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1. INTRODUCTION

1.1 Project Background

1.1.1.1 With the growing concern on making the best use of the limited land resource, in the 2016 Policy Address (PA), the Government announced to carry out the re-planning for the development of the land at Tseung Kwan O Area 137 (TKO 137) and examine the feasibility of using the site for residential, commercial and other development purposes.

1.1.1.2 To take forward the re-planning process, Civil Engineering and Development Department (CEDD) and Planning Department (PlanD) jointly commissioned the "Planning and Engineering Study for Re-planning of TKO 137" (the P&E Study) in December 2016, with a view to ascertaining and maximising the development potential of the available land in TKO 137.

1.1.1.3 The Government has announced in the 2022 PA that TKO 137 would be developed into a new community primarily for housing purpose providing about 50,000 residential units, to be served by the existing road network, as well as the TKO Line Southern Extension (TKLSE) and the Tseung Kwan O – Yau Tong Tunnel (TKO-YTT) recommended under the Strategic Studies on Railways and Major Roads beyond 2030 (RMR 2030+) by Transport and Logistics Bureau. At the same time, to make way for the housing development at TKO 137, a review has been conducted to identify suitable locations for accommodating existing public facilities in TKO 137 and other location-specific public facilities. Based on the findings of the P&E Study, a Preliminary Outline Development Plan (PODP) was formulated for TKO 137 and the land to be created off TKO Area 132 (TKO 132) in January 2023.

1.1.1.4 Currently, vast majority of the existing traffic on Wan Po Road south of LOHAS Park is generated by Tseung Kwan O Fill Bank (TKOFB) located at TKO 137. The heavy vehicles, such as diesel fuel dump trucks, are running through the existing road network of TKO New Town to TKOFB which cause potential fugitive dust, exhaust gas emission and noise nuisance to local residents. With TKOFB converting into a housing development, the traffic on Wan Po Road is expected to shift predominantly from heavy vehicle to mostly private cars and commercial vehicles, which are mainly electric and petroleum vehicles. Less gaseous emission and noise nuisance to the locals would be anticipated.

1.1.1.5 The Legislative Council (LegCo) Panel on Development was briefed on the PODP on 31 January 2023. Besides, during the period from February to March 2023, two Sai Kung District Council (DC) Meetings were held to brief the DC and the public on the PODP and solicit participants' views on the plan. The project team also made pro-active efforts in reaching out to the local community to collect their views on the development proposal. In the course of the exercise, the project team organised twelve meetings with local stakeholders and attended two residents' forums, meeting representatives from over 30 organisations such as the owners' committees of the residential estates in TKO, estates' representatives, local personalities, villagers and concern groups, etc. Taking into account comments received from LegCo members, the public and key stakeholders on the PODP, and on-going liaison with relevant Government B/Ds, a Recommended Outline Development Plan (RODP) was formulated.

1.1.1.6 According to the P&E Study, the Project is a Designated Project under Schedule 3 of the Environmental Impact Assessment Ordinance (EIAO) and comprises of various Schedule 2 Designated Projects (DPs) under the EIAO for necessary infrastructures.

1.1.1.7 In November 2023, CEDD engaged AECOM Binnies (TKO137) Joint Venture (hereafter referred to "the Consultants") to undertake Agreement No. CE 40/2023 (CE) –

Development of Tseung Kwan O Area 137 and Associated Reclamation Sites – Investigation, Design and Construction (hereafter referred to "the Project").

1.2 The Project

1.2.1.1 The proposed scope of the Project includes reclamation, slope-cutting, site formation, engineering infrastructure works and other works for the development at TKO 137 and formed land off TKO 132 as shown on **Figure 1.1**, comprises the following principal works elements:

1.2.1.2 Engineering Infrastructure Works in TKO 137

(a) Formation of about 20 hectare (ha) of land through reclamation and associated site formation works at TKO 137.

(b) Site formation works of the existing land area at TKO 137.

(c) Engineering infrastructure works including roads, drainage, sewerage (including advance sewage pumping station) and waterworks including service reservoirs and the associated water mains, access roads and other facilities to support the proposed developments.

(d) An Effluent Polishing Plant (EPP) at TKO 137 and associated sewage pumping station and effluent pipeline (*The Consultants* carry out preliminary design and conducts statutory Environmental Impact Assessment (EIA) for the EPP under this Designated Project under Schedule 2 in the Investigation Phase. The subsequent design and construction of EPP would be implemented by Drainage Services Department (DSD) tentatively).

(e) Landscaping, streetscaping and ancillary works.

(f) Provision of environmental mitigation measures for the works mentioned above.

1.2.1.3 Engineering Infrastructure Works off TKO 132

(a) Formation of about 20 ha of land off TKO 132 though reclamation off the existing shoreline and slope-cutting and associated site formation works for the proposed developments.

(b) Construction of marine viaducts to connect the land to be created off TKO 132 to existing Tseung Lam Highway.

(c) Engineering infrastructure works including roads, drainage, sewerage (including sewage pumping station) and waterworks to support the development.

1.2.1.4 Other Works for the developments at TKO 137 and TKO 132

(a) Developments at TKO 137 including residential development, Government, Institutional or Community (G/IC) facilities, schools, recreational facilities and landscaping, electrical substations, a green fuel station, salt and fresh water service reservoirs, and

(b) Developments at TKO 132[1] including a Public Fill Transfer Facility, a Concrete Batching Plant, a Construction Waste Handling Facility, a Refuse Transfer Station, Electricity Facilities and a sewage pumping station.

1.2.1.5 The Project is targeted to commence the construction works in Year 2025 and would be completed by end 2041. The Project would be commissioned in phases with the first population intake in Year 2030.

1.3 Designated Projects

1.3.1.1 The Project is a Designed Project (DP) under Item 1 Schedule 3 of Environmental Impact Assessment Ordinance (EIAO) as it covers a development area of approximately 123 ha and will accommodate around 135,000 population upon full development. The Project also comprises of various Schedule 2 DPs (as shown in **Table 1.1** and **Figure 1.2**) for necessary infrastructures.

1.3.1.2 Under this Assignment, the statutory EIA covers the development under Schedule 3 of the EIAO and all the Schedule 2 DPs in the Development Area except a RTS, a facility for the treatment of construction waste, and a 400kV electricity substation and transmission line. Separate EIA studies for these Schedule 2 DPs shall be carried out by the respective project proponents in accordance with EIAO.

Table 1.1 Schedule 2 Designated Projects in this Project

Ref. No.	Schedule 2 Designated Project		Work Component /Reference in Recommended Outline Development Plan (RODP)
DP1 [1]	A.8	A carriageway bridge for motor vehicles, or a railway bridge, the length between abutments for which is more than 100 m, with bridge piers over the sea supporting the bridge	Construction and operation of a carriageway bridge in form of viaduct structure for motor vehicles with minimum length between abutments of around 700 m, with bridge piers over the sea supporting the bridge, will be constructed near Tseung Kwan O – Lam Tin Tunnel to provide a direct and convenient connection to the proposed facilities at TKO 132.
DP2 [1]	C.1	Reclamation works (including associated dredging works) more than 5 ha in size	Around 20 ha of land will be formed by reclamation at TKO 137.Reclamation works at TKO 137 and off TKO 132 Around 19 ha of land will be formed by reclamation at TKO 132
	C.2	Reclamation works (including associated dredging works) that are of more than 1 ha in size, and a boundary of which is less than 100 m from the nearest boundary of an existing residential area	Project boundary of the reclamation works (around 19 ha) at TKO 132 is around 30 m from the nearest boundary of On Luen Village (location of existing government land licences).
DP3 [1]	F.1	Sewage treatment works with an installed capacity of more than 15,000 m^3 per day	Construction and operation of a Effluent Polishing Plant with an installed capacity of approx. 54,000

[1] The MRCP was proposed during the PODP stage and has been excluded from the RODP.

Ref. No.	Schedule 2 Designated Project		Work Component /Reference in Recommended Outline Development Plan (RODP)
	F.2	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 and educational institution	m^3 per day at TKO 137. The EPP is around 100 m from the planned residential area and around 60 m from the planned educational institution at TKO 137.
DP4 [2]	G.2	A refuse transfer station	Construction and operation of a RTS at formed land off TKO 132
DP5 [2]	G.5	A facility for the treatment of construction waste with a designed capacity of more than 500 tonnes per day; and a boundary of which is less than 200 m from the nearest boundary of an existing or planned residential area	Construction and operation of a Construction Waste Handling Facility with handling capacity of around 3,000 tonnes per day at TKO 132. The Construction Waste Handling Facility is around 140 m from On Luen Village (location of existing government land licences).
DP6 [2 3]	H.1	A 400kV electricity substation and transmission line	Construction and operation of Electricity Facilities at TKO 132. Electricity Facilities are planned to house equipment up to 400kV.

Notes:
1 Application of Environmental Permit would be supported by this EIA Study.
2 Application of Environmental Permit to be supported by a separate Schedule 2 EIA Study or separate Direct Application of Environmental Permit.
3 There is no design information for Electricity Facilities provided from the operator at the time of assessment, assumption of a 400 kV electricity substation, a Schedule 2 DP under EIAO, considered in this EIA study.

1.4 Purpose of the Manual

1.4.1.1 The purpose of this Environmental Monitoring and Audit (EM&A) Manual is to guide the setups of an EM&A programme to ensure compliance with the EIA study recommendations, to assess the effectiveness of the recommended mitigation measures and to identify any further need for additional mitigation measures or remedial action. This Manual outlines the monitoring and audit programme for the construction and operational phases of the Project. It aims to provide systematic procedures for monitoring, auditing and minimising environmental impacts associated with construction works and operational activities.

1.4.1.2 Hong Kong environmental regulations and the Hong Kong Planning Standards and Guidelines have served as environmental standards and guidelines in the preparation of this Manual. In addition, the EM&A Manual has been prepared in accordance with the requirements stipulated in Annex 21 of the EIAO-TM.

1.4.1.3 This Manual contains the following information:

- Responsibilities of the Contractor, the Engineer or Engineer's Representative (ER), Environmental Team (ET) and Independent Environment Checker (IEC) with respect to the environmental monitoring and audit requirements during the course of the Project;
- Project organisation for the Project;
- The basis for, and description of the broad approach underlying the EM&A programme;

- Requirements with respect to the construction programme schedule and the necessary environmental monitoring and audit programme to track the varying environmental impact;
- Details of the methodologies to be adopted, including all field laboratories and analytical procedures, and details on quality assurance and quality control programme;
- The rationale on which the environmental monitoring data will be evaluated and interpreted;
- Definition of Action and Limit levels;
- Establishment of Event and Action plans;
- Requirements for reviewing pollution sources and working procedures required in the event of non-compliance with the environmental criteria and complaints;
- Requirements for presentation of environmental monitoring and audit data and appropriate reporting procedures; and
- Requirements for review of EIA predictions and the effectiveness of the mitigation measures / environmental management systems and the EM&A programme.
- For the purpose of this manual, the ET leader, who shall be responsible for and in charge of the ET, shall refer to the person delegated the role of executing the EM&A requirements.
- This Manual is a dynamic document that should be reviewed regularly and updated as necessary during the construction and operational of the Project. The Contractor should regularly review the mitigation measures and project implementation schedule in Appendix B with respect to the design developments and construction methodology.

1.5 Project Organisation

1.5.1.1 The roles and responsibilities of the various parties involved in the EM&A process and the organisational structure of the organisations responsible for implementing the EM&A programme are outlined below. The proposed project organisation and lines of communication with respect to environmental protection works are shown in **Appendix A**.

The Contractor

1.5.1.2 The Contractor shall report to the Engineer. The duties and responsibilities of the Contractor are:

- Implement the recommendations and requirements of the EIA study;
- Provide assistance to ET in carrying out monitoring and auditing;
- Provide information / advice to ET regarding works activities which may contribute, or be continuing to the generation of adverse environmental condition(s);
- Submit proposals on mitigation measures in case of exceedances of Action and Limit levels in accordance with the Event and Action Plans;
- Implement measures to reduce impact where Action and Limit levels are exceeded until the events are resolved;
- Implement the corrective actions instructed by the Engineer;
- Accompany joint site inspection undertaken by the ET; and
- Adhere to the procedures for carrying out complaint investigation.

Environmental Team (ET)

1.5.1.3 The ET Leader and the ET shall be employed to conduct the EM&A programme and ensure the Contractor's compliance with the project's environmental performance requirements during construction. The ET Leader shall be an independent party from the Contractor and have relevant professional qualifications, or have sufficient relevant EM&A experience subject to approval of the Engineer's Representative (ER) and the Environmental Protection Department (EPD). The ET shall be led and managed by the ET leader. The

ET leader shall possess at least 10 years of experience in EM&A and/or environmental management.

1.5.1.4 The duties and responsibilities of the ET are:

- Monitor various environmental parameters as required in this EM&A Manual;
- Analyse the environmental monitoring and audit data and review the success of EM&A programme to cost-effectively confirm the adequacy of mitigation measures implemented and the validity of the EIA predictions and to identify any adverse environmental impacts arising;
- Carry out regular site inspection to investigate and audit the Contractors' site practice, equipment and work methodologies with respect to pollution control and environmental mitigation, and effect proactive action to pre-empt problems; carry out ad hoc site inspections if significant environmental problems are identified;
- Audit and prepare monitoring and audit reports on the environmental monitoring data and site environmental conditions;
- Report on the environmental monitoring and audit results to the Independent Environmental Checker, Contractor, the ER and EPD or its delegated representative;
- Recommend suitable mitigation measures to the Contractor in the case of exceedance of Action and Limit levels in accordance with the Event and Action Plans;
- Advice to the Contractor on environmental improvement, awareness, enhancement matters, etc. on site;
- Timely submission of the EM&A report to the Project Proponent and the EPD; and
- Adhere to the procedures for carrying out complaint investigation in accordance with Section 15 of this Manual.

Engineer or Engineer's Representative (ER)

1.5.1.5 The Engineer is responsible for overseeing the construction works and for ensuring that the works undertaken by the Contractor in accordance with the specification and contractual requirements. The duties and responsibilities of the Engineer with respect to EM&A may include:

- Supervise the Contractor's activities and ensure that the requirements in the EM&A Manual are fully complied with;
- Inform the Contractor when action is required to reduce impacts in accordance with the Event and Action Plans;
- Participate in joint site inspection undertaken by the ET; and
- Adhere to the procedures for carrying out complaint investigation.
- The Engineer may delegate some of his power to the ER, who is his representative on site, in order to meet the site supervision needs.

Independent Environmental Checker (IEC)

1.5.1.6 The IEC shall be an independent party from the Contractor and the Environmental Team and possess at least 10 years' experience in EM&A and/or environmental management.

1.5.1.7 The duties and responsibilities of the IEC are:

- Review the EM&A works performed by the ET (at least at monthly intervals);
- Carry out random sample check and audit the monitoring activities and results (at least at monthly intervals);
- Conduct random site inspection;
- Review the EM&A reports submitted by the ET;
- Review the effectiveness of environmental mitigation measures and project environmental performance;
- Review the proposal on mitigation measures submitted by the Contractor in accordance with the Event and Action Plans;

- Check the mitigation measures that have been recommended in the EIA and this Manual, and ensure they are properly implemented in a timely manner, when necessary; and
- Adhere to the procedures for carrying out complaint investigation.

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

2. AIR QUALITY

2.1 Introduction

2.1.1.1 Potential air quality impact arising from the construction phase of the Project was addressed in the EIA Report. No adverse air quality impact arising from construction of the Project with the implementation of the mitigation measures. Dust monitoring and regular site audit are proposed to be conducted during the entire construction phase of the Project so as to check compliance with the legislative requirements.

2.1.1.2 Potential air pollutant emissions impact from operation of the proposed Effluent Polishing Plant (EPP) was assessed and no adverse air pollutant emissions impact would be anticipated during the operational phase. Nevertheless, it is recommended to conduct commissioning test prior to operation of the proposed EPP at each stack of combined heat and power (CHP) units and boiler to demonstrate compliance with the design emission limits.

2.1.1.3 Odour impact from the planned odour sources including proposed EPP at TKO 137, RTS and the proposed sewage pumping station at TKO 132, and two existing odour sources, ASB Biodiesel (Hong Kong) Limited and Leachate Treatment Plant at South East New Territories Landfill Extension (SENTX) within the 500 m assessment area from the Project boundary was assessed. No adverse cumulative odour impact would be anticipated at the planned air sensitive uses and existing air sensitive receivers (ASRs). Nevertheless, odour monitoring in terms of H_2S at the deodorizing unit is recommended upon commissioning and during first three years of operation of proposed EPP to determine whether it can meet the odour removal performance requirement. Upon the third-year monitoring, the odour monitoring should be reviewed and agreed with EPD if the monitoring is required to be continued. In addition, odour patrol should be carried out after regular and ad hoc maintenance or cleaning of the deodorizing unit of proposed EPP to ensure no adverse odour impacts arisen from the operation of the Project. An Odour Complaint Registration System is proposed for proposed EPP to check whether the deodorizing units can fulfil the recommended odour removal performance.

2.1.1.4 There will be separate EIA studies for the proposed RTS and CWHF at TKO 132, the environmental monitoring and audit requirement should be subject to the outcome of its EIA studies. However, continuous H_2S and NH_3 monitoring and air flow at the exhaust outlet of the deodorizing unit after commissioning, odour complaint registration system and odour patrol are proposed to be conducted during operation of the RTS for consideration. Dust monitoring and site audit are proposed to be conducted during operation of CBP, CWHF and PFTF at TKO 132. The details of the EM&A programme for operation of these three facilities will be reviewed under separate studies(i.e. an EIA study under EIAO for CWHF, a Specified Process Licence Application under APCO for CBP and a Preliminary Environmental Review (PER) under planning and funding mechanism for PFTF) to be conducted by their respective project proponents.

2.1.1.5 This section presents the requirements, methodology, equipment, monitoring locations, criteria and protocols for the monitoring and audit of air quality impact during the construction and operational phases of the Project.

2.2 Construction Phase

Monitoring Parameters

2.2.1.1 For regulatory purpose, the concentration of particulate matters including 24-hour average Respirable Suspended Particulates (RSP) concentrations and 24-hour average Fine

Suspended Particulate (FSP) concentrations are recommended to be monitored and audited at the proposed monitoring locations during the construction phase. To ensure that any deteriorating air quality could be readily detected and timely action could be undertaken, 1-hour average RSP concentrations should also be monitored at the proposed monitoring locations during the construction phase.

2.2.1.2 Monitoring and audit of the abovementioned RSP and FSP concentrations shall be carried out by the ET. Should any deteriorating air quality be detected, timely action shall be undertaken to rectify such situation.

Monitoring Equipment

2.2.1.3 The abovementioned parameters should be monitored continuously by air sensor at monitoring stations specified in **Section 2.3**. The air sensor to be employed should meet the purpose of the monitoring which is 1-hour RSP, 24-hour RSP and 24-hour FSP concentrations in the ambient air. The air sensor should have a resolution of at least 1μg/m^3, an accuracy of ± 10% to standard particles, equipped with a shelter to protect the sensor and capable of operating continuously for a 7 days period. It should be capable of detection of PM_{10}, while size specification would be optional subject to the environmental management strategy of the site. Particulates is typically measured using an optical approach where light scattered by a particle is used to estimate the particle mass concentration. The measurement range and detection limit of the air sensor should be able to measure the full range of particulates commonly found in the ambient, e.g. 0 – 1000 μg/m^3. The accuracy of a sensor, in terms of precision and bias, should also be evaluated during selection of air sensor, according to the manufacturer's specification, evaluation reports and published literature. Whether the air sensor has calibrated upon purchase, when and how collocation should be performed and how to correct the measurement should be consulted with the sensor manufacturer and fully understood before the air monitoring. Other factors, such as response time, durability, enclosure, ease of use, power supply, any data display, data transmission, data access, data handling and cost should also be considered when selecting air sensor. *Guidelines on the use of air sensor refer to The Enhanced Air Sensor Guidebook 2022, USEPA*, or for further technical details at USEPA's Air Sensor Toolbox website.

2.2.1.4 Generally, air sensors should be placed at least 1.5 metres above ground and away from any obstruction, vegetation or emission source which would interfere with the measurement. Other factors of the monitoring location, such as security, availability of power supply, reliable communication (cellular, Wi-Fi, etc.), should also be considered.

On-site Calibration and Quality Control

2.2.1.5 To ensure accuracy of the measurement, monitoring equipment, including the air sensors, should be calibrated regularly. The calibration should be conducted by collocating the air sensor and a Transfer Standard (TS).

2.2.1.6 A Transfer Standard (TS) is another particulate matter (PM) monitor that is at least as capable as the air sensor to be calibrated. Another sensor that has just been calibrated may serve the purpose provided its performance is known to be stable during the subsequent collocation period to be used as TS. Right before each on-site calibration, the TS itself needs to be calibrated e.g. collocating with an PM reference monitor - such as the Federal Reference Method (FRM) or the Federal Equivalent Method (FEM) PM monitor at the accredited laboratories or research institutes - that has been calibrated against traceable standard. The TS/reference monitor collocation should last at least seven days.

2.2.1.7 The TS with known performance characteristics will visit and collocate with each air sensor for calibration. During collocation, the TS should be placed near the subject sensor (<1 m if practicable) so that both devices would be monitoring under the same environment, i.e. the same pollution sources and weather conditions. The TS is then turned on to warm-up for 30–60 minutes. The collocation period starts after the warm-up and TS is then left running with the subject sensor for at least three hours. The measurements from the sensor to be calibrated and the TS during the collocation period will be statistically analysed. The response of the sensor should be adjusted if its performance during on-site calibration does not meet the evaluation criteria as shown in **Table 2.1**.

2.2.1.8 On-site calibration of the monitoring equipment shall be conducted by ET and agreed by IEC on the following approach:

- Prepare a TS for PM monitoring, which has been calibrated against a PM reference monitor (i.e. the FRM or FEM PM monitor).
- The inlets of the TS and the subject sensor shall be collocated at the same height with a horizontal separation distance of <1 m.
- Warm-up the transfer standard on-site for 30-60 minutes.
- Collocated monitoring shall be conducted in a continuous period to collect at least 180 valid minute average measurements. The valid data rate shall be at least 80% during the collocation period.
- The collected minute average measurement results should be statistically analysed using the two-tier approach as presented in **Table 2.1**.

Table 2.1 Recommended Performance Metrics and Target Values for On-site Checking of PM Monitoring Equipment

Performance Metric			**Target Value**
Tier 1 – Linear regression of minute average measurements	Bias	Slope	0.75 – 1.25
	Linearity	Coefficient of Determination (R^2)	>0.70
Tier 2 – Root mean squared error of minute average measurements	Error	Root Mean Squared Error (RMSE)	<8 μgm^{-3} for RSP and <5 μgm^{-3} for FSP

2.2.1.9 During Tier 1 checking, linear regression of the minute average measurements from the sensors and the TS should be performed. The slope and coefficient of determination (R^2) from the linear regression should be calculated and meet the target values in **Table 2.1**. If these criteria are not met due to narrow range of PM concentration (>30 $\mu g/m^3$ and >25$\mu g/m^3$ as recommended span range for RSP and FSP, respectively) during the collocation period, the Tier 2 checking on mean squared error shall be determined and compared against the target value in **Table 2.1**. If the monitoring equipment fails to meet both Tiers 1 and 2 target values, the monitoring equipment needs to be re-calibrated or replaced.

2.2.1.10 The collocated monitoring of TS and each air sensor on the field should be carried out every month. If a sensor failed in 3 consecutive collocated monitoring, the sensor should be checked or maintained to improve its performance, or it should be replaced.

Wind Data Monitoring Equipment

2.2.1.11 Wind data monitoring equipment should also be provided and set up at conspicuous locations for logging wind speed and wind direction near to the dust monitoring locations. The equipment installation location should be proposed by the ET and agreed with the ER in consultation with the IEC. For installation and operation of wind data monitoring equipment, the following points should be observed:

- the wind sensors should be installed on masts at an elevated level 10m above ground so that they are clear of obstructions or turbulence caused by the buildings;

- the wind data should be captured by a data logger. The data recorded in the data logger should be downloaded periodically for analysis at least once a month;
- the wind data monitoring equipment should be re-calibrated at least once every six months; and
- wind direction should be divided into 16 sectors of 22.5 degrees each.

2.2.1.12 In exceptional situations, the ET may propose alternative methods to obtain representative wind data upon approval from the ER and agreement from the IEC.

2.2.1.13 If the ETL proposes alternative dust monitoring equipment / methodology after the approval of this Manual, agreement from the IEC and EPD should be sought. The instrument should also be calibrated regularly following the requirements specified by the equipment manufacturers.

Construction Dust Monitoring Plan

2.2.1.14 Before commencing the air monitoring, the ET should formulate a construction dust monitoring plan with air sensor and submit to IEC to seek their feedback and consent. The plan should be aligned with the EM&A Manual and verified by IEC. The plan should include but not limited to the followings:

- Details on the pollutants and environmental parameters to be monitored;
- Describe the equipment and measurement method to be used;
- Address the criteria for placing air sensors;
- Discuss the monitoring locations selected and rationale;
- Describe the criteria for selecting air sensors and test to determine if they are working properly;
- Determine the collocation location and establish the calibration and/or collocation and data correction methods;
- Identify types of data that may be used in the data analysis, including nearby reference monitor data, weather data, etc.
- List the procedures to maintain and operate air sensors, including site visits, routine maintenance, emergency maintenance, daily data review, periodic collocations, etc.;
- Describe the QC procedures to be performed;
- Describe how the data are processed, stored and adjusted;
- Describe the ownership of the data and who is granted access to it;
- Describe how the air monitoring data to be managed, tracing the path of data generation in the field to the final data use and end storage;
- Describe the procedures to verify and validate data during collection period;
- Describe the methods to produce meaningful figures and visualization;
- Describe how the monitoring results will be used.

2.2.1.15 The ET is responsible for the provision of the monitoring equipment and should provide sufficient number of air sensors for the field work and TS for carrying out continuous on-site monitoring and ad-hoc monitoring.

2.3 Dust Monitoring Stations

2.3.1.1 The selected monitoring locations are air sensitive receivers located the nearest to construction sites and covered different wind directions to capture the potential worst-case impact from the construction of the Project. The proposed dust monitoring locations during construction phase are listed in **Table 2.2** and are illustrated in **Figure 2.1**. The ET should agree with IEC on the position of the air sensor for installation. The considerations for the positioning of air sensor refer to **Section 2.3.1.4**, the air monitoring plan with sensors and the feedbacks from IEC.

Table 2.2 Proposed Dust Monitoring Stations during Construction Phase of the Project

Monitoring Station No.[1]	ASR ID in EIA Report	ASR Description	Duration
M01	A02	TVB City	Entire construction period of Development at TKO 137, when construction works is conducted within 500 m from the monitoring station.
M02	A04	P-Tech Landfill Gas (SENT) Co. Ltd.	
M03	A07	Office Building of SENTX	
M04	A01	Admin Building of TKO Desalination Plant	
M05	P09	E1	Monitoring should be commenced when the site is accessible after population intake of the planned development, and when construction works is conducted within 500 m from the monitoring station
M06	P23	PU3&4	
M07	P12	PU6	
M08	P32	PR1	
M09	P41	PR4	
M10	A50	Ocean Shores Tower 1	Entire construction period of TKO 132 and the associated marine viaduct when construction works is conducted within 500 m from the monitoring station
M11	A51	Capri House 15	
M12	A59	Ocean Shores Tower 17	
M13	A57	Lau Shui Hang On Luen Village	
M14	A56	Lau Shui Hang On Luen Village	

Note:
1 Continuous hourly RSP and FSP monitoring should be conducted at the monitoring stations.
2 The coverage of construction works refer to Section 1.2.1.1. When there are major construction activities under Project-related construction works (i.e. site formation, excavation, backfilling and reclamation works) being undertaken within a radius of 500 m from the monitoring stations, the monitoring should be conducted by the Project Proponent.

2.3.1.2 The status and locations of air monitoring locations may change after this Manual is issued. In such case, the ET should propose alternative monitoring locations and seek agreement from the IEC and EPD.

2.3.1.3 When alternative monitoring locations are proposed, the monitoring stations should be chosen based on the following criteria:

- Monitoring at ASRs close to the major site activities which are likely to have air quality impacts;
- Monitoring as close as possible to the ASRs as defined in the EIAO-TM;
- Assurance of minimal disturbance to the occupants and working under a safe condition during monitoring; and
- Take into account the prevailing meteorological conditions.

2.3.1.4 The ET should agree with IEC on the position of the air sensor for installation of the monitoring equipment. When positioning the air sensor, the following points should be noted:

- A horizontal platform with appropriate support to secure the samplers against gusty wind should be provided;
- general housekeeping, cleaning works and other preventative maintenance activities such as checking the operating status of individual monitoring equipment should be carried out to ensure the proper operation of the system;
- the distance between the sampler and an obstacle, such as buildings, must be at least twice the height that the obstacle protrudes above the sampler;
- a minimum of 2 m separation from walls, parapets and penthouses is required for rooftops samplers;
- a minimum of 2 m separation from any supporting structure, measures horizontally is required;
- no furnace or incinerator flue is located nearby the samplers;
- airflow around the sampler is unrestricted;
- the sampler is more than 20 m from the dripline;
- any wire fence and gate to protect the sampler, should not cause any obstruction during monitoring;
- permission must be obtained to set up the samplers and to obtain access to the monitoring stations; and
- a secured supply of electricity is needed to operate the samplers.

2.3.1.5 Subject to site conditions and monitoring results, the ETL, with IEC and EPD endorsement, may decide whether additional monitoring locations should be included or any monitoring locations could be removed / relocated during the construction phase.

2.4 Impact Monitoring

2.4.1.1 During construction phase of the Project, the ET shall carry out continuous impact monitoring in terms of 1-hour average RSP concentration, 24-hour rolling average RSP concentration and 24-hour rolling average FSP concentration at proposed dust monitoring station as presented in **Table 2.2**, with air sensors throughout the construction phase of the Project.

Event and Action Plan

2.4.1.2 The ET shall compare the impact monitoring results with air quality criteria set up for RSP and FSP. **Table 2.3** shows the air quality criteria, namely Action and Limit levels to be used. Should non-compliance of the air quality criteria occur, action in accordance with the Action Plan in **Table 2.4** shall be carried out.

Table 2.3 Action and Limit Levels for Air Quality (Dust)

Parameter	Action Level	Limit Level
1-hour RSP	150 µg/m^3	Not Applicable
24-hour RSP (rolling average)	Not Applicable	100 µg/m^3
24-hour FSP (rolling average)	Not Applicable	50 µg/m^3

Note:
1 The above action level and limit levels are based on prevailing Air Quality Objectives at the time of preparation of the EM&A Manual. The ET should agree with EPD on the action and limit levels prior to commencement of the monitoring. The action and limit levels may subject to change according to the prevailing AQOs implemented at the time of impact monitoring.

Table 2.4 Event and Action Plan for Air Quality (Construction Dust)

Event	Action			
	ET	IEC	ER	Contractor
Action level exceedance for one sample	1. Notify IEC and ER; 2. Check the monitoring data and error messages to confirm if the performance of the monitoring equipment is normal; 3. If exceedance is confirmed, identify source(s), investigate the causes of exceedance and propose remedial measures; 4. Assess effectiveness of Contractor's remedial measures and keep IEC and ER informed of the results until exceedance stops.	1. Check monitoring data submitted by ET; 2. Check Contractor's working method; 3. Discuss with ET, ER and Contractor on possible remedial measures; 4. Advise ER and ET on the effectiveness of the proposed remedial measures; 5. Supervise implementation of remedial measures.	1. Confirm receipt of notification of exceedance in writing; 2. Notify Contractor; 3. In consultation with IEC and ET, agree with the Contractor on the remedial measures to be implemented; 4. Ensure remedial measures are properly implemented.	1. Identify sources of exceedance and discuss with ER, ET and IEC on possible remedial measures; 2. Implement remedial measures; 3. Amend working methods if appropriate.
Action level exceedance for two or more consecutive samples	1. Notify IEC and ER; 2. Check the monitoring data and the performance of the monitoring equipment (refer to **Section 2.2.1.8**); 3. If exceedance is confirmed, identify source(s), investigate the causes of exceedance and propose remedial measures; 4. Discuss with IEC and Contractor on possible remedial measures required; 5. Assess effectiveness of Contractor's remedial measures and keep IEC and ER informed of the results until exceedance stops.	1. Check monitoring data submitted by ET; 2. Check Contractor's working method and verify the performance of the monitoring equipment to be checked by ET (refer to **Section 2.2.1.8**); 3. Discuss with ET and Contractor on possible remedial measures; 4. Advise ER and ET on the effectiveness of the proposed remedial measures; 5. Supervise implementation of remedial measures.	1. Confirm receipt of notification of exceedance in writing; 2. Notify Contractor; 3. In consultation with IEC and ET, agree with the Contractor on the proposal for remedial measures to be implemented; 4. Ensure the proposal for remedial measures are properly implemented.	1. Identify the sources and discuss with ER, ET and IEC on possible remedial measures; 2. Submit a proposal for remedial measures to ER, IEC and ET within 2 working days of notification of exceedance for agreement; 3. Implement the agreed proposal; 4. Amend proposal if appropriate.

Event	Action			
	ET	IEC	ER	Contractor
	6. Notify EPD if the exceedance is confirmed to be related to the Project.			
Limit level exceedance for one 24-hr rolling average RSP concentration record or/and one 24-hr rolling average FSP concentration record	1. Notify IEC, ER, Contractor and EPD; 2. Check the monitoring data and the performance of the monitoring equipment (refer to **Section 2.2.1.8**); 3. If exceedance is confirmed, identify source(s), investigate the causes of exceedance and propose remedial measures; 4. Discuss with IEC, ER and Contractor on possible remedial measures required; 5. Assess effectiveness of Contractor's remedial measures and keep IEC and ER informed of the results until exceedance stops. 6. Notify EPD if the exceedance is confirmed to be related to the Project.	1. Check monitoring data submitted by ET; 2. Check Contractor's working method; and verify the performance of the monitoring equipment to be checked by ET (refer to **Section 2.2.1.8**); 3. Discuss with ER, ET and Contractor on the possible remedial measures; 4. Advise ER and ET on the effectiveness of the proposed remedial measures; 5. Review Contractor's remedial measures whenever necessary to assure their effectiveness and advise ER and ET accordingly; 6. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of exceedance in writing; 2. Notify Contractor; 3. In consultation with the IEC and ET, agree with the Contractor on the proposal for remedial measures to be implemented; 4. Ensure the proposal for remedial measures are properly implemented; 5. If exceedance continues, identify what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.	1. Identify the sources and discuss with ER, ET and IEC on possible remedial measures; 2. Take immediate action to avoid further exceedance; 3. Submit a proposal for remedial measures to ER, IEC and ET within 2 working days of notification of exceedance for agreement; 4. Implement the agreed proposal; 5. Review and resubmit proposals if the problem is still not under control; 6. Stop the relevant portion of works as determined by ER until the exceedance is abated.

2.5 Operational Phase

Commissioning Test at the Exhausts of CHP and Boiler of Proposed EPP

2.5.1.1 Measurement of air quality parameters of concern due to stack emissions from the combined heat and power (CHP) units and boiler should be conducted at each stack during commissioning stage, i.e. prior to operation of the proposed EPP, to demonstrate the process/facility is properly operated and the emissions can be minimized to meet the design emission limits as presented in **Table 2.5**. The proposed analytical parameters and methodology for measured parameters are listed in **Table 2.6**. The proposed methods below are for reference only. The monitoring can be conducted via on-site sampling and laboratory analysis, on-site monitoring by portable meters, or continuous monitoring, subject to availability of suitable equipment. The commissioning test scopes, including but not limited to measurement duration, frequency, equipment and methods to be adopted, shall be agreed with EPD at least one month before measurement.

Table 2.5 Emission Limit for CHP and Boiler Units

Parameters	Maximum Emission Level (mg/Nm^3)
RSP	15
NOx	250
SO_2	50

Note:
1 The emission level refers to oxygen content in the exhaust gas of 5% and dry basis.

Table 2.6 Analytical Parameters and Methodology

Parameters	Method
Particulates (as RSP)	USEPA Method 201A
NOx	USEPA Reference methods USEPA Method 7 and associated methods
SO_2	USEPA Method 8

Hydrogen Sulphide Monitoring at Proposed EPP

2.5.1.2 The odour monitoring (in term of H_2S concentration) at the inlets and outlets of each deodorizing unit (DO) shall be conducted by H_2S sensor sensor for both Phase 1 and Phase 2 of the EPP upon commissioning and quarterly in the first three years upon operation of the proposed EPP to determine whether the odour removal efficiency meet the requirements as stated in the EIA Report. Since H_2S is the major emission source from effluent polishing plant, the H_2S concentration should be measured at inlet and outlet of each of the DO unit. The outlet odour concentration (in OU/m^3) should be reduced by at least 95% based on the assessment. As a conservative approach, it is recommended that a removal efficiency of 99.5%, in terms of H_2S concentration, shall be adopted to minimize the odour emission. The first odour monitoring shall be conducted within one month, after the operation of the proposed EPP. Subsequent odour monitoring shall be conducted quarterly, i,e. at the 4th, 7th and 10th month for the first year. For the second and third years, the frequency of the impact monitoring could be reduced to once every 6 months subject to EPD's approval, if no non-compliance is found.

2.5.1.3 If there is any non-compliance, the operator should inspect the deodorizing unit, consider change of filter materials and replacing the DO unit. The H_2S concentration at DO inlet and outlet should be measured to ensure at least 99.5% H_2S removal efficiency. The frequency of odour monitoring shall be resumed to quarterly.

2.5.1.4 Upon the third year monitoring, the odour monitoring should be reviewed and agreed with EPD if the monitoring is required to be continued.

Odour Complaint Registration for Proposed EPP

2.5.1.5 In the event when an odour complaint is received at the proposed EPP, the operator shall liaise with the complainant and a Complaint Registration Form shall be completed. The Complaint Registration Form is to record detailed information regarding the odour complaint and hence, facilitates efficient investigation work. The registration form shall contain, but not be limited to the following information:

- Location of where the odour nuisance occurred, including whether the odour was experienced indoors or outdoors;
- Date and time of the complaint and the nuisance event;
- Description of the complaint, i.e., the type and characteristics of the odour; and an indication of the odour strength (highly offensive / offensive / slightly offensive / just continuously detectable /intermittently detectable); and
- Name and contact information of the complainant.

2.5.1.6 This information shall be obtained by the plant engineer or his representative(s) of the proposed EPP when the complaint is received. The Complaint Registration Form is shown in **Appendix D** for reference.

2.5.1.7 In addition, the following information shall be obtained during investigation and presented in the Complaint Registration Form:

- Meteorological conditions (including temperature, wind speed, relative humidity) from the Hong Kong Observatory's Tseung Kwan O automatic weather stations at the time of the complaint;
- Whether any abnormal operations were being carried out at the proposed EPP at the time the nuisance occurred;
- Possible odour sources causing the nuisance; and
- Remedial and preventive actions taken to resolve the odour problem.

2.5.1.8 The Odour Complaint Register shall be kept at the proposed EPP.

Odour Patrol for Proposed EPP

2.5.1.9 Odour patrol is proposed to monitor the potential odour impact from the proposed EPP after regular and ad hoc maintenance or cleaning of the deodorizing unit. The odour patrols will be conducted by an odour patrol team. The odour patrol team will patrol and sniff along an odour patrol route within the proposed EPP 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.

2.5.1.10 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 18 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.

2.5.1.11 The independent trained personnel / competent persons should use their noses (olfactory sensors) to sniff odours along the site boundary of the proposed EPP. The main odour emission sources and the areas to be affected by the odour nuisance shall be identified.

2.5.1.12 The perceived odour intensity is divided into 5 levels. **Table 2.7** describes the odour intensity for different levels.

Table 2.7 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

2.5.1.13 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.

Event and Action Plan

2.5.1.14 **Table 2.8** shows the air quality criteria, namely Action and Limit levels to be used for the odour patrol and odour complaint registration. Should the action or limit level be reached, action in accordance with the Action Plan in **Table 2.9** shall be carried out.

Table 2.8 Action and Limit Levels for Air Quality (Odour)

Parameter	Action Level	Limit Level
Odour Patrol	Odour intensity of 2 is measured from odour patrol	Odour intensity of 3 or above is measured from odour patrol
Odour Complaint	When one documented complaint is received	Two or more documented complaints are received within a week

Table 2.9 Event and Action Plan for Air Quality (Odour)

EVENT	ACTION		
	EPP Engineer-in-charge of Odour Patrol and Odour Complaint Register	**DSD Sewage Treatment Division 2 (ST2)**	**DSD Project Team**
ACTION LEVEL			
Action level from Odour Patrol is reached	1. Identify source / reason of exceedance; 2. Repeat odour patrol to confirm finding	1. Carry out investigation to identify the source/reason of exceedance; 2. Rectify any unacceptable practice; and 3. Implement more mitigation measures if necessary.	1. Assist ST2 to find the root cause of non-compliance; and 2. Modify or improve design as appropriate.
Receipt of any Odour Complaint	1. Identify source/reason of odour complaint	1. Carry out investigation to identify the source/reason of complaints; 2. Rectify any unacceptable practice; 3. Amend working methods if required; 4. Inform DSD Project Team if cause of complaint is considered to be caused by civil or E&M design problems; 5. Correspond to the complainant within 10 days to inform the cause of the nuisance and action taken; and 6. Implement amended working methods.	1. Assist ST2 to find the root cause of the complaint; and 2. Modify or improve design as appropriate.
LIMIT LEVEL			
Limit level from Odour Patrol is reached	1. Identify source / reason of non-compliance; 2. Repeat odour patrol to confirm findings; 3. Assess effectiveness of remedial action and keep EPD informed of the results	1. Carry out investigation to identify the source/reason of non-compliance; 2. Rectify any unacceptable practice; 3. Amended working methods if required; 4. Notify DSD Project Team; 5. Formulate remedial actions; 6. Ensure amended working methods and remedial actions properly implemented; and 7. If non-compliance continues, consider what portion of the work is responsible and stop that portion of the work until the non-compliance is abated.	1. Assist ST2 to find the root cause of non-compliance; 2. Modify or improve design as appropriate; and 3. Formulate remedial actions in association with ST2.

EVENT	ACTION		
	EPP Engineer-in-charge of Odour Patrol and Odour Complaint Register	**DSD Sewage Treatment Division 2 (ST2)**	**DSD Project Team**
Two or more documented complaints are received within a week	1. Identify source / reason of odour complaints; 2. Repeat measurements to confirm findings; 3. Increase monitoring frequency to monthly; 4. If non-compliance stops, cease additional monitoring.	1. Carry out investigation to identify the source/reason of complaints. Investigation shall be completed within 1 week; 2. Rectify any unacceptable practice; 3. Amended working methods if required; 4. Notify DSD Project Team; 5. Formulate remedial actions; 6. Ensure amended working methods and remedial actions properly implemented; 7. If non-compliance continues, consider what portion of the work is responsible and stop that portion of the work until the non-compliance is abated; and 8. Correspond to the complainant within 10 days to inform the cause of the nuisance and action taken.;	1. Assist ST2 to find the root cause of non-compliance; 2. Modify or improve design as appropriate; and 3. Formulate remedial actions in association with ST2.

EM&A for RTS, CWHF, PFTF and CBP

2.5.1.15 There will be separate EIA Studies for the proposed RTS and CWHF, the environmental monitoring and audit requirement should be subject to the outcome of its respective EIA studies. However, dust monitoring and site audit are proposed to be conducted during operation of CBP, CWHF and PFTF at TKO 132. The details of the EM&A programme for operation of these three facilities will be reviewed under separate studies (i.e. an EIA study under EIAO for CWHF, a Specified Process Licence Application under APCO for CBP and a Preliminary Environmental Review (PER) under planning and funding mechanism for PFTF) to be conducted by their respective project proponents. Should any crusher be involved used in the process, dust mitigation measures and monitoring requirements should refer to *A Guidance Note on the Best Practicable Means for Mineral Works (Stone Crushing Plants) (BPM 11/1 (95))*. The operation of CBP should follow the requirements stipulated in *A Guidance Note on the Technical, Management and Monitoring Requirements for Specified Process – Cement Works (Concrete Batching Plant) (BPM 3/2 (16))*.

2.6 Mitigation Measures

2.6.1.1 Mitigation measures for construction phase air quality impacts and appropriate design for minimizing potential operational odour impact have been recommended in the EIA Report. All the recommended mitigation measures and designs are detailed in the implementation schedule in **Appendix B**. The Contractor should be responsible for the design and implementation of these measures.

2.7 Audit Requirements

2.7.1.1 Regular site inspection and audit at least once per week should be conducted during the entire construction phase of the Project to ensure the recommended mitigation measures are properly implemented.

3. NOISE

3.1 Introduction

3.1.1.1 Construction noise impact during the construction phase of the Project, fixed noise, railway noise, road traffic noise, and marine traffic noise during the operational phase of the Project were assessed in the EIA Study.

3.1.1.2 With the mitigation measures in place, no adverse construction noise impact would be anticipated. Construction noise assessment, including Construction Noise Management Plan (CNMP), is required to be submitted to EPD before tendering and commencement of the construction works. A noise monitoring and audit programme during construction phase should be undertaken to confirm such mitigation measures would be implemented properly.

3.1.1.3 Although no adverse road traffic noise impact is anticipated from the Project with provision of recommended mitigation measures in place, road traffic noise levels should be monitored at representative NSRs, which are in the vicinity of the recommended direct mitigation measures, during the first year after road opening and population intake of protected NSRs. The purpose of the monitoring is to ascertain that the recommended mitigation measures are effective in reducing the noise levels.

3.1.1.4 For fixed noise, FNMPs or corresponding fixed noise impact assessment should be submitted to EPD before tendering and commencement of construction of fixed noise sources. The FNMPs should also contain commissioning test plans and monitoring and audit programme.

3.1.1.5 No adverse airborne rail noise impact would be expected based on the EIA Study. No noise monitoring would be recommended during the operational phase under this EM&A Manual. However, as the operational ground-borne rail noise impact assessment will be conducted in the separate EIA for TKLSE, which would detail the EM&A requirements, as necessary.

3.1.1.6 No adverse marine traffic noise impact would be expected based on the EIA Study. No noise monitoring would be recommended under this EM&A Manual.

3.1.1.7 In this section, the requirements, methodology, equipment, monitoring locations, criteria and protocols for the monitoring and audit of noise impacts during the construction and operational phases of the Project are presented.

3.2 Monitoring Equipment

3.2.1.1 As referred to in the TM issued under the Noise Control Ordinance (NCO), sound level meters in compliance with the International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1) specifications shall be used for carrying out the noise monitoring. Immediately prior to and following each noise measurement the accuracy of the sound level meter shall be checked using an acoustic calibrator generating a known sound pressure level at a known frequency. Measurements shall be accepted as valid only if the calibration level from before and after the noise measurement agree to within 1.0 dB.

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

3.2.1.3 The Environmental Team (ET) is responsible for the provision of the monitoring equipment. The ET shall ensure that sufficient noise measuring equipment and associated instrumentation are available for carrying out the baseline monitoring, regular impact monitoring and ad hoc monitoring. All the equipment and associated instrumentation shall be clearly labelled. The equipment installation location shall be proposed by the ET Leader and agreed with the Engineer's Representative (ER) and Environmental Protection Department (EPD) in consultation with the IEC.

3.3 Monitoring Parameters for Construction Noise

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

3.3.1.2 Supplementary information for data auditing and statistical results such as L_{10} and L_{90} should also be obtained for reference. Sample noise field data sheets are shown in **Appendix C** of this Manual for reference. The Environmental Team (ET) Leader may modify the data record sheet for this EM&A programme but the format of which should be agreed by the Independent Environmental Checker (IEC).

3.4 Monitoring Locations for Construction Noise

3.4.1.1 Noise monitoring locations were selected as the nearest noise assessment point (NAP) to the active construction works area for the construction phase of the Project is shown in **Figure 3.1** and **Figure 3.2**. The proposed noise monitoring locations are summarised in **Table 3.1**.

Table 3.1 Proposed Construction Noise Monitoring Stations during Construction Phase of the Project

Station	NAP ID (Referenced to EIA Report)	Location
CM1	E-OS-R-C1	Tower 1, Ocean Shore
CM2	E-OLV-R-C2	Lau Shui Hang On Luen Village
CM3	E-OLV-R-C4	Lau Shui Hang On Luen Village
CM4	P-PU12-R-C6	Residential Block at the Proposed Site PU1&2
CM5	P-PU34-R-C3	Residential Block at the Proposed Site PU3&4
CM6	P-PU6-R-C2	Residential Block at the Proposed Site PU6
CM7	P-E2-E-C2	School at the Proposed Site E2
CM8	P-PR1-R-C1	Residential Block at the Proposed Site PR1
CM9	P-PU5-R-C1	Residential Block at the Proposed Site PU5
CM10	E-OS-R-C2	Tower 17, Ocean Shores
CM11	E-C-R-C1	Capri

3.4.1.2 Noise sensitive receivers may change after issuing this Manual. If such cases exist, the ET shall propose updated monitoring locations and seek approval from the ER and IEC and agreement from EPD of the proposal.

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

(i) at locations close to the major site activities which are likely to have noise impacts;

(ii) close to the noise sensitive receivers; and

(iii) for monitoring locations located in the vicinity of the sensitive receivers, care shall be taken to cause minimal disturbance to the occupants during monitoring.

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

3.5 Baseline Monitoring for Construction Noise

3.5.1.1 Baseline noise monitoring shall be carried out daily in all of the identified monitoring stations for at least 2 weeks prior to the commencement of the construction works. A schedule of the baseline monitoring shall be submitted to the ER for approval before the monitoring starts.

3.5.1.2 During the baseline monitoring, there shall not be any construction activities in the vicinity of the monitoring stations.

3.5.1.3 In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET leader shall liaise with EPD and in consultation with ER and the IEC to agree on an appropriate set of data to be used as a baseline reference.

3.6 Impact Monitoring for Construction Noise

3.6.1.1 Construction noise monitoring should be carried out at the designated monitoring station when there are Project-related construction activities (as stated in **Section 1.2.1.1**) being undertaken within a radius of 300 m from the monitoring stations. The monitoring frequency should depend on the scale of the construction activities. An initial guide on the monitoring is to obtain one set of $L_{eq\ (30\text{-}minute)}$ measurement at each station between 0700 and 1900 hours on normal weekdays at a frequency of once a week when construction activities are underway.

3.6.1.2 If construction works are extended to include works during the hours of 1900 - 0700, additional weekly impact monitoring shall be carried out during evening and night-time works. Applicable permits under NCO shall be obtained by the Contractor.

3.6.1.3 In case of non-compliance with the construction noise criteria, more frequent monitoring, as specified in the Action Plan in **Table 3.3** shall be carried out. This additional monitoring shall be continued until the recorded noise levels are rectified or proved to be irrelevant to the construction activities.

3.7 Event and Action Plan for Construction Noise

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

Table 3.2 Action and Limit Levels for Construction Noise

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

Notes:

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

2 *70 dB(A) and 65 dB(A) for schools during normal teaching periods and school examination periods, respectively.

Table 3.3 Event and Action Plan for Construction Noise

Event	Action			
	ET	IEC	ER	Contractor
Action Level	1. Notify IEC and Contractor; 2. Carry out investigation; 3. Report the results of investigation to the IEC, ER and Contractor; 4. Discuss with the Contractor and formulate remedial measures; and 5. Increase monitoring frequency to check mitigation effectiveness.	1. Review the analysed results submitted by the ET; 2. Review the proposed remedial measures by the Contractor and advise the ER accordingly; and 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Require Contractor to propose remedial measures for the analysed noise problem; and 4. Ensure remedial measures are properly implemented.	1. Submit noise mitigation proposals to IEC; and 2. Implement noise mitigation proposals.
Limit Level	1. Identify source; 2. Inform IEC, ER, EPD and Contractor; 3. Repeat measurements to confirm findings; 4. Increase monitoring frequency; 5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented; 6. Inform IEC, ER and EPD the causes and actions taken for the exceedances; 7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results; and 8. If exceedance stops, cease additional monitoring.	1. Discuss amongst ER, ET, and Contractor on the potential remedial actions; 2. Review Contractors remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly; and 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Require Contractor to propose remedial measures for the analysed noise problem; 4. Ensure remedial measures properly implemented; and 5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.	1. Take immediate action to avoid further exceedance; 2. Submit proposals for remedial actions to IEC within 3 working days of notification; 3. Implement the agreed proposals; 4. Resubmit proposals if problem still not under control; and 5. Stop the relevant portion of works as determined by the ER until the exceedance is abated.

3.8 Operational Fixed Noise Sources

3.8.1.1 For Designated Project (DP) fixed noise sources, Fixed Noise Sources Management Plan (FNMP), should be prepared before the issue of tender and before commencement of the installation of fixed plant, subject to the contract arrangement of the Project and agreement with EPD. FNMP(s) should contain quantitative fixed noise source impact assessment with reference to the updated plant inventories of the fixed noise source, recommended noise mitigation measures, commissioning test requirements and environmental monitoring and audit programme. To ensure full implementation of the recommended mitigation measures, the mitigation measures implementation schedule including implementation party, implementation location and timing should be included in the FNMP(s). The FNMP should be certified by Certified Noise Modelling Professional of Hong Kong Institute of Qualified Environmental Professionals (HKIQEP) or equivalent.

3.8.1.2 For non-DP fixed noise sources, quantitative fixed noise impact assessment, in the form of Preliminary Environmental Review (PER) or as required under land lease condition, should be submitted to and agreed with DEP in accordance with the requirements of the HKPSG, before construction/installation of the fixed noise source(s).

3.8.1.3 Fixed noise assessment in the form of Environmental Assessment Study (EAS) or Class Assessment Document should be submitted to and agreed with DEP before construction of the proposed noise sensitive uses.

3.8.1.4 In addition, subject to recommendation in the fixed noise assessment, Fixed Noise Audit Report (FNAR) should be prepared to demonstrate the compliance of the fixed plant noise sources. The FNAR should be certified by the ETL and verified by the IEC as conforming to the information and recommendations contained in the fixed noise assessment.

3.9 Noise Parameters for Operational Road Traffic Noise

3.9.1.1 The ET should carry out monitoring of road traffic noise after the works under Contract are completed and upon commencement of operation of the Project. The noise monitoring should be carried out during the first year of the operational phase with full intake of population. The road traffic noise during operation of the Project should be measured in terms of the A-weighted equivalent of $L_{10\ (1\text{-}hr)}$. During the traffic noise measurement, traffic count including traffic volume, percentage of heavy vehicles as defined in Calculation of Road Traffic Noise (CRTN) and traffic speed should also be undertaken concurrently. Supplementary information for data auditing and statistical results such as L_{eq} and L_{90} should also be obtained for reference.

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

3.10 Monitoring Locations for Operational Road Traffic Noise

3.10.1.1 The most affected NSRs identified in the EIA Report are selected as the noise monitoring locations in this EM&A Manual. The traffic noise monitoring locations during operational phase are listed in **Table 3.4** and shown in **Figure 3.3**. The locations for operation noise monitoring shall be defined during detailed design on the basis of the status of the most up-to-date information on proposed developments surrounding the Project.

Table 3.4 Proposed Road Traffic Noise Monitoring Stations during Operation

Station	NSR ID (Referenced to EIA Report)	Location
ON1	P-PU1-R-T04_02	Podium Level of PU1 facing Road L8
ON2	P-PU3-R-T03_01	Podium Level of PU3 facing Road L8
ON3	P-PU5-R-T01_02	Ground floor of PU5 facing Road L1

3.11 Mitigation Measures

3.11.1 Construction Noise

3.11.1.1 To alleviate the construction noise impact on the affected NSRs, the below mitigation measures which are considered feasible and practicable should be adopted:

- Adoption of quieter construction methods;
- Use of quality PME;
- Careful schedule of use of PME among nearby construction work site;
- Grouping of PMEs;
- Use of movable noise barriers and full enclosures; and
- Good site practices.

3.11.1.2 The above mitigation measures should need to be implemented in work sites as good practices where appropriate, subject to the recommendation in the Construction Noise Management Plan(s) of the corresponding construction activities. The implementation schedule for the recommended mitigation measures is presented in **Appendix B**.

3.11.1.3 Construction Noise Management Plan(s) (CNMP) should be prepared based on the best available information before the issue of tender and the commencement of construction works, subject to the contract arrangement of the Project and agreement with EPD. The CNMPs shall include the exact inventory of noise sources, quantitative construction noise impact assessment, listing of the quieter construction method/equipment, review the effectiveness and practicality of all proposed mitigation measures for the construction noise impact of the Project, implementation schedule of the mitigation measures (including implementation party, location, timing of implementation), and the details of the construction noise impact monitoring and audit program. The CNMPs should be prepared by a Certified Noise Modelling Professional as recognized by the Hong Kong Institute of Qualified Environmental Professionals Limited (HKIQEP), or equivalent as agreed by the Director of Environmental Protection.

3.11.2 Road Traffic Noise

3.11.2.1 There is no noise exceedance of road traffic noise for all existing representative noise assessment points. No road traffic noise mitigation measures and no eligibility test are required for all existing NSRs. Direct road traffic noise mitigation measures such as low noise road surfacing (LNRS), and provision of acoustic windows for proposed residential NSRs; fixed windows/blank façade design and noise insulation with suitable window type and air-conditionings for proposed planned schools are proposed to alleviate adverse road traffic noise impact during the operational phase. Alternative land use, alternative siting, screening by noise tolerant buildings shall be considered and evaluated in appropriate manner. The implementation schedule for the recommended mitigation measures is presented in **Appendix B**.

3.11.3 Fixed Noise

3.11.3.1 Potential fixed noise impact arising from the existing and proposed fixed noise sources would be anticipated. To avoid the potential fixed noise impact, direct mitigation measures should be considered at source to minimize the potential fixed noise impact. Direct mitigation measures include using quieter fixed plant, enclosing the fixed plant within reinforced concrete building or acoustic enclosure with openings directed away from NSRs, use of silencer, installation of acoustic louvre, installation of noise barrier, and installation of noise enclosure, etc. would be recommended to minimize the potential fixed noise sources impact from the proposed fixed noise sources, such that the fixed noise level would comply with the criteria at the NSR.

3.11.3.2 The mitigation measures as recommended in the EIA Report for the fixed plant associated with the Project is also presented in **Appendix B**. These measures should be reviewed and refined by the ER and ETL if there are any major design changes during the detailed design phase such that the recommended measures are adequate for alleviating the potential operational fixed noise impacts.

3.11.3.3 Fixed Noise Source Management Plan (FNMP)/ fixed noise assessment should be submitted to EPD for agreement prior to commencement of the construction of proposed fixed noise sources and proposed noise sensitive uses. Considering the large scale of the Project and expecting that different fixed noise sources to be constructed and operated by different parties at various time frame, the proponent of each of the proposed fixed noise sources should submit its own FNMP/ fixed noise assessment to EPD. Some of the proposed NSRs are located within 300 m from the existing fixed noise sources, i.e. Sites PU1&2, PU3&4, PU5, PU6, E3, E4 and E5. To ensure fixed noise compliance at these proposed NSRs, fixed noise assessment should be submitted to EPD by the developer of these NSRs prior to construction of the NSRs. FNMP(s) / fixed noise assessment should contain quantitative fixed noise source impact assessment with reference to the updated plant inventories of the fixed noise source, recommended noise mitigation measures, recommended commissioning test requirements and recommended environmental monitoring and audit programme. To ensure full implementation of the recommended mitigation measures, the FNMP(s) / fixed noise assessment would also contain the mitigation measures implementation schedule, implementation party, implementation location and implementation timing. The FNMP(s) for the proposed fixed noise sources should also contain fixed noise sources commissioning test plan to ensure compliance with the noise criteria stipulated in the EIA Report and the NCO.

3.12 Audit Requirements

3.12.1.1 Regular site environmental audit during the construction phase of the Project should be conducted at least once per week to ensure proper implementation of mitigation measures and good site practices as listed in **Appendix B** and the noise control requirements stated in EPD's "Recommended Pollution Control Clauses for Construction Contracts" to further minimize the potential noise nuisance during construction phase.

4. WATER QUALITY

4.1 Introduction

4.1.1.1 Baseline monitoring of marine water quality should be conducted prior to the commencement of construction works. Marine water quality monitoring should be carried out during the marine construction period and post-construction period of this Project. Regular site inspections should be undertaken throughout the construction phase to inspect the construction activities and work areas to ensure that the recommended mitigations measures are properly implemented.

4.1.1.2 During the operational phase, marine water quality monitoring should be carried out during the first year operation of the Effluent Polishing Plant (EPP) at Tseung Kwan O Area 137 (TKO 137). Marine water quality monitoring is also recommended in case of any emergency discharge from the EPP. Monitoring of the treated effluent quality from the EPP will be governed by the Water Pollution Control Ordinance (WPCO) license to ensure that the effluent quality would comply with the design standards.

4.1.1.3 Marine water quality monitoring should also be carried out during the first year operation of the PFTF and CBP at TKO 132 and in case of accidental spillage from the PFTF and CBP. Water quality monitoring requirements for the designated projects at TKO 132 (i.e. CWHF, EFs and RTS) will be reviewed under separate EIA studies to be conducted by their respective project proponents and are not covered in this EM&A Manual.

4.1.1.4 The future party responsible for carrying out the maintenance dredging works for the berthing facility of TKO 132 Development will separately propose the associated water quality monitoring programme prior to the commencement of the maintenance dredging work. These associated water quality monitoring and reporting requirements are therefore not covered in this EM&A Manual.

4.1.1.5 Water quality monitoring works are proposed for different stages of the Project as follows:

- Baseline water quality monitoring prior to the commencement of the construction of the Project;
- Water quality monitoring during the marine construction period and a 4-week post-construction period of the Project;
- Water quality monitoring during the first year operation of the EPP;
- Water quality monitoring in case of emergency discharge from the EPP during operational phase;
- Water quality monitoring during the first year operation of the PFTF and CBP at TKO 132; and
- Water quality monitoring in case of accidental marine spillage from the PFTF and CBP at TKO 132 during operational phase.

4.2 Water Quality Monitoring Stations

4.2.1.1 It is recommended to establish control and impact monitoring stations to monitor water quality impact during marine construction and operation periods. The impact monitoring stations have been selected at major Water Sensitive Receivers (WSRs) in the vicinity to the Project sites. The control stations have been selected such that they are located within the same water body as the impact monitoring stations but are located outside the area of influence of the Project. Data collected from the control stations enables a comparison of the water quality at the potentially impacted site with the ambient water quality. Sixteen impact monitoring stations (C1a, C1d, C1e, C1f, C1g, C2, CR1, FW1, CR2, C7, FW5, FW6,

SW1, C19, C20 and F1) and two control stations (CS1 and CS2) are proposed as summarized in **Table 4.1**. **Figure 4.1** indicates the approximate locations of these monitoring stations.

Table 4.1 Proposed Water Quality Monitoring Stations

Station (Figure 4.1)	Purpose of Monitoring Station	Easting	Northing	Monitoring Period		
				Baseline	Marine Construction, EPP Operation and Emergency Discharge from EPP at TKO 137	Marine Construction, Operation of PFTF and CBP and Accidental Marine Spillage from PFTF and CBP at TKO 132
C1a	Serves as impact monitoring station	844067	817412	✓		✓
C1d	Serves as impact monitoring station	843271	816217	✓		✓
C1e	Serves as impact monitoring station	843637	816572	✓		✓
C1f	Serves as impact monitoring station	843468	816762	✓		✓
C1g	Serves as impact monitoring station	843927	817252	✓		✓
C2	Serves as impact monitoring station	844035	816609	✓		✓
CR1	Serves as impact monitoring station	843358	816667	✓		✓
FW1	Serves as impact monitoring station	845489	817392	✓		✓
CR2	Serves as impact monitoring station	845334	815070	✓	✓	
C7	Serves as impact monitoring station	846651	813738	✓	✓	
FW5	Serves as impact monitoring station	842899	815596	✓	✓	✓
FW6	Serves as impact monitoring station	843720	814514	✓	✓	✓
SW1	Serves as impact monitoring station	846980	814135	✓	✓	
C19	Serves as impact monitoring station	844754	813601	✓	✓	
C20	Serves as impact monitoring station	844532	813078	✓	✓	
F1	Serves as impact monitoring station	847279	812946	✓	✓	
CS1	Serves as control station at ebb and flood tides	839729	817636	✓	✓	✓
CS2	Serves as control station at ebb and flood tides	845747	810847	✓	✓	✓

4.2.1.2 The status and locations of WSRs and the marine / Project activities may change after issuing this Manual. The appointed ET Leader may propose alternative monitoring

locations taking into consideration of the latest status, availability and/or accessibility of the various possible monitoring locations. In particular, Stations C1e, C1f, C1g, C2 and CR2 are located in close proximity to the marine works area and the practicability of these monitoring stations shall be reviewed with reference to the actual design of the marine works e.g. travelling route and locations of construction vessels and safety consideration etc. Any change to the monitoring stations shall be justified by the ET Leader, agreed by the ER, verified by the IEC before seeking approval from EPD prior to the implementation of monitoring programme.

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

- at locations close to 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
- control station shall be selected at a location to allow a comparison of the water quality at the potentially impacted site with the ambient water quality. The control station shall be selected such that it is located within the same body of water as the impact monitoring station but is located outside the area of influence of the works.

4.2.1.4 Duplicate *in-situ* measurements shall be taken at each water depth at each station. For laboratory analysis, the number of duplicate samples per batch shall be submitted to EPD for approval prior to the commencement of monitoring programme as specified in Section 4.4.11.

4.3 Water Quality Monitoring Parameters

4.3.1.1 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 Project works or are a standard check on water quality conditions. Parameters to be measured in the baseline, construction and operation stages are summarized in **Table 4.2**.

Table 4.2 Parameters measured in the Marine Water Quality Monitoring

Parameters	Unit	Event				
		Baseline Monitoring	Marine Construction and Post-construction Monitoring	Monitoring for EPP Operation and Emergency Discharge from EPP	Monitoring for Operation of PFTF and CBP and Accidental Marine Spillage from PFTF and CBP	Monitoring Locations
***In-situ* measurements**						
Dissolved Oxygen (DO)	mg/L	✓	✓	✓	✓	Relevant designated monitoring locations in **Table 4.1**
Salinity	ppt	✓	✓	✓	✓	
Temperature	℃	✓	✓	✓	✓	
pH	-	✓	✓	✓	✓	
Turbidity	NTU	✓	✓	✓	✓	
Laboratory measurements						
Suspended Solids (SS)	mg/L	✓	✓	✓	✓	Relevant designated monitoring locations in **Table 4.1** (unless otherwise specified)
5-day Biochemical Oxygen Demand (BOD_5)	mg/L	✓ Note [1]		✓		

Parameters	Unit	Event				
		Baseline Monitoring	Marine Construction and Post-construction Monitoring	Monitoring for EPP Operation and Emergency Discharge from EPP	Monitoring for Operation of PFTF and CBP and Accidental Marine Spillage from PFTF and CBP	Monitoring Locations
Chemical Oxygen Demand (COD)	mg/L	✓ Note [1]		✓		Note [1] – Monitoring at CR2, C7, FW5, FW6, SW1, C19, C20, F1, CS1, CS2 only
Ammonia Nitrogen (NH_3-N)	mg/L	✓ Note [1]		✓		
Unionized Ammonia (UIA)	mg/L	✓	✓	✓		
Nitrite Nitrogen (NO_2-N)	mg/L	✓	✓	✓		
Nitrate Nitrogen (NO_3-N)	mg/L	✓	✓	✓		
Total Inorganic Nitrogen (TIN)	mg/L	✓	✓	✓		
Total Kjeldahl Nitrogen (TKN)	mg/L	✓ Note [1]		✓		
Total Nitrogen (TN)	mg/L	✓ Note [1]		✓		
Total Phosphorus (TP)	mg/L	✓ Note [1]		✓		
E.coli	cfu/ 100mL	✓ (Monitoring at secondary contact recreation subzone and fish culture zone: C1a, C1d, C1e, C1f, C1g, CR1, F1 only)	✓ (Monitoring at secondary contact recreation subzone and fish culture zone: C1a, C1d, C1e, C1f, C1g, CR1, F1 only)	✓	✓ (Monitoring at secondary contact recreation subzone and fish culture zone: C1a, C1d, C1e, C1f, C1g, CR1 only)	
Chlorophyll-*a*	mg/L	✓		✓		SW1 only
Oil and Grease (O&G)	mg/L	✓	✓			
Arsenic (As)	µg/L	✓	✓			
Chromium (Cr)	µg/L	✓	✓			
Copper (Cu)	µg/L	✓	✓			
Lead (Pb)	µg/L	✓	✓			
Silver (Ag)	µg/L	✓	✓			
Zinc (Zn)	µg/L	✓	✓			
Mercury (Hg)	µg/L	✓	✓			
Cadmium (Cd)	µg/L	✓	✓			
Nickel (Ni)	µg/L	✓	✓			
Total Dissolved Solids (TDS)	mg/L	✓		✓		
Boron	mg/L	✓		✓		
Bromide	mg/L	✓		✓		

4.3.1.2 Measurements shall be taken at three water depths, including 1 m below water surface, mid-depth and 1 m above sea bed, except where the water depth is less than 6 m, in which case the mid-depth station may be omitted. If the water depth is less than 3 m, only the mid-depth station will be monitored.

4.3.1.3 In addition to the water quality parameters as shown in **Table 4.2**, other relevant data shall also be recorded, including monitoring location / position, time, water depth, pH value, salinity, temperature, tidal stages, current velocity and direction, sea conditions, weather conditions and any special phenomena or work activities undertaken around the monitoring and works area that may influence the monitoring results. A sample data record sheet is shown in **Appendix C** for reference.

4.4 Monitoring Procedures and Monitoring Equipment

4.4.1 Dissolved Oxygen and Temperature Measuring Equipment

4.4.1.1 The instrument shall be a portable and weatherproof Dissolved Oxygen (DO) measuring instrument complete with cable and sensor, and a DC power source. The equipment shall be capable of measuring:

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

4.4.1.2 It shall have a membrane electrode with automatic temperature compensation complete with a cable. Sufficient stocks of spare electrodes and cables shall be available for replacement where necessary. For example, YSI model 59 meter, YSI 5739 probe, YSI 5795A submersible stirrer with reel and cable or an approved similar instrument.

4.4.1.3 Shall salinity compensation not be built-in to the DO equipment, in-situ salinity shall be measured to calibrate the DO equipment prior to each DO measurement.

4.4.2 Turbidity Measurement Instrument

4.4.2.1 Turbidity shall be measured in-situ by the nephelometric method. The instrument shall be portable and weatherproof turbidity measuring instrument using a DC power source complete with cable, sensor and comprehensive operation manuals. It shall have a photoelectric sensor capable of measuring turbidity between 0 - 1000 NTU (for example, Hach model 2100P or an approved similar instrument). The cable shall not be less than 25m in length. The meter shall be calibrated to establish the relationship between NTU units and the levels of suspended solids.

4.4.3 Sampler

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

4.4.4 Water Depth Detector

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

4.4.5 Salinity

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

4.4.6 pH

4.4.6.1 The instrument shall consist of a potentiometer, a glass electrode, a reference electrode and a temperature-compensating device. It shall be readable to 0.1 pH in a range of 0 to 14. Standard buffer solutions of at least pH 7 and pH 10 shall be used for calibration of the instrument before and after use. Details of the method shall comply with American Public Health Association (APHA), 19th ed. 4500-HTB.

4.4.7 Sample Containers and Storage

4.4.7.1 Water samples shall be stored in high density polythene bottles with no preservative added, packed in ice (cooled to 4°C without being frozen) and delivered to the laboratory and analyzed as soon as possible after collection. Sufficient volume of samples shall be collected to achieve the required detection limit.

4.4.8 Monitoring Position Equipment

4.4.8.1 A hand-held or boat-fixed type digital Differential Global Positioning System (DGPS) with way point bearing indication or other equipment instrument of similar accuracy, shall be provided and used during marine water monitoring to ensure the monitoring vessel is at the correct location before taking measurements.

4.4.9 Current Velocity and Direction

4.4.9.1 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.

4.4.10 Calibration of *In-Situ* Instruments

4.4.10.1 All *in-situ* monitoring instruments shall be checked, calibrated and certified by a laboratory accredited under HOKLAS or any other international accreditation scheme before use and subsequently re-calibrated at three monthly intervals throughout all stages of the water quality monitoring programme. Responses of sensors and electrodes shall be checked with certified standard solutions before each use. Wet bulb calibration for a DO meter shall be carried out before measurement at each monitoring location.

4.4.10.2 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 some equipment is under maintenance, calibration, etc.

4.4.11 Laboratory Measurement / Analysis

4.4.11.1 Determination of the concentrations of SS, BOD, COD, TIN [2], NH_3-N, NO_2-N, NO_3-N, UIA[3], TKN, TP, *E. coli*, O&G, TDS, boron, bromide, chlorophyll-*a* and heavy metals shall be carried out in a HOKLAS or other international accredited laboratory. Sufficient water samples shall be collected at the monitoring stations for carrying out the necessary laboratory analysis. The analysis shall commence within 24 hours after collection of the water samples. The analyses shall follow the standard methods described in APHA Standard Methods for the Examination of Water and Wastewater, 19th edition or other approved methods. Detailed testing methods, 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 shall be submitted to EPD for approval prior to the commencement of monitoring programme. EPD may also request the laboratory to carry out analysis of known standards provided by EPD for quality assurance. Additional duplicate samples may be required by EPD for inter laboratory calibration. Remaining samples after analysis shall be kept by the laboratory for 3 months in case repeat analysis is required. If in-house or non-standard methods are proposed, details of the method verification may also be required to submit to EPD. In any circumstance, the sample testing shall have comprehensive quality assurance and quality control programmes. The laboratory shall prepare to demonstrate the programmes to EPD or his representatives when requested.

4.5 Details of Water Quality Monitoring

4.5.1 Baseline Monitoring

4.5.1.1 Baseline conditions of water quality should be established by the ET and agreed with IEC and Director of Environmental Protection (DEP). The purposes of the baseline monitoring are to establish ambient conditions prior to the commencement of the construction works, to demonstrate the suitability of the proposed control and impact monitoring stations, and for establishment of the action and limit levels.

4.5.1.2 The baseline conditions for construction phase should be established by measuring the water quality parameters including pH, salinity, temperature, turbidity, DO (in mg/L and % of saturation), SS at all designated monitoring stations. Heavy metals and O&G should be measured at the seawater intake of Desalination Plant (SW1). The proposed monitoring stations are shown in **Table 4.1**. The baseline monitoring for construction phase should be conducted at a frequency of 3 days a week, at mid-flood and mid-ebb tides, for a period of 4 weeks prior to the commencement of construction works. The interval between two sets of monitoring shall not be less than 36 hours, and the baseline monitoring schedule shall be submitted to DEP and IEC at least two weeks prior to the commencement of the baseline monitoring. The ET Leader shall seek approval from the ER, IEC and EPD on the alternative proposal prior to its implementation.

4.5.1.3 There shall not be any major construction activities 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.

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[2] Total Inorganic Nitrogen (TIN) = Ammonia Nitrogen (NH_3-N) + Nitrate-N (NO_3-N) + Nitrite Nitrogen (NO_2-N)

[3] The level of Unionized Ammonia (UIA) shall be calculated from the Ammonia Nitrogen (NH_3-N) level, salinity, pH and temperature using the method proposed by Bower, C. E. and Bidwell, J. P. (1978)

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

4.5.1.5 Specific ambient water quality data at SW1 may be available from the Water Supplies Department (WSD). For operational phase, the ET Leader shall collect all relevant existing available monitoring data and seek approval from the ER, IEC and EPD on an appropriate set of data to be used as baseline reference as well as the additional baseline monitoring methodology for operational phase prior to the commencement of such monitoring.

4.5.2 Construction Monitoring

4.5.2.1 During the course of the marine construction works, impact monitoring shall be undertaken three days per week, at mid-flood and mid-ebb tides, with sampling/measurement at the relevant monitoring stations as shown in **Table 4.1**. The ET should carry out spot check to ensure that the Contractor has undertaken all recommended mitigation measures. Parameters to be monitored should follow the baseline monitoring for construction phase in Section 4.5.1 and **Table 4.2**. The interval between two sets of monitoring shall not be less than 36 hours except where there are exceedances of Action and/or Limit levels, in which case the monitoring frequency shall be increased.

4.5.2.2 Requirements as stated in Sections 4.2.1.2 to 4.2.1.4 shall be followed. Any change to the EM&A requirements or programme shall be justified by the ET Leader, agreed by the ER, verified by the IEC before seeking approval from EPD prior to its implementation.

4.5.2.3 Upon completion of all construction activities, a post-construction monitoring exercise on water quality shall be carried out for four weeks in the same manner as the baseline monitoring. The results of the monitoring shall be presented in the Final EM&A Summary Report.

4.5.2.4 Proposed water quality monitoring schedule shall be submitted to ER, IEC and EPD at least two weeks before the first day of the monitoring month. The ER, IEC and EPD shall also be notified immediately for any changes in schedule.

4.5.3 First Year Operational Phase of EPP

4.5.3.1 Upon commissioning of the EPP, Drainage Services Department (DSD) or its appointed agent shall carry out marine water quality monitoring for a minimum of once per week at mid-flood and mid-ebb tides for one-year.

4.5.3.2 The proposed water quality monitoring schedule should be submitted to EPD at least 4 weeks before the first day of the monitoring month. The EPD should also be notified immediately for any changes in schedule. Relevant water quality parameters presented in **Table 4.2** should be monitored at the 8 impact monitoring stations (CR2, C7, FW5, FW6, SW1, F1, C19 and C20) and 2 control stations (CS1 and CS2) as shown in **Figure 4.1** and **Table 4.1**.

4.5.3.3 DSD or its appointed agent shall gather all relevant water quality information collected during the baseline stage of this Project as described in Section 4.5.1 above. After obtaining one year of the operational phase monitoring results, the DSD or its appointed agent shall review against the baseline conditions to identify if there is any change to the overall water quality in the assessment area and propose remedial action if there is any deterioration in water quality due to the EPP.

4.5.4 Emergency Discharge Monitoring Exercise for EPP

4.5.4.1 The emergency discharge follow-up monitoring requirements will be proposed in the Emergency Contingency Plan that will be formulated prior to commissioning of EPP. As a basic approach, in case of emergency discharge during the EPP operation, a follow-up water quality monitoring exercise shall be commenced within 24 hours after the start of the emergency discharge at 10 designated stations (CR2, C7, FW5, FW6, SW1, F1, C19, C20, CS1 and CS2) as shown in **Table 4.1**. The monitoring shall be conducted by DSD or other agent appointed by the DSD. The result of the monitoring each day shall be compared with the baseline data collected under normal Project operation to identify the degree of impact caused by the emergency discharge. The monitoring exercise shall be repeated on the next day until the baseline water quality is restored for 2 consecutive days.

4.5.4.2 DSD or its appointed agent shall inform relevant government departments (e.g. AFCD, WSD and EPD) everyday on the latest results of the water quality monitoring exercise to allow these parties to make informed decisions. By the end of the follow-up water quality monitoring exercise, DSD or its appointed agent shall also inform these parties that the ambient water quality is restored at all WSRs for two consecutive days to signal the recovery of water quality. It is recommended that the DSD / EPP operators shall maintain good communications with various concerned parties. A list of address, email address, phone and fax number of key persons in various departments responsible for action shall be made available to the Plant operators. A summary of the mitigation measures and monitoring requirements for emergency discharge is provided in **Table 4.3**.

Table 4.3 Mitigation Measures and Monitoring Requirement for Emergency Discharge from EPP Operation

Event	Mitigation Measures and Monitoring Requirement
Emergency Discharge during operation of EPP	1. Investigate the reason of failure and determine possible remedial measures and identify the need of emergency discharge. 2. Inform EPD, WSD and AFCD of the emergency discharge. 3. Ensure remedial measures are implemented. 4. Assess the effectiveness of the implemented remedial measures and identify alternative measures if necessary. 5. Discuss with EPD, WSD and AFCD for the required remedial actions if necessary and ensure all necessary remedial actions are properly implemented. 6. Conduct water quality impact monitoring daily until the baseline water quality is restored for 2 consecutive days. 7. The monitoring data collected in Item 6 above shall be compared with the baseline data collected under normal EPP operation to identify the degree of impact caused by the emergency discharge.

4.5.5 First Year Operational Phase of PFTF and CBP at TKO 132

4.5.5.1 The timings for commissioning of the PFTF and CBP at TKO 132 may be different. The operator of each concerned facility or its appointed agent shall separately implement the same water quality monitoring programme recommended in this EM&A Manual for at least 1 year after commissioning of that facility. The water quality monitoring and audit requirements for CBP (to be operated by private sector) shall be specified in the relevant lease conditions.

4.5.5.2 During the one-year monitoring period, impact marine water quality monitoring should be carried out for a minimum of once per week at mid-flood and mid-ebb tides at 12 designated stations (C1a, C1d, C1e, C1f, C1g, C2, CR1, FW1, FW5, FW6, CS1 and CS2) as shown in **Table 4.1**.

4.5.5.3 The operators of the PFTF and CBP shall gather the monitoring data collected during the baseline stage of this Project (as described in Section 4.5.1 above), and also share their own impact water quality monitoring results with each other. The information shall be used to assist the interpretation of the water quality impact. After obtaining one year of impact monitoring results, the operators of PFTF and CBP shall review the impact monitoring data against the baseline conditions and other relevant information to identify if there is any change to the overall water quality in Junk Bay and propose remedial action if there is any deterioration in water quality due to operation of the facility. The review should also determine the need and requirement of further monitoring. The review findings shall be submitted to EPD. Agreement on the review results shall be obtained from EPD prior to the amendment or termination of the impact water quality monitoring programme.

4.5.6 Accidental Marine Spillage Monitoring Exercise for PFTF and CBP at TKO 132

4.5.6.1 The requirements of follow-up monitoring in case of accidental marine spillage should be proposed in the Emergency Response Plan of the Environmental Management Plan that will be formulated by the respective project proponents or operators of PFTF and CBP prior to commissioning of the facilities. As a basic approach, in case of accidental marine spillage, a follow-up marine water quality monitoring exercise shall be commenced within 24 hours after occurrence of the spillage at 12 designated stations (C1a, C1d, C1e, C1f, C1g, C2, CR1, FW1, FW5, FW6, CS1 and CS2) as shown in **Table 4.1**. The monitoring shall be conducted by the operators of PFTF and CBP or their appointed agents. The result of the monitoring each day shall be compared with the baseline data collected under normal Project operation to identify the degree of impact caused by the accidental spillage. The monitoring exercise shall be repeated on the next day until the baseline water quality is restored for 2 consecutive days.

4.5.6.2 The operators of PFTF and CBP or their appointed agents shall inform relevant government departments (e.g. AFCD, WSD and EPD) every day on the latest results of the water quality monitoring exercise to allow these parties to make informed decisions. By the end of the follow-up water quality monitoring exercise, the relevant operators or their appointed agents shall also inform these parties that the ambient water quality is restored at all WSRs for two consecutive days to signal the recovery of water quality. It is recommended that the relevant operators of PFTF and CBP shall maintain good communications with various concerned parties. A list of address, email address, phone and fax number of key persons in various departments responsible for action shall be made available to the operators of PFTF and CBP. A summary of the mitigation measures and monitoring requirements for accidental marine spillage is provided in **Table 4.4**.

Table 4.4 Mitigation Measures and Follow-up Monitoring Requirement for Accidental Marine Spillage at TKO 132

Event	Mitigation Measures and Monitoring Requirement
Accidental Marine Spillage during operation of PFTF and CBP	1. Investigate the source / cause of spillage and determine possible remedial measures and necessary actions according to the Environmental Management Plan. 2. Inform EPD, WSD and AFCD of the accidental spillage. 3. Ensure remedial measures are implemented. 4. Assess the effectiveness of the implemented remedial measures and identify alternative measures if necessary. 5. Discuss with EPD, WSD and AFCD for the required remedial actions if necessary and ensure all necessary remedial actions are properly implemented. 6. Conduct marine water quality impact monitoring daily until the baseline water quality is restored for 2 consecutive days.

Event	Mitigation Measures and Monitoring Requirement
	7. The monitoring data collected in Item 6 above shall be compared with the baseline data collected under normal operation of PFTF and CBP to identify the degree of impact caused by the accidental spillage.

4.6 Water Quality Compliance

4.6.1.1 Construction phase water quality monitoring will be evaluated against Action and Limit Levels. The proposed Action and Limit Levels for water quality is presented in **Table 4.5**. 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 4.6**) should be undertaken and a review of works will be carried out by the Contractor(s).

4.6.1.2 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 4.5 Action and Limit Levels for Water Quality

Parameters	Action	Limit
DO in mg/L [1] (Depth-averaged [2] and Bottom)	All Impact Monitoring Stations ***Depth-averaged*** 5 percentile (%ile) of baseline data for surface and middle layer ***Bottom*** 5%ile of baseline data for bottom layer	All Impact Monitoring Stations ***Depth-averaged*** 4 mg/L or 1%ile of baseline data for surface and middle layer, whichever is lower [4] ***Bottom*** 2 mg/L or 1%ile of baseline data for bottom layer, whichever is lower [4]
SS in mg/L (depth-averaged [1]) [3]	Fish Culture Zone, Coral Communities and Coral Recipient Sites (F1, C1a, C1d, C1e, C1f, C1g, C2, CR1, CR2, C7, C19, C20) and Seawater Intake of TKO Desalination Plant (SW1) 95%ile of baseline data or 120% of upstream control station's SS recorded on the same day, whichever is higher [6] Flushing Water Intakes (FW1, FW5 and FW6) 10 mg/L or 95%ile of baseline data or level at control station (whichever is higher [7])	Fish Culture Zone, Coral Communities and Coral Recipient Sites (F1, C1a, C1d, C1e, C1f, C1g, C2, CR1, CR2, C7, C19, C20) and Seawater Intake of TKO Desalination Plant (SW1) [5] 99%ile of baseline data or 130% of upstream control station's SS recorded on the same day, whichever is higher [6] Flushing Water Intakes (FW1, FW5 and FW6) 10 mg/L or 99%ile of baseline data or level at control station (whichever is higher [7])
Turbidity in NTU (depth-averaged [1]) [3]	All Impact Monitoring Stations 95%ile of baseline data or 120% of upstream control station's turbidity recorded on the same day, whichever is higher [6]	All Impact Monitoring Stations 99%ile of baseline data or 130% of upstream control station's turbidity recorded on the same day, whichever is higher [8]
Depth-averaged [1] Concentration at Seawater Intake at TKO Desalination Plant (SW1)		
O&G [3]	95%ile of baseline data	99%ile of baseline data
Arsenic (As) [3]	13 µg/L or 95%ile of baseline data or level at control station (whichever is higher [6])	13 µg/L or 99%ile of baseline data or level at control station (whichever is higher [6])

Parameters	Action	Limit
Chromium (Cr) [3]	4.4 µg/L or 95%ile of baseline data or level at control station (whichever is higher [6])	4.4 µg/L or 99%ile of baseline data or level at control station (whichever is higher [6])
Copper (Cu) [3]	1.3 µg/L or 95%ile of baseline data or level at control station (whichever is higher [6])	1.3 µg/L or 99%ile of baseline data or level at control station (whichever is higher [6])
Lead (Pb) [3]	4.4 µg/L or 95%ile of baseline data or level at control station (whichever is higher [6])	4.4 µg/L or 99%ile of baseline data or level at control station (whichever is higher [6])
Silver (Ag) [3]	1.4 µg/L or 95%ile of baseline data or level at control station (whichever is higher [6])	1.4 µg/L or 99%ile of baseline data or level at control station (whichever is higher [6])
Zinc (Zn) [3]	8 µg/L or 95%ile of baseline data or level at control station (whichever is higher [6])	8 µg/L or 99%ile of baseline data or level at control station (whichever is higher [6])
Mercury (Hg) [3]	0.3 µg/L or 95%ile of baseline data or level at control station (whichever is higher [6])	0.3 µg/L or 99%ile of baseline data or level at control station (whichever is higher [6])
Cadmium (Cd) [3]	2.5 µg/L or 95%ile of baseline data or level at control station (whichever is higher [6])	2.5 µg/L or 99%ile of baseline data or level at control station (whichever is higher [6])
Nickel (Ni) [3]	8.2 µg/L or 95%ile of baseline data or level at control station (whichever is higher [6])	8.2 µg/L or 99%ile of baseline data or level at control station (whichever is higher [6])

Notes:
1. For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
2. "Depth-averaged" is calculated by taking the arithmetic means of reading of all three depths.
3. For parameters (other than DO), non-compliance of the water quality limits occurs when monitoring result is higher than the limits.
4. The lower DO level is adopted as the Limit Level to address uncertainty due to seasonal background DO fluctuations, considering that the baseline monitoring covers only 4 weeks.
5. The design limit of seawater intake at TKO Desalination Plant is 40 mg/L. In view that the background SS level in the assessment area is much lower than 40 mg/L, the proposed Limit Level for the seawater intake is conservative.
6. The higher level is adopted to address uncertainty due to possible seasonal fluctuations of ambient background level, considering that the baseline monitoring covers only 4 weeks.
7. The higher SS level is adopted as the Action / Limit Level as the ambient background SS level could be higher than 10 mg/L.

Table 4.6 Event and Action Plan for Water Quality Monitoring

	Action			
Event	**ET**	**IEC**	**ER**	**Contractor**
Action level being exceeded by one sampling day	○ Repeat *in situ* measurement on the next day of exceedance to confirm findings; ○ Check monitoring data, plant, equipment and Contractor(s)'s working methods; ○ Identify source(s) of impact and record in notification of exceedance; ○ Inform IEC, Contractor(s) and ER	○ Check monitoring data submitted by ET and Contractor(s)'s working methods; ○ Inform EPD and AFCD.	○ Confirm receipt of notification of exceedance in writing	○ Confirm receipt of notification of exceedance in writing; ○ Check plant and equipment and rectify unacceptable practice
Action level being exceeded by two or more consecutive sampling days	○ Repeat *in situ* measurement on the next day of exceedance to confirm findings; ○ Check monitoring data, plant, equipment and	○ Check monitoring data submitted by ET and Contractor(s)'s working methods; ○ Inform EPD and AFCD;	○ Confirm receipt of notification of exceedance in writing; ○ Discuss with the IEC on the proposed additional mitigation measures and	○ Confirm receipt of notification of exceedance in writing; ○ Check plant and equipment and rectify unacceptable practice;

	Action			
Event	**ET**	**IEC**	**ER**	**Contractor**
	Contractor(s)'s working methods; ○ Identify source(s) of impact and record in notification of exceedance; ○ Inform IEC, Contractor(s) and ER; ○ Discuss with IEC and Contractor(s) on additional mitigation measures and ensure that they are implemented.	○ Discuss with ET and Contractor(s) on additional mitigation measures and advise ER accordingly; ○ Assess the effectiveness of the implemented mitigation measures.	agree on the mitigation measures to be implemented. ○ Ensure additional mitigation measures are properly implemented.	○ Consider changes of working methods; ○ Discuss with ET and IEC on additional mitigation measures and propose them to ER within 3 working days; ○ Implement the agreed mitigation measures.
Limit level being exceeded by one sampling day	○ Repeat *in situ* measurement on the next day of exceedance to confirm findings; ○ Check monitoring data, plant, equipment and Contractor(s)'s working methods; ○ Identify source(s) of impact and record in notification of exceedance; ○ Inform IEC, Contractor(s) and ER; ○ Discuss with IEC and Contractor(s) on additional mitigation measures and ensure that they are implemented.	○ Check monitoring data submitted by ET and Contractor(s)'s working methods; ○ Inform EPD and AFCD; ○ Discuss with ET and Contractor(s) on additional mitigation measures and advise ER accordingly; ○ Assess the effectiveness of the implemented mitigation measures.	○ Confirm receipt of notification of exceedance in writing; ○ Discuss with the IEC on the proposed additional mitigation measures and agree on the mitigation measures to be implemented. ○ Ensure additional mitigation measures are properly implemented. ○ Request Contractor(s) to critically review the working methods.	○ Confirm receipt of notification of exceedance in writing; ○ Check plant and equipment and rectify unacceptable practice; ○ Critically review the need to change working methods; ○ Discuss with ET and IEC on additional mitigation measures and propose them to ER within 3 working days; ○ Implement the agreed mitigation measures.
Limit level being exceeded by two or more consecutive sampling days	○ Repeat *in situ* measurement on the next day of exceedance to confirm findings; ○ Check monitoring data, plant, equipment and Contractor(s)'s working methods; ○ Identify source(s) of impact and record in notification of exceedance; ○ Inform IEC, Contractor(s) and ER; ○ Discuss with IEC and Contractor(s) on additional mitigation measures and ensure that they are implemented.	○ Check monitoring data submitted by ET and Contractor(s)'s working methods; ○ Inform EPD and AFCD; ○ Discuss with ET and Contractor(s) on additional mitigation measures and advise ER accordingly; ○ Assess the effectiveness of the implemented mitigation measures.	○ Confirm receipt of notification of exceedance in writing; ○ Discuss with the IEC on the proposed additional mitigation measures and agree on the mitigation measures to be implemented. ○ Ensure additional mitigation measures are properly implemented. ○ Request Contractor(s) to critically review the working methods.	○ Confirm receipt of notification of exceedance in writing; ○ Check plant and equipment and rectify unacceptable practice; ○ Critically review the need to change working methods; ○ Discuss with ET and IEC on additional mitigation measures and propose them to ER within 3 working days; ○ Implement the agreed mitigation measures.

4.7 Construction Site Audits

4.7.1.1 Regular site environmental audit during the construction phase of the Project should be conducted at least once per week to ensure that the recommended mitigation measures are to be properly undertaken during construction phase of the Project. It can also provide an effective control of any malpractices and therefore achieve continual improvement of environmental performance on site.

4.7.1.2 Site inspections should be carried out by the ET based on the recommended mitigation measures for water pollution control as detailed in **Appendix B**. In the event that the recommended mitigation measures are not fully or properly implemented, deficiency shall be recorded and reported to the site management. Suitable actions should be carried out to:

- Investigate the problems and the causes;
- Issue action notes to the Contractor which is responsible for the works;
- Implement remedial and corrective actions immediately;
- Re-inspect the site conditions upon completion of the remedial and corrective actions; and
- Record the event and discuss with the Contractor for preventive actions

5. SEWERAGE AND SEWAGE TREATMENT IMPLICATIONS

5.1 Introduction

5.1.1.1 Based upon the assessment, it is concluded that there would be insignificant sewerage and sewage treatment implications during the operation of this Project.

5.2 EM&A Requirements

5.2.1.1 No environmental monitoring and audit requirements would be required.

6. WASTE MANAGEMENT IMPLICATION

6.1 Introduction

6.1.1.1 It will be the contractor's responsibility to ensure that any wastes produced during the construction and demolition works are handled, stored and disposed of in accordance with good waste management practices and relevant EPD's regulations and other legislative requirements.

6.1.1.2 Waste arisings generated during construction activities, such as construction and demolition (C&D) materials, chemical waste, sediment, floating refuse and general refuse, are recommended to be audited monthly to ensure that proper storage, transportation and disposal practices are being implemented. The Contractor would be responsible for the implementation of any mitigation measures recommended in the EIA report to minimise waste or resolve the issues associated with the management of wastes. Regular environmental audit should be conducted to ensure proper management and handling of waste, and appropriate implementation of the pollution control measures. A Waste Management Plan (WMP), as a part of the Environmental Management Plan (EMP), should be prepared by the Contractor in accordance with *ETWB TC (W) No.19/2005* and submitted to the Engineer for approval. A trip ticket system in accordance with *DEVB TCW No. 6/2010* should be in place. The auditing requirement stated in *ETWB TC (W) No.19/2005* and *DEVB TCW No. 6/2010* should be followed with regard to the management of C&D materials.

6.1.1.3 Provided that the waste is handled, transported and disposed of using approved methods, adverse environmental impacts would be expected with the implementation of good waste management practices. EM&A would not be necessary during the operational phase.

6.2 Mitigation Measures

6.2.1.1 Mitigation measures for waste management recommended in the EIA Report should form the basis of the site WMP to be developed by the Contractor in the construction stage. **Appendix B** provides the implementation schedule of the recommended mitigation measures during both construction and operational phases.

6.2.1.2 Waste generated during the construction activities should be audited regularly by the ET to determine if waste is being managed in accordance with approved procedures and the site WMP. The audit should look at all aspects of on-site waste management practices including waste generation, storage, recycling, transport and disposal. Apart from site inspection, documents including licences, permits, disposal and recycling records should be reviewed and audited for compliance with the legislations and contract requirements. In addition, the routine site inspections should check the implementation of the recommended good site practices, waste reduction measures, and other waste management mitigation measures.

6.2.1.3 With the appropriate handling, storage and removal of waste arisings during the construction and operation of the Project as presented in **Appendix B**, the potential to cause adverse environmental impacts would be minimised. During the site inspections, the ET shall pay special attention to the issues relating to waste management and check whether the Contractor has implemented the recommended good site practices, waste reduction measures and other mitigation measures.

6.3 Audit Requirement

6.3.1.1 Regular audits and site inspections should be carried out during construction phase by the ER, ET and Contractor to ensure that the recommended good site practices and the

recommended mitigation measures in **Appendix B** are properly implemented by the Contractor. The audits should concern all aspects of on-site waste management practices including waste generation, storage, recycling, transport and disposal. Apart from site inspection, documents including licences, permits, disposal and recycling records should be reviewed and audited for compliance with the legislation and contract requirements.

6.3.1.2 The requirements of the environmental audit programme are set out in **Section 15** of this Manual. The audit programme will verify the implementation status and evaluate the effectiveness of the mitigation measures.

7. LAND CONTAMINATION

7.1 Introduction

7.1.1.1 As the areas with potential land contamination concerns are still in operation / under construction, and that site clearance will not commence until 2029 based on the tentative construction programme, there could be changes in the operation or changes in land use within the concerned which may cause further contamination issues. Further site appraisal should be carried out for the concerned sites when site operation has ceased / after site handover in order to assess the latest site conditions / to identify the presence of any potential land contamination sources, and to address any new contamination issues caused by any changes in site operation and/or land use within concerned sites. Any necessary SI works and remediation action are recommended to be carried out after the site operation has ceased / decommissioning of the facility but prior to the commencement of construction works at the concerned sites / areas.

7.1.1.2 The recommended further works, including the submission of Contaminated Assessment Plan(s) (CAP(s)), Contamination Assessment Report(s) (CAR(s)) and if necessary, Remediation Action Plan(s) (RAP(s)) and Remediation Report(s) (RR(s)) to EPD for agreement, would follow relevant Guidance Manual, Guidance Note and Practice Guide.

7.2 Construction Phase

7.2.1.1 Remediation works, if necessary, would be carried out after site operation has ceased / land resumption but prior to the construction works at the concerned areas. Mitigation measures for the remediation works, if necessary, as recommended in the EIA Report, Appendix B of this Manual and future RAP(s) should be implemented during the remediation works. EM&A should be carried out in the form of regular site inspection to ensure the recommended mitigation measures are properly implemented and findings of the audit should be reported in the EM&A reports.

7.3 Operational Phase

7.3.1.1 As any contaminated soil / groundwater would be identified and properly treated prior to the construction works of the Project, land contamination during the operational phase is not expected. As such, environmental monitoring and audit during operational phase for land contamination is not necessary.

8. ECOLOGY

8.1 Introduction

8.1.1.1 As stated in the EIA, potential ecological impacts have been identified with mitigation measures proposed accordingly. No adverse residual ecological impacts are expected from the Project upon the proper implementation of mitigation measures, as summarised in **Section 8.2**. The implementation of all mitigation measures for terrestrial and marine ecological impact described in the EIA report (also refer **Appendix B**) should be subject to regular audit. This section describes the specific mitigation measures that require monitoring and auditing.

8.2 Mitigation Measures and Monitoring Requirements

8.2.1.1 Under the current proposed Development in TKO 137 and TKO 132, key ecological impacts include the direct impact on marine habitats (e.g. rocky shore, subtidal hard substrata, etc.) and associated organisms, potential impact on floral and faunal species of conservation importance (e.g. flora, hard and black coral) and indirect disturbance impact (e.g. noise, water quality, human disturbance, etc). Mitigation measures and monitoring requirements are proposed for each of these aforementioned ecological resources, as detailed in the following sections.

Protection of Floral Species of Conservation Importance

8.2.1.2 Floral species of conservation importance recorded within the Project footprint (e.g. *Diospyros vaccinioides*) should be protected as far as possible. As a mitigation measure, all the unavoidably affected individuals should be preserved on site, transplanted or compensated to suitable habitat(s) nearby prior to the commencement of works. A detailed vegetation survey should be conducted by a qualified ecologist / botanist with at least 5 years relevant experience to identify and record the affected individuals before the commencement of works. Details of monitoring programme and remedial measures recommended in the transplantation proposal should be reviewed and updated by a qualified ecologist / botanist with at least 5 years relevant experience to formulate a final transplantation proposal. Agreement / approval of the final transplantation proposal should be obtained from relevant government authorities (e.g. AFCD and EPD) prior to commencement of any construction activities.

Protection of Faunal Species of Conservation Importance

8.2.1.3 Although no direct impact on faunal species of conservation importance is anticipated, preconstruction survey should be conducted for TKO 132 and TKO 137 by qualified ecologist with at least 5 years relevant experience to identify if any faunal species of conservation importance within and in the surrounding of the Project footprint, in particular any nest / breeding pairs of Black Kite is presented in the surrounding of the TKO 132 footprint. Afterwards, Pre-construction Fauna Survey Report prepared by a qualified ecologist with at least 5 years relevant experience shall be submitted to relevant government authorities (e.g. AFCD and EPD). In case any fauna species of conservation importance recorded during the pre-construction survey, protection and monitoring programme should be proposed and carried out to avoid potential direct impact.

Translocation of Affected Coral Colonies

8.2.1.4 To minimise the unavoidable direct loss/damage to the coral colonies due to the reclamation, translocation will be implemented for affected coral colonies of high ecological value as a mitigation measure in TKO 132. In addition, as the reclamation in TKO 137

would also directly affect the coral colonies within or adjacent to the reclamation extend, as a precautionary measure, translocation of affected corals is also recommended when necessary. A pre-construction detailed coral survey shall be conducted in the marine works area prior to the commencement of marine works by a qualified coral ecologist(s) with SCUBA diving qualification and at least 5 years relevant experience, the curriculum vitae of whom shall be submitted to AFCD along with the scope and methodology of the detailed coral survey for review and agreement prior to commencement of the survey. The survey should investigate the number and location of coral colonies to be directly affected by the construction of the pile-supporting deflection pier, the reclamation and associated sediment removal works. Identified coral colonies should be sized, mapped and tagged. An assessment of the suitability of translocation for each identified coral colony should be presented in the coral translocation plan, along with the proposed recipient site, translocation methodology and programme, monitoring methodology and programme for the translocation coral colonies. The potential translocation recipient site should possess a coral colony composition similar to that of the existing site and should be located well outside areas where direct and indirect impacts from the marine works of the Project, as well as of other planned/committed projects nearby, are expected. Post-translocation monitoring survey shall be conducted. Information gathered during post-translocation monitoring survey should include observations on the presence, survival, health condition and growth of the translocated coral colonies. These parameters should then be compared with the baseline results collected from the pre-translocation survey to assess the effectiveness of the translocation works. The post-translocation monitoring results will be evaluated against Action and Limit Levels. Evaluation will be based on recorded changes in percentage of partial mortality of the corals. The proposed Action and Limit Levels are defined in **Table 8.1**.

Table 8.1 Action and Limit Levels for Post-Translocation Coral Monitoring

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

8.2.1.5 If the defined Action Level or Limit Level for coral monitoring as listed in **Table 8.2** is exceeded, the actions as set out in will be implemented.

Table 8.2 Event and Action Plan for Coral Post-Translocation Monitoring

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

Notes:

ET- Environmental Team

IEC – Independent Environmental Checker

ER – Engineer's Representative

Monitoring of Mitigation Measures for Disturbance Impact

8.2.1.6 EM&A programmes were recommended to ensure compliance in regard of the potential air quality and noise impacts (e.g. potential dust emission during construction phase, and potential noise exceedance from construction noise). Monitoring requirements for construction dust emission and construction noise monitoring are further stated at **Section 2** and **Section 3** respectively. Regular site environmental audit during construction phase is also recommended to ensure proper implementation of mitigation measures and good site practices. Details of the mitigation measures are also provided in **Appendix B.**

8.2.1.7 Water quality monitoring and regular site inspections would be undertaken during the construction to ensure that the recommended mitigation measures for water quality shall be properly implemented. Details on monitoring requirement for water quality is further stated in **Section 4** and **Appendix B**.

9. FISHERIES IMPACT

9.1 Introduction

9.1.1.1 The development of the Project would lead to the loss of fishing ground and fishing habitat in Junk Bay area. Nonetheless, considering the generally low importance of the fishing area in inner Junk Bay as compared to the Hong Kong fishery, the impact on fisheries is considered minor. Thus, no mitigation measure on fisheries is required.

9.1.1.2 For the indirect fisheries impact arising from the water quality impact, with the implementation of mitigation and precautionary measures proposed in **Section 4**, potential water quality impacts arising from the Project would be minimised. No specific EM&A programme is required for the potential fisheries impact, as the monitoring and audit requirement for potential water quality impact have been covered by the EM&A programme recommended in **Section 4** and **Appendix B**.

10. LANDSCAPE AND VISUAL IMPACT

10.1 Introduction

10.1.1.1 The Environmental Impact Assessment (EIA) has recommended landscape and visual mitigation measures to be undertaken during both the construction and operational phases of the Project. The design, implementation and maintenance of landscape and visual mitigation measures should be checked to ensure that any potential conflicts between the proposed landscape and visual measures and any other works of the Project would be resolved as early as practicable without affecting the implementation of the mitigation measures.

10.2 Mitigation Measures

10.2.1.1 The proposed mitigation measures of landscape and visual impacts are summarised in **Appendix B**. The landscape and visual mitigation measures proposed should be incorporated in the detailed landscape and engineering design. The construction phase mitigation measures should be adopted from the commencement of construction and should be in place throughout the entire construction period. Mitigation measures for the operational phase should be adopted during the detailed design and be built as part of the construction works so that they are in place on commissioning of the Project.

10.2.1.2 Any potential conflicts among the proposed mitigation measures, the Project works, and operational requirements should also be identified and resolved at early stage. Any changes to the mitigation measures should be incorporated in the detailed design.

10.3 EM&A Requirement

10.3.1.1 The construction phase EM&A of the mitigation measures shall be carried out as part of the site audit programme. EM&A during operational phase of the Project shall be carried out within the 12-month establishment period of the landscape and visual mitigation measures by the corresponding implementation agency to ensure the proposed mitigation measures in the EIA and as depicted in the Landscape and Visual Mitigation Plan are fully implemented.

10.3.1.2 All mitigation measures proposed in the EIA and implemented by the Contractor should be audited by Registered Landscape Architect (RLA), as a member of the Environmental Team, on a regular basis to ensure compliance with the intended aims of the measures. The mitigation measures proposed should be embodied into the detailed engineering design and landscape design drawings and contract document. Site inspection should be undertaken monthly throughout the construction period. In particular, the extent of the agreed works areas should be regularly checked during the construction phase. The landscape auditor should audit the proposed mitigation measures in the EIA to ensure that they are fully implemented during construction and the 12-month establishment period during operational phase.

11. CULTURAL HERITAGE

11.1 Introduction

11.1.1.1 No declared monument, proposed monument, graded historic building or government historic sites are identified within the Project Boundary of TKO 137 or TKO 132. A total of six (6) built heritage and other identified items were identified to be located outside the Project Boundary but within the 300 m assessment area in the EIA Report. Direct impacts of damages, as well as indirect impacts of ground-borne vibration, tilting and settlement on these built heritage and items would not be anticipated during the construction and operational phases.

11.1.1.2 There are one (1) declared monument and three (3) Sites of Archaeological Interest (SAIs) identified within the 300 m assessment area of TKO 137. While direct impact on these heritage sites have been avoided with proper design of the Project, indirect impact on Fat Tau Chau House Ruin SAI (SAI185) which is in the close vicinity of the Project Boundary would be anticipated if construction works are carried out nearby. Besides, for the areas on Fat Tau Chau within the Project boundary of TKO137, there would possibly be potential impact during the construction phase. Hence, mitigation measures for this archaeological heritage have been recommended in the EIA Report to minimise the potential indirect impacts during the construction phase.

11.1.1.3 A Marine Archaeological Investigation (MAI) has been conducted for the Project. No impact on marine archaeology is anticipated from the Project during both the construction and operational phases.

11.2 Mitigation Measures

11.2.1.1 Since no adverse impacts on built heritage during both the construction and operational phases, no mitigation measures have been recommended in the EIA Report.

11.2.1.2 As potential indirect impact on Fat Tau Chau House Ruin SAI (SAI185) would be anticipated if construction works are carried out nearby, mitigation measures have been recommended in the EIA Report, including a condition and structural survey before and after the construction phase, monitoring of ground-borne vibration, tilting and ground settlement (if required), dust suppression measures and a buffer zone to physical separate the heritage site from the works. Direct impact on the heritage sites would not be anticipated.

11.2.1.3 Since there is no declared monument and SAI within the Project boundary of TKO 137 and TKO 132, no direct impact on them is anticipated during the construction phase. For the areas on Fat Tau Chau within the Project boundary of TKO137, there would possibly be potential impact during the construction phase. To ensure that no archaeological resource related to the Customs Station on Fat Tau Chau or other facilities would be affected by the Project, an Archaeological Impact Assessment should be undertaken during the detailed design phase when the details of the proposed works on Fat Tau Chau are available. This Archaeological Impact Assessment at the detailed design phase shall assess the archaeological potential concerning the existence of remains or features in relation to the Customs Stations or other facilities within the Project boundary of TKO 137 on Fat Tau Chau, particularly in areas that would be affected by the proposed works. Based on the details and extent of proposed works to be carried out on Fat Tau Chau, the Archaeological Impact Assessment at the detailed design phase would propose appropriate measures, if any impact on archaeological heritage is identified, for consideration and agreement by AMO. The Archaeological Impact Assessment at the detailed design phase shall be conducted by an archaeologist. It shall incorporate desktop information, site inspection results and recommendation of appropriate mitigation measures, namely change of work

design, preservation of archaeological heritage *in-situ*, preservation by relocation, archaeological survey cum excavation or rescue excavation, archaeological watching brief or preservation by record subject to the level of potential impacts to be confirmed in the Archaeological Impact Assessment at detailed design phase upon availability of the details and extent of the proposed works to be carried out on Fat Tau Chau, as necessary for consideration and agreement by AMO. This Archaeological Impact Assessment at the detailed design phase should be conducted by the project proponent. In the light of the above considerations, no adverse impact would be anticipated with mitigation measures agreed by AMO and implemented to the satisfaction of AMO to ensure preservation of the archaeological heritage within the Project boundary of TKO 137 on Fat Tau Chau.

11.2.1.4 Furthermore, if antiquities or supposed antiquities under the Antiquities and Monuments Ordinance (Cap. 53) are discovered during the construction works within the Project boundary of TKO 137 and TKO 132, the project proponent is required to inform AMO immediately for discussion of appropriate mitigation measures to be agreed by AMO before implementation by the project proponent to the satisfaction of AMO.

11.2.1.5 As no impact on marine archaeology would be anticipated from the Project during both the construction and operational phases, no mitigation measures have been recommended. Nevertheless, as a precautionary measure, it has been recommended to designate the areas with data gaps and the uninvestigated anomaly as exclusion zones during the marine works of the Project to ensure no impact on the seabed from anchoring of work vessels during the marine works of the Project in these locations.

11.2.1.6 The implementation schedule of the recommended mitigation measures is given in **Appendix B**.

11.3 Monitoring Requirements

11.3.1.1 A condition and structural survey, as well as a baseline vibration review shall be conducted for construction works located in close proximity to the Fat Tau Chau House Ruin SAI (SAI185), including:

1) Reclamation of Phase 1B and Construction of Box Culvert and Seawall Outfall Works;
2) Reclamation of Phase 1C;
3) TKO 137 Infrastructure Works (O1) (should there be considerable piling works or works that would create strong ground-borne vibration occurred);
4) TKO 137 Infrastructure Works (O6);
5) Site Formation and Site Development of Service Reservoirs (OU5 and OU6); and
6) Site Development of PR1 including Permanent PTI/TIH (PR1).

11.3.1.2 Condition and structural survey should be carried out for Fat Tau Chau House Ruin SAI (SAI185) both before and after all construction works to inspect its physical condition and structural integrity. The surveys shall be undertaken by registered structural engineers or heritage specialists. The methodology for the condition and structural surveys shall be proposed by the registered structural engineers or heritage specialist. The results of the pre-construction condition survey shall form a baseline and taken into consideration when formulating the monitoring strategy. The pre- and post- condition survey reports should be submitted for AMO's record.

11.3.1.3 Based on the pre-construction condition and structural survey results and construction details, the baseline vibration review before the construction phase shall evaluate if monitoring of ground-borne vibration, tilting and ground settlement is required for Fat Tau Chau House Ruin SAI during the construction phase. The baseline vibration review should be submitted to AMO for comment and agreement before implementation. Any vibration and building movement induced from the construction works should be strictly monitored

to ensure no disturbance and physical damages made to the heritage sites during the course of works. If monitoring of ground-borne vibration is required, a monitoring proposal, including vibration limit, type of monitoring, checkpoint locations, installation details and frequency of monitoring should be submitted by contractor to AMO for agreement before commencement of the works. Prior agreement and consent should be sought from the owner(s), stakeholder(s) and relevant Government department(s) for the installation of monitoring points on the archaeological heritage before commencement of the works. Should the monitoring data be approaching to the vibration limit, the contractor shall propose measures to mitigate movement situation at the heritage site for consideration by AMO and implement on site, with examples, not limited to, increasing monitoring frequency, additional condition surveys, amendment / review of design of the construction, etc., so that the concerned archaeological heritage would be protected and preserved. AMO should be informed immediately should irregularities be observed.

11.4 Audit Requirements

11.4.1.1 Regular site audits should be carried out by the ET at least once per week during the construction phase to ensure that the recommended mitigation measures related to cultural heritage are properly implemented.

12. HAZARD TO LIFE

12.1 Introduction

12.1.1.1 Hazard to Life assessments in association with the planned desalination plant, existing SNG production plant, proposed effluent polishing plant, existing explosives off-loading pier and proposed green fuel station (GFS) were performed. The EIA study concluded that no unacceptable risk is anticipated during both construction and operational phases of the Project, and hence no mitigation measure would be required.

12.2 EM&A Requirement

12.2.1.1 No environmental monitoring and audit requirements would be required.

13. LANDFILL GAS HAZARD

13.1 Introduction

13.1.1.1 The northeastern quadrant of TKO 137 (about 32.3 ha) lies within the 250m Consultation Zone for the South East New Territories (SENT) landfill and its extension (SENTX) as shown in **Figure 13.1**. TKO 132 development resides beyond 250m of any landfill therefore no landfill gas monitoring is required.

13.1.1.2 Qualitative LFG risk assessment in Section 14 of the EIA Report indicates that potential hazard associated with landfill gas for areas the TKO 137 Development within the 250m Consultation Zone for the SENT and SENTX landfills ranges from “Low to Medium” for the Construction Phase whilst for the Operational Phase, risk category for is “Low” or “Very Low” for Open Space (O), whilst for Government, Institution or Community (G/IC), Public Housing Site (RSc), Education (E), risk categories range from “High”, “Medium” or “Low”. For Other Specified Uses – Effluent Polishing Plant the risk category is “High”. These operational phase classifications are intended only as preliminary guidance on the nature of protective works anticipated for the development, and a more detailed investigation and reassessment at the development stage will allow targeted and more accurate design of protective measures.

13.1.1.3 All the proposed mitigation measures during construction phase are stipulated in the EIA Report and summarised in **Appendix B**. During the construction phase, for risk classified as “Medium” or “Low”, the safety requirements stated in Chapter 8 - Hazards Arising During Construction of the LFGHA Guidance Note should be implemented properly.

13.1.1.4 A Safety Officer, trained in the use of gas detection equipment and landfill gas-related hazards, should be present on site throughout the ground-works phase. The Safety Officer should be provided with an intrinsically safe portable instrument, which is appropriately calibrated and able to measure methane in the range of 0-100% LEL and 0-100% v/v , carbon dioxide in the range of: 0-100% and oxygen in the range of 0-21%

13.1.1.5 The monitoring frequency and areas to be monitored should be set down prior to commencement of groundworks either by the Safety Officer or by an appropriately qualified person.

13.1.1.6 Routine monitoring should be carried out in all excavations, manholes and chambers and any other confined spaces that may have been created by, for example, the temporary storage of building materials on the site surface. All measurements in excavations should be made with the monitoring tube located not more than 10mm from the exposed ground surface.

13.1.1.7 For excavations deeper than 1m, measurements should be made:

- At the ground surface before excavation commences;
- Immediately before any worker enters the excavation;
- At the beginning of each working day for the entire period the excavation remains open; and
- Periodically through the working day whilst workers are in the excavation.

13.1.1.8 For excavations between 300 mm and 1m deep, measurements should be made:

- Directly after the excavation has been completed; and
- Periodically whilst the excavation remains open.
- For excavations less than 300 mm deep, monitoring may be omitted, at the discretion of the Safety Officer or other appropriately qualified person.

13.1.1.9 The proposed mitigation measures during design and operational phases are stipulated in the EIA Report and summarised in **Appendix B**. Project proponents of future developments located within the 250m landfill gas consultation zone shall conduct a detailed LFGHA following the LFGHA Guidance Note issued by EPD at detailed design stage to re-confirm the landfill gas hazard risk and undertake detailed design of the mitigation measures, as appropriate.

- LFG monitoring should be carried out within the ground floor of buildings and enclosures within the consultation zone, prior to the operation and for the first year of operation, monthly monitoring is recommended. Should the monitoring reveal the presence of landfill gas joints sealings shall be inspected and sealed.
- During the operational phase of the Project, prior to entry into service rooms / voids, manholes and chambers, pre-entry monitoring for landfill gases shall be conducted, following the requirements of the Factories and Industrial Undertaking (Confined Spaces) Regulation is recommended.
- In addition, if any construction is required for the maintenance work during operational stage, the responsible party should follow the monitoring works stated in Chapter 8 - Hazards Arising During Construction of the LFGHA Guidance Note.
- Any service voids, manholes or chambers which are large enough to permit access to personnel should be subject to entry safety procedures. Works in confined spaces are controlled by the Factories and Industrial Undertakings (Confined Spaces) Regulation of the Factories and Industrial Undertakings Ordinance and the Safety Guide to Working in Confined Spaces should be followed to ensure compliance with the Regulation.

13.1.1.10 For operational phase, protective and mitigation measures will be adopted to ensure that the planned development is safe. Reassessment at the design/development stage will allow targeted and more accurate design of any protective / detection measures required and the frequency and duration of monitoring. For entry into service rooms / voids, manholes and chambers, the safety measures recommended in Chapter 8 - Hazards Arising During Construction of the LFGHA Guidance Note should also be strictly followed. The operational phase monitoring programme and detailed actions should be submitted to EPD for approval in a detailed LFGHA during the detailed design stage.

13.1.1.11 The monitoring programme (e.g. proposed parameters, locations and frequency of landfill gas monitoring) should be submitted to EPD for approval in a detailed LFGHA during the detailed design stage.

13.2 Mitigation Measures

Construction Phase

Specific Advice Relating to the Drilling of Boreholes within the Consultation Zone

13.2.1.1 Drilling should only proceed with adequate care and precautions against the potential hazards which may be encountered.

13.2.1.2 Before site works begin, the drilling contractor should devise a 'method-of-working' statement covering all normal and emergency procedures and the site supervisor and all operatives must be familiar with this statement.

13.2.1.3 The method-of-working statement should cover, inter alia:

- number of operatives;
- experience and special skills of operatives;
- normal method of operations;

- emergency procedures, including firefighting;
- supervisors' responsibilities;
- storage and use of safety equipment;
- safety procedures; and
- signs, barriers and guarding.

Safety Equipment and Clothing

13.2.1.4 An intrinsically safe, portable methane meter should be available at all times. Other safety equipment should include:

- no smoking signs, to be placed prominently adjacent to the drilling area;
- portable fire extinguisher;
- high visibility clothing to be worn by all drilling operatives; and
- additional protective clothing should include stout industrial boots (with steel toe cap
- and insole), plastic hard hats, heavy duty waterproof industrial gloves.

Working Procedures

13.2.1.5 On arrival at site the drilling rig should be set-up up-wind of the borehole location, 'No smoking' signs set out and the working area should be roped or coned-off.

13.2.1.6 At the end of the working day all vehicles, the drilling rig and any hand tools should be hosed down with clean water to remove deposits of excavated spoil.

13.2.1.7 Suitable guards or barriers should be placed around the excavation or borehole to prevent access by unauthorized persons.

Safety Procedures

13.2.1.8 One person should be present at all times during drilling operations, with the sole responsibility of assuring the observance of all safety procedures. This person should be trained in the use of all recommended safety equipment.

13.2.1.9 Smoking should be prohibited within 15 metres of a boring or excavation at any locations within the Consultation Zone.

13.2.1.10 For large diameter boreholes, a working platform should be placed over the hole which will prevent accidental entry into the hole by operatives.

13.2.1.11 No worker should be allowed to work alone at any time near the edge of the well under construction. Another worker should always be present, beyond the area considered to be subject to the possible effects of landfill gas or cave-in.

13.2.1.12 Periodically during the well construction, the work areas should be monitored for levels of methane.

13.2.1.13 If the well construction is not completed by the end of the working day, the hole should be covered with a plate of sufficient overlap to prevent access to the hole and sufficient structural strength to support expected loads. The plate should be weighted down to discourage removal and, on landfill sites, the edges of the plate should be covered with sufficient depth of wet soil to prevent escape of gas.

13.2.1.14 All pipes or casings should be capped at the end of each working day.

13.2.1.15 Engine-driven rigs should have vertical exhaust stacks discharging not less than 1.5m above ground level and should have overspeed limits to prevent engine run away on ingested gas.

13.2.1.16 Diesel engine air-intakes should also be located not less than 1.5m above ground level.

13.2.1.17 Any electrical equipment should be intrinsically safe.

13.2.1.18 Additional safety advice and guidance may be found in 'Investigation into Establishing an Effective Practical Safe Working Practice When Drilling in Landfill Sites and Adjacent Areas and Contaminated Ground and Adjacent Areas' compiled by the British Drilling Association (1993).

Utility Protection Design Measures (applicable to construction phase)

13.2.1.19 For all service runs, the aim should be to provide a protective barrier at the point where the trenches pass through the perimeter of the consultation zone such that trench excavations do not form a route for gas migration to or from unprotected utilities beyond the Consultation Zone.

13.2.1.20 For service runs within the consultation zone these may remain “unprotected” as the general public may not have access to such underground features, however ducts, manholes and chambers to utility services within the consultation zone should be sealed from the surrounding ground to prevent gas entry and provided with vented covers to allow any gas that enters to dissipate to atmosphere.

13.2.1.21 The service run should be designated as a “special route” and utility companies should be informed to that effect so that they may implement precautionary measures. Precautionary measures should include ensuring that staff members are aware of the potential hazards of working in confined spaces such as manholes and service chambers, and that appropriate monitoring procedures are in place to prevent hazards due to asphyxiating atmospheres in confined spaces. Detailed guidance on entry into confined spaces is given in Code of Practice on Safety and Health at Work in Confined Spaces (Labour Department, Hong Kong).

13.2.1.22 Above ground (minor) termination features e.g. transformers, gas kiosks and telecom cabinets should be considered to be “buildings” and should be protected by e.g. membrane barriers to minimize the possibility of gas ingress.

13.2.1.23 Any future works such as maintenance or extensions should be subject to the recommendations specified in the LFGHA Guidance Note.

Operational Phase

Guidance for Entry into Service Rooms / Voids, Manholes and Chambers

13.2.1.24 Any service voids, manholes or chambers which are large enough to permit access to personnel should be subject to entry safety procedures. Works in confined spaces are controlled by the Factories and Industrial Undertakings (Confined Spaces) Regulation of the Factories and Industrial Undertakings Ordinance and the Safety Guide to Working in Confined Spaces should be followed to ensure compliance with the Regulation.

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

developed by an appropriately qualified person and the system should be consistently employed. All the access to the confined spaces would be restricted only to authorized personnel who should be aware of the LFG hazard. No member of the general public should be permitted or allowed to access these confined spaces, manholes or inspection chambers. The safety measures recommended in Chapter 8 - Hazards Arising During Construction of the LFGHA Guidance Note should also be strictly followed.

13.3 Monitoring Requirement

13.3.1 Landfill Gas Parameters

13.3.1.1 LFG monitoring shall be carried out to identify any migration between SENT and SENTX and the planned development to ensure the safety of the construction, operation and maintenance personnel working on-site. The following parameters shall be monitored:

- Methane
- Oxygen
- Carbon Dioxide

13.3.1.2 The presentation format for LFG monitoring shall be agreed with EPD in advance.

13.3.2 Monitoring Equipment

13.3.2.1 For the Project area within 250m landfill consultation zone, LFG monitoring shall be carried out using intrinsically safe, a portable multi-gas monitoring instrument normally operating in diffusion mode unless required for spot sampling when it should be capable of operating by means of an aspirator or pump. The equipment should have low battery, fault and over range indicators incorporated and be able to datalog measurements for subsequent down-load.

13.3.2.2 The equipment should be able to measure in the following ranges:

Methane	0-100% Lower Explosion Limit (LEL) and 0-100% v/v
Carbon dioxide	0-100%
Oxygen	0-21%

13.3.2.3 The equipment should alarm (audibly and visibly) in the event that:

Methane	>10% LEL
Carbon dioxide	>0.5% by volume; and
Oxygen	<19% by volume

13.3.3 Monitoring Locations and Frequency

Construction Phase

13.3.3.1 Periodically during ground-works construction, the works area should be monitored for methane, carbon dioxide and oxygen using appropriately calibrated portable gas detection equipment.

13.3.3.2 The monitoring frequency and areas to be monitored should be set down prior to commencement of groundworks either by the Safety Officer or by an appropriately qualified person.

13.3.3.3 Routine monitoring should be carried out in all excavations, manholes and chambers and any other confined spaces that may have been created by, for example, the temporary

storage of building materials on the site surface. A sample data record sheet is shown in **Appendix C** for reference.

13.3.3.4 All measurements in excavations should be made with the monitoring tube located not more than 10mm from the exposed ground surface.

Monitoring of excavations

13.3.3.5 For excavations deeper than 1 m, measurements should be made:

- At the ground surface before excavation commences;
- Immediately before any worker enters the excavation;
- At the beginning of each working day for the entire period the excavation remains open; and
- Periodically through the working day whilst workers are in the excavation.
- For excavations between 300 mm and 1 m deep, measurements should be made:
- Directly after the excavation has been completed; and
- Periodically whilst the excavation remains open.

13.3.3.6 For excavations less than 300 mm deep, monitoring may be omitted, at the discretion of the Safety Officer or other appropriately qualified person.

Operational Phase

13.3.3.7 Following construction, and dependant on the detailed design, routine monitoring may be required for buildings within the 250m landfill consultation zone. The first intake for the project is anticipated to be end of 2030. The anticipated monitoring frequency will be monthly for the first two year of operation. The monitoring of each development area is anticipated to be undertaken by individual operator. If the monitoring results show no sign of LFG migration, reduce the monitoring frequency to once every six months to verify the effectiveness and to ensure the continued performance of the implemented protection measures.

13.3.3.8 Manholes and utility pits should be monitored at mid depth and the base with each measurement recorded over a minimum period of 10 minutes. A steady reading and peak reading should be recorded for each measurement. The need for venting the manhole/ utility pit and further monitoring will be reviewed after the initial monitoring. As the exact location of these will be dependent upon the detailed design monitoring locations cannot be specified prior to completion of the detailed design.

13.3.3.9 During the detailed design stage, the consultant should provide a more detailed assessment and finalize the design of the gas protective measures or ventilation to underground confined utility pits, manholes and ground floor rooms. The detailed design (drawings and specification) of landfill gas protection measures as well as the requirement for maintenance and monitoring should be prepared by a competent professional person and submitted to EPD for vetting in the detailed LFGHA.

13.3.3.10 The operator of each development area should submit (i) monitoring reports on quarterly basis within 7 calendar days of monitoring conducted in the last quarter and (ii) a final report summarizing all monitoring results and recommendation for any necessary follow-up action(s) within 14 calendar days of the last monitoring to EPD for information. The reports should include valid calibration certificate of the monitoring equipment.

13.3.4 Limit Levels and Action Plan For Landfill Gas Monitoring

13.3.4.1 Limit levels and Actions in the event of LFG being detected in excavations, utilities or any enclosed on-site areas are shown in **Table 13.1**. Depending on the results of the measurements, actions required will vary and should be set down by the Safety Officer or another appropriately qualified person. As a minimum these should cover those actions specified in **Table 13.1**.

Table 13.1 Limit Levels and Action Plan for Landfill Gas Monitoring

Parameter	Limit Level	Action
Oxygen	<19%	Ventilate trench/void to restore O_2 to > 19%
	<18%	Stop works Evacuate personnel/prohibit entry Increase ventilation to restore oxygen to >19%
Methane	>10% LEL (i.e. > 0.5% by volume)	Post "No Smoking" signs Prohibit hot works Ventilate to restore methane to <10% LEL Investigate and submit an investigation report to EPD
	>20% LEL (i.e. > 1% by volume)	Stop works Evacuate personnel / prohibit entry Increase ventilation to restore methane to <10% LEL Investigate and submit an investigation report to EPD
Carbon Dioxide	>0.5%	Ventilate to restore carbon dioxide to < 0.5%
	>1.5%	Stop works Evacuate personnel / prohibit entry Increase ventilation to restore carbon dioxide to < 0.5%

13.3.4.2 If methane exceeding 10% of LEL is detected during monitoring, the operator should investigate and submit an investigation report within 7 calendar days to EPD, explaining in details the possible reason(s) and recommending any necessary remedial action(s) (e.g. Increasing monitoring frequency and duration) for review and information.

14. ELECTRIC AND MAGNETIC FIELD

14.1 Introduction

14.1.1.1 The proposed ESSs at Sites OU1 and OU2 would be of 132kV voltage, and have similar design as existing 132kV ESSs. Potential electric and magnetic field impact due to the ESSs would comply with the limits of exposure as stated in guidelines on limits of exposure to EMF issued by International Commission on Non-Ionizing Radiation Protection (ICNIRP) in 1998. No specific monitoring programme for electric field and magnetic field is required for the proposed ESSs.

14.1.1.2 The proposed EFs at TKO 132 would be of 400kV voltage, and have similar nature and design as existing 400kV ESSs. Potential electric and magnetic field impact due to the EFs would be comply with the limits of exposure as stated in Guidelines on Limits of Exposure to 50Hz Power Frequency Electric and Magnetic Fields Issued by ICNIRP. Nevertheless, the design of the EFs would be subject to the further review by the operator, who would apply for an Environmental Permit (EP) separately following the EIAO mechanism. EM&A requirements, if deemed necessary, would be recommended during the separate EP application.

15. SITE ENVIRONMENTAL AUDIT

15.1 Site Inspections

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

15.1.1.2 The Environmental Team (ET) Leader shall be responsible for formulating the environmental site inspection, the deficiency and remedial action reporting system, and for carrying out the site inspection works. He shall submit a proposal for site inspection and deficiency and remedial action reporting procedures to the Contractor for agreement, and to the Engineer's Representative (ER) for approval. The ET's proposal for rectification would be made known to the Independent Environmental Checker (IEC).

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

- the Environmental Impact Assessment (EIA) and Environmental Monitoring and Audit (EM&A) recommendations on environmental protection and pollution control mitigation measures;
- ongoing results of the EM&A program;
- works progress and programme;
- individual works methodology proposals (which shall include proposal on associated pollution control measures);
- contract specifications on environmental protection and pollution prevention control;
- relevant environmental protection and pollution control laws; and
- previous site inspection results undertaken by the ET and others.

15.1.1.4 The Contractor shall keep the ET Leader updated with all relevant information on the construction contract necessary for him to carry out the site inspections. Inspection results and associated recommendations for improvements to the environmental protection and pollution control works shall be submitted to the IEC and the Contractor within 24 hours for reference and for taking immediate remedial action. The Contractor shall follow the procedures and time-frame stipulated in the environmental site inspection, and the deficiency and remedial action reporting system formulated by the ET Leader, to report on any remedial measures subsequent to the site inspections.

15.1.1.5 The ET shall also carry out ad hoc site inspections if significant environmental problems are identified. Inspections may also be required subsequent to receipt of an environmental complaint, or as part of the investigation work, as specified in the Action Plan for environmental monitoring and audit.

15.2 Compliance with Legal and Contractual Requirements

15.2.1.1 There are contractual environmental protection and pollution control requirements as well as environmental protection and pollution control laws in Hong Kong with which construction activities must comply.

15.2.1.2 In order that the works are in compliance with the contractual requirements, all works method statements submitted by the Contractor to the ER for approval shall be sent to the ET Leader for vetting to see whether sufficient environmental protection and pollution control measures have been included. The implementation schedule of mitigation measures is summarised in **Appendix B**.

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

15.2.1.4 The Contractor shall regularly copy relevant documents to the ET Leader so that works checking could be carried out effectively. The document shall at least include the updated Works Progress Reports, updated Works Programme, any application letters for different licence / permits under the environmental protection laws, and copies of all valid licences / permits. The site diary shall also be available for the ET Leader's inspection upon his request.

15.2.1.5 After reviewing the documentation, the ET Leader shall advise the Contractor of any non-compliance with contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the ET Leader's review concludes that the current status on licence / permit application and any environmental protection and pollution control preparation works may result in potential violation of environmental protection and pollution control requirements, he shall also advise the Contractor accordingly.

15.2.1.6 Upon receipt of the advice, the Contractor shall undertake immediate action to remedy the situation. The ER shall follow up to ensure that appropriate action has been taken in order to satisfy contractual and legal requirements.

15.3 Environmental Complaints

15.3.1.1 Complaints shall be referred to the ET Leader for action. The ET Leader shall undertake the following procedures upon receipt of any complaint:

(i) log complaint and date of receipt onto the complaint database and inform the IEC immediately;

(ii) investigate the complaint to determine its validity, and assess whether the source of the problem is due to works activities;

(iii) identify mitigation measures in consultation with the IEC if a complaint is valid and due to works;

(iv) advise the Contractor if mitigation measures are required;

(v) review the Contractor's response to identified mitigation measures, and the updated situation;

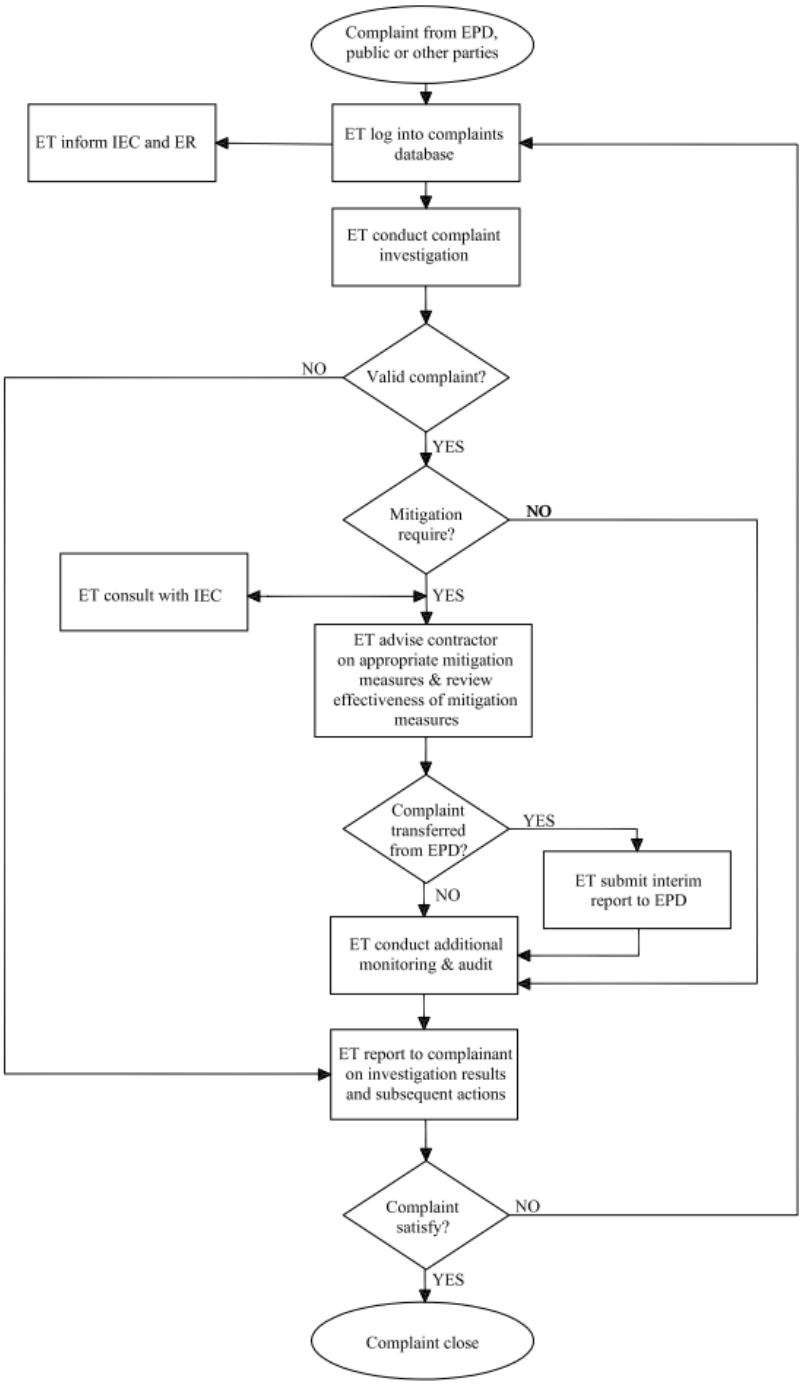
(vi) if the complaint is transferred from the Environmental Protection Department (EPD), submit interim report to the EPD on status of the complaint investigation and follow-up action within the time frame assigned by the EPD;

(vii) undertake additional monitoring and audit to verify the situation if necessary, and review that circumstances leading to the complaint do not recur;

(viii) report investigation results and subsequent actions to complainant (if the source of complaint is identified through EPD, the results should be reported within the timeframe assigned by EPD); and

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

15.3.1.2 A flow chart of the complaint response procedure is shown below:



16. REPORTING

16.1 General

16.1.1.1 Reports can be provided in an electronic medium upon agreeing the format with the Engineer's Representative (ER) and Environmental Protection Department (EPD). This would enable a transition from a paper / historic and reactive approach to an electronic / real time proactive approach. All the monitoring data (baseline and impact) shall also be submitted in electronic format. The formats for air quality, noise, water quality and landfill gas monitoring data to be submitted are shown in **Appendix C**.

16.1.1.2 Types of reports that the Environmental Team (ET) Leader shall submit include baseline monitoring report, monthly Environmental Monitoring and Audit (EM&A) report, quarterly EM&A summary report and final EM&A review report. In accordance with Annex 21 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM), a copy of the monthly, quarterly summary and final review EM&A reports shall be made available to the Director of Environmental Protection.

16.2 Electronic Reporting of EM&A Information

16.2.1.1 To facilitate public inspection of the baseline monitoring report and various EM&A reports via the Environmental Impact Assessment Ordinance (EIAO) Internet website and at the EIAO register office, electronic copies of these reports shall be prepared in Hyper Text Markup Language (HTML) (version 4.0 or later) and in Portable Document Format (PDF Adobe 11 Pro version or later), unless otherwise agreed by EPD and shall be submitted at the same time as the hardcopies. For the HTML version, a content page capable of providing hyperlink to each section and sub-section of these reports shall be included at the beginning of the document. Hyperlinks to all figures, drawings and tables in these reports shall be provided in the main text from where the respective references are made. All graphics in these reports shall be in interlaced GIF format unless otherwise agreed by EPD. The content of the electronic copies of these reports must be the same as the hard copies. The summary of the monitoring data taken shall be included in the various EM&A Reports to allow for public inspection via the EIAO Internet website.

16.3 Baseline Monitoring Report

16.3.1.1 Baseline Environmental Monitoring Report(s) shall be prepared within 10 working days of completion of the baseline monitoring and then certified by the ET Leader. Copies of the Baseline Environmental Monitoring Report shall be submitted to the Contractor, the Independent Environmental Checker (IEC), the ER and the EPD. The ET Leader shall liaise with the relevant parties on the exact number of copies they require. The report format and baseline monitoring data format shall be agreed with the EPD prior to submission.

16.3.1.2 The baseline monitoring report shall include, but not be limited to the following:

i. up to half a page executive summary;

ii. brief project background information;

iii. drawings showing locations of the baseline monitoring stations;

iv. an updated construction programme with milestones of environmental protection / mitigation activities annotated;

v. monitoring results (in both hard and soft copies) together with the following information:

- monitoring methodology;

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

vi. 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.

vii. determination of the Action and Limit Levels (AL levels) for each monitoring parameter and statistical analysis of the baseline data, the analysis shall conclude if there is any significant difference between control and impact stations for the parameters monitored;

viii. revisions for inclusion in the EM&A Manual; and

ix. comments, recommendations and conclusions.

16.4 Monthly EM&A Reports

16.4.1.1 The results and findings of all EM&A work required in the Manual shall be recorded in the monthly EM&A reports prepared by the ET Leader. The EM&A report shall be prepared and submitted within 10 working days at the end of each reporting month, with the first report due the month after construction commences. Each monthly EM&A report shall be submitted to the following parties: the Contractor, the IEC, the ER and EPD. Before submission of the first EM&A report, the ET Leader shall liaise with the parties on the required number of copies and format of the monthly reports in both hard copy and electronic medium.

16.4.1.2 The ET leader shall review the number and location of monitoring stations and parameters every six months, or on as needed basis, in order to cater for any changes in the surrounding environment and the nature of works in progress.

First Monthly EM&A Report

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

i. executive summary (1-2 pages):

- breaches of AL 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;
- management structure, and

- works undertaken during the month.

iii. environmental status:

- works undertaken during the month with illustrations (such as location of works, daily dredging/filling rates, percentage of fines in the fill materials used, etc); and
- drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations (with co-ordinates of the monitoring locations).

iv. a brief summary of EM&A requirements including:

- all monitoring parameters;
- environmental quality performance limits (AL levels);
- Event-Action Plans;
- environmental mitigation measures, as recommended in the Final Environmental Impact Assessment (EIA) report; and
- environmental requirements in contract documents.

v. implementation status:

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

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

- monitoring methodology;
- name of laboratory and types of equipment used and calibration details;
- parameters monitored;
- monitoring locations (and depth);
- monitoring date, time, frequency, and duration;
- weather conditions during the period;
- graphical plots of the monitored parameters in the month annotated against:
  - the major activities being carried out on site during the period;
  - weather conditions that may affect the results; and
  - any other factors which might affect the monitoring results;
- any other factors which might affect the monitoring results; and
- quality assurance (QA) / quality control (QC) results and detection limits.

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

- record of all non-compliance (exceedances) of the environmental quality performance limits (AL levels);
- record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
- record of all notification of summons and successful prosecutions for breaches of current environmental protection / pollution control legislations, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;

- review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
- description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.

viii. others:

- an account of the future key issues as reviewed from the works programme and work method statements;
- advice on the solid and liquid waste management status;
- a forecast of the works programme, impact predictions and monitoring schedule for the next three months;
- compare and contrast the EM&A data with the EIA predictions and annotate with explanation for any discrepancies; and
- comments (for examples, effectiveness and efficiency of the mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions.

Subsequent monthly EM&A Reports

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

i. executive summary (1 - 2 pages):

- breaches of AL levels;
- complaints 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, any environmental sensitive receivers and the locations of the monitoring and control stations.

iii. implementation status:

- advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the Final EIA report, 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 types of equipment used and calibration details;
- parameters monitored;
- monitoring locations (and depth);
- monitoring date, time, frequency, and duration;
- weather conditions during the period;

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

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

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

vi. others:

- an account of the future key issues as reviewed from the works programme and work method statements;
- advice on the solid and liquid waste management status;
- a forecast of the works programme, impact predictions and monitoring schedule for the next three months;
- compare and contrast the EM&A data with the EIA predictions and annotate with explanation for any discrepancies; and
- comments (for examples, effectiveness and efficiency of the mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions.

vii. appendix

- AL levels;
- graphical plots of trends of monitored parameters at key stations over the past four reporting periods for representative monitoring stations annotated against the following:
    - major activities being carried out on site during the period;
    - weather conditions during the period; and
    - any other factors that might affect the monitoring results.
- monitoring schedule for the present and next reporting period;
- cumulative statistics on complaints, notifications of summons and successful prosecutions;
- outstanding issues and deficiencies

16.5 Quarterly EM&A Summary Reports

16.5.1.1 A quarterly EM&A summary report of around five pages shall be produced by the ET Leader and shall contain at least the following information. Apart from these, the first quarterly summary report should also confirm that the monitoring work is proving effective and that it is generating data with the necessary statistical power to categorically identify or confirm the absence of impact attributable to the works. Each quarterly EM&A report shall be submitted to the following parties: the IEC, the ER and EPD.

i. executive summary (1 - 2 pages);

ii. basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of works undertaken during the quarter;

iii. a brief summary of EM&A requirements including:

- monitoring parameters;
- environmental quality performance limits (AL levels); and
- environmental mitigation measures, as recommended in the Final EIA report.

iv. advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the Final EIA report, summarised in the updated implementation schedule;

v. drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;

vi. graphical plots of the trends of monitored parameters over the past four months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:

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

vii. advice on the solid and liquid waste management status;

viii. a summary of non-compliance (exceedances) of the environmental quality performance limits (AL levels);

ix. a brief review of the reasons for and the implications of non-compliance, including a review of pollution sources and working procedures;

x. a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;

xi. a summarised record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;

xii. 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;

xiii. comments (for examples, a review of the effectiveness and efficiency of the mitigation measures and the performance of the environmental management system, that is, of the overall EM&A programme); recommendations (for example, any improvement in the EM&A programme) and conclusions for the quarter; and

xiv. proponents' contacts and any hotline telephone number for the public to make enquiries.

16.6 Final EM&A Review Reports for Construction Phase

16.6.1.1 The EM&A program for construction phase shall be terminated upon completion of those construction activities that have the potential to result in a significant environmental impact.

16.6.1.2 Prior to the proposed termination, it may be advisable to consult relevant local communities (such as village representatives/communities and/or District Boards). The proposed termination should only be implemented after the proposal has been endorsed by the IEC, the Engineer and the Project proponent followed by final approval from the Director of Environmental Protection.

16.6.1.3 The final EM&A report should be prepared by the ET Leader and contain at least the following information. The Final EM&A Review report shall be submitted to the following parties: the IEC, the ER and EPD.

i. executive summary (1 - 2 pages);

ii. basic project information including a synopsis of the project organisation, contacts of key management, and a synopsis of work undertaken during the course of the project or past twelve months;

iii. a brief summary of EM&A requirements including:

- monitoring parameters;
- environmental quality performance limits (AL levels); and
- environmental mitigation measures, as recommended in the Final EIA report.

iv. advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the Final EIA report, summarised in the updated implementation status proformas;

v. drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;

vi. graphical plots of the trends of monitored parameters over the course of the project, including the post-project monitoring for all monitoring stations annotated against:

- the major activities being carried out on site during the period;
- weather conditions during the period;
- any other factors which might affect the monitoring results; and
- the return of ambient environmental conditions in comparison with baseline data.

vii. compare and contrast the EM&A data with the EIA predictions and annotate with explanation for any discrepancies;

viii. provide clear-cut decisions on the environmental acceptability of the project with reference to the specific impact hypothesis;

ix. advice on the solid and liquid waste management status;

x. a summary of non-compliance (exceedances) of the environmental quality performance limits (AL levels);

xi. a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;

xii. a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;

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

xiv. review monitoring methodology adopted and with the benefit of hindsight, comment on its effectiveness (including cost effectiveness);

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

xvi. review the practicality and effectiveness of the EIA process and EM&A programme (for examples, a review of the effectiveness and efficiency of the mitigation measures and the performance of the environmental management system, that is, of the overall EM&A programme), recommendations (for example, any improvement in the EM&A programme); and

xvii. a conclusion to state the return of ambient and / or the predicted scenario as per EIA findings.

16.7 EM&A Reports for Operational Phase

16.7.1.1 Unless otherwise agreed by EPD, quarterly EM&A reports shall be submitted to record the results and findings of the hydrogen sulphide monitoring for the first three years of EPP operation, odour patrol during the regular and ad hoc maintenance of the deodorizing unit, and the water quality monitoring during the first year of EPP operation.

16.7.1.2 A final EM&A review report for operational phase shall be submitted after completion of operation monitoring. The final EM&A review report for operational phase should contain at least the following information:

i. executive summary (1 - 2 pages);

ii. drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and/or control stations;

iii. basic project information including a synopsis of the project organisation, contacts of key management, and a synopsis of work undertaken during the course of the project or past twelve months;

iv. a brief summary of EM&A requirements including:

- Environmental mitigation measures for operation stage, as recommended in the project EIA Report;
- environmental impact hypotheses tested;
- environmental quality performance limits (Action and Limit levels);
- all monitoring parameters;
- Event and Action Plans;

v. a summary of the implementation status of environmental protection and pollution control / mitigation measures for operation stage, as recommended in the project EIA Report and summarised in the updated implementation schedule;

vi. graphical plots and the statistical analysis of the trends of monitoring parameters over the course of the project, including:

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

vii. a summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);

viii. a review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate;

ix. a description of the actions taken in the event of non-compliance;

x. a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up actions taken and results;

xi. a review of the validity of EIA predictions for operation stage and identification of shortcomings in EIA recommendations;

xii. comments (for example, a review of the effectiveness and efficiency of the mitigation measures, the performance of the environmental management system, and the overall EM&A programme for operation stage); and

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

16.8 Data Keeping

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

16.9 Interim Notifications of Environmental Quality Limit Exceedances

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