verify the environmental acceptability of permanent and temporary works, relevant design plans and submissions; and

(viii) Comply with the agreed Event and Action Plan in the event of any exceedance.

- The **Independent Environmental Checker (IEC)** shall advise the ER on environmental issues related to the Project. The IEC shall not be in any way an associated body of the ER, the Contractor or the ET for the Project. The IEC shall be empowered to audit from an independent viewpoint the environmental performance during the construction of the Project. The IEC shall be a person who has relevant professional qualifications in environmental control and at least 7 years experience in EM&A and environmental management.

  The IEC shall be responsible for the duties defined in this Manual, and shall audit the overall EM&A programme, including the implementation of all environmental mitigation measures, submissions required in this Manual, as well as any other relevant submissions required under the Environmental Permit. The IEC shall be responsible for verifying the environmental acceptability of permanent and temporary works, relevant design plans and submissions under the EP. The IEC shall verify the logbook prepared and kept by the ET Leader. The IEC shall notify EPD by fax, within 24 hours of receipt of notification from the ET Leader of any such instance or circumstance or change of circumstances or non-compliance with the EIA Report or the EP, which might affect the monitoring or control of adverse environmental impact.

  The main duties of the IEC are to carry out independent environmental audit of the Project. This shall include, inter alias, the following:

  (i) Review and audit in an independent, objective and professional manner in all aspects of the EM&A programme;

  (ii) Validate and confirm the accuracy of monitoring results, appropriateness of monitoring equipment, monitoring locations with reference to the locations of the nearby sensitive receivers, and monitoring procedures;

  (iii) Carry out random sample check and audit on monitoring data and sampling procedures, etc;

  (iv) Conduct random site inspection (at least once a month);

  (v) Audit the EIA recommendations and EP requirements against the status of implementation of environmental protection measures on site;

  (vi) Review the effectiveness of environmental mitigation measures and environmental performance of the Project;

(vii) On an as needed basis, verify and certify the environmental acceptability of the construction methodology (both temporary and permanent works), relevant design plans and submissions under the environmental permit. Where necessary, the IEC shall agree in consultation with the ET Leader and the Contractor(s) the least impact alternative;

(viii) Verify investigation results of complaint cases and the effectiveness of corrective measures;

(ix) Verify EM&A reports submitted and certified by the ET Leader; and

(x) Feedback audit results to ER/ ET by signing according to the Event/ Action Plans specified in this Manual.

- An **Environmental Team (ET)** headed by an ET Leader shall be appointed to carry out the recommended EM&A programme for the Project. Neither ET Leader nor ET shall be in any way an associated body of the IEC. The ET Leader shall plan, organise and manage the implementation of the EM&A programme, and ensure that the EM&A works are undertaken to the required standards. The ET Leader shall have relevant professional qualifications in environmental control and possess at least 7 years experience in EM&A and/or environmental management subject to the approval of their employer.

  The ET Leader shall be responsible for the implementation of the EM&A programme in accordance with the EM&A requirements specified in this Manual and the EP. The ET Leader shall keep a contemporaneous logbook for recording each and every instance or circumstance or change of circumstances that may affect the compliance with the recommendations of the EIA report. This logbook shall be kept readily available for inspection by the IEC, and Director of Environmental Protection (DEP) or his authorised officers.

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

  The broad categories of works of the ET comprise the following:

  (i) To monitor the various environmental parameters as required by the EM&A programme;

  (ii) To follow up and close out of the non-compliance actions;

  (iii) To investigate and audit the Contractor's equipment and work methodologies with respect to pollution control and environmental mitigation, and to anticipate environmental issues that may require mitigation before the problem arises;

  (iv) To audit and prepare audit reports on the environmental monitoring data and the site environmental conditions;

(v) To review the EM&A programme after the collection and analysis of the baseline data,

(vi) To modify the EM&A programme in terms of parameters, sites, sample sizes, frequency etc. if appropriate in consultation with the ER and EPD, and

(vii) To report the environmental monitoring and audit results to the IEC, Contractor and the ER.

- The **Contractor(s)** shall assign an on-site environmental coordinator to oversee Contractor's environmental performance and the implementation of the EM&A duties. The coordinator shall be a person who has relevant professional qualifications in environmental control and is subject to approval by the ER.

  The broad categories of works of the Contractor comprise the following:

  (i) Work within the scope of the construction contract and other tender conditions with respect to environmental requirements;

  (ii) Operate and strictly adhere to the guidelines and requirements in this EM&A programme and contract specifications;

  (iii) Provide assistance to ET in carrying their monitoring;

  (iv) Participate in the site inspections undertaken by the ET as required, and undertake corrective actions;

  (v) Provide information / advice to the ET regarding works activities which may contribute, or be continuing to the generation of adverse environmental conditions;

  (vi) Submit proposals on mitigation measures in case of exceedances of Action and Limit levels in accordance with the Event / Action Plans;

  (vii) Implement measures to reduce impact where Action and Limit levels are exceeded; and

  (viii) Adhere to the procedures for carrying out complaint investigation.

  The Contractor(s) should also participate in the environmental performance review undertaken by the ER and undertake any corrective actions as instructed by the ER.

1.7 Structure of the EM&A Manual

The remainder of this Manual is set out as follows:

- *Section 2* sets out the general requirements of EM&A;
- *Section 3* details the requirements for air quality audit;
- *Section 4* details the requirements for noise monitoring;
- *Section 5* details the requirements for water quality monitoring;
- *Section 6* details the requirements for waste management and land contamination audit;
- *Section 7* details the requirements for ecology;
- *Section 8* details the requirements for fisheries;
- *Section 9* details the requirements for landscape and visual;
- *Section 10* details the requirements for cultural heritage;
- *Section 11* describes the scope and frequency of site inspection/auditing;
- *Section 12* details the EM&A reporting requirements;
- Annex A contains the implementation schedule summarizing all mitigation measures proposed in the *EIA Report*; and
- *Annex B* contains the monitoring and complaint log sheets.

This Manual is an evolving document that should be updated to maintain its relevance as the Project progresses. The primary focus for these updates will be to ensure the impacts predicted and the recommended mitigation measures remain consistent and appropriate to the manner in which the works are to be carried out.

2 General Requirement of EM&A

In this section, the general requirements of the EM&A programme for the Project are presented. The scope of the programme is developed with reference to the findings and recommendations of the EIA Report.

2.1.1 EM&A in Construction Phase

The environmental issues, which were identified during the EIA process and are associated with the construction phase of the Project will be addressed through the monitoring and controls specified in this EM&A Manual and in the construction contracts.

During the construction phases of the Project, air quality, noise, water quality, waste management, ecology, landscape and visual, and cultural heritage will be subject to EM&A. Monitoring of the effectiveness of the mitigation measures will be achieved through the environmental monitoring programme as well as through site inspections. The inspections will include mechanisms to review and assess the Contractor(s)'s environmental performance, ensuring that the recommended mitigation measures have been properly implemented, and that the timely resolution of received complaints are managed and controlled in a manner consistent with the recommendations of the EIA Report.

a) Environmental Monitoring

The environmental monitoring work throughout the construction period will be carried out in accordance with this EM&A and reported by the ET. Monitoring works will comprise of quantitative assessment of physical parameters which also form an important part of the whole monitoring programme. The monitoring programme will be conducted at the chosen representative sensitive receivers in the vicinity of the construction sites.

b) Action and Limit Levels

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

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

- *Limit Level:* statutory and/or agreed contract limits stipulated in the relevant pollution control ordinances, Hong Kong Planning Standards & Guidelines or Environmental Quality Objectives established by the EPD as appropriate. If these are exceeded, works will not proceed without appropriate remedial action, including a critical review of plant and working methods.

c) Event and Action Plans

The purpose of the Event and Action Plans (EAPs) is to provide, in association with the monitoring and audit activities, procedures for ensuring that if any significant

environmental incident occurs, the cause will be quickly identified and remediated. This also applies to the exceedances of A/L criteria identified in the EM&A programme.

d) Site Inspection and Audit

In addition to monitoring, as a means of assessing the ongoing performance of the Contractor(s), the ET will undertake site inspections and audits of the compliance with stipulated procedures and on-site practices. The primary objective of the inspection and audit programme will be to assess the effectiveness of the environmental controls established by the Contractor(s) and the implementation of the environmental mitigation measures recommended in the EIA Report. The IEC will undertake site inspection and audit on as need basis to assess the performance of the Contractor(s).

Whilst the audit and inspection programme will complement the monitoring activity, the criteria against which the audits will be undertaken will be derived from the Clauses within the Contract Documents which seek to enforce the recommendations of the EIA Report and the EM&A Manual, and the conditions in the EP if any.

The findings of site inspections and audits will be made known to the Contractor(s) at the time of the inspection to enable the rapid resolution of identified non-conformities. Non-conformities, and the corrective actions undertaken, will also be reported in the monthly EM&A Reports.

Section 11 of this Manual presents details of the scope and frequency of on-site inspections and defines the range of issues that the audit protocols will be designed to address.

e) Enquiries, Complaint and Requests for Information

Enquiries, complaints and requests for information may occur from a wide range of individuals and organisations including members of the public, Government departments, the press and community groups, etc.

All enquiries concerning the environmental impacts of the Project, irrespective of how they are received, should be reported to the Project Proponent and IEC, and directed to the Contractor and ET who should set up procedures for handling, investigation and storage of such information. The following steps should be followed:

(i) The ET Leader should notify the IEC and ER of the nature of the enquiry.

(ii) An investigation should be initiated to determine the validity of the complaint and to identify the source(s) of the problem.

(iii) The ET Leader and the Contractor(s) should undertake the following steps, as necessary:

- investigate and identify source(s) of the problem;

- if considered necessary by Project Proponent following consultation with the IEC, undertake additional monitoring to verify the existence and severity of the alleged complaint;

- identify necessary remedial measures and implement as soon as possible;

- if the complaint is transferred from EPD, submit interim report to EPD on status of the complaint investigation and follow-up action within the time frame assigned by EPD;

- repeat the monitoring to verify effectiveness of mitigation measures; and,

- repeat review procedures to identify further possible areas of improvement if the repeat monitoring results continue to substantiate the complaint.

(iv) The outcome of the investigation and the action taken will be documented on a complaint log (see *Annex B*). A formal response to each complaint received will be prepared by the Contractor(s) within five working days and submitted to Project Proponent, in order to notify the concerned person(s) that action has been taken. All enquiries/complaints that trigger this process should be reported in the monthly EM&A reports, which should include results of investigations undertaken by the ET Leader and the Contractor, and details of the measures taken, and additional monitoring results (if deemed necessary). It should be noted that the receipt of complaint or enquiry should not be, in itself, a sufficient reason to introduce additional mitigation measures.

(v) During the complaint investigation work, the Contractor(s) and ER shall cooperate with the ET Leader in providing all necessary information and assistance for completion of the investigation. If mitigation measures are identified in the investigation, the Contractor(s) shall promptly carry out the mitigation. The ER shall ensure that the measures have been carried out by the Contractor(s).

f) Reporting

Baseline, construction phase and post-construction phase monitoring, monthly, and annual/final reports will be prepared and certified by the ET Leader and verified by the IEC. The reports will be submitted to the DSD, Contractor(s), ER and EPD. The monthly reports will be prepared and submitted within two weeks of the end of each calendar month**.**

g) Cessation of EM&A

The cessation of EM&A programme is subject to the satisfactory completion of the *EM&A Final Report*, agreement with the IEC and approval from EPD.

2.1.2 EM&A in Operation Phase

Based on the findings of the EIA Report, air quality, noise, water quality monitoring during operation phase is considered necessary. Monitoring of any planting works should also be

continued over their establishment period, which may extend into the operation phase, and will be covered by regular site inspections.

3 Air Quality

3.1 Introduction

3.1.1 In this section, the EM&A requirements during the construction phase and the operation phase of the Project are presented. The EM&A requirements have been developed with reference to the findings and recommendations of the EIA Report.

3.2 Construction Phase

3.2.1 The EIA study concluded that no Air Sensitive Receivers (ASRs) will be affected by construction dust through the implementation of mitigation measures to reduce dust levels. Potential impacts of dust, gaseous and odour emissions from construction phase are not predicted to yield concentrations that would lead to significant air quality impacts at the ASRs. Therefore, no air quality monitoring will be required for the construction phase, aside from that required by specific emissions licenses.

3.2.2 Regular site inspections and audits will be carried out during the construction phase in order to confirm that the mitigation measures are implemented and are working effectively. The Contractor(s) will be responsible for the design and implementation of the mitigation measures which are presented in Annex A.

3.3 Operation Phase

3.3.1 Commissioning Test

a) A commissioning test is recommended to be performed for the operation phase to ascertain the effectiveness of the deodorization systems at the San Shek Wan STW and the proposed SPSs. Exhaust air flow rate, temperature of exhaust, odour emission rates at the outlet of the deodorization systems shall be monitored during the commissioning test. The exhaust air flow rate, temperature of exhaust, odour emission rates presented in *Table 3.1* shall be maintained. Daily monitoring of odour emission at the exhaust at STW and SPSs by taking odour samples is recommended to be conducted in the first three months of the first year of the operation. The daily monitoring parameter will include exhaust flow rate, temperature of exhaust and odour emission rates and the monitoring results shall be compared with that presented in *Table 3.1*. The recommended method for the odour monitoring is presented in *Table 3.2*.

Table 3.1 Design Parameter of Exhaust Stack and H2S and Odour Emission Rates of SPS

Design Parameter	Unit	Sewage Treatment Works (a)		Sewage Pumping Station					
Location	-	STW_A	STW_B	Shui Hau	Tong Fuk	Cheung Sha	Cheung Fu St	San Shek Wan	Pui O
No. of emission points	-	1	1	1	1	1	1	1	1
Building height	m	13	13	4.8	4.8	4.8	6.5	4.8	4.8
Stack height [(b)]	m	15	15	5.8	5.8	5.8	7.6	5.8	5.8
Stack diameter	m	0.70	1.01	0.25	0.25	0.25	0.15	0.25	0.25
Exit temperature	°C	30	30	30	30	30	30	30	30
	°K	303	303	303	303	303	303	303	303
Exit velocity	ms^{-1}	9	9	9.8	9.8	9.8	15.0	9.8	9.8
Odour emission rate at inlet	OUs^{-1}	16500	21400	1100	1140	815	718	1210	1980
% of odour removal [(c)]	%	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5
Odour emission rate at exhaust	OUs^{-1}	82.5	107.0	5.5	5.7	4.1	3.6	6.1	9.9

Note:

a) STW_A is for sewage treatment while STW_B is for sludge treatment.

b) Stack height is in meters above ground.

c) The odour efficiency adopted was referenced from the DSD project of Proposed Upgrading of Kwun Tong Preliminary Treatment Works.

Table 3.2 Odour Monitoring Methodology

Monitoring Location	Parameter	Recommended Method
Stack of San Shek Wan STW and all the proposed SPSs	• Exhaust air flow rate • Temperature of exhaust • Odour concentration	Air sampling: • grab sampling using Teflon bag Physical parameter: • flow meter Laboratory analysis: • Forced-choice Dynamic Olfactometer according to European Standard Method (EN 13725)

b) If the monitoring results show no non-compliance, the frequency is recommended to be reduced to weekly in the subsequent three months and reduced to monthly in the remaining six months of the first year if no non-compliance is found. If there is any non-compliance, the operator should inspect the deodorization unit. The odour monitoring is also recommended to continue in the same way in the second year of the operation until no non-compliance is found. If monitoring in the first two years of operation shows that compliance can be achieved consistently, the Project Proponent may propose and seek approval with EPD to reduce monitoring frequency to every six-month or yearly basis throughout the year for subsequent years of operation.

3.3.2 Odour Monitoring

a) The life expectancy of the deodorization system is 15 years. The replenishment of deodorization chemicals would be done annually or the average odour removal efficiency of deodorization facility is less than 99.5%.

b) Odour monitoring at the exhaust of standby odour removal system during maintenance or cleaning is also recommended to confirm the odour removal efficiency. Odour monitoring is proposed during the period of maintenance or cleaning of the deodorization system (i.e. activated carbon) in Cheung Sha Trunk SPS. It is generally defined as Level 0 to Level 4 in which Level 0 means no odour and Level 4 means unacceptable odour. If Level 3 – 4 is reported and the source of odour is confirmed to be exhaust of Cheung Sha Trunk SPS, the operator should be notified immediately and should investigate and rectify the problem of the cleaning or maintenance works within 24 hours in order to restore the level to Level 0 – 2.

c) Odour monitoring will be conducted by an odour patrol team. The odour patrol team will patrol and sniff along an odour patrol route at the existing Cheung Sha Trunk SPS site boundary. The implementation of the odour patrols shall be subject to the prevailing weather forecast condition and should not be carried out during rainy days.

d) 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;
- Be engaged for a sufficient period to build up and monitor/detect at several monitoring location;
- Not be allowed to smoke, eat, drink (except water) or use chewing gum or sweets 30 minutes 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.

e) 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 start from less odorous locations to stronger odorous locations. The perceived odour intensity is divided into 5 levels. *Table 3.3* describes the odour intensity for different levels.

Table 3.3 Odour Intensity Levels

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

f) The independent trained personnel / competent persons 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.

g) *Table 3.4* shows the action and limit level to be used for the odour patrol. Should any exceedance of the action or limit level occurs, actions in accordance with the event and action plan presented in *Table 3.5* should be carried out.

Table 3.4 Action and Limit Levels for Odour Nuisance

Parameter	Action Level	Limit Level
Odour Nuisance	Odour intensity of 2 is measured from odour patrol	Odour intensity of 3 or above is measured from odour patrol

Table 3.5 Event and Action Plan for Odour Monitoring

Event	Action	
	Person-in-charge of Odour Monitoring	**Project Proponent**
Action Level	1. Identify source/reason of exceedance; 2. Repeat odour patrol to confirm finding	1. Carry out investigation to identify to source/reason of exceedance. Investigation should be completed within 2 weeks; 2. Rectify any unacceptable practice; 3. Implement more mitigation measures if necessary; 4. Inform EPD and operator of Cheung Sha Trunk SPS if exceedance is considered to be caused by the operation of Cheung Sha Trunk SPS.
Limit Level	1. Identify source/reason of exceedance; 2. Inform EPD; 3. Repeat odour patrol to confirm findings; 4. Assess effectiveness of remedial action and keep EPD informed of the results	1. Carry out investigation to identify the source/reason of exceedance. Investigation should be completed within 2 weeks; 2. Rectify any unacceptable practice; 3. Formulate remedial actions; 4. Ensure remedial actions properly implemented; 5. If exceedance continues, consider what more/enhanced mitigation measures should be implemented; 6. Inform EPD and operator of Cheung Sha Trunk SPS if exceedance is considered to be caused by the operation of Cheung Sha Trunk SPS.

4 Noise

The mitigation measures and general requirements, methodology and equipment for monitoring and audit of noise impacts associated with the Project are described in this section.

4.1 Methodology & Criteria

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

Supplementary information for data auditing, statistical results such as L_{10} and L_{90} shall also be obtained for reference. A sample data record sheet is shown in *Annex B* for reference.

4.1.1 Baseline Monitoring

The ET should carry out the baseline noise monitoring prior to the commencement of the major construction works. The baseline noise levels should be measured for a continuous period of at least 14 consecutive days at a minimum logging interval of 30 minutes during daytime between 0700 and 1900 hours. The L_{eq}, L_{10} and L_{90} should be recorded at the specified intervals. A schedule for the baseline monitoring should be submitted to the IEC for approval before the commencement of baseline monitoring.

There should not be any construction activities in the vicinity of the monitoring stations during the baseline monitoring. Any non-project related construction activities in the vicinity of the monitoring stations during the baseline monitoring should be noted and the source and location of such activities should be recorded.

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

4.1.2 Impact Monitoring

The impact noise monitoring should be carried out at all the designated monitoring stations when there are project-related construction activities undertaken within a radius of 300m from the monitoring stations. Monitoring of $L_{eq(30min)}$ should be carried out at each station at 0700-1900 hours on normal weekdays at a frequency of once a week when construction activities are underway. Any general construction work carried out during restricted hours is controlled by Construction Noise Permit (CNP) under the NCO.

In case of non-compliances with the construction noise criteria, more frequent monitoring as specified in the Event and Action Plan (*Section 4.4*) should be carried out. This additional monitoring should be continued until the recorded noise levels show that the non-compliance is rectified or proved to be irrelevant to the project-related construction activities.

4.1.3 Impact Monitoring for Construction of Village Sewers/ Rising Main

Noise monitoring shall be undertaken at the designated monitoring stations when there are construction works of village sewers undertaken within a radius of 300m from the monitoring stations. The following is an initial guide on the regular monitoring frequency for each station on a per week basis when construction activities are undertaken:

- one set of $L_{eq(30min)}$ noise level as six consecutive $L_{eq(5min)}$ between 07:00-19:00 hours on normal weekdays;

- one set of $L_{eq\ (15min)}$ noise level as three consecutive $L_{eq\ (5\ min)}$ for the restricted hours.

Major noise sources observed, both on-site and off-site, at each location shall be recorded. Where the designated noise monitoring station is a school, noise monitoring shall be scheduled during the school examination period. 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.

In the case of non-compliance with the construction noise criteria, more frequent monitoring as specified in the Event and Action Plan in Table 4.3 shall be carried out. This additional monitoring shall be continued until the exceedance is rectified or proved to be from a source other than the construction activities.

4.1.4 Operational Phase Monitoring

The EIA Report recommended that the operational noise monitoring shall be conducted for the operation of San Shek Wan STW and SPS during the testing and commissioning stage. Noise monitoring of these noise sources shall be conducted at the designated monitoring station as listed in Table 4.1. The fixed plant will be operated with full power for 30 minutes during daytime and night-time and the monitoring of $L_{eq(30min)}$ noise levels during daytime and night-time will be carried out in accordance with the methodology stated in the TM at the proposed monitoring stations. Any non-related operation activities in the vicinity of the monitoring stations during the monitoring shall be noted and the source and location shall be recorded. The L_{max}, L_{10} and L_{90} shall also be recorded at the specified interval.

The ET should prepare and deposit to EPD, at least 6 months before the operation of the proposed fixed plant under the Project, a monitoring plan for the purpose of fixed plant noise sources. The monitoring plan should contain monitoring locations, monitoring schedules, methodology of noise monitoring including noise measurement procedures and data analysis of measured noise level. The ET should implement the monitoring plan in accordance with the deposited monitoring plan unless with prior justifications. The monitoring plan should be certified by the ET Leader before deposit with EPD.

4.2 Monitoring Equipment

As referred to 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 should be accepted as valid only if the calibration level from before and after the noise measurement agrees to within 1.0 dB.

Noise measurements will be made in accordance with standard acoustical principles and should not be made in fog, rain, wind with a steady speed exceeding 5 m s^{-1} or wind with gusts exceeding 10 m s^{-1}. The wind speed shall be checked with a portable wind speed meter capable of measuring the wind speed in m s^{1}.

The ET is responsible for the provision of the monitoring equipment to 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.

4.3 Monitoring Locations

According to the environmental findings detailed in the EIA Report, the designated locations for the baseline, impact and operational noise monitoring are listed in *Table 4.1* and shown in *Figures 4.1 – 4.8*.

Table 4.1 Representative Noise Sensitive Receivers (NSRs) identified for Construction and Operational Noise Monitoring

ID	Noise Sensitive Receivers	Baseline Monitoring and Impact Monitoring during Construction Phase	Operational Phase Monitoring
N01a	Shui Hau Village	✓	
N01c	Shui Hau Village	✓	
N03a	Tong Fuk Village	✓	
N05a	Residences at Cheung Fu Street	✓	
N07	Government Holiday Bungalows	✓	
N08	Cheung Sha Ha Tsuen	✓	
N10	Cheng Sha Sheung Tsuen	✓	
N11b	San Shek Wan – Ming Garden	✓	✓
N12a	Lo Uk Tsuen	✓	✓
N12b	Lo Uk Tsuen	✓	
N13	Pui O San Wai Tsuen	✓	
N14	South Lantau Community Centre	✓	
N15b	Pui O Lo Wai Tsuen	✓	
N16a	Residences at Ham Tin	✓	
N16b	Residences at Ham Tin	✓	
N17	Bui O Public School	✓	

The status and location of the NSRs may change after this EM&A Manual has been issued. In such case, and if changes to the monitoring locations are considered necessary, the ET should propose alternative monitoring locations and seek the agreement from the IEC and EPD on such proposal. When alternative monitoring locations are proposed, they should be chosen based on the following criteria:

(i) The monitoring locations close to the major construction works activities that are likely to have noise impacts;
(ii) The monitoring close to the NSRs as defined in the EIAO-TM; and,
(iii) The assurance of the minimal disturbance and working under a safe condition to the occupants during the monitoring in the vicinity of the NSRs.

The monitoring stations should normally be at a point 1m from the exterior of the facade of the NSR and be at a position 1.2m above ground. If there is a problem with access to the normal monitoring position, an alternative position should be chosen, and a correction to the measurement results should be made. For reference, a façade correction of +3dB(A) should be made to the free-field measurements. The ETL should agree with the IEC and EPD on the alternative monitoring position and corrections adopted. Once the positions for the monitoring stations are chosen, the baseline and impact monitoring should be carried out at the same positions. If changes to the monitoring stations are required upon the impact monitoring, the ET will propose and carry out the monitoring at alternative locations that can effectively represent the conditions at the impact monitoring locations. The alternative locations of impact monitoring will be approved by the ER and agreed with the IEC and EPD.

4.4 Event and Action Plan

The action and limit levels for construction noise are defined in *Table 4.2*. If non-compliance occurred, actions as stated in *Table 4.3* should be undertaken.

According to the EIA Report, the construction activities would cause noise exceedances at various NSRs and, therefore, appropriate mitigation measures and good site practices are recommended. The Contractor should be responsible for the design and implementation of these measures. The Implementation Schedule of the mitigation measures is included in Annex A of this EM&A Manual.

Table 4.2 Action and Limit Levels for Construction Noise Impact Monitoring

Time Period	Action Level [(a)]	Limit Level
Construction Noise:		
07:00 – 19:00 hours on normal weekdays	When one documented complaint is received from any one of the noise sensitive receivers or 75 dB(A) recorded at the monitoring station	• 70 db(A) for school and • 65 db(A) during examination period

Notes:
(a) Limits specified in the GW-TM and IND-TM for construction and operational noise, respectively.

Table 4.3 Event and Action Plan for Construction Noise Monitoring

Event	Action			
	ET	**IEC**	**ER**	**Contractor(s)**
Action Level	1. Carry out investigation to identify the source and cause of the complaint/ exceedance(s) 2. Notify IEC, ER, and Contractor(s) and report the results of investigation to the Contractor(s), ER and the IEC 3. Discuss with the Contractor(s) and IEC for remedial measures required 4. If the complaint is related to the Project, conduct additional monitoring for checking mitigation effectiveness and report the findings and results to the IEC, ER and the Contractor(s)	1. Review the analyzed results submitted by the ET 2. Review the proposed remedial measures by the Contractor(s) and advise the ER accordingly 3. Supervise the implementation of remedial measures	1. Confirm receipt of Notification of Exceedance in writing 2. Require Contractor(s) to propose remedial measures for the analysed noise problem 3. Ensure remedial measures are properly implemented	1. Submit noise mitigation proposals, if required, to the IEC and ER 2. Implement noise mitigation proposals.
Limit Level	1. Carry out investigation to identify the source and cause of the exceedance 2. Notify IEC, ER, Project Proponent, EPD and Contractor(s) 3. Repeat measurements to confirm findings 4. Provide investigation report to IEC, ER, EPD and Contractor(s) he causes of the exceedances 5. If the exceedance is related to the Project, assess effectiveness by additional monitoring. 6. Report the remedial action implemented and the additional monitoring results to IEC, EPD, ER and Contractor(s) 7. If exceedance stops, cease additional monitoring	1. Review the analyzed results submitted by the ET 2. Discuss the potential remedial measures with ER, ET Leader and Contractor(s) 3. Review Contractor(s)'s remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly 4. Supervise the implementation of remedial measures	1. Confirm receipt of Notification of Exceedance in writing 2. Require the Contractor(s) to propose remedial measures for the analysed noise problem 3. Ensure remedial measures are properly implemented 4. If exceedance continues, consider what activity of the work is responsible and instruct the Contractor(s), in agreement with the Project Proponent, to stop that activity of work until the exceedance is abated	1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to IEC and ER within 3 working days of notification 3. Implement the agreed proposals 4. Resubmit proposals if problem still not under control 5. Stop the relevant activity of works as determined by the Project Proponent until the exceedance is abated

Notes : ET – Environmental Team, IEC – Independent Environmental Checker; ER = Engineering Representatives

5 Water Quality

In accordance with the recommendations of the EIA, water quality EM&A is required during the construction phase and operation phase of the Project. In addition, baseline water quality monitoring will be required prior to the commencement of construction activities. The following Section provides details of the water quality monitoring to be undertaken by the Environmental Team (ET) to verify the distance of sediment plume and effluent plume dispersion and to identify whether the potential exists for any indirect impacts to occur to ecological sensitive receivers. The water quality monitoring programme will be carried out to allow any deteriorating water quality to be readily detected and timely action taken to rectify the situation. The status and locations of water quality sensitive receivers may change after issuing this Document. If required, the ET in consultation with IEC will propose updated monitoring locations and seek approval from EPD.

Water quality monitoring for the Project can be divided into the following stages:

- Construction Phase Marine Water Quality Monitoring;
- Operational Phase Marine Water Quality Monitoring; and,
- Operational Phase STW Effluent Quality Monitoring.

5.1 Sampling & Testing Methodology

5.1.1 Water Quality Parameters

The parameters that have been selected for measurement *in situ* and in the laboratory are those that were either determined in the EIA to be those with the most potential to be affected by the construction works (i.e. suspended solids, turbidity and dissolved oxygen) or are a standard check on water quality conditions (i.e. temperature and salinity). Parameters to be measured in the marine water quality monitoring during construction phase and operational phase and effluent quality monitoring during operation phase are listed in *Table 5.1*.

Table 5.1 Parameters measured in the marine water quality monitoring

Parameters	**Unit**	**Abbreviation**	**Marine Water Quality**			Operational Phase STW Effluent Quality
			Baseline	Construction Phase	Operational Phase	
In situ measurements						
Dissolved oxygen	mg/L	DO	✓	✓	✓	✓
Temperature	°C	-	✓	✓	✓	✓
Turbidity	NTU	-	✓	✓	✓	✓
Salinity	$^{0}/_{00}$	-	✓	✓	✓	✓
Laboratory measurements						
Suspended Solids	mg/L	SS	✓	✓	✓	✓
5-day Biochemical Oxygen Demand	mg/L	BOD_5	✓		✓	✓
Total Inorganic Nitrogen	mg/L	TIN	✓		✓	✓
Unionized Ammonia	mg/L	UIA	✓		✓	✓
E. coli	cfu/100mL	-	✓		✓	✓

In addition to the water quality parameters, other relevant data will also be measured and recorded in Water Quality Monitoring Logs, including the location of the sampling stations,

water depth, time, weather conditions, sea conditions, tidal stage, current direction and velocity, special phenomena and work activities undertaken around the monitoring and works area that may influence the monitoring results. A sample data record sheet is shown in *Annex B* for reference.

5.1.2 Monitoring Equipment

For water quality monitoring, the following equipment will be used:

Dissolved Oxygen and Temperature Measuring Equipment - The instrument will be a portable, weatherproof dissolved oxygen measuring instrument complete with cable, sensor, comprehensive operation manuals, and will be operable from a DC power source. It will be capable of measuring: dissolved oxygen levels in the range of 0 - 20 mg L^{-1} and 0 - 200% saturation; and a temperature of 0 - 45 degrees Celsius. It shall have a membrane electrode with automatic temperature compensation complete with a cable of not less than 35 m in length. Sufficient stocks of spare electrodes and cables shall be available for replacement where necessary (e.g. YSI model 59 DO meter, YSI 5739 probe, YSI 5795A submersible stirrer with reel and cable or an approved similar instrument). The salinity compensation shall not be built-in to the DO equipment. In-situ salinity shall be measured to calibrate the DO equipment prior to each DO measurement.

Turbidity Measurement Equipment - The instrument will be a portable, weatherproof turbidity-measuring unit complete with cable, sensor and comprehensive operation manuals. The equipment will be operated from a DC power source, it will have a photoelectric sensor capable of measuring turbidity between 0 - 1000 NTU and will be complete with a cable with at least 35 m in length (for example Hach 2100P or an approved similar instrument).

Salinity Measurement Instrument - A portable salinometer capable of measuring salinity in the range of 0 - 40 ppt will be provided for measuring salinity of the water at each monitoring location.

Water Depth Gauge – A portable, battery-operated echo sounder (for example Seafarer 700 or a similar approved instrument) will be used for the determination of water depth at each designated monitoring station. This unit will shall either be hand-held or be affixed to the bottom of the work boat if the same vessel is to be used throughout the monitoring programme. The echo sounder should be suitably calibrated. The ET shall seek approval for their proposed equipment with the client prior to deployment.

Current Velocity and Direction – No specific equipment is recommended for measuring the current velocity and direction. The environmental contractor shall seek approval of their proposed equipment with the client prior to deployment.

Positioning Device – A Global Positioning System (GPS) shall be used during monitoring to allow accurate recording of the position of the monitoring vessel before taking measurements. The Differential GPS, or equivalent instrument, should be suitably calibrated at appropriate checkpoint (e.g. Quarry Bay Survey Nail) to verify that the monitoring station is at the correct position before the water quality monitoring commence.

Water Sampling Equipment - A water sampler, consisting of a PVC or glass cylinder of not less than two litres, which can be effectively sealed with cups at both ends, will be used (e.g. Kahlsico Water Sampler 13SWB203 or an approved similar instrument). The water sampler will 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.

5.1.3 Sampling / Testing Protocols

All *in situ* monitoring instruments will be checked, calibrated and certified by a laboratory accredited under HOKLAS [(1)] or any other international accreditation scheme before use, and subsequently re-calibrated at monthly intervals throughout the stages of the water quality monitoring. Responses of sensors and electrodes will be checked with certified standard solutions before each use.

On-site calibration of field equipment shall follow the "*Guide to On-Site Test Methods for the Analysis of Waters*", BS 1427: 2009. Sufficient stocks of spare parts shall be maintained for replacements when necessary. Backup monitoring equipment shall also be made available so that monitoring can proceed uninterrupted even when equipment is under maintenance, calibration etc.

5.1.4 Laboratory Measurement and Analysis

All laboratory work shall be carried out in a HOKLAS accredited laboratory [(2)]. Sufficient volume of each water sample shall be collected at the monitoring stations for carrying out the laboratory analyses. Using chain of custody forms, collected water samples will be transferred to an HOKLAS accredited laboratory for immediate processing. The determination work shall start within the next working day after collection of the water samples. The laboratory measurements shall be provided to the client within 5 working days of the sampling event. Analytical methodology and sample preservation of other parameters will be based on the latest edition of *Standard Methods for the Examination of Waste and Wastewater* published by APHA, AWWA and WPCF and methods by USEPA, or suitable method in accordance with requirements of HOKLAS or another internationally accredited scheme. The submitted information should include pre-treatment procedures, instrument use, Quality Assurance/Quality Control (QA/QC) details (such as blank, spike recovery, number of duplicate samples per-batch etc), detection limits and accuracy. The QA/QC details shall be in accordance with requirements of HOKLAS or another internationally accredited scheme.

Parameters for laboratory measurements, their standard methods and their reporting limits are presented in *Table 5.2.*

Table 5.2 Laboratory measurements, standard methods and corresponding reporting limits of marine water quality monitoring

Parameters	Standard Methods	Reporting Limit	Precision
Construction Phase			
Dissolved oxygen (mg/L)	Instrumental, CTD	0.1	±25%
Temperature (°C)	Instrumental, CTD	0.1	±25%
pH	Instrumental, CTD	0.1	±25%
Turbidity (NTU)	Instrumental, CTD	0.1	±25%
Salinity ($^0/_{00}$)	Instrumental, CTD	0.1	±25%
Suspended Solids (mg/L)	APHA 2540E	1.0	±25%
Operational Phase			
Dissolved oxygen (mg/L)	Instrumental, CTD	0.1	±25%

([1]) The laboratory will be contracted before commencement of the monitoring programme.
([2]) The laboratory will be contracted before commencement of the monitoring programme.

Parameters	Standard Methods	Reporting Limit	Precision
pH	Instrumental, CTD	0.1	±25%
Turbidity (NTU)	Instrumental, CTD	0.1	±25%
Salinity ($^0/_{00}$)	Instrumental, CTD	0.1	±25%
Suspended Solids (mg/L)	APHA 2540E	1.0	±25%
5-day Biochemical Oxygen Demand (mg/L)	APHA 19ed 5210B	0.1	±25%
Total Inorganic Nitrogen (mg/L)	By calculation	0.01	±25%
Unionized Ammonia (mg/L)	By calculation	0.001	±25%
E. coli (CFU per 100 ml)	membrane filtration with CHROMagar Liquid *E. coli* –coliform culture *	1.0	±25%

*Notes
Enumeration of *E. coli* in environmental waters and wastewater using a chromogenic medium. Wat. Sci. Tech.Vol.35, No.11-12, pp.409-413; method adopted in 1997.

5.1.5 Monitoring Locations

The water quality monitoring locations for baseline, construction, operation phases in first-year upon full commissioning of STW are shown in *Figure 5.1* and detailed in *Table 5.3* below. A schedule for water quality monitoring shall be prepared by the ET and approved by IEC and EPD prior to the commencement of the monitoring.

Table 5.3 Location of Water Quality Monitoring Stations

Station	Description	Remarks			
		Baseline	Construction	Operation	Operational Phase STW Effluent Quality Monitoring
CE	Upstream control station at ebb tide	✓	✓	✓	
CF	Upstream control station at flood tide	✓	✓	✓	
SR4	Ecological Sensitive Receiver (Coral Communities) at Pui O Wan	✓	✓	✓	✓
SR5	Ecological Sensitive Receiver (Coral Communities) at Pui O Wan	✓	✓	✓	✓
SR6	Gazetted Bathing Beach at Lower Cheung Sha	✓	✓	✓	✓
SR9	Ecological Important Stream at Tong Fuk	✓	✓	✓	
SR10	Secondary Contact Recreational Zones at South Lantau	✓	✓	✓	
SR12	Proposed Special Site of Scientific Interest (SSSI) at Shui Hau Wan	✓	✓	✓	
SR15	Gazetted Bathing Beach at Pui O and Ecologically Important Stream at Pui O	✓	✓	✓	✓

The status and locations of water quality sensitive receivers and the monitoring sites may change after issuing this Manual. If such cases exist, the ET shall propose updated monitoring locations and seek approval from the ER, the IEC, and the IEC.

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

- at locations close to and preferably at the boundary of the site activities as indicated in the EIA Report, which are likely to have water quality impacts;
- close to the sensitive receptors which are directly or likely to be affected;
- for monitoring locations located in the vicinity of the sensitive receptors, care should be taken to cause minimal disturbance during monitoring; and
- reference stations which are at locations representative of the project site in its undisturbed condition.

5.1.6 Sampling Frequency

a) Baseline Monitoring

Baseline conditions for water quality shall be established and agreed with the IEC and the EPD prior to the commencement of works. The purpose of the baseline monitoring is to establish ambient conditions prior to the commencement of the works and to demonstrate the suitability of the proposed impact and control monitoring stations. The baseline conditions shall normally be established by measuring the water quality parameters specified above.

The measurements shall be taken at all designated monitoring stations including control stations, for three times a week at mid-ebb and mid-flood tides for 4 consecutive weeks during prior to the commencement of the construction works. Measurements shall be taken at each station at any time. The interval between two sets of monitoring shall not be less than 36 hours.

No construction activities shall be on-going in the vicinity of the stations during the baseline monitoring. The ET shall be responsible for undertaking the baseline monitoring and submitting the results within 10 working days from the completion of the baseline monitoring work.

In exceptional cases when insufficient baseline monitoring data or questionable results are obtained, the ET shall seek approval from the IEC and the EPD on an appropriate set of data to be used as baseline reference.

The baseline monitoring schedule shall be issued to the IEC and EPD at least 1 week prior to the commencement of baseline monitoring.

b) Construction Phase Marine Water Quality Monitoring

During construction phase period, impact monitoring should be undertaken at the monitoring stations as shown in *Figure 5.1* and *Tables 5.1* three times a week. Monitoring at each station would be undertaken at both mid-ebb and mid-flood tides on the same day. The tidal range selected for the baseline monitoring will be at least 0.5 m for both flood and ebb tides as far as practicable. The interval between two monitoring days would not be less than 36 hours. The monitoring frequency would be increased in the case of exceedances of Action/Limit Levels if considered necessary by ET. Monitoring frequency would be maintained as far as practicable.

The monitoring location/position, time, water depth, water temperature, salinity, weather conditions, sea conditions, tidal stage, special phenomena and work underway at the marine works site will be recorded.

c) Operational Phase Marine Water Quality Monitoring

A post project monitoring programme is recommended to confirm the water quality predictions presented in the EIA Report. It is suggested to start the marine water quality monitoring for the operational phase three months after the commissioning of San Shek Wan STW. Marine water samples and *in-situ* measurements shall be taken at a frequency of twice per month at mid-flood and mid-ebb tides, respectively to determine whether there is any deterioration in water quality compared to the baseline monitoring. The monitoring programme can be discontinued after one year (12 months) of monitoring if there is no obvious deterioration in water quality.

d) Operational Phase STW Effluent Quality Monitoring

The effluent shall be collected in a full 24-hour period for the parameters listed in *Table 5.1*. Twenty four-hour flow-weighted composite effluent sample for subsequent chemical analysis and testing should be prepared by the following procedures:

- Collect effluent sub-sample at bi-hourly interval over a 24 hour period
- Obtain flow record of the Project for the 24-hour sampling period
- Calculate the volume of each sub-sample for preparation of flow-weighted composite sample
- Transfer the appropriate volume of sub-samples to a clean container and mix thoroughly

Continuous effluent quality monitoring shall be conducted in in accordance with the effluent parameters and standards stipulated by the WPCO Discharge License conditions and therefore would not be further detailed in this document. The monitoring requirement for the continuous effluent quality monitoring shall be approved by EPD. The effluent results reflect whether the effluent quality is in compliance with the Discharge License requirements. In case of non-compliance, suitable actions shall be undertaken to notify the plant operator for the non-compliance and identify the cause for the non-compliance. Corrective and remedial actions shall be implemented to improve the effluent quality. The monitoring frequency should also be increased until the effluent quality is in compliance with the Discharge License requirements. The non-compliance events and preventive measures shall be documented.

In case of an emergency discharge, daily marine water monitoring should be conducted throughout the discharge period until the normal STW operation is resumed and the quality of receiving marine water resumes to its normal level.

5.1.7 Sampling Depths & Replication

For baseline, construction phase and operation phase marine water quality monitoring, each station will be sampled and measurements/ water samples will be taken at three depths, 1 m below the sea surface, mid-depth and 1 m above the seabed. For stations that are less than 3

m in depth, only the mid depth sample shall be taken. For stations that are less than 6 m in depth, only the surface and seabed sample shall be taken. For *in situ* measurements, duplicate readings shall be made at each water depth at each station. Duplicate water samples shall be collected at each water depth at each station.

5.2 Water Quality Compliance

Water quality monitoring will be evaluated against Action and Limit Levels. The key assessment parameters are dissolved oxygen and suspended sediment and thus Action and Limit Levels based on the assessment criteria are identified for these. However turbidity can also provide valuable instantaneous information on water quality and thus Action and Limit Levels are also recommended for this parameter to facilitate quick responsive action in the event of any apparent unacceptable deterioration attributable to the works. The proposed Action and Limit Levels are shown in *Table 5.4*.

Action and Limit levels are used to determine whether operational modifications are necessary to mitigate impacts to water quality. In the event that the levels are exceeded, appropriate actions in Event and Action Plan (*Table 5.5)* should be undertaken and a review of works will be carried out by the Contractor(s).

Any noticeable change to water quality will be recorded in the monitoring reports and will be investigated and remedial actions will be undertaken to reduce impacts. Particular attention will be paid to the Contractor(s)'s implementation of the recommended mitigation measures.

Table 5.4 Action and Limit Level for Water Quality

Parameter	Action Level	Limit Level
Construction Phase Marine Water Monitoring		
DO in mgL^{-1} [b]	Surface and Middle 5%-ile of baseline data for surface and middle layer Bottom 5%-ile of baseline data for bottom layers	Surface and Middle 4 mg L^{-1} Bottom 2 mg L^{-1}
Turbidity (Tby) in NTU (Depth-averaged [a]) [c]	95%-ile of baseline data, **or** 20% exceedance of value at any impact station compared with corresponding data from control station	99%-ile of baseline data, **or** 30% exceedance of value at any impact station compared with corresponding data from control station

Parameter	Action Level	Limit Level
SS in mgL^{-1} (Depth-averaged [a]) [c]	95%-ile of baseline data, **or** 20% exceedance of value at any impact station compared with corresponding data from control station	99%-ile of baseline data, **or** 30% exceedance of value at any impact station compared with corresponding data from control station
Operation Phase Marine Water Monitoring		
Dissolved oxygen in mg/L [b]	Surface and Middle 5%-ile of baseline data for surface and middle layer Bottom 5%-ile of baseline data for bottom layers	Surface and Middle 4 mg L^{-1} Bottom 2 mg L^{-1}
Turbidity in NTU (Depth-averaged [a]) [c]	95%-ile of baseline data, **or** 20% exceedance of value at any impact station compared with corresponding data from control station	99%-ile of baseline data, **or** 30% exceedance of value at any impact station compared with corresponding data from control station
SS in mg/L (Depth-averaged [a]) [c]	95%-ile of baseline data, **or** 20% exceedance of value at any impact station compared with corresponding data from control station	99%-ile of baseline data, **or** 30% exceedance of value at any impact station compared with corresponding data from control station
5-day Biochemical Oxygen Demand in mg/L (Depth-averaged [a]) [c]	95%-ile of baseline data, **or** 20% exceedance of value at any impact station compared with corresponding data from control station	99%-ile of baseline data, **or** 5 mg/L
Total Inorganic Nitrogen in mg/L (Depth-averaged [a]) [c]	95%-ile of baseline data	99%-ile of baseline data, **and** 0.1 mg/L
Unionized Ammonia in mg/L (Depth-averaged [a]) [c]	95%-ile of baseline data	99%-ile of baseline data, **or** 0.021 mg/L
E. coli in cfu per 100 ml (Depth-averaged [a]) [c]	95%-ile of baseline data, **or** 20% exceedance of value at any impact station compared with corresponding data from control station	(i) 99 %-ile of baseline or 610 cfu/100mL as geometric mean for secondary contact, recreation subzones (ii) 99 %-ile of baseline or 180 cfu/100mL as geometric mean for bathing beach subzones.

Notes:

a. "Depth-averaged" is calculated by taking the arithmetic means of reading of all three depths.
b. For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
c. For SS, turbidity, 5-day Biochemical Oxygen Demand, Total Inorganic Nitrogen, Unionized Ammonia and E. coli, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.

5.3 Emergency Response

An Emergency Response Plan shall be prepared and implemented in the event of emergency discharge of untreated sewage. The Emergency Response Plan should include the following:

- Locations of the sensitive receivers in vicinity of the emergency discharge;
- A list of relevant governmental bodies to inform of and to ask for assistance in the event of emergency discharge, including key contact persons and telephone numbers;
- Reporting procedures required in the event of emergency discharge; and
- Responsibilities and procedures for clean-up of the affected water body/sensitive receivers after the emergency discharge.

Table 5.5 Event and Action Plan for Water Quality Monitoring

Event	Action			
	ET	**IEC**	**ER**	**Contractor(s)**
Action Level being exceeded by one sampling day	1. Repeat *in situ* measurement on the next day of exceedance to confirm findings; 2. Check monitoring data, plant, equipment and Contractor(s)'s working methods; 3. Identify source(s) of impact and record in notification of exceedance; 4. Inform IEC, Contractor(s) and ER.	1. Check monitoring data submitted by ET and Contractor(s)'s working methods; 2. Inform EPD, AFCD and other departments as appropriate.	1. Confirm receipt of notification of exceedance in writing.	1. Confirm receipt of notification of exceedance in writing; 2. Check plant and equipment and rectify unacceptable practice; 3. Amend working method if appropriate.
Action Level being exceeded by two or more consecutive sampling days	1. Repeat *in situ* measurement on the next day of exceedance to confirm findings; 2. Check monitoring data, plant, equipment and Contractor(s)'s working methods; 3. Identify source(s) of impact and record in notification of exceedance; 4. Inform IEC, Contractor(s) and ER; 5. Discuss with IEC and Contractor(s) on additional mitigation measures and ensure that they are implemented; 6. Increase the monitoring frequency to daily until no exceedance of Action Level.	1. Check monitoring data submitted by ET and Contractor(s)'s working methods; 2. Inform EPD, AFCD and other departments as appropriate; 3. Discuss with ET and Contractor(s) on additional mitigation measures and advise ER accordingly; 4. Supervise the implementation of the mitigation measures.	1. Confirm receipt of notification of exceedance in writing; 2. Discuss with the ET, IEC and Contractor(s) on the proposed additional mitigation measures and agree on the mitigation measures to be implemented; 3. Ensure additional mitigation measures are properly implemented; 4. Assess the effectiveness of the implemented mitigation measures.	1. Confirm receipt of notification of exceedance in writing; 2. Check plant and equipment and rectify unacceptable practice; 3. Consider changes of working methods; 4. Discuss with ET, IEC and ER on additional mitigation measures and propose them to ER within 3 working days of the notification of exceedance; 5. Implement the agreed mitigation measures.

Event	Action			
	ET	**IEC**	**ER**	**Contractor(s)**
Limit Level being exceeded by one sampling day	1. Repeat *in situ* measurement on the next day of exceedance to confirm findings; 2. Check monitoring data, plant, equipment and Contractor(s)'s working methods; 3. Identify source(s) of impact and record in notification of exceedance; 4. Inform IEC, Contractor(s) and ER; 5. Discuss with IEC, ER and Contractor(s) on additional mitigation measures and ensure that they are implemented.	1. Check monitoring data submitted by ET and Contractor(s)'s working methods; 2. Inform EPD, AFCD and other departments as appropriate; 3. Discuss with ET and Contractor(s) on additional mitigation measures and advise ER accordingly; 4. Review the proposed mitigation measures submitted by the Contractor(s) and advise ER accordingly; 5. Supervise the implementation of the mitigation measures.	1. Confirm receipt of notification of exceedance in writing; 2. Discuss with the ET, IEC and Contractor(s) on the proposed additional mitigation measures and agree on the mitigation measures to be implemented; 3. Ensure additional mitigation measures are properly implemented and review the effectiveness of the implemented mitigation measures; 4. Request Contractor(s) to critically review the working methods.	1. Confirm receipt of notification of exceedance in writing; 2. Check plant and equipment and rectify unacceptable practice; 3. Critically review the need to change working methods; 4. Discuss with ET, IEC and ER on additional mitigation measures and propose them to ER within 3 working days of notification of exceedance; 5. Implement the agreed mitigation measures.
Limit Level being exceeded by two or more consecutive sampling days	1. Repeat *in situ* measurement on the next day of exceedance to confirm findings; 2. Check monitoring data, plant, equipment and Contractor(s)'s working methods; 3. Identify source(s) of impact and record in notification of exceedance; 4. Inform IEC, Contractor(s) and ER; 5. Discuss with IEC and Contractor(s) on additional mitigation measures and ensure that they are implemented; 6. Increase the monitoring frequency to daily until no exceedance of Limit Level for two consequence days.	1. Check monitoring data submitted by ET and Contractor(s)'s working methods; 2. Inform EPD, AFCD and other departments as appropriate; 3. Discuss with ET and Contractor(s) on additional mitigation measures and advise ER accordingly; 4. Review the proposed mitigation measures submitted by the Contractor(s) and advise ER accordingly; 5. Supervise the implementation of the mitigation measures.	1. Confirm receipt of notification of exceedance in writing; 2. Discuss with the ET, IEC and Contractor(s) on the proposed additional mitigation measures and agree on the mitigation measures to be implemented; 3. Ensure additional mitigation measures are properly implemented and review the effectiveness of the implemented mitigation measures; 4. Request Contractor(s) to critically review the working methods; 5. Consider and instruct, if necessary, the Contractor(s) to slow down or to stop all or part of the relevant construction activities until no exceedance of Limit Level.	1. Confirm receipt of notification of exceedance in writing; 2. Check plant and equipment and rectify unacceptable practice; 3. Critically review the need to change working methods; 4. Discuss with ET, IEC and ER on additional mitigation measures and propose them to ER within 3 working days of notification of exceedance; 5. Implement the agreed mitigation measures; 6. As directed by ER, slow down or stop all or part of the relevant construction activities until no exceedance of Limit Level.

Notes : ET – Environmental Team, IEC – Independent Environmental Checker; ER = Engineer's Representatives
The above actions should be taken within 1 working day after the exceedance is identified during operation phase.

6 Waste Management and Land Contamination

During the construction phase, the main activities that will result in generation of waste include site clearance, land excavation, backfilling, facilities installation works and marine dredging. The typical waste types associated with these activities include:

- Dredged marine sediment from submarine outfall construction;
- Excavated material from site formation works and pipe laying;
- Construction & demolition (C&D) materials from construction of new buildings;
- Chemical waste; and
- General refuse.

In addition to the above, dewatered sludge, chemical wastes and solid wastes will be generated during operation phase.

Mitigation measures, where appropriate, have been recommended as part of the EIA to avoid or reduce potential adverse environmental impacts associated with handling, collection and disposal of waste arising from the construction of the proposed Project.

Waste management will be the Contractor(s)'s responsibility and wastes produced during the construction phase will be managed in accordance with appropriate waste management practices and EPD's regulations and requirements.

Auditing of waste management practices during regular site inspections will confirm that these solid and liquid wastes generated during construction are not disposed of into the surrounding storm drains. The construction Contractor(s) will be responsible for the implementation of any mitigation measures to reduce waste or redress issues arising from the waste materials.

6.1 Waste Management Practices

The waste management practices and recommended mitigation measures will be incorporated into a Waste Management Plan (WMP) as stated in the "*ETWB TC(W) No. 19/2005, Environmental Management on Construction Sites"* and C&D Material Management Plan (C&DMMP) for the Project for managing the different types of wastes by the Contractors on site. The Waste Management Plan (WMP) will become a part of the Environmental Management Plan (EMP), as required under the quoted *ETWB TCW No. 19/2005*. The contractor is required to prepare the EMP and submit it to the Architect/Engineer under the Contract for approval and then implement the EMP accordingly. The WMP will also be certified by the ET Leader and verified by the IEC as conforming to the information and recommendations contained in the EIA Report.

The WMP shall describe the arrangements for avoidance, reuse, recovery and recycling, storage, collection, treatment, the estimated rate of construction and demolition materials generation and disposal, and the recommended mitigation measures on waste management as set out in *Section 9.5* of the EIA Report. The WMP shall indicate the disposal arrangements and locations of C&D materials and other wastes.

A Trip Ticket system will be included in the WMP. Surplus excavated spoil and other wastes will not be disposed at any other designated disposal locations unless otherwise approved in writing by EPD, Secretary of Public Fill Committee and/or other authorities as appropriate.

The Implementation Schedule (Annex A*)* provides details on the appropriate mitigation measures for avoiding and preventing adverse environmental impacts associated with dredged marine mud, C&D materials, chemical wastes, general refuse and sewage from the workforce. The WMP will be refined and updated as more detailed information is generated on the volume of dredged marine mud and the agreed disposal arrangements. Similarly, it will be regularly reviewed, and updated as appropriate, throughout the course of the construction works to confirm that it remains current with the latest detailed information and works practices.

The WMP will also outline the requirements for a waste audit program to verify that the measures outlined in the plan are effectively implemented and adhered too.

6.2 Methodology and Criteria

The construction Contractor(s) must confirm that the necessary disposal permits or licences are obtained from appropriate authorities in accordance with the various Ordinances. In addition to the monthly joint inspections/ audits, each construction Contractor(s) will designate a member of staff as being responsible for routine inspections and audits of on-site waste management practices, with reference to the relevant legislation and guidelines as well as the recommendations given in the Implementation Schedule contained in Annex A of this Manual, and defined below:

a) General Legislation

- *Waste Disposal Ordinance (WDO) (Cap 354);*
- *Waste Disposal (Chemical Waste) (General) Regulation (Cap 354C);*
- *Waste Disposal (Charges for Disposal of Construction Waste) Regulation;*
- *Land (Miscellaneous Provisions) Ordinance (Cap 28);*
- *Public Health and Municipal Services Ordinance (Cap 132) – Public Cleansing and Prevention of Nuisances Regulations; and*
- *Dumping at Sea Ordinance (DASO) (Cap. 466).;*

b) Other Relevant Guidelines

- *Waste Disposal Plan for Hong Kong (December 1989), Planning, Environment and Lands Branch Government Secretariat, Hong Kong SAR Government;*
- *Chapter 9 - Environment (2008), Hong Kong Planning Standards and Guidelines, Hong Kong Government;*
- *New Disposal Arrangements for Construction Waste (1992), EPD & CED, Hong Kong Government;*
- *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes (1992), EPD, Hong Kong SAR Government;*
- *Hong Kong Planning Standards and Guidelines Planning (2014), Planning Department, Hong Kong SAR Government;*
- *WBTC No. 2/93 - Public Dumps, Works Branch, Hong Kong SAR Government;*

- *WBTC No. 2/93B - Public Filling Facilities, Works Branch, Hong Kong SAR Government;*
- *WBTC No. 16/96 - Wet Soil in Public Dumps, Works Branch, Hong Kong SAR Government;*
- *Waste Reduction Framework Plan, 1998 to 2007, Planning, Environment and Lands Bureau, Government Secretariat, 5 November 1998;*
- *WBTC No. 4/98 and 4/98A - Use of Public Fill in Reclamation and Earth Filling Projects, Works Bureau, Hong Kong SAR Government;*
- *WBTC No. 25/99, 25/99A and 25/99C - Incorporation of Information on Construction and Demolition Material Management in Public Works Subcommittee Papers, Works Bureau, Hong Kong SAR Government;*
- *WBTC No. 12/2000 - Fill Management, Works Bureau, Hong Kong SAR Government;*
- *WBTC No. 19/2001 - Metallic Site Hoardings and Signboards; Works Bureau, Hong Kong SAR Government;*
- *WBTC No. 11/2002 - Control of Site Crushers, Works Bureau, Hong Kong SAR Government;*
- *WBTC No. 12/2002 - Specifications Facilitating the Use of Recycled Aggregates, Works Bureau, Hong Kong SAR Government;*
- *ETWB TC(W) No. 33/2002 - Management of Construction and Demolition Material Including Rock, Environment, Transport and Works Bureau, Hong Kong SAR Government;*
- *ETWB TC(W) No. 34/2002 - Management of Dredged/ Excavated Sediment, Environment, Transport and Works Bureau, Hong Kong SAR Government;*
- *ETWB TC(W) No. 19/2005 - Environmental Management on Construction Sites, Environment, Transport and Works Bureau, Hong Kong SAR Government;*
- *DevB TC(W) No. 6/2010 - Trip Ticket System for Disposal of Construction & Demolition Materials, Development Bureau, Hong Kong SAR Government;*
- *DEVB TC(W) No. 8/2010, Enhanced Specification for Site Cleanliness and Tidiness, Development Bureau, Hong Kong SAR Government;*
- *Section 3.3 of Chapter 2 of Project Administration Handbook for Civil Engineering Works, 2012 Edition, Civil Engineering and Development Department, Hong Kong SAR Government;*
- *Sections 4.1.3 and 4.13 of Chapter 4 of Project Administration Handbook for Civil Engineering Works, 2012 Edition, Civil Engineering and Development Department, Hong Kong SAR Government;*
- *Section 9.12 of Chapter 5 of Project Administration Handbook for Civil Engineering Works, 2012 Edition, Civil Engineering and Development Department, Hong Kong SAR Government; and*
- *Section 21.25 of Chapter 7 of Project Administration Handbook for Civil Engineering Works, 2012 Edition, Civil Engineering and Development Department, Hong Kong SAR Government.*
- *Hong Kong Planning Standards and Guidelines Planning (2014), Planning Department, Hong Kong SAR Government;*
- *WBTC No. 25/99, 25/99A and 25/99C - Incorporation of Information on Construction and Demolition Material Management in Public Works Subcommittee Papers, Works Bureau, Hong Kong SAR Government; and*

- *Practice Note for Authorized Persons and Registered Structural Engineers No. 252 - Management Framework for Disposal of Dredged/Excavated Sediment, Buildings Department, Hong Kong SAR Government.*

The Contractor(s)'s waste management practices will be audited with reference to the checklist detailed in *Table 6.1* below.

Details of the required mitigation measures are included in the Implementation Schedule of Annex A of this EM&A Manual.

Table 6.1 Waste Management Checklist

Activities	Timing	Checking Frequency	If non-compliance noted, Action Required
Necessary waste disposal permits or licences have been obtained	Before the commencement of works	Once	The ET will inform the Contractor(s), IEC and ER. The Contractor(s) will apply for the necessary permits/ licences prior to disposal of the waste. The ET will verify that corrective action has been taken.
Dredged sediments are managed and disposed in accordance with *ETWB TC(W) No. 34/2002: Management Framework for Disposal of Dredged/ Excavated Sediment* .	Throughout the dredging works.	Each Week	The ET will inform the Contractor(s), IEC and ER. ER will instruct the Contractor(s) to manage and dispose the dredged materials properly. The Contractor(s) will immediately suspend dredging until the dredging materials are properly managed and disposed.
Only licensed waste hauliers are used for waste collection.	Throughout the works	Each Week	The ET will inform the Contractor(s), IEC and ER. ER will instruct the Contractor(s) to use a licensed waste haulier. The Contractor(s) will temporarily suspend waste collection of that particular waste until a licensed waste haulier is used. Corrective action will be undertaken within 48 hours.
Records of quantities of wastes generated, recycled and disposed are properly kept. For demolition material/waste, the number of loads for each day will be recorded (quantity of waste can then be estimated based on average truck load. For landfill charges, the receipts of the charge could be used for estimating the quantity).	Throughout the works	Each Week	The ET will inform the Contractor(s), IEC and ER. The Contractor(s) will estimate the missing data based on previous records and the activities carried out. The ET will review the results and forward to ER for approval.
Sufficient waste disposal points are provided. Wastes are collected and removed from site in a timely manner. General refuse is collected on a regular basis.	Throughout the works	Each Week	The ET will inform the Contractor(s), IEC and ER. ER will instruct the Contractor(s) to remove waste accordingly.
Waste storage areas are properly cleaned and do not cause windblown litter and dust nuisance. Appropriate measures to reduce windblown litter and dust nuisance of waste will be adopted, e.g. by either covering trucks or by transporting wastes in enclosed containers.	Throughout the works	Each Week	The ET will inform the Contractor(s), IEC and ER. ER will instruct the Contractor(s) to clean the storage area and/or cover the waste.
Different types of waste are segregated in different containers or skip to enhance reuse and recycling of material and proper disposal of waste.	Throughout the works	Each Week	The ET will inform the Contractor(s), IEC and ER. ER will instruct the Contractor(s) to provide separate skips/ containers. The Contractor(s) will verify that the workers place the waste in the appropriate containers.

Activities	Timing	Checking Frequency	If non-compliance noted, Action Required
Chemical wastes are stored, handled and disposed of in accordance with the *Code of Practice on the Packaging, Handling and Storage of Chemical Wastes*, published by the EPD. Chemical wastes are separated for special handling and appropriate treatment at the Chemical Waste Treatment Centre at Tsing Yi.	Throughout the works	Each Week	The ET will inform the Contractor(s), IEC and ER. ER will instruct the Contractor(s) to rectify the issues immediately. Warning will be given to the Contractor(s) if corrective actions are not taken within 24 hrs.
Demolition materials are properly covered before leaving the site.	Throughout the works	Each Week	The ET will inform the Contractor(s), IEC and ER. ER will instruct the Contractor(s) to comply. The Contractor(s) will confirm that the demolition materials are properly covered when transport out of the site.
Wastes are disposed at licensed sites.	Throughout the works	Each Week	The ET will inform the Contractor(s), IEC and ER. ER will warn the Contractor(s) and instruct the Contractor(s) to confirm that the wastes are disposed of at the licensed sites. Should it involve chemical waste, the Waste Control Group of EPD will be notified.
Regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors are provided. A recording system for the amount of wastes generated/ recycled and disposal sites is developed and implemented.	Throughout the works	Each Week	The ET will inform the Contractor(s), IEC and ER. ER will instruct the Contractor(s) to comply.

Note: ET – Environmental Team, IEC – Independent Environmental Checker, ER – Engineer's Representatives

6.3 Marine Dredged Material Management

Prior to the commencement of dredging activities, the disposal strategy for the dredged sediment will be determined in accordance with the *ETWB TC(W) No. 34/2002: Management Framework for Disposal of Dredged/ Excavated Sediment*. A Sediment Quality Report (SQR) for contaminated marine sediment generated by the Project will be prepared and agreement of the SQR and WDP will be sought with the Marine Fill Committee (MFC) of the Civil Engineering and Development Department and other relevant authorities, e.g. EPD. The SQR and WDP will contain the location of the disposal site(s) / disposal option(s) as agreed by the MFC and EPD, and it will be certified by the ET Leader and verified by the IEC as conforming to the information and recommendations contained in the approved EIA Report. The SQR and WDP will then be submitted to the EPD.

6.4 Waste Management EM&A

To facilitate monitoring and control over the contractors' performance on waste management, a waste inspection and audit programme will be implemented throughout the construction phase. The programme will look at the aspects of waste management including waste generation, storage, recycling, transport and disposal. An appropriate audit programme will be undertaken with the first audit conducted at the commencement of the construction works.

The aims of the waste inspection and audit programme are:

- To review the WMP including the quantities and types of C&D materials generated, reused and disposed of off-site; the amount of fill materials exported from/imported to the site and the quantity of timber used in temporary works construction for each process/activity;

- To confirm that the wastes arising from works are handled, stored, collected, transferred and disposed of an environmentally acceptable manner and comply with the relevant requirements under the Waste Disposal Ordinance (WDO) and its regulations;

- To confirm that the construction Contractor(s) properly implements the appropriate environmental protection and waste pollution control mitigation measures, as outlined in the WMP and the Implementation Schedule and presented in Annex A, to reduce and control the potential for waste impacts.

- To monitor the implementation and achievement of the WMP on site to assess its effectiveness; and

- To monitor the follow-up action on deficiencies identified.

Weekly audits of the waste management practices will be carried out during the construction phase to determine if wastes are being managed in accordance with the recommended good site practices, WMP and C&DMMP. Joint site inspections and audits by the ET, the IEC and the contractor will be undertaken once per month. The inspection/ audit will look at all aspects of on-site waste management practices including waste generation, storage, recycling, transport and disposal. Particular attention will be given to the contractor's provision of sufficient spaces, adequacy of resources and facilities for on-site sorting and temporary storage of C&D materials. The C&D materials to be disposed of from the site will be visually inspected. The public fill for delivery to the off-site stockpiling area will

contain no observable non-inert materials (e.g. general refuse, timber, etc). Furthermore, the waste to be disposed of at refuse transfer stations or landfills will as practicable contains no observable inert or reusable/recyclable C&D materials (e.g. soil, broken rock, metal, and paper/cardboard packaging, etc). Apart from site inspection, documents including licences, permits, disposal and recycling records will be reviewed and audited for compliance with the legislation and Contract requirements. Any irregularities observed during the site audits will be raised promptly to the contractor for rectification.

The findings of the waste audits will be reported in the *Monthly EM&A Reports, Quarterly EM&A Reports and Annual/Final EM&A Reports*.

7 Ecology

Marine Ecology

The Project only affects a small area of subtidal soft bottom habitat of low ecological value. With the implementation of good site practices, no unacceptable marine ecological impacts from the construction of the Project are found. The implementation of the ecological mitigation measures (Annex A) will be inspected regularly as part of the EM&A procedures during the construction period. The monitoring and control of water quality will also serve to avoid unacceptable impacts to marine ecological resources during operation phase.

In the unlikely event of emergency discharge in operation phase, DSD is committed to repair the STW and SPSs as soon as practicable usually within 6 hours for SPSs and 8 hours for STW including time of travelling and repairing. An Emergency Response Plan shall be prepared and implemented to cope with emergency discharge of untreated sewage. The Emergency Response Plan shall include, but not limited to, details on the following:

- Arrangements for standby facilities (i.e. main treatment units and accessories/ equipment parts) and dual power supply (if dual power supply is available) to secure electrical power supply;

- Arrangements for adequate emergency storage for SPSs and STW;

- Regular inspection and maintenance to prevent equipment failure by a maintenance crew organized by DSD/ST2 - regular inspection team which will station in San Shek Wan STW;

- Arrangements for existing mobile team (except regular inspection team of DSD) from Ma Wan STW to backup the regular team in non-office hours, and emergency team (except regular inspection team and existing mobile team of DSD) to assist the existing mobile team to handle the situation in order to reduce the maintenance time in non-office hour;

- Communication procedures with relevant government departments including EPD, LCSD and DSD shall be informed by the STW operator as soon as possible of any emergency discharge of untreated sewage

Terrestrial Ecology

Approximately of 0.52 to 0.55 ha of mixed woodland with moderate ecological value will be lost due to the construction of the San Shek Wan STW, San Shek Wan SPS (Proposed and Alternative Sites) and their associated roads. Woodland compensation to mitigate for the loss of mixed woodland due to construction of the San Shek Wan STW, San Shek Wan SPS (Proposed and Alternative Sites) and their associated roads is recommended to fully compensate the loss of mixed woodland. A Woodland Compensation Proposal shall be prepared and implemented to provide details for the compensatory woodland planting, including but not limited to:

- Location and boundary of the proposed woodland compensation area, which shall be at least two times of the areas affected, i.e about 1.11 ha;

- Species proposed for planting are pioneer native tree and shrub species often present in natural woodlands in the Study Area, including a number of shrub species known to be of value in providing food for native fauna;

- Methods and procedures for tree planting for woodland compensation, including the preservation of existing native trees and shrubs in the planting area as far as possible, and site preparation by selective removal of exotic species if needed. Planting near roadside and within the nearby woodland area will be avoided; and

- For establishment and after-establishment caring measures of the compensatory mixed woodland, including responsibilities for implementation and maintenance, the project proponent (i.e. DSD) will be responsible for the establishment and maintenance of about 1.11 ha compensatory woodland area during the first 10 years of its establishment. It is expected that after 10 years, with proper maintenance the woodland would be self-sustained and will be passed to relevant government department (e.g. Lands Department) for maintenance per existing arrangement for government land.

For the affected individuals of *Aquilaria sinensis* at San Shek Wan SPS Alternative Site and STW, transplantation plan will be developed, including an EM&A programme for monitoring the transplantation of the tree individuals.

Monitoring in the form of regular site inspections shall be required to ensure ecological measures in the form of tree transplantation and establishment are being implemented and are effective.

7.1 Impact Monitoring

The recommended good site practices should be audited at least once every week as part of the site audit programme. The weekly site audit to be carried out by the ET should include checking whether good site practices are being properly implemented by the Contractor.

The extent of the work site boundaries should be checked by the ET during the weekly site audit. Any disturbance by the Contractor outside the works area especially any damage to the vegetation and surrounding habitats outside the Project area shall be reported to ER and IEC. ET shall also check and ensure the transplanting of the trees of *Aquilaris sinensis*, establishment and after-establishment caring measures of the compensatory mixed woodland are not affected by any unacceptable construction works. In event such non-compliance are found, the relevant Event/ Action Plan should be implemented (*Table 7.1*).

Table 7.1 Event and Action Plan for Ecology during Construction Phase

Event	Action			
	ET	**IEC**	**ER**	**Contractor(s)**
Non-conformity on one occasion	1. Identify source; 2. Inform IEC and ER; 3. Discuss remedial actions with IEC, the ER and the Contractor(s); 4. Monitor/ audit/ review remedial actions until rectification has been completed.	1. Check monitoring/ auditing results; 2. Check the Contractor(s)'s working method; 3. Discuss with the ET, ER and Contractor(s) on possible remedial measures; 4. Advise the ER on effectiveness of proposed remedial measures; 5. Supervise the implementation of remedial measures.	1. Notify Contractor(s); 2. Ensure remedial measures are properly implemented; 3. Consider and instruct, if necessary, the Contractor(s) to slow down or to stop all or part of the works in case of serious non-conformity until situation is rectified.	1. Take immediate action to avoid further problem; 2. Amend working methods if needed; 3. Submit proposals for remedial actions to ET, ER and IEC; 4. Rectify damage and implement the agreed remedial actions; 5. As directed by ER, slow down or stop all or part of the works until the situation is rectified.
Repeated Non-conformity	1. Identify source; 2. Inform IEC, ER, EPD, AFCD and other departments as appropriate; 3. Increase monitoring and audit frequency; 4. Discuss remedial actions with the IEC, the ER and the Contractor(s); 5. Monitor/ audit/ review remedial actions until rectification has been completed; 6. If non-conformity stops, cease additional monitoring/ auditing.	1. Check monitoring/ auditing results; 2. Check the Contractor(s)'s working method; 3. Discuss with the ET, ER and Contractor(s) on possible remedial measures; 4. Supervise the implementation of remedial measures; 5. Advise the ER on effectiveness of proposed remedial measures and keep EPD, AFCD and other departments as appropriate informed.	1. Notify Contractor(s); 2. Ensure remedial measures are properly implemented; 3. Consider and instruct, if necessary, the Contactor(s) to slow down or to stop all or part of the works in the case of serious non-conformity until situation is rectified.	1. Take immediate action to avoid further problem; 2. Amend working methods if needed; 3. Submit proposals for remedial actions to ET, ER and IEC; 4. Rectify damage and implement the agreed remedial actions; 5. As directed by ER, slow down or stop all or part of the works until the situation is rectified.

Notes : ET – Environmental Team, IEC – Independent Environmental Checker; ER – Engineer's Representatives

8 Fisheries

The EIA concluded that the Project would not affect fisheries resources and fishing activities significantly. The construction of the Project will involve minor marine dredging works for the installation of the submarine outfall diffuser. The dredging works will be designed to confirm compliance with the assessment criteria at sensitive receivers and control water quality impacts to within acceptable levels, and water quality mitigation measures will be developed and implemented when required to further avoid/reduce potential impacts. These measures are expected to control and reduce potential impacts to fisheries resources as well, and no fisheries-specific mitigation measures, monitoring or compensation are thus required during construction and operation phases.

Nonetheless, water quality monitoring programme at various locations is recommended during construction and operation phases to ensure no unacceptable water quality impact is arising from the works. Details of the water quality monitoring and audit requirements and the associated event and action plans are described in *Section 5* of this Manual.

In the unlikely event of emergency discharge in operation phase, DSD is committed to repair the STW and SPSs as soon as practicable usually within 6 hours for SPSs and 8 hours for STW including time of travelling and repairing. An Emergency Response Plan shall be prepared and implemented to cope with emergency discharge of untreated sewage as detailed in *Section 7*. Relevant government departments, including EPD, AFCD, LCSD and DSD, as well as the mariculturists of Cheung Sha Wan FCZ, shall be informed by the STW operator as soon as possible of any emergency discharge of untreated sewage.

9 Landscape & Visual

The EIA has recommended that checking of implementation of the mitigation measure for landscape and visual resources will be undertaken as part of the site inspection programme during construction, extending into operation phase depending on the duration of establishment period of the planting works carried out (See *Table 1.1* and *Sections 2.1.1*, *2.1.2*).

Prior to the commencement of construction works, a baseline report shall be prepared to check, record and re-confirm the status of the Landscape Resources and Landscape Character Areas within the works area. The report shall review the proposed mitigation measures and assess their feasibility with reference to the operational requirements of the detailed project works. Any potential conflicts between proposed mitigation measures and the proposed works shall be resolved at an early stage (prior to construction) and any necessary changes to the mitigation measures shall be incorporated into the detailed design.

The implementation and monitoring of mitigation measures shall be carried out by the contractor and ET respectively. Competent person specialised in landscape and visual aspect shall be part of the ET, to monitor and check whether the mitigation measures are properly implemented and the effectiveness of these measures are meeting the intended requirements.

Monitoring of the planting works should also be continued over their establishment period, which may extend into the operation phase, and will be covered by regular site inspections. Monitoring of the landscape works shall be undertaken by competent person specialised in landscape works and he shall inspect the planting on a bi-monthly basis to ensure the plantings have become established and self-sustainable in order to provide long term landscape and visual mitigation as intended.

10 Cultural Heritage

10.1 Built Heritage

Potential impact to a total of 20 built heritage features (comprising historic landscape feature; Grade 3 Historic Buildings; Proposed Grade 3 Historic Building and historic buildings) have been identified during construction stage of the Project and appropriate mitigation measures have been recommended as summarized in *Table 10.1* for the concerned built heritage features to avoid and minimise the impact. Key Plan showing locations of these built heritage features is present in *Figure 10.1*. The mitigation measures recommended are summarized as below:

1. Refinement of Alignment

Refine the proposed alignment to avoid the direct impact to these items in the detailed design stage of this Project.

2. Baseline Condition Survey and Baseline Vibration Impact Assessment

Prior to commencement of the construction works, a baseline condition survey and baseline vibration impact assessment should be conducted by a qualified building surveyor and a qualified structural engineer to define the vibration limit and to evaluate if construction vibration monitoring and structural strengthening measures are required during construction phase to ensure the construction performance meets with the vibration criteria as prescribed in the Building Department's Practice Note for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers, PNAP APP-137. Only baseline condition survey and baseline vibration impact assessment of the graded and proposed graded buildings should be submitted to the AMO for comment before the commencement of construction works.

3. Provision of Proper Protection Measures

Safe public access, buffer zones and protective covering should be provided to the built heritage during and after the proposed works. If construction works will be conducted within 1m from the walls/structures of the built heritage, proper protection measure such as fencing and cover-up of nylon/ plastic sheets for the walls/structures of the built heritage shall be carried out.

Table 10.1 Mitigation Measures Recommended for 20 Built Heritage Features

Features Code	Site Name	Approximate Distance from the proposed alignment (m)	Mitigation Measures 1. Refinement of alignment 2. Baseline condition survey and baseline vibration impact assessment 3. Provision of Proper Protection Measures	Figure No.
Grade 3 Historic Buildings				
PO-HB-8	Cheung Ancestral Hall (張氏祠堂)	1	2, 3	Figures 10.3 and 10.11
HT-HB-4	Lin Kong Tong (蓮江堂)	1.6	2, 3	Figures 10.2 and 10.12

Features Code	Site Name	Approximate Distance from the proposed alignment (m)	Mitigation Measures 1. Refinement of alignment 2. Baseline condition survey and baseline vibration impact assessment 3. Provision of Proper Protection Measures	Figure No.
Proposed Grade 3 Historic Building				
SH-HB-7	No.49-50 Shui Hau	2	2, 3	Figures 10.4 and 10.5
Historic Built Structure				
SH-HB-1	Chan Ancestral Hall (陳氏宗祠)	2.5	2, 3	Figure 10.5
SH-HB-2	No.25-26 Shui Hau	0.4	2, 3	Figure 10.5
SH-HB-5	No.53 Shui Hau	1.5	2, 3	Figure 10.5
SH-HB-6	No.57 Shui Hau	1.9	2, 3	Figure 10.5
SH-HB-8	No.46 Shui Hau	2	2, 3	Figure 10.5
SH-HB-9	No.52 Shui Hau	1.5	2, 3	Figure 10.5
TF-HB-4	Earth-god Shrine	1	2, 3	Figure 10.7
CS-HB-1	Earth-god Shrine	2.8	2, 3	Figure 10.8
CS-HB-2	Earth-god Shrines	1.9	2, 3	Figure 10.8
CS-HB-3	Earth-god Shrine	1.9	2, 3	Figure 10.9
SSW-HB-1	Mo Ancestral Hall (毛氏祖祠)	1.3	2, 3	Figure 10.10
PO-HB-4	Earth-god Shrine	1.5	2, 3	Figure 10.11
PO-HB-5	Stone Wall	0.5	2, 3	Figure 10.11
PO-HB-7	Wan Ancestral Hall (溫氏宗祠)	1.9	2, 3	Figure 10.11
HT-HB-5	Cheung Study Hall (張氏家塾) and Si Tak Tong (四德堂)	1.6	2, 3	Figure 10.12
Historic Graves				
SH-HG-3	Cheung Clan Grave	2.4	2, 3	Figure 10.6
Historic Landscape Features				
TF-HL-1	Fung Shui Forest	0	1	Figure 10.7

During the construction period, no mechanical equipment, such as excavator, shall be operated within 20m from the identified built heritage and only handheld tools and handheld electric driven equipment shall be used. All construction tools, construction materials, excavated materials or any materials generated from the works under this project shall keep clear of the built heritage structures.

10.2 Archaeological Resources

Potential archaeological impact has been identified at an area with medium archaeological potential (see *Figure 10.13* for the sewer alignment in blue and brown colour) and four areas with low archaeological potential (see *Figures 10.13*, *10.14*, *10.15* and *10.16*). Potential impact is anticipated and mitigation measures are proposed as below.

10.2.1 General requirement

Pursuant to the Antiquities and Monuments Ordinance, the project proponent shall inform the AMO immediately in case of discovery of antiquities or supposed antiquities in the course of soil excavation works in construction stage in the proposed works area including the areas of proposed works with no or low archaeological potential.

A Communication Plan to communicate event of discovery of antiquities or supposed antiquities to the AMO shall be prepared by the contractor before the commencement of construction works. The plan shall be approved by the engineer, and circulated among the relevant parties prior to approval. A document presenting the plan shall be posted in site office(s) for reference.

All site staff, including workers, who will be responsible for the excavation works within the Sites of Archaeological Interest will be formally briefed with the Communication Plan to make sure that they are fully comprehended the procedures of discovering remain(s) within Sites of Archaeological Interest.

10.2.2 Survey-cum-Rescue Excavation for Medium Archaeological Potential Area

A Survey-cum-Rescue Excavation shall be conducted at the concerned area along the proposed sewer alignment with medium archaeological potential as shown in *Figure 10.13* for the sewer alignment in blue and brown colour before the commencement of the excavation work of the proposed alignment to define the precise archaeological deposits extent and to preserve the archaeological resources as far as possible. Further test pits shall be carried out as appropriate for a survey to refine the demarcation of archaeological deposit area for the excavation. The scope and work programme of the survey-cum-rescue excavation shall be agreed with AMO prior to commencement. The Survey-cum-Rescue Excavation shall be conducted by a qualified archaeologist and shall include, but not limited to the following tasks:

- Prepare a Survey-cum-Rescue Excavation Proposal to define the scope of work and agree it with the AMO;
- Obtain a *License to Excavate and Search for Antiquities* from the Authority under the *AM Ordinance* (Cap. 53) by the qualified Archaeologist for the required fieldworks of the archaeological works;
- Conduct Survey-cum-Rescue Excavation before the commencement of the excavation work of the concerned sewer alignment by a qualified archaeologist;
- Conduct proper recording in accordance with normal archaeological practice;
- Collect and process identified finds according to the AMO's *Guidelines for Handling of Archaeological Finds and Archives (As at 28 November 2011)*; and
- Prepare a Survey-cum-Rescue Excavation Report upon completion of the archaeological works in accordance with the AMO's *Guidelines for Archaeological Reports (As at April 2011)*.

10.2.3 In Case of Change in Project Boundary

The archaeological impact assessment covered only the CHIA Study Area as shown in *Figure 10.1*. If the project boundary changes in later stage of the Project to cover additional

area not covered in the EIA, the need for further archaeological survey and subsequent impact assessment shall be reviewed and AMO should be consulted.

The recommended mitigation measures are summarized in the implementation schedule as shown in Annex A.

11 Environmental Site Inspection and Audit

11.1 Site Inspection and Audit

Site inspections provide a direct means to track and ensure the enforcement of specified environmental protection and pollution control measures. Regular site inspections will be carried out by the ET and the Contractor(s) once per week during construction phase. The IEC will also undertake monthly site audit to assess the performance of the Contractor(s). Additionally, the ET will be responsible for defining the scope of the inspections, detailing any deficiencies that are identified, and reporting any necessary action or mitigation measures that were implemented as a result of the inspections. The site inspections and audits checklists, to be used for undertaking site inspections and audits, will be prepared by the ET and IEC respectively and submitted to the ER for approval. The results of the inspections and audits should be made available to the Contractor(s), IEC, ER and Project Proponent.

The areas of inspections/audits should include the general environmental conditions in the vicinity of the Site and pollution control and mitigation measures within the Site. It should also review the environmental conditions outside the site area which are likely to be affected, directly or indirectly, by site activities. The ET should make reference to the following information in conducting the inspections:

- the EIA and EM&A recommendations on environmental protection and pollution control mitigation measures;
- ongoing results of the EM&A programme;
- works progress and programme;
- individual works method statements which will include proposals on associated pollution control measures;
- contract specifications on environmental protection; and
- relevant environmental protection and pollution control laws.

The ET's inspection findings and their associated recommendations on improvements to the environmental protection and pollution control works should be submitted to the IEC and the Contractor(s) within 24 hours, for comment and for taking immediate action if needed. They should also be presented, along with the remedial actions taken, in the monthly EM&A reports. The Contractor(s) should follow the procedures and time-frames stipulated in the environmental site inspections for the implementation of mitigation proposals. An action reporting system should be formulated and implemented to report on any remedial measures implemented subsequent to the site inspections.

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

11.2 Compliance with Legal & Contractual Requirements

There will be contractual environmental protection and pollution control requirements as well as Hong Kong's environmental protection and pollution control laws which the construction activities will comply with.

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

The Contractor(s) should also regularly copy relevant documents to the ET Leader, IEC, ER and Project Proponent so that the checking work can be carried out. The relevant documents are expected to include the updated Work Progress Reports, the updated Works Programme, application letters for different licences/permits under the environmental protection laws, and all the valid licences/permit. The site logbooks should also be available, upon request, to the ET Leader during his site inspections.

After reviewing the documentation, the ET should advise IEC, ER, Project Proponent, EPD and Contractor of any non-compliance with the contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the ET Leader's review concludes that the current status on licence/permit application and any environmental protection and pollution control preparation works is incompatible with the works programme or may result in potential violation of environmental protection and pollution control requirements by the works in due course, he should also advise the Contractor(s) accordingly.

Upon receipt of the advice, the Contractor(s) should undertake immediate actions to remedy the situation. The ET, IEC and ER should follow up to ensure the appropriate actions have been taken by the Contractor(s) in order that the environmental protection and pollution control requirements are fulfilled.

11.3 Environmental Complaints

Environmental complaints shall be immediately referred to the ET Leader for carrying out complaint investigation procedures. The ET Leader should undertake the following procedures upon receipt of a complaint:

- log complaint and date of receipt into the complaint database and inform the Contractor(s), ER, IEC and Project Proponent immediately;
- investigate the complaint jointly with the Contractor(s) and the IEC and discuss with the Contractor(s) and IEC to determine its validity and to assess whether the source of the issue is due to construction or operation of the Project;
- if a complaint is considered valid due to the construction or operation activities, the ET Leader should identify mitigation measures in consultation with the Contractor(s), and submitted to the IEC and ER for review. The ER should report the results to the Project Proponent;
- if mitigation measures are required, the ET Leader should advise the Contractor(s) accordingly;
- review the Contractor(s)'s responses on the identified mitigation measures and the updated situation;

- if the complaint is transferred from EPD, an interim report should be submitted to EPD on the status of the complaint investigation and follow-up action within the time frame assigned by EPD;

- undertake additional monitoring and audits to verify the situation if necessary and ensure that any valid reason for complaint does not recur;

- report the investigation results and the subsequent actions on the source of the complaint for responding to complainant. If the source of complaint is EPD, the results should be reported within the time frame assigned by EPD; and

- record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports.

During the complaint's investigation work, the Contractor(s) and ER shall cooperate with the ET Leader in providing all necessary information and assistance for completion of the investigation. If mitigation measures are identified in the investigation, the Contractor(s) should promptly carry out the mitigation measures. EPD will approve the proposed mitigation measures, and the ET Leader and IEC should check that the measures have been carried out by the Contractor(s).

11.4 Log-Book

The ET Leader should keep a contemporaneous log-book of each and every instance or circumstance or change of circumstances which may affect the findings of the environmental impact assessment and non-compliance with the Environmental Permit. The ET Leader should notify the IEC within one working day of the occurrence of any such instance or circumstance or change of circumstance. The ET Leader's log-book should be kept readily available for inspection by persons (such as IEC and Contractor(s)) assisting in supervision of the implementation of the recommendations of the EIA Report and the conditions set out in the Environmental Permit if any, or by EPD or his authorised officers.

12 Reporting

Reports shall be provided in an electronic medium upon agreeing the format with the Contractor(s), IEC, ER, Project Proponent and the EPD. All the monitoring data should also be submitted on diskettes or CD Rom.

12.1 Baseline Monitoring Report

The ET Leader shall prepare and submit a baseline monitoring report within 10 days of completion of the baseline monitoring. The baseline monitoring report will be submitted to the Contractor(s), IEC, ER and EPD. The baseline monitoring report will include at least the following:

(a) up to half a page executive summary;

(b) brief project background information;

(c) drawings showing locations of the baseline monitoring stations;

(d) an updated construction programme;

(e) monitoring results (in both hard and diskette copies) together with the following information:

- monitoring methodology;
- name of laboratory and types of equipment used and calibration details;
- parameters monitored;
- monitoring locations;
- monitoring date, time, frequency and duration; and
- quality assurance (QA) / quality control (QC) results and detection limits;

(f) details on influencing factors, including:

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

(g) determination of the Action and Limit Levels (A/L levels) for each monitoring parameter and statistical analysis of the baseline data;

(h) revisions for inclusion in the EM&A Manual; and

(i) comments and conclusions.

12.2 Monthly EM&A Reports

The results and findings of all EM&A works required in the Manual should be recorded in the monthly EM&A reports and be prepared by the ET and verified by the ET Leader. The reports will be submitted to the Contractor(s), IEC and EPD within 10 working days of the end of each reporting month, with the first report due in the month after construction works commence. The ET should liaise with the relevant parties to confirm the exact number and format of monthly reports in both hard copy and electronic format. The report should include, but not be limited to, the following elements:

a) First Monthly EM&A Report

The first monthly EM&A report should include at least but not be limited to the following:

(i) Executive Summary (1-2 pages);

- Exceedances of Action/Limit Levels;
- Complaint log;
- Notifications of any summons and successful prosecutions;
- Reporting changes; and
- Future key issues.

(ii) Basic Project Information

- Project organisation including key personnel contact names and telephone numbers;
- Construction programme with fine tuning of construction activities showing the inter-relationship with environmental protection/ mitigation measures for the month; and
- Works undertaken during the month.

(iii) Environmental Status

- Works undertaken during the month with illustrations (such as location of works); and
- Drawing showing the Project area, environmental sensitive receivers and monitoring locations.

(iv) Summary of EM&A Requirements including:

- Environmental mitigation measures, as recommended in the EIA Report; and
- Environmental monitoring requirements and contractual requirements;

(v) Implementation Status

- Advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the EIA Report and summarised in the updated implementation schedule.

(vi) Site Inspection and Audit Reports

(vii) Monitoring Results (in both hard and diskette copies) together with the following information:

- Monitoring methodology;
- Name of laboratory and equipment used and calibration details;
- Parameters monitored;
- Monitoring locations (and depth); and
- Monitoring date, time, frequency, and duration.

(viii) Report on Complaints, Notifications of Summons and Successful Prosecutions

- 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 notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
- Review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
- Description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to non-compliance.

(ix) Others

- An account of the future key issues as reviewed from the works programme and work method statements; and
- Submission of implementation status proforma, proactive environmental protection proforma, regulatory compliance proforma, site inspection proforma, data recovery schedule and complaint log summarising the EM&A of the period.

b) Subsequent Monthly EM&A Reports

The subsequent monthly EM&A reports should include the following:

(i) Executive Summary (1-2 pages)

- Exceedances of Action/Limit Levels;
- Complaint log;
- Notifications of any summons and successful prosecutions;
- Reporting changes; and
- Future key issues.

(ii) Environmental Status

- Construction programme with fine tuning of construction activities showing the inter-relationship with environmental protection/ mitigation measures for the month;
- Works undertaken during the month with illustrations including key personnel contact names and telephone numbers; and
- Drawing showing the project area, environmental sensitive receivers and monitoring locations.

(iii) Implementation Status

- Advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA Report and summarised in the updated implementation schedule.

(iv) Monitoring results (in both hard and diskette copies) together with the following information:

- Monitoring methodology;
- Name of laboratory and equipment used and calibration details;
- Parameters monitored;
- Monitoring locations (and depth); and
- Monitoring date, time, frequency, and duration.

(v) Report on Complaints, Notifications of Summons and Successful Prosecutions

- 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 notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;

- Review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and

- Description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.

(vi) Others

- An account of the future key issues as reviewed from the works programme and work method statements.

(vii) Appendix

- Supporting documents

- Outstanding issues and deficiencies.

12.3 Quarterly EM&A Summary Reports

The quarterly EM&A summary reports should contain the following listed information:

(a) Executive summary (up to half page);

(b) Basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of work undertaken during the quarter;

(c) A brief summary of EM&A requirements including:

- Monitoring parameters;

- Environmental quality performance limits (Action and Limit levels); and

- Environmental mitigation measures, as recommended in the EIA Report.

(d) Advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the EIA Report and summarised in the updated implementation schedule;

(e) Drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;

(f) Graphical plots of the trends of monitored parameters over the past 4 months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:

- The major activities being carried out on site during the period;
- Weather conditions during the period; and
- Any other factors which might affect the monitoring results;

(g) Advice on the solid and liquid waste management status;

(h) A summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);

(i) A brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;

(j) A summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;

(k) A summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;

(l) 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;

(m) Comments (e.g. effectiveness and efficiency of the mitigation measures), recommendations (e.g. any improvement in the EM&A programme) and conclusions for the quarter; and

(n) Project Proponent's contacts and hotline telephone number if any for the public to make enquiries.

12.4 Annual EM&A Review Reports

The annual EM&A review reports should contain the following listed information:

(a) Executive summary (up to half page);

(b) Drawings showing the Project area, environmental sensitive receivers and monitoring and control stations;

(c) Basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of work undertaken during the quarter;

(d) 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 EIA Report and summarised in the updated implementation schedule.

(e) Summary of the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the EIA Report and summarised in the updated implementation schedule;

(f) Graphical plots of the trends of monitored parameters over the past 4 months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:

- The major activities being carried out on site during the period;
- Weather conditions during the period; and
- Any other factors which might affect the monitoring results.

(g) A summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);

(h) A brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;

(i) A summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;

(j) A summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;

(k) 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;

(l) Comments (e.g. effectiveness and efficiency of the mitigation measures), recommendations (e.g. any improvement in the EM&A programme) and conclusions for the quarter; and

(m) Project Proponent's contacts and hotline telephone number if any for the public to make enquiries.

12.5 Final EM&A Summary Report

The EM&A programme will be terminated upon the completion of the construction works and specified operation phase monitoring period so that the potential to cause significant environmental impacts is ceased and the post-project monitoring is concluded.

The final EM&A summary report will include, *inter alia*, the following:

(a) An executive summary;

(b) Drawings showing the project area, environmental sensitive receivers and monitoring and control stations;

(c) Basic project information including a synopsis of the project organisation, programme, contracts of key management, and a synopsis of work undertaken during the entire construction period;

(d) A brief summary of EM&A requirements including environmental mitigation measures as recommended in the EIA Report;

(e) Advice on the implementation status of environmental protection and pollution control/mitigation measures as recommended in the EIA Report and summarised in the updated implementation schedule;

(f) Provide clear-cut decisions on the environmental acceptability of the Project with reference to the specific impact hypothesis;

(g) A summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;

(h) A summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;

(i) A summary record of notification 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;

(j) A review of the practicality and effectiveness of the EIA Report's recommendations and EM&A programme (e.g. effectiveness and efficiency of the mitigation measures) with recommendations on any improvement in the EM&A programme; and

(k) A conclusion to state the return of ambient and/or the predicted scenario as per EIA findings.

12.6 Data Keeping

Documentation such as the monitoring field records, site inspection forms, etc. are not required to be included in the monthly EM&A reports for submission. However, such documents should be well kept by the ET Leader and should be available for the inspection of the IEC, Project Proponent and EPD upon request. All relevant information should be clearly and systematically recorded in the documents. The monitoring data should also be recorded in electronic format. All the documents and data should be kept for at least five years after completion of the construction contract(s).