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HIGHWAYS DEPARTMENT

ARUP asia infrastructure solutions

Agreement No. CE 80/2023 (CE)

Smart and Green Mass Transit System in East Kowloon – Investigation, Design and Construction

Deliverable No. 57 - Environmental Monitoring and Audit (EM&A) Manual

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1. Introduction

1.1 Project Background

1.1.1 The northern areas of Kwun Tong are densely populated. With the gradual population intake of the housing developments in the areas, the transport demand in the northern uphill areas of Kwun Tong will continue to increase. At present, residents in Kwun Tong uphill areas who wish to take the railway need to use the road-based transport feeder services to gain access to the nearby railway stations. To address the commuting needs of residents in the northern uphill areas of Kwun Tong, it is considered necessary to provide a feeder transit system to connect the Kwun Tong uphill areas to the existing railway network.

1.1.2 The Chief Executive's 2023 Policy Address announced to implement a Smart and Green Mass Transit System in East Kowloon (SGMTS-EK) with an aim to improving the overall transportation of East Kowloon and unleashing development potential. The Project has also been incorporated in the "Hong Kong Major Transport Infrastructure Development Blueprint" published by the Transport and Logistics Bureau in December 2023.

1.1.3 With a length of about 7 km, the proposed SGMTS-EK would connect the uphill areas of Kwun Tong, including Choi Wan, Shun Lee, Shun On, Sau Mau Ping, Po Tat, Ma Yau Tong and Lam Tin, and would pass through New Clear Water Bay Road, Lee On Road, Shun On Road, Sau Mau Ping Road, Po Lam Road, Lin Tak Road, Pik Wan Road, Lei Yue Mun Road, etc. The implementation of the SGMTS-EK would provide light and green transport feeder services in the northern uphill areas of Kwun Tong to the nearby railway stations and major public transport interchanges, facilitating access to MTR Choi Hung Station and Yau Tong Station, thus providing convenient access and more commuting options for the public. In addition, the provision of pedestrian linkage facilities to Anderson Road area would be studied with a view to providing convenient connections in response to the commuting needs of the residents of On Tai Estate and On Tat Estate.

1.1.4 The proposed SGMTS-EK is a light and green transit system of medium to low carrying capacity, which will adopt environmentally friendly and smart technologies and operate on a dedicated corridor to improve the transport efficiency, safety and convenience. On the other hand, the dedicated elevated corridor will be separated from road traffic along the alignment which would not be affected by traffic conditions.

1.1.5 Arup-AIS Joint Venture (AAJV) was commissioned by Railway Development Office of Highways Department (i.e. the Project Proponent) in July 2024 to provide consultancy services for the investigation and design of the Project, including the Environmental Impact Assessment (EIA) study to satisfy the statutory requirements under the Environmental Impact Assessment Ordinance (EIAO).

1.2 Purpose of the Manual

1.2.1 The purposes of this Environmental Monitoring and Audit (EM&A) Manual are to:

- Guide the set up of an EM&A programme to ensure compliance with the Environmental Impact Assessment (EIA) recommendations;

- Describe the requirements for site environmental audit; and
- Describe the requirements for reporting for the EM&A.

1.2.2 This Manual outlines the audit programme for the construction and operation of the Project and provides systematic procedures for auditing and minimising environmental impacts. The detailed design of the proposed viaduct structure, stations, transit system and other design elements are subject to further refinement.

1.2.3 Hong Kong environmental regulations have served as environmental standards and guidelines in the preparation of this Manual. In addition, this EM&A Manual has been prepared in accordance with the requirements stipulated in Annex 21 of the Technical Memorandum on the EIA Process (EIAO-TM).

1.2.4 This Manual contains the following information:

- Responsibilities of the future Consortium for the detailed design, construction and operation of the transit system (the Consortium), the Project Manager or Project Manager's Delegate (PM), Environmental Team (ET), and the Independent Environmental Checker (IEC) under the context of EM&A;
- Project organisation for the EM&A works;
- The basis for, and description of the broad approach underlying the EM&A programme;
- An implementation schedule, summarising all recommended environmental mitigation measures with reference to the programme for their implementation including those identified at detailed design, contract preparation, construction and operation stages of the Project;
- Details of the methodologies to be adopted, including all 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 complaints; and
- Requirements for presentation of environmental audit and appropriate reporting procedures.

2. Project Description

2.1 General Description of the Project

2.1.1 Section 2 of the EIA Report has described the approaches adopted to avoid and minimise various environmental impacts throughout the design process. The design has therefore been taken forward as the basis for this EIA to demonstrate that all statutory requirements under the EIA Study Brief (No.: ESB-374/2025) and the EIAO-TM regarding the DP elements under the revised EIAO are complied with.

2.2 Designated Projects

2.2.1 The Project comprises the following which are classified as Designated Projects (DPs) as per Part I, Schedule 2 of the EIAO:

- Item A.2 “A railway and its associated stations”;
- Item A.4 “A railway siding, depot, maintenance workshop, marshalling yard or goods yard” or Item A.6 “A transport depot located less than 100m from the nearest boundary of an existing or planned (a) residential area”; and
- Item A.7 “A road or railway tunnel more than 800m in length between portals”.

2.3 Construction Programme

2.3.1 According to the latest information, the construction works of the Project are anticipated to commence tentatively in Year 2027/28 for completion in Year 2032/33. The construction elements of the Project were identified based on the available preliminary design information and will be subject to further refinement during the subsequent design stage.

3. Project Organisation

3.1 Project Organisation

3.1.1 The ET should be an independent party from the IEC and the Consortium. The ET shall be established before the commencement of construction of the Project. The ET leader should possess at least 7 years of experience in EM&A and/ or environmental management.

3.1.2 An IEC shall be employed before commencement of construction of the Project. The IEC shall be an independent party from the Consortium and the ET and possess at least 7 years' experience in EM&A and/or environmental management.

3.1.3 The proposed project organisation and lines of communications with respect to environmental protection works are shown in **Appendix 3.1**.

3.1.4 The responsibilities of respective parties are:

The Project Proponent / The Consortium

- Carry out the detailed design, construction and operation of the SGMTS-EK;
- Implement the EIA recommendations and requirements;
- Provide assistance to ET in carrying out relevant monitoring and auditing; and
- Adhere to the agreed procedures for carrying out environmental compliant investigation.

Project Manager or Project Manager's Delegate (PM)

- Supervise the Contractor/ the Operator's activities and ensure that the requirements in the EM&A Manual are fully complied with;
- Assist the Project Proponent/ the Consortium in employing an ET to undertake environmental audit;
- Assist the Project Proponent in employing an IEC to audit the results of the EM&A works carried out by the ET;
- Participate in joint site inspections and audits undertaken by the ET; and
- Adhere to the procedures for carrying out complaint investigations.

Environmental Team (ET)

- Review the success of EM&A programme, confirm the adequacy of mitigation measures implemented and the validity of the EIA predictions, and to identify any adverse environmental impacts arising;
- Carry out site inspection to investigate and audit the Consortiums' site practice, equipment and work methodologies with respect to pollution control and environmental mitigation measures, and take proactive actions to pre-empt problems;
- Audit and prepare audit reports on the site environmental conditions;

- Report on the environmental audit results to the IEC, the Consortium, the PM or its delegated representative;
- Undertake regular on-site audits / inspections and report to the Consortium and the PM of any potential non-compliance on the requirement as stipulated in the EM&A Manual;
- Advise the Consortium on environmental improvement, awareness, enhancement matters, etc. on site; and
- Adhere to the procedures for carrying out environmental complaint investigation.

Independent Environmental Checker (IEC)

- Review the EM&A works performed by the ET (at not less than monthly intervals) in an independent, objective and professional manner;
- Report the audit results to the PM and Environmental Protection Department (EPD);
- Review the EM&A reports (monthly and quarterly summary reports) submitted by the ET;
- 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
- Report the findings of site inspections and other environmental performance reviews to PM and EPD.

3.1.5 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 of the Project.

4. Air Quality Impact

4.1 Introduction

4.1.1 The EIA has considered the potential air quality impacts during construction and operational phases of the Project. With the implementation of recommended good site practices and mitigation measures, adverse construction dust impact is not anticipated. Continuous construction dust monitoring and regular site environmental audit at least once per week are also recommended to check the implementation of good site practices and mitigation measures, and to ensure no adverse dust impact on the nearby air sensitive receivers. The EIA has also concluded that there will be no adverse air quality impacts during operational phase and hence environmental monitoring and site inspections during operational phase are not required.

4.2 Mitigation Measures

Construction Phase

4.2.1 In order to reduce the construction dust emission from the Project, regular watering and other good site practices should be implemented. All the recommended good practices are summarised in the Environmental Mitigation Implementation Schedule (EMIS) in **Appendix 4.1**.

Operational Phase

4.2.2 Adverse air quality impacts during operational phase are not anticipated. Hence, mitigation measures are not required.

4.3 Air Quality Monitoring Parameters

4.3.1 Monitoring and audit of the Respirable Suspended Particulate (RSP) and Fine Suspended Particulate (FSP) levels shall be carried out by the ET to ensure that any deteriorating air quality could be readily detected and timely actions could be taken to rectify the situation.

4.3.2 1-hour and 24-hour rolling average RSP, and 24-hour rolling average FSP levels shall be measured continuously to indicate the impacts of construction dust on air quality. The hourly RSP and FSP levels shall be measured by Particulate Matter (PM) sensors.

4.3.3 All relevant data including temperature, pressure, weather conditions, wind direction and speed, reading from the monitoring equipment, and any other local atmospheric factors affecting or affected by site conditions, etc., shall be recorded down in detail. A sample data sheet is shown in **Appendix 4.2**.

4.4 Monitoring Equipment

4.4.1 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 under-stood 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. The best practices and recommendations in "The Enhanced Air Sensor Guidebook" (USEPA, 2022), USEPA's Air Sensor Toolbox website or equivalent should be followed.

4.4.2 PM sensor complying with the following specifications shall be used for carrying out the 1-hour and rolling 24-hour average RSP, and rolling 24-hour average FSP monitoring:

- Capable of real-time monitoring for RSP and FSP;
- Averaging period: 1 hour and 24 hour;
- Concentration range: 0 – 1000μg/m^3;
- Resolution: at least 1μg/m^3;
- Accuracy: ± 10% to standard particles;
- Equipped with a shelter to protect the sensor; and
- Capable of operating continuously for a 7 days period.

4.5 Monitoring Methodology

Measuring Procedure

4.5.1 The ET is responsible for the provision, installation, operation, maintenance, dismantle of the monitoring equipment. They shall ensure that sufficient number of PM sensors are available for carrying out the monitoring and ad hoc monitoring.

4.5.2 General measurement procedures involved in the impact 1-hour and rolling 24-hour average RSP, and rolling 24-hour average FSP monitoring are summarised below. The exact measurement procedures will be subject to different brands of the PM sensor as described in the respective user manual.

- Mount the PM senor on a tripod or other solid structure at 1.5mAG;
- Ensure the PM sensor is properly connected to secured supply of electricity / batteries;
- Power up the PM sensor and connect the PM sensor to data management software via wired or wireless means;
- Check if the measurement data could be proper transferred to the data management software;
- Check if the measurement data could be properly stored; and
- Start the dust measurement with the site conditions and dust sources at the nearby area being properly recorded in a record sheet.

4.5.3 Wind data monitoring equipment shall also be provided and set up for logging wind speed and wind direction near the dust monitoring locations. The equipment installation location shall be proposed by the ET and agreed with the IEC. For

installation and operation of wind data monitoring equipment, the following points shall be observed:

- The wind sensors should be installed at an elevated level 10 meters above ground so that they are clear of obstructions or turbulence caused by buildings;
- The wind data should be captured by a data logger, the data recorded in the data logger shall 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.

4.5.4 On-site checking of the PM sensor shall be conducted by ET and agreed by IEC on the following approach:

- Prepare a transfer standard for PM monitoring, which has been calibrated against a PM reference monitor (i.e. the Federal Reference Methods (FRM) or Federal Equivalent Method (FEM) PM monitor);
- The inlets of the transfer standard and the monitoring equipment shall be collocated at the same height with a horizontal separation distance of less than 1 m;
- Warm-up the transfer standard on-site if necessary;
- Collocated monitoring shall be conducted in a continuous period to collect at least 20 valid 10-minute average measurements. The valid data rate shall be at least 80% during the collocation period; and
- The performance metrics and target values are shown in **Table 4.5.1**. If the performance of the monitoring equipment fails to meet the target values, the monitoring equipment needs to be re-calibrated or replaced.

Table 4.5.1 Recommended performance metrics and target values for on-site verification of PM monitoring equipment

Performance Metric		Target Value
Tier 1		
Bias	Slope	1.00±0.25
Linearity	Coefficient of Determination (R^2)	>0.70
Tier 2 If Tier 1 criteria are not met due to narrow range of PM concentration (>30 μg/m^3 and >25 μg/m^3 as recommended span range for RSP and FSP, respectively) during the collocation period, Tier 2 will apply.		
Error	Root Mean Squared Error (RMSE)	<8 μg/m^3 for RSP <5 μg/m^3 for FSP

Calibration of PM Sensor

Transfer Standard (TS)

4.5.5 A TS is another PM monitor that is at least as capable as the 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, a TS can be used on-site, the TS itself needs to be calibrated e.g. collocating with an PM reference monitor, such as the FRM or 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.

On-site Calibration

4.5.6 The TS should be placed near (less than 1 m if practicable) the sensor to be calibrated so that both devices would be monitoring a similar environment. The TS is then turned on to warm-up for 30 to 60 minutes. The collocation period starts after the warm-up and TS is then left running with the sensor to be calibrated for at least three hours. The measurements from the sensor to be calibrated and the TS during the collocation period will be statistically analyzed.

Quality Control Criteria

4.5.7 The response of the sensor should be adjusted if its performance during on-site calibration does not meet the following evaluation criteria. For each device, data below its detection limit will be excluded.

Tier 1: Correlation

4.5.8 The minute average measurements from the two devices when subject to linear regression should have a coefficient of determination (R2)>0.7. The regression line slope should be between 0.75 to 1.25. If these criteria are not met due to narrow range of PM concentration (more than 30 $\mu g/m^3$ and more than 25$\mu g/m^3$ as recommended span range for RSP and FSP, respectively) during the collocation period, Tier 2 will apply.

Tier 2: Root mean squared error

4.5.9 The root mean squared error of the sensor minute average measurements should be less than 8 $\mu g/m^3$ for RSP and less than 5 $\mu g/m^3$ for FSP.

Frequency

4.5.10 Each deployed sensor should be calibrated every month. If a sensor repeatedly failed in 2 or 3 consecutive calibrations, the sensor should be checked and maintained to improve its performance or replaced.

Construction Dust Monitoring Plan

4.5.11 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.

4.5.12 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.

4.6 Monitoring Location during Construction Phase

4.6.1 **Figure 4.1** shows the locations of the proposed construction dust monitoring stations. The status and location of ASRs may change after issuing this Manual. If such cases exist, the ET shall propose alternative monitoring locations and seek approval from PM and agreement from the IEC and EPD. The locations of construction dust monitoring stations shall be reviewed and revised during detailed design on the basis of the latest information of the Project. The exact location of the dust monitoring point may be subject to minor adjustments in response to site conditions, as determined by the ET.

Table 4.6.1 Proposed Construction Dust Monitoring Locations and Monitoring Periods

Monitoring Station ID	ASR ID	Location	Construction Activity	Approximate Horizontal Distance from the Proposed Works Area (m)	Monitoring Period [1]
Existing ASRs					
DM1	A011	Hong Kong Society for The Blind Factory	• Site clearance; • Foundation works (including site excavation, site formation and slope works) for viaduct, stations and the depot; • Construction of viaduct sections of about 6 km long and the associated piles; • Construction of a tunnel section of about 1 km long under Black Hill between Lam Tin Park and Pik Wan Road; • Construction of 9 stations including CHE, CWA, SLE, SON, SMP, POT, MYT, LTN and YTE; and station entrances and the associated pedestrian linkage facilities; • Construction of the Depot; • Construction of ancillary buildings including ventilation building and emergency access points for the tunnel section	Within boundary	Throughout the construction period of corresponding activity
DM2	A017	Choi Wan St. Joseph's Primary School Basketball Court		<10	
DM3	A018	Choi Wan Estate Pak Fung House		<10	
DM4	A184	Caritas Cable & Wireless Shelter		10	
DM5	A028	Choi Wan Estate Boon Yuet House		15	
DM6	A029	Haven of Integrated Vocational Rehabilitation Services Centre		<10	
DM7	A033	Sing Yin Secondary School Basketball Court		10	
DM8	A035	St. Joseph's Anglo-Chinese School		20	
DM9	A055	Shun Lee Estate Lee Yip House		<10	
DM10	A056	Shun Lee Estate Lee Yat House		<10	
DM11	A062	Shun Chi Court Shun Fai House		<10	
DM12	A198	Shun Chi Court Shing Fai House		<10	
DM13	A082	Ning Po No. 2 College		10	
DM14	A083	Shun Tin Estate Basketball Court		10	
DM15	A086	On Tai Estate Yung Tai House		70	
DM16	A087	On Tai Estate Kam Tai House		20	
DM17	A090	On Sau Road Park		20	
DM18	A092	On Tat Shopping Centre North Wing		25	
DM19	A096	Sau Mau Ping Estate Sau Lok House		20	
DM20	A191	Sau Mau Ping Estate Sitting-out Area		75	
DM21	A110	Sau Mau Ping Catholic Primary School		20	
DM22	A112	Sau Mau Ping Catholic Primary School Basketball Court		15	
DM23	A199	Badminton Court near Po Tat Estate Tat Chui House		15	
DM24	A114	Po Tat Estate Tat Yan House		25	

Monitoring Station ID	ASR ID	Location	Construction Activity	Approximate Horizontal Distance from the Proposed Works Area (m)	Monitoring Period [1]
DM25	A115	Po Tat Estate Tat Yi House		15	
DM26	A117	Po Tat Estate Basketball Court and Park		65	
DM27	A119	Village House at 3-4 Ma Yau Tong		50	
DM28	A122	Village House at 261A Ma Yau Tong		55	
DM29	A136	St. Edward's Catholic Primary School		10	
DM30	A137	Tak Tin Estate Tak King House		10	
DM31	A138	Tak Tin Estate Tak Lai House		10	
DM32	A141	Tak Tin Estate Tak Yee House		25	
DM33	A143	Tak Tin Estate Tennis Court		35	
DM34	A145	Hong Nga Court Heng Nga House		10	
DM35	A146	Ping Tin Estate Ping Shing House		50	
DM36	A151	Kwong Ching House		10	
DM37	A152	Chung Pak House		35	
DM38	A166	Yau Mei Court Yun Mei House		10	
DM39	A177	Yau Mei Court Ho Mei House		15	
DM40	A178	Ko Cheung Court Ko Hang House		<10	
Planned ASRs					
DM41	P013	Planned Residential Care Home for The Elderly cum Day Care Unit at Ko Hei Court	• Site clearance; • Foundation works (including site excavation, site formation and slope works) for viaduct, stations and the depot; • Construction of viaduct sections of about 6 km long and the associated piles; • Construction of YTE station and station entrances and the associated pedestrian linkage facilities;	20	Throughout the construction period of corresponding activity

Notes:
[1] The monitoring period is subject to the construction programme of the relevant contracts in the construction phase.
[2] The exact location of the dust monitoring point may be subject to minor adjustments in response to site conditions.

4.6.2 When alternative monitoring locations are proposed, the proposed locations should, as far as practicable:

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

4.6.3 The ET shall agree with IEC on the position of the PM sensor. When positioning the sensor, the following points shall be noted:

- A horizontal platform with appropriate support to secure the sensors against gusty wind should be provided;
- The distance between the sampler and an obstacle, such as buildings, should be at least twice the height that the obstacle protrudes above the sensors;
- A minimum of 2m of separation from walls, parapets and penthouses is required for rooftop sensors;
- A minimum of 2m separation from any supporting structure, measured horizontally is required;
- No furnace or incinerator flue is nearby;
- Airflow around the sampler is unrestricted;
- The sampler is more than 20m from the dripline;
- Any wire fence and gate, to protect the sensors, should not cause any obstruction during monitoring;
- Permission must be obtained to set up the sensors and to obtain access to the monitoring stations; and
- A secured supply of electricity / batteries is needed to operate the sensors.

4.6.4 The ET may, depending on site conditions and monitoring results, decide whether additional monitoring locations shall be included or any monitoring locations could be removed / relocated during any stage of the construction phase, upon the agreement from the IEC and EPD.

4.7 Impact Monitoring

4.7.1 The ET shall carry out impact monitoring during major construction activities for the Project as specified in **Table 4.6.1**. Continuous RSP and FSP monitoring should be undertaken throughout the construction stage.

4.7.2 The monthly schedule of the impact monitoring programme should be drawn up by the ET one month prior to the commencement of the scheduled construction period. Before commencing impact monitoring, the ET shall inform the IEC of the impact monitoring programme such that the IEC can conduct on-site audit.

4.8 Action and Limit Levels

4.8.1 The ET shall compare the impact monitoring results with air quality criteria set up for 1-hour and rolling 24-hour average RSP, and rolling 24-hour average FSP. **Table 4.8.1** shows the air quality criteria, namely Action and Limit Levels to be used. The Action and Limit Levels may be subject to the change based on the prevailing AQOs implemented at the time of the dust monitoring works. The ET should agree with EPD on the action and limit levels prior to commencement of the monitoring.

Table 4.8.1 Action Level and Limit Level for Air Quality (Dust)

Action Level	Limit Level
1-hour RSP level = 128 µg/m^3	24-hour RSP level (rolling average) = 75 µg/m^3 24-hour FSP level (rolling average) = 37.5 µg/m^3

4.9 Event and Action Plan

4.9.1 Should non-compliance of the air quality criteria occur, actions in accordance with the Event and Action Plan in **Table 4.9.1** shall be carried out.

Table 4.9.1 Event and Action Plan for Air Quality

Event	Action			
	ET	**IEC**	**PM**	**The Consortium**
Action level exceedance for one sample	1. Notify IEC and PM; 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; and 4. Assess effectiveness of the Consortium's remedial measures and keep IEC and PM informed of the results until exceedance stops.	1. Check monitoring data submitted by ET; 2. Check the Consortium's working method; 3. Discuss with ET, PM and the Consortium on possible remedial measures; 4. Advise PM and ET on the effectiveness of the proposed remedial measures; and 5. Supervise implementation of remedial measures.	1. Confirm receipt of notification of exceedance in writing; 2. Notify the Consortium; 3. In consultation with IEC and ET, agree with the Consortium on the remedial measures to be implemented; and 4. Ensure remedial measures are properly implemented.	1. Identify sources of exceedance and discuss with PM, ET and IEC on possible remedial measures; 2. Implement remedial measures; and 3. Amend working methods if appropriate.
Action level exceedance for two or more consecutive samples	1. Notify IEC and PM; 2. Check the monitoring data and the performance of the monitoring equipment (refer to **Section 4.5.4**); 3. If exceedance is confirmed, identify source(s), investigate the causes of exceedance and propose remedial measures; 4. Discuss with IEC and the Consortium on possible remedial measures required; 5. Assess effectiveness of the Consortium's remedial measures and keep IEC and PM informed of the results until exceedance stops; and 6. Notify EPD if the exceedance is confirmed to be related to the Project.	1. Check monitoring data submitted by ET; 2. Check the Consortium's working method and verify the performance of the monitoring equipment to be checked by ET (refer to **Section 4.5.4**); 3. Discuss with ET and the Consortium on possible remedial measures; 4. Advise PM and ET on the effectiveness of the proposed remedial measures; and 5. Supervise implementation of remedial measures.	1. Confirm receipt of notification of exceedance in writing; 2. Notify the Consortium; 3. In consultation with IEC and ET, agree with the Consortium on the proposal for remedial measures to be implemented; and 4. Ensure the proposal for remedial measures are properly implemented.	1. Identify the sources and discuss with PM, ET and IEC on possible remedial measures; 2. Submit a proposal for remedial measures to PM, IEC and ET within 2 working days of notification of exceedance for agreement; 3. Implement the agreed proposal; and 4. Amend proposal if appropriate.

Event	Action			
	ET	**IEC**	**PM**	**The Consortium**
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, PM, the Consortium and EPD; 2. Check the monitoring data and verify the performance of the monitoring equipment (refer to **Section 4.5.4**); 3. If exceedance is confirmed, identify source(s), investigate the causes of exceedance and propose remedial measures; 4. Discuss with IEC, PM and the Consortium on possible remedial measures required; 5. Assess effectiveness of the Consortium's remedial measures and keep IEC and PM informed of the results until exceedance stops; and 6. Notify EPD if the exceedance is confirmed to be related to the Project.	1. Check monitoring data submitted by ET; 2. Check the Consortium's working method and verify the performance of the monitoring equipment to be checked by ET (refer to **Section 4.5.4**); 3. Discuss with PM, ET and the Consortium on the possible remedial measures; 4. Advise PM and ET on the effectiveness of the proposed remedial measures; 5. Review the Consortium's remedial measures whenever necessary to assure their effectiveness and advise PM and ET accordingly; and 6. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of exceedance in writing; 2. Notify the Consortium; 3. In consultation with the IEC and ET, agree with the Consortium on the proposal for remedial measures to be implemented; 4. Ensure the proposal for remedial measures are properly implemented; and 5. If exceedance continues, identify what portion of the work is responsible and instruct the Consortium to stop that portion of work until the exceedance is abated.	1. Identify the sources and discuss with PM, ET and IEC on possible remedial measures; 2. Take immediate action to avoid further exceedance; 3. Submit a proposal for remedial measures to PM, 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; and 6. Stop the relevant portion of works as determined by PM until the exceedance is abated.

Notes:

ET – Environmental Team

IEC – Independent Environmental Checker

PM – Project Manager or Project Manager's Delegate

4.10 Audit Requirements

4.10.1 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.

5. Noise Impact

5.1 Introduction

5.1.1 The EIA Report has considered the potential noise impacts associated with the construction and operation of the Project. Construction noise arising from the construction activities, would be the major potential noise impacts during the construction phase. With the implementation of mitigation measures, adverse construction noise is not anticipated. Nevertheless, a Construction Noise Management Plan (CNMP) is required and will be submitted to the Director of Environmental Protection Department (DEP).

5.1.2 Transit system noise is not anticipated with the implementation of mitigation measures such as noise barriers. Nevertheless, a Noise Management Plan (NMP) is required and will be submitted to the DEP.

5.1.3 Adverse fixed noise impact from stations, ancillary buildings and depot is not anticipated with the proper implementation of noise control mitigation measures. Nevertheless, a Fixed Noise Source Management Plan (FNMP) is required and will be submitted to the DEP.

5.2 Mitigation Measures

Construction Phase

5.2.1 Adverse construction noise impact is not anticipated with the implementation of mitigation measures such as good site practices, use of quality powered mechanical equipment (QPME) and quieter construction methods, use of temporary noise barriers and noise enclosures to screen noise from relatively static PMEs, etc. All the recommended mitigation measures and good site practices are summarised in the EMIS given in **Appendix 4.1**.

5.2.2 The Consortium shall be required to prepare a CNMP with reference to Section 8 and Annex 21 of the EIAO-TM as well as Section 4.4.55 of the EIA Report and this EM&A Manual. CNMP containing a quantitative construction noise impact assessment, the adopted quieter construction method(s) and equipment, noise mitigation measures and the construction noise impact monitoring and audit programme will be submitted to the EPD, with reference to the updated and identified plant inventories once available before the commencement of the construction of the Project. It shall also include an implementation schedule clearly listing out the mitigation measures, the implementation party, location and timing of implementation.

Operational Phase

Transit System Noise

5.2.3 With the implementation of mitigation measures such as noise barriers and Low Noise Road Surfacing (LNRS), adverse transit system noise impact is not anticipated. In order to ascertain the effectiveness of mitigation measures in reducing the noise levels, transit system noise shall be monitored in the vicinity of the representative NSRs of the direct mitigation measures during the first year after commencement of operation. The Consortium shall be required to prepare a Noise

Management Plan (NMP) containing the quantitative transit system noise impact assessment and noise mitigation measures will be submitted to the EPD with reference to the updated noise source and the operation parameters, if any, in any case before commencement of construction of the Project.

Fixed Noise Source

5.2.4 For the proposed fixed noise sources, adverse noise impact from stations, ventilation building and depot is not anticipated with the properly selection of the equipment and installation of acoustic attenuators such as quieter plant, silencer, barriers, enclosures, etc. All of the noise mitigation measures during operational phase are summarised in the EMIS given in **Appendix 4.1**.

5.2.5 The Consortium shall be required to prepare a FNMP with reference to Section 8 and Annex 21 of the EIAO-TM as well as Section 4.6.10 of the EIA Report and this EM&A Manual. The FNMP containing the quantitative fixed noise source impact assessment, noise mitigation measures and the fixed noise source impact monitoring and audit programme will be submitted to the EPD, with reference to the updated and identified inventories and utilisation schedule once available and in any case before commencement of operation of the Project. If there is any change to the specifications of the planned fixed noise sources, layout design, operation modes, mitigation measures, or any other factors that would have implications on the fixed noise sources impact as concluded in the FNMP, an updated FNMP shall be submitted to the EPD no later than one month before the implementation of any such change. It shall also include an implementation schedule clearly listing out the mitigation measures, the implementation party, location and timing of implementation.

5.3 Noise Monitoring Parameter

Construction Phase

5.3.1 Construction noise level shall be measured in terms of the A-weighted equivalent continuous sound pressure level (L_{eq}). L_{eq} (30min) shall be used as the monitoring parameter for the time period between 0700 and 1900 hours on normal weekdays. If construction works are extended to include works during the hours of 1900 - 0700, and/or percussive piling is be carried out, applicable permits under NCO shall be obtained by the Consortium. The monitoring requirements and conditions stipulated in the permits have to be followed. A sample data sheet is shown in **Appendix 5.1**. Supplementary information for data auditing and statistical results such as L_{10} and L_{90} should also be obtained for reference.

Operational Phase

Transit System Noise

5.3.2 Airborne transit system noise commissioning test should be conducted prior to the operation of the Project and noise monitoring for the airborne transit system noise is recommended to verify the prediction.

Fixed Noise Sources

5.3.3 For the fixed noise sources from Public Address system at open structure stations, maintenance activities inside depot at Ma Yau Tong, opening or louvers of tunnel

ventilation building located at Black Hill, Emergency Access Point near Yau Lai Estate and mechanical ventilation system of plantrooms at stations, associated pedestrian linkage facilities and depot shall be conducted for comparison with Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites (IND-TM) for selecting appropriate Area Sensitive Ratings.

5.4 Monitoring Equipment for Construction and Operational Phases

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

5.4.2 Noise measurements should be made in accordance with standard acoustical principles and practices in relation to weather conditions. The wind speed shall be checked with a portable wind speed meter capable of measuring the wind speed in m/s.

5.4.3 The ET is responsible for the provision, installation, operation, maintenance and dismantling of the monitoring equipment. He shall ensure that sufficient noise measurement 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.

5.5 Construction Noise Monitoring

Monitoring Locations and Methodology

5.5.1 The locations of construction noise monitoring stations are summarised in **Table 5.4** and shown in Figure 5.1. The locations of construction noise monitoring stations shall be reviewed and revised during detailed design on the basis of the latest information of the Project.

Table 5.5.1 Proposed Construction Noise Monitoring Locations

Monitoring Station ID	NAP ID	Location	Key Construction Activity	Monitoring Period [1]
Existing NSRs				
NM1	HKB-N01	Hong Kong Society for the Blind (Factory for the Blind)	• Site clearance • Foundation works (including site excavation, site formation and slope works) for viaduct, stations and depot • Construction of viaduct • Construction of tunnel and portals • Construction of 9 stations including CHE, CWA, SLE, SON, SMP, POT,	Throughout the construction period
NM2	CWE-N17	Choi Wan Estate		
NM3	SJA-N04	St. Joseph's Anglo-Chinese School		
NM4	SLE-N12	Shun Lee Estate		
NM5	NPC-N01	Ning Po No.2 College		
NM6	OTA-N02	On Tat Estate		

Monitoring Station ID	NAP ID	Location	Key Construction Activity	Monitoring Period [1]
NM7	PTE-N09	Po Tat Estate	MYT, LTN and YTE and pedestrian linkage facilities • Construction of Depot • Construction of ventilation building • Construction of emergency access point	
NM8	MYT-N01	Ma Yau Tong Village		
NM9	HWC-N04	Hong Wah Court		
NM10	TTE-N01	Tak Tin Estate		
NM11	TTE-N07	Tak Tin Estate		
NM12	YLE-N01	Yau Lai Estate		
NM13	SAG-N03	Saint Antonius Primary School		
NM14	YMC-N05	Yau Mei Court		

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

- At locations close to the major site activities which are likely to have noise impacts;
- Close to the most affected existing noise sensitive receivers; and

5.5.3 For monitoring locations located in the vicinity of the sensitive receivers, care should be taken to cause minimal disturbance to the occupants during monitoring.

5.5.4 The construction noise monitoring station shall be at the lowest sensitive floor of each designated monitoring location and normally be at a position 1.2m above ground inside the building structures. If there is a problem with access to the normal monitoring station, an alternative position shall be chosen, and a correction to the measurement results should be made.

5.5.5 The ET shall agree with the IEC on the monitoring position and the corrections adopted. Once the positions for the monitoring stations are chosen, the baseline monitoring and the impact monitoring shall be carried out at the same positions.

5.5.6 The status and locations of the NSRs may change after issuing this Manual. In such case, the ET shall propose updated monitoring locations and seek approval from the PM and agreement from the IEC and EPD on the proposal.

Baseline Monitoring

5.5.7 The ET shall carry out baseline noise monitoring inside the buildings/structures in all noise monitoring station prior to the commencement of the construction works. There shall not be any construction activities in the vicinity of the stations during the baseline monitoring. Continuous baseline noise monitoring for the A-weighted levels L_{eq}, L_{10} and L_{90} shall be carried out daily for a period of at least two weeks in a sample period of 30 minutes between 0700 and 1900, and 5 minutes between 1900 and 0700 as well as all time at general holidays including Sundays. A schedule on the baseline monitoring shall be submitted to the PM and IEC for approval before the monitoring starts.

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

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

Impact Monitoring

5.5.10 During normal construction working hours (0700 to 1900, Monday to Saturday), monitoring of L_{eq}, (30min) noise levels shall be carried out at the agreed monitoring locations once every week in accordance with the methodology in the TM issued under NCO.

5.5.11 In case of non-compliance with the construction noise criteria, more frequent monitoring, as specified in the Event and Action Plan, 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.

5.5.12 The monthly schedule of the impact monitoring programme should be drawn up by the ET at least 2 weeks prior to the commencement of the scheduled construction period. Before commencing impact monitoring, the ET shall inform the IEC of the impact monitoring programme such that the IEC can conduct on-site audit.

Action and Limit Levels

5.5.13 The ET shall compare the construction noise monitoring results with noise criteria. **Table 5.5.2** and **Table 5.5.3** show the noise criteria, namely Action and Limit Levels to be used.

Table 5.5.2 Action and Limit Levels for Construction Noise Noise for Daytime

Time Period	Land Use	Action Level	Limit Level
0700 - 1900 hours on normal weekdays	• All domestic premises; • Temporary housing accommodation. • Hostels; • Convalescent homes; and • Homes for the aged	When one documented complaint is received	75
	• Places of public worship; • Courts of law; and • Hospitals and medical clinics		70
	• Educational institutions (including kindergartens and nurseries)		70 65 (During Examination)

Table 5.5.3 Action and Limit Levels for Construction Noise during Restricted Hours

Time Period	Area Sensitivity Rating (ASR)	Action Level	Limit Level, dB(A) [1]
All weekdays during the evening (1900 to 2300 hours), and general holidays (including Sundays) during the day and evening (0700 to 2300 hours)	A	When one documented	60 (45)
	B		65 (50)
	C		70 (55)

Time Period	Area Sensitivity Rating (ASR)	Action Level	Limit Level, dB(A) [1]
All days during the night-time (2300 to 0700 hours)	A	complaint is received	45 (30)
	B		50 (35)
	C		55 (40)

Note:
[1] Figures in brackets are ANLs for SPME construction work in designated areas.

Event and Action Plan

5.5.14 Should non-compliance of the noise criteria occur, actions in accordance with the Event and Action Plan in **Table 5.5.4** shall be carried out.

Table 5.5.4 Event and Action Plan for Construction Noise

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

Notes:
ET – Environmental Team
IEC – Independent Environmental Checker
PM – Project Manager or Project Manager's Delegate

5.6 Transit System Noise Commissioning Test and Operational Noise Monitoring

Transit System Noise

5.6.1 Before the Project is in operation, a commissioning test will be conducted by the ET for verification of EIA predictions and checking compliance of the airborne noise levels within the NCO noise criteria. Measurement of transit system noise levels will be carried out in the commissioning test at the proposed monitoring locations during night-time period, i.e. 2300-0700 before the Project is in operation. Background noise levels shall also be measured.

5.6.2 Monitoring of L_{eq} (30mins) transit system noise levels will be carried out at the proposed monitoring locations during night-time period, i.e. 2300-0700 on a monthly basis after the Project is in operation. Background noise levels shall also be measured. It is recommended to conduct the monitoring for the initial start-up for 6 months to verify the prediction. With compliance of the noise limit and agreement from IEC, the 6-month monitoring will be terminated.

Monitoring Equipment and Methodology

5.6.3 The monitoring equipment and methodology for transit system noise commissioning test and operational monitoring should be the same as those recommended for construction noise monitoring.

Monitoring Location

5.6.4 The most representative and affected Noise Sensitive Receiver (NSR) was selected as monitoring stations and details could be referred to EIA Report. The locations of transit system noise monitoring stations are summarised in **Table 5.6.1** and shown in **Figure 5.2**.

Table 5.6.1 Proposed Transit System Noise Monitoring Station

Monitoring Station ID	NAP ID	Location	Noise Mitigation Measures
NM15	SLE-N05	Shun Lee Estate	V1
NM16	SLE-N17	Shun Lee Estate	V2
NM12	YLE-N01	Yau Lai Estate	V3

Background Noise Monitoring

5.6.5 Existing L_{eq} (30 minutes) levels should be monitored at the monitoring locations without transit system running to obtain the ambient noise levels. Supplementary information for data auditing, statistical results, such as L_{max}, L_{10} and L_{90} should also be obtained for reference. After the transit system noise levels are measured (if measured directly), these ambient levels should be deducted from the measured L_{eq} (30 minutes) levels to obtain the operational noise levels in the absence of ambient noise.

Fixed Noise Sources Audit

5.6.6 The Consortium should also carry out a noise audit for all fixed noise sources before the operation of the Project, in order to ensure compliance of the noise levels with 5dB(A) below the appropriate Acceptable Noise Levels (ANLs) in the IND-TM or the prevailing background noise levels. The ANLs for different Area Sensitivity Ratings during different periods are summarised in the **Table 5.6.2**.

Table 5.6.2 ANLs for Fixed Noise Sources

Time Period	ANL, dB(A)		
	Area Sensitivity Rating A	**Area Sensitivity Rating B**	**Area Sensitivity Rating C**
Day (0700 to 1900 hours)	60	65	70
Evening (1900 to 2300 hours)	60	65	70
Night (2300 to 0700 hours)	50	55	60

6. Water Quality Impact

6.1 Introduction

6.1.1 The EIA Report has assessed the potential water quality impacts associated with the construction and operation of the Project. According to the EIA Report, adverse environmental impact is not anticipated during the construction and operational phases with proper implementation of the recommended mitigation measures and good site practices. Nevertheless, regular site environmental inspection is recommended during the construction phase to ensure that the recommended mitigation measures are properly implemented. No monitoring or audit is required in the operational phase.

6.2 Mitigation Measures

Construction Phase

6.2.1 During the construction phase, recommended mitigation measures such as good site practices to control construction site runoff, provision of perimeter drains, on-site treatment of construction works prior to discharge, etc., should be implemented. All the recommended mitigation measures are summarised in the EMIS in **Appendix 4.1**.

Operational Phase

6.2.2 With proper connection to the public stormwater drainage and sewerage systems and mitigation measure in place such as stormwater surface runoff discharged to the nearby government drainage system with provision of silt trap, standard oil interceptors and the practices outlined in ProPECC PN 1/23, adverse impact is not anticipated during the operational phase. Therefore, no water quality monitoring and site audit are required.

6.3 Environmental Monitoring and Site Audit Requirements

Construction Phase

6.3.1 Mitigation measures have been recommended in the EIA Report. The Consortium shall be responsible for the design and implementation of these good practices and mitigation measures. Regular audits and site inspection at least once per week should be carried out during the construction phase by the Consortium and ET to ensure that the recommended good practices have been properly implemented by the Consortium.

Operational Phase

6.3.2 Adverse water quality impacts during operational phase are not anticipated. Hence, monitoring and audit are not required.

7. Waste Management Implications

7.1 Introduction

7.1.1 The quantity, quality and timing for the generation of waste during construction phase have been estimated in the EIA Report. Measures including the opportunity for on-site sorting, reusing Construction and Demolition (C&D) materials etc., are devised in the construction methodology to minimise the surplus materials to be disposed. Chemical waste should be collected by licensed chemical waste collectors for proper disposal.

7.1.2 As there would be limited quantities of waste to be generated from the operation of the Project, no adverse environmental impacts would be anticipated with the implementation of good waste management practices. Monitoring and audit programme for the operational phase of the Project would not be required.

7.2 Mitigation Measures

Construction Phase

7.2.1 All the proposed mitigation measures during construction phase are stipulated in the EIA Report and summarised in **Appendix 4.1**.

7.2.2 Wastes will be handled in accordance with the relevant legislation and guidelines and with the implementation of the proposed mitigation measures, no adverse environmental impacts from waste management are anticipated. EM&A is required for waste management during the construction phase only and the effective management of waste arising during the construction phase will be monitored through the site audit programme. The aims of the waste audit are:

- To ensure the waste arising from the works are handled, stored, collected, transferred and disposed of in an environmental acceptable manner; and
- To encourage the reuse and recycling of material.

7.2.3 A trip-ticket system should be operated to monitor all movements of both inert and non-inert C&D materials for delivered to Public Fill Reception Facilities (PFRFs), disposal at landfill and chemical wastes which will be collected by licensed chemical waste collectors to licensed facilities for final treatment and disposal. All dump trucks engaged on site for delivery of inert C&D materials from the site to PFRFs and for disposal of non-inert C&D materials from the site to the landfill should be equipped with GPS or equivalent system for tracking and monitoring of their travel routings and parking locations to prohibit illegal dumping and landfilling of C&D materials. Record and analysis of data collected by the mentioned GPS or equivalent system should be kept. Recommendations have been made in the EIA Report to ensure proper treatment and proper disposal of these wastes and summarised in **Appendix 4.1**.

Operational Phase

7.2.4 For the general refuse from the employees within mainly the depot and partly from the tunnel ventilation buildings, it should be separated from chemical waste by

providing separated bins for storage to maximise the recyclable volume as far as practicable. A reputable waste collector should be employed to remove general refuse regularly to minimize odour, pest and litter impacts. Other than general refuse, opportunities for the reusing and recycling of chemical wastes should be explored where possible. As chemical waste is expected to be generated, a trip-ticket system should be operated in accordance with the Waste Disposal (Chemical Waste) (General) Regulation to monitor all movements of chemical wastes which will be collected by a licensed chemical waste collector to a licensed facility for final treatment and disposal. With proper management, adverse waste management implications are not anticipated.

7.3 Environmental Monitoring and Site Audit Requirements

Construction Phase

7.3.1 The Contractor shall be required to pay attention to the environmental standards and guidelines, carry out appropriate waste management and obtain the relevant licenses/ permits for waste disposal. The ET shall ensure that the Contractor has obtained from the appropriate authorities the necessary waste disposal permits or licenses including:

- Chemical Waste Disposal License under the Waste Disposal Ordinance (Cap 354);
- Dumping License under the Land (Miscellaneous Provisions) Ordinance (Cap 28); and
- Water Pollution Control Ordinance License under the Water Pollution Control Ordinance (Cap 358).
- The Contractor shall refer to EPD's Guidance Notes for license applications when applying for the license/ permit and the ET shall refer to these Guidance Notes for auditing purposes.

7.3.2 Regular audits and site inspections (i.e. on a weekly basis) should be carried out during the construction phase by the ET to ensure that the recommended good site practices and other mitigation measures recommended in the EIA Report and in **Appendix 4.1** 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, a Waste Management Plan (WMP) as part of the Environmental Management Plan (EMP) shall be prepared by the Contractor and submitted to the PM for approval. Documents including licenses, permits, disposal and recycling records should be reviewed and audited for compliance with the legislation and contract requirements. Monitoring of the implementation of the trip ticket system for disposal of C&D materials in accordance with DEVB TC(W) No. 6/2010 is also recommended.

Operational Phase

7.3.3 As it is anticipated that there would not be any insurmountable impacts during the operational phase, monitoring and audit requirements are not required.

8. Land Contamination Impact

8.1 Introduction

8.1.1 The EIA Report has assessed the land contamination associated with the Project. Based on desktop review findings, the information collected during the site surveys and from relevant government departments, no land contamination issue within the assessment area is anticipated.

8.2 Mitigation Measures

8.2.1 Potentially contaminating land uses or activities within the Project site were not identified and hence mitigation measures are not required.

8.3 Environmental Monitoring and Site Audit Requirements

Construction Phase

8.3.1 Environmental monitoring and audit are not required for construction phase.

Operational Phase

8.3.2 Environmental monitoring and audit are not required for operational phase.

9. Ecological Impact

9.1 Introduction

9.1.1 The EIA Report has evaluated the ecological impacts associated with the construction and operation of the Project and recommended ecological mitigation measures to avoid, minimise and compensate the impact arising from the Project.

9.1.2 The required mitigation measures to be adopted to avoid, minimise and mitigate for the ecological impacts arising from the Project were identified in **Section 9** of the EIA Report and are described in the following sections. The proposed ecological mitigation measures should be checked as an element of the environmental audit programme under the Project.

9.2 Mitigation Measures

Construction Phase

9.2.1 The proposed mitigation measures for ecological impacts are summarized in the EMIS in **Appendix 4.1**.

9.3 Environmental Monitoring and Site Audit Requirements

Monitoring of Woodland Compensation

9.3.1 The permanent loss of woodland (around 3.54 ha) will be mitigated by compensatory planting in Black Hill. Should reinstatement of the extent of woodland to be temporarily affected be confirmed not feasible in the detailed design stage, the loss will also be compensated in the same compensatory woodland planting site in Black Hill, the extent and area of which are subject to change. The planting list of tree species should include native tree species which will be directly impacted by the Project. Upon completion of the compensatory woodland planting works, a maintenance and monitoring programme on the compensation woodland at the compensatory woodland planting site should be undertaken during establishment period which normally takes at least 9 years. A monitoring programme would be provided in the Woodland Compensation Plan to be prepared by a qualified plant ecologist to monitor the health condition and survival of the seedlings/saplings to be planted. Monitoring of the compensatory woodland should be performed on a regular basis after the first planting, to monitor the survival and establishment of trees and wildlife use. Survey in each compensatory woodland location will commence after the first planting. Individuals of each planted species to be randomly selected will be tagged and their survival rate will be computed. Supplementary planting will be recommended if deemed necessary. Wildlife use of the planted vegetation will also be monitored. Details of the monitoring will be included in the Woodland Compensation Plan to be submitted during the detailed design stage and agreed with relevant authorities.

Preservation, Transplantation and Compensatory Planting of Flora Species of Conservation Importance

9.3.2 A pre-construction detailed vegetation survey should be conducted by an qualified plant ecologist, whose curriculum vitae should be submitted to the AFCD for

comments and approval beforehand, focusing on plant species of conservation importance, including but not limited to for the *Aquilaria sinensis*, *Artocarpus hypargyreus*, *Diospyros vaccinioides*, *Pavetta hongkongensis* and *Tectaria decurrens* recorded in the literature and current study, to update and verify their presence and/or abundance. In-situ preservation of plant species of conservation importance should be given priority where feasible. Transplantation and/or compensatory planting of seedlings would be recommended should on-site preservation be confirmed unfeasible with justification during the detailed design stage. Relevant measures (e.g. setting up plant protection zone) should be implemented, and monthly monitoring of the condition of the plant species of conservation importance to be preserved and site audit of the recommended protection measures should be conducted. A Preservation, Transplantation and Compensatory Planting Proposal, detailing (1) the quantity and location of preserved, transplanted and planted individuals of plant species of conservation importance and (2) the post-transplanting and/or post-planting monitoring frequency, should be prepared and submitted to relevant authorities for comments and approval in prior.

Capture and Translocation of Amphibian and Freshwater Invertebrate Species of Conservation Importance

9.3.3 A pre-construction detailed survey for amphibian and freshwater invertebrate species of conservation importance, including Lesser Spiny Frog, *Cryptopotamon anacoluthon* and *Nanhaipotamon hongkongense*, should be undertaken along and in the vicinity of ND-MYT by an qualified ecologist to be approved by the authority, prior to survey commencement. A Capture and Translocation Plan detailing the methodology of capture and translocation, identification of suitable recipient site(s) and the methodology of post-translocation monitoring, will be submitted to relevant authorities for prior approval.

10. Landscape and Visual Impact

10.1 Introduction

10.1.1 The EIA has recommended that EM&A for landscape and visual resources is undertaken during the design, construction and operational phases of the Project. The design, implementation and maintenance of landscape mitigation measures should be checked to ensure that any potential conflicts between the proposed landscape measures and any other works of the Project would be resolved at early as practical without affecting the implementation of the mitigation measures.

10.2 Mitigation Measures

10.2.1 The landscape and visual impact assessment of the EIA Report proposes a number of mitigation measures to ameliorate the landscape and visual impacts of the Project. These measures are listed in **Table 10.2.1** below and the implementation is summarised in the EMIS in **Appendix 4.1**.

Table 10.2.1 Proposed Mitigation Measures

ID No.	Mitigation Measures	Mitigate Landscape Impact	Mitigate Visual Impact
Construction Phase			
CM01	Tree Protection and Preservation	Y	-
CM02	Tree Transplantation	Y	-
CM03	Works Area and Temporary Works Areas	Y	-
CM04	Advance Implementation of Mitigation Planting	Y	-
Operational Phase			
OM01	Integrated Design Approach	Y	Y
OM02	NOT USED	-	-
OM03	Compensatory Planting Proposals	Y	Y
OM04	Post-Planting Monitoring	Y	Y
OM05	Treatment of Retaining Wall and Slopes	Y	Y
OM06	Design of Tunnel Portals	-	Y
OM07	Reinstatement and upgrading of disturbed Landscape Open Space	Y	Y

10.3 Environmental Monitoring and Site Audit Requirements

10.3.1 Site audit should be undertaken during the construction phase of the Project to check that the proposed landscape and visual mitigation measures are properly implemented and maintained as per their intended objectives. Site inspections should be undertaken monthly by the tree specialist or a qualified arborist or endorsed by a registered landscape architect engaged by ET during the construction period.

11. Cultural Heritage

11.1 Introduction

11.1.1 No sites of archaeological interest would be affected by the Project and associated works. The identified built heritage and other identified item are located separated from the proposed and associated works by some distances. The relevant works drawings and proposal shall be submitted to Antiquities and Monuments Office (AMO) for consideration. Mitigation measures required during and after the construction phase include a condition survey before and after the construction phase, ongoing vibration monitoring and any other monitoring identified in the condition survey and a buffer zone to provide physical separation between the heritage site from the works.

11.1.2 AMO should be informed immediately in case of discovery of antiquities / supposed antiquities, or buildings / structures both at-grade and underground with potential heritage value that would likely be affected by the development in the course of the project works in accordance for discussion of appropriate mitigation measures to be agreed by AMO before implementation by the Project Proponent to the satisfaction of AMO.

11.2 Mitigation Measures

Construction Phase

Archaeology

11.2.1 No adverse archaeological impact due to the proposed works is identified. As a precautionary measure, the Project Proponent and the Contractor are required to inform AMO immediately when any antiquities or supposed antiquities under the Antiquities and Monuments Ordinance (Cap. 53) are discovered during the course of works.

Built Heritage

11.2.2 Potential vibration impact rising from the Project may be a concern for St. Joseph's Home for the Aged, Dormitory A (GB-02), St. Joseph's Home for the Aged, Villa (GB-03) and St. Joseph's Home for the Aged, Gate House (GB-04). Special attention should be paid to design proposal, method of works and choice of machinery should be targeted to minimize adverse impacts to the items. Any vibration and building movement induced from the proposed works should be strictly monitored to ensure no physical damages made to the items during the course of works.

11.2.3 Monitoring proposal for the heritage sites, including checkpoint locations, installation details, response actions for each of the Alert/ Alarm/ Action (3As) levels and frequency of monitoring should be submitted for AMO's consideration before construction. The movement analysis will take into account the cumulative effect of various construction activities. Recommended 3As levels for Grade 2 and Grade 3 heritage site are as below:

Table 11.2.1 Recommended Alert / Alarm / Action Levels

Type of Monitoring for	Alert	Alarm	Action
Vibration (PPV)	5mm/s	6mm/s	7.5mm/s
Settlement	6mm	8mm	10mm
Tilting	1/2000	1/1500	1/1000

Note:
[1] Monitoring criteria would be subjected to review upon updates of grading status of heritage sites.

11.2.4 In addition, pre- and post-construction condition surveys are recommended for checking the condition of GB-02, GB-03 and GB-04. Such survey reports shall be submitted to AMO for record. Detailed mapping, extent, measurement and quantification should be included if structural damages and noticeable defects are surveyed. Regular and interval inspections or surveys may be considered if any irregularities are observed from the monitoring record, with circulation to AMO for record. The condition survey should include sufficient information on any signs of deterioration, damage, or structural weaknesses for evaluation in a comprehensive structural assessment. Building and/or Engineering professionals shall evaluate necessary repairs or restoration to ensure the Historic Building's structural integrity and safety, documenting their recommendations in separate assessment report. All survey and assessment reports shall be submitted to the AMO for record.

11.2.5 Potential indirect impacts (including ground-borne vibration, tilting and settlement) on or threaten the structural integrity of the Historic Building are anticipated under the next work stage, a geotechnical and structural prediction of the effects on the Historic Building should be conducted at the design stage or before the construction stage. Analysis is reminded to take into account of the cumulative effect due to various construction activities like blasting, foundation, tunnelling, drilling and excavation works. Submission of such professional predictions for both permanent and associated temporary works is required for AMO's record.

Operational Phase

11.2.6 As no direct impact to archaeology, built heritage and other identified items are anticipated, mitigation measures are not required for operational phase.

11.3 Environmental Monitoring and Site Audit Requirements

Construction Phase

11.3.1 Identified built heritages are located in the vicinity of the Project Site and hence mitigation measures and site audit are required for construction phase. Moreover, ongoing vibration monitoring, any other monitoring identified in the condition survey are required.

11.3.2 As no archaeological impact is expected during both construction and operational phases of the Project, monitoring and audit are considered not necessary.

Operational Phase

11.3.3 Environmental monitoring and site audit are not required during operational phase.

12. Hazard to Life

12.1 Introduction

12.1.1 The EIA Report concluded that with the implementation of proposed mitigation measures, no insurmountable potential risk arising from transportation and use of explosives is anticipated. Blasting activities regarding transportation and use of explosives should be supervised and audited by the competent site staff to ensure strict compliance with the blasting permit conditions. The operation of the Project does not involve any use of explosives, potential risk during operational phase is not envisaged.

12.2 Mitigation Measures

Construction Phase

12.2.1 Recommendations have been made for implementation to meet the EIAO-TM requirements as listed out in **Appendix 4.1**. Other good site practices and design measures as listed out in **Appendix 4.1** are also proposed to further minimize the potential risk.

Operational Phase

12.2.2 No specific mitigation measures are required as no potential risk during operational phase is envisaged.

12.3 Environmental Monitoring and Site Audit Requirements

Construction Phase

12.3.1 Blasting activities regarding transport and use of explosives should be supervised and audited by the competent site staff to ensure strict compliance with the blasting permit conditions. Therefore, additional environmental monitoring and site audit is not required.

Operational Phase

12.3.2 No specific mitigation measures are required as no potential risk during operational phase is envisaged. Hence, environmental monitoring and site audit are not required.

13. Landfill Gas Hazard Impact

13.1 Introduction

13.1.1 The EIA Report has documented the landfill gas (LFG) hazards associated with the Project. According to the EIA Report, with the provision of mitigation measures adverse impacts on the targets within the Project are not anticipated.

13.2 Mitigation Measures

Construction Phase

13.2.1 All the proposed precautionary and protection measures during construction phase are stipulated in the EIA Report and summarised in **Appendix 4.1**. These measures include appointment of Safety Officer, site safety measures, landfill gas monitoring and emergency management.

Operational Phase

13.2.2 During the operational phase, the following precautionary and protection measures will be provided and implemented whether practicable:

- Passive control measures (e.g. gas-resistant membrane, dense well-compacted concrete, and synthetic composite geotextiles);
- Active control measures (e.g. mechanical ventilation system);
- Gas barriers and gas vents;
- Regular LFG monitoring; and
- Entry safety procedures for confined spaces.

13.2.3 All the proposed mitigation measures during the operational phase are stipulated in the EIA Report and summarised in **Appendix 4.1**.

13.3 Environmental Monitoring and Site Audit Requirements

Construction Phase

13.3.1 Monitoring will be undertaken when construction works are carried out in area within the Consultation Zone. Monitoring would be undertaken when construction works are carried out in confined space within the CZ. The monitoring requirements and procedures specified in Paragraphs 8.23 to 8.28 of EPD's LFG Hazard Assessment Guidance Note are highlighted below:

- Periodically during ground-works construction, the works area should be monitored for methane, carbon dioxide and oxygen using appropriately calibrated portable gas detection equipment. The equipment should be intrinsically safe and calibrated according to the manufacturer's instructions.
- The monitoring frequency and areas to be monitored should be set down prior to commencement of works either by the Safety Officer or by an appropriate qualified person.

- 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.
- A standard form, detailing the location, time of monitoring and equipment used together with the gas concentrations measured, should be used when undertaking manual monitoring to ensure that all relevant data are recorded.
- Monitoring of excavations should be undertaken as follows:

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

  - at the ground surface before excavation commences;
  - immediately before any staff 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 the construction team is in the excavation.

  For excavations between 300mm 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 300mm deep, monitoring may be omitted, at the discretion of the Safety Officer or other appropriately qualified person.
- If methane (flammable gas) or carbon dioxide concentrations are in excess of the trigger levels or that of oxygen is below the levels specified in the Emergency Management in the following section, then evacuation would be initiated.

13.3.2 Depending on the results of the measurements, actions required would vary and should be set down by the Safety Officer or another appropriately qualified person. As a minimum these should encompass those actions specified in **Table 13.3.1** below.

Table 13.3.1 Actions in the Event of Gas Being Detected during Construction Phase

Parameter	Measurement	Action
Oxygen	< 19% v/v	Increase ventilation to restore oxygen to >19% v/v
	<18% v/v	Stop works Evacuate all personnel Increase ventilation further to restore oxygen to >19% v/v
Methane	>10% LEL	Post 'No Smoking' signs Prohibit hot works Increase ventilation to restore methane to <10% LEL
	>20% LEL	Stop works Evacuate all personnel Increase ventilation to restore methane to <10% LEL

Parameter	Measurement	Action
Carbon Dioxide	>0.5% v/v	Increase ventilation to restore carbon dioxide to <0.5%
	>1.5% v/v	Stop works Evacuate all personnel Increase ventilation to restore carbon dioxide to <0.5%

Operational Phase

13.3.3 When the detailed design of the Project is available, the Consortium is required to undertake review on this assessment taking into account of the more readily available detailed information to finalize the design of the LFG precautionary measures recommended in this report. The detailed design of gas precautionary measures and a LFG monitoring programme should be submitted to EPD for vetting.

13.3.4 During operation, regular monitoring of LFG should be conducted at buildings and enclosures within the Consultation Zone to verify the effectiveness and to ensure the continued performance of the implemented protection measures. Should abnormality be observed, it should be reported to EPD and the operator of the concerned landfills.

14. Site Environmental Audit

14.1 Site Inspection

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

14.1.2 The ET shall be responsible for formulating the environmental site inspection programme as well as the deficiency and action reporting system, and for carrying out the site inspections. The proposal for rectification, if any, should be prepared and submitted to the ET Leader and IEC by the Consortium.

14.1.3 Regular site inspections shall be carried out and led by the PM and attended by the Consortium and ET at least once per week during the construction phase. The IEC shall undertake regular site audit at least once per month to assess the performance of the Consortium(s). 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 conditions of locations outside the works area which is likely to be affected, directly or indirectly, by the construction site activities of the Project. The ET shall make reference to the following information in conducting the inspection. During the inspection, the following information should be referred to:

(i) EIA Report and the Manual recommendations on environmental protection and pollution control mitigation measures;

(ii) Ongoing results of the EM&A programme;

(iii) Works progress and programme;

(iv) Individual works methodology proposals (which shall include the proposal on associated pollution control measures);

(v) Contract specifications on environmental protection;

(vi) Relevant environmental protection and pollution control legislations; and

(vii) Previous site inspection results undertaken by the ET and others.

14.1.4 The Consortium shall keep the PM and ET Leader updated with all the relevant environmental related information on the construction contract necessary for him to carry out the site inspections. Site inspection results and associated recommendations for improvements to the environmental protection and pollution control efforts should be recorded and followed up by the Consortium in an agreed time-frame. The Consortium shall follow the procedures and time-frame as stipulated in the environmental site inspection, and the deficiency and action reporting system formulated by the ET, to report on any remedial measures subsequent to the site inspections.

14.1.5 The PM, ET and the Consortium should also carry out ad-hoc site inspections if significant environmental problems are identified. Inspections may also be required subsequent to receipt of a valid environmental complaint, or as part of the

investigation work, as specified in the Event and Action Plans for the EM&A programme.

14.2 Environmental Compliance

14.2.1 There are statutory requirements on environmental protection and pollution control requirements with which construction activities must comply.

14.2.2 In order to ensure the works comply with statutory requirements, all method statements of works should be submitted by the Consortium to the PM for approval and to the ET Leader to ensure sufficient environmental protection and pollution control measures have been included. EMIS is summarised in **Appendix 4.1**. Any proposed changes to the mitigation measures shall be certified by the ET Leader and verified by the IEC as conforming to the relevant information and recommendations contained in the EIA Report.

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

14.2.4 The Consortium should provide the update of the relevant documents to the ET Leader so that checking can be carried out. The document shall at least include the updated works progress reports, updated works programme, method statements, any application letters for different licenses / permits under the environmental protection laws, and copies of all valid licenses / permits. The site diary and environmental records shall also be available for inspection by the relevant parties.

14.2.5 After reviewing the document, the ET shall advise the IEC and the Consortium of any non-compliance with legislative requirements on environmental protection and pollution control so that they can timely take follow-up actions as appropriate. If the follow-up actions still result in potential violation of environmental protection and pollution control requirements, the PM and ET should provide further advice to the Consortium to take remedial action to resolve the problem.

14.2.6 Upon receipt of the advice, the Consortium shall undertake immediate actions to correct the situation. The PM and ET shall follow up to ensure that appropriate action has been taken in order to satisfy legal requirements.

14.3 Choice of Construction Method

14.3.1 At times during the construction phase, the Consortium may submit method statements for various aspects of construction. This state of affairs would only apply to those construction methods that the EIA has not imposed conditions while for construction methods that have been assessed in the EIA, the Consortium is bound to follow the requirements and recommendations in the EIA study. The Consortium's options for alternative construction methods may introduce adverse environmental impacts into the Project. It is the responsibility of the Consortium and ET, in accordance with established standards, guidelines and EIA study recommendations and requirements, to review and determine the adequacy of the environmental protection and pollution control measures in the Consortium's proposal in order to ensure no unacceptable impacts would result. To achieve this end, the ET shall provide a copy of the Proactive Environmental Protection

Proforma as shown in **Appendix 4.1** to the IEC for approval before commencement of work. The IEC should audit the review of the construction method and endorse the proposal on the basis of no adverse environmental impacts.

14.4 Environmental Complaints

14.4.1 The following procedures should be undertaken upon receipt of any environmental complaint:

- The Consortium to log complaint and date of receipt onto the complaint database and inform the PM, ET and IEC immediately;
- The Consortium to investigate, with the PM and ET, the complaint to determine its validity, and assess whether the source of the problem is due to construction works of the Project with the support of additional monitoring frequency and stations, if necessary;
- The Consortium to identify remedial measures in consultation with the IEC, ET and PM if a complaint is valid and due to the construction works of the Project;
- The Consortium to implement the remedial measures as required by the PM and to agree with the ET and IEC any additional monitoring frequency and stations, where necessary, for checking the effectiveness of the remedial measures;
- The PM, ET and IEC to review the effectiveness of the Consortium's remedial measures and the updated situation;
- The ET/ Consortium to undertake monitoring and audit to verify the situation if necessary, and oversee that circumstances leading to the complaint do not recur;
- If the complaint is referred by the EPD, the Consortium to prepare interim report on the status of the complaint investigation and follow-up actions stipulated above, including the details of the remedial measures and monitoring identified or already taken, for submission to EPD within the time frame assigned by the EPD; and
- The ET to record the details of the complaint, results of the investigation, subsequent actions taken to address the complaint and updated situation including the effectiveness of the remedial measures, supported by regular and additional monitoring results in the monthly EM&A reports.

15. Reporting

15.1 General

15.1.1 Reports can be provided in an electronic medium upon agreeing the format with the PM and EPD. This would enable a transition from a paper / historic and reactive approach to an electronic / real time proactive approach. All the monitoring data shall also be submitted on diskettes or other approved medium. The formats for monitoring data to be submitted shall be separately agreed.

15.1.2 Types of reports that the ET shall prepare and submit include monthly EM&A report and final EM&A review report. In accordance with Annex 21 of the EIAO-TM, a copy of the monthly reports and final EM&A review reports shall be made available to the Director of Environmental Protection.

15.2 Baseline Monitoring Report

15.2.1 The baseline monitoring report shall include at least the following:

(i) up to half a page executive summary;

(ii) brief project background information;

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

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

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

(v) details of influencing factors, including:

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

(vi) determination of the Action and Limit levels for each monitoring parameter and statistical analysis of the baseline data;

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

(viii) comments, recommendations and conclusions.

15.2.2 The ET should prepare and submit a baseline monitoring report at least two weeks before commencement of construction of the Project. Copies of the baseline monitoring report should be submitted to the IEC, the ER and EPD. The ET should liaise with the relevant parties on the exact number of copies required.

15.3 Monthly Monitoring Report

15.3.1 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 and endorsed by the IEC. The EM&A report shall be prepared and submitted to EPD within 10 working days of the end of each reporting month, with the first report within the month after major construction works commences. Copies of each monthly EM&A report shall be submitted to the following parties: the IEC, the PM and EPD. Before submission of the first EM&A report, the ET shall liaise with the parties on the required number of copies and format of the monthly reports in both hard copy and electronic medium.

15.3.2 The ET 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

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

(i) Executive summary (1-2 pages):

- Breaches of Action and Limit levels;
- Compliant log;
- Notifications of any summons and successful prosecutions;
- Reporting changes; and
- Future key issues.

(ii) Basic project information:

- Project organisation including key personnel contact names and telephone numbers;
- Programme;
- Management structure; and
- The work undertaken during the month.

(iii) Environmental status:

- Advice on the status of statutory environmental compliance such as the status of compliance with the environmental permit (EP) conditions under the EIAO, submission status under the EP and implementation status of mitigation measures;
- Works undertaken during the month with illustrations (such as location of works, daily excavation rate, etc.); and
- Drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring stations (with co-ordinates of the monitoring locations).

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

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

- Event and Action Plans;
- Environmental mitigation measures, as recommended in the 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 EIA Report.

(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;
- Monitoring parameters;
- Monitoring locations;
- Monitoring date, time, frequency, and duration;
- Weather conditions during the period;
- Any other factors which might affect the monitoring results; and
- QA / QC results and detection limits.

(vii) Report on non-compliance, complaints, and notifications of summons and successful prosecutions:

- Record of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- Record of all complaints received for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
- Record of all notification of summons and successful prosecutions for breaches of current environmental protection / pollution control legislation, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
- Review of the reasons for and the implications of non-compliances, 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;

- Record of any project changes from the originally proposed as described in the EIA Report (e.g. construction methods, mitigation proposals, design changes, etc.); and
- Comments (for example, effectiveness and efficiency of the mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions.

Subsequent Monthly EM&A Reports

15.3.4 Subsequent monthly EM&A reports shall include at least the following:

(i) Executive summary (1-2 pages):

- Breaches of Action and Limit levels;
- Compliant log;
- Notifications of any summons and successful prosecutions;
- Reporting changes; and
- Future key issues.

(ii) Basic project information:

- Project organisation including key personnel contact names and telephone numbers;
- Programme;
- Management structure; and
- The work undertaken during the month; and
- Any updates as needed to the scope of works and construction methodologies.

(iii) Environmental status:

- Advice on the status of statutory environmental compliance such as the status of compliance with the EP conditions under the EIAO, submission status under the EP and implementation status of mitigation measures;
- Works undertaken during the month with illustrations (such as location of works, daily excavation rate, etc.); and
- Drawings showing the Project area, any environmental sensitive receivers and the locations of the monitoring stations (with co-ordinates of the monitoring locations).

(iv) Implementation status:

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

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

- Monitoring methodology;
- Name of laboratory and types of equipment used and calibration details;

- Monitoring parameters;
- Monitoring locations;
- Monitoring date, time, frequency, and duration;
- Weather conditions during the period;
- Any other factors which might affect the monitoring results; and
- QA / QC results and detection limits.

(vi) Report on non-compliance, complaints, and notifications of summons and successful prosecutions:

- Record of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- Record of all complaints received for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
- Record of all notification of summons and successful prosecutions for breaches of current environmental protection / pollution control legislation, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
- Review of the reasons for and the implications of non-compliances, 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.

(7) 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;
- Record of any project changes from the originally proposed as described in the EIA (e.g. construction methods, mitigation proposals, design changes, etc.); and
- Comments (for example, effectiveness and efficiency of the mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions.

(vii) Appendices:

- Action and Limit levels;
- Graphical plots of trends of the monitoring parameters at key stations over the past four reporting periods for representative monitoring stations annotated against the following:
- Major activities being carried out on site during the period;
- Weather conditions during the period; and

- Any other factors that might affect the monitoring results;
- Monitoring schedule for the present and next reporting period;
- Cumulative statistics on complaints, notifications of summons and successful prosecutions; and
- Outstanding issues and deficiencies.

15.4 Final EM&A Review Report

15.4.1 The EM&A program should be terminated upon completion of the construction activities and insignificant environmental impacts of the remaining outstanding construction works, trend analysis to demonstrate the narrow down of monitoring exceedances due to construction activities and the return of ambient environmental conditions in comparison with baseline data and no environmental complaint and prosecution.

15.4.2 The proposed termination should only be implemented after the proposal has been endorsed by the IEC, the PM and the Project Proponent followed by approval from the Director of Environmental Protection.

15.4.3 The final EM&A report should contain at least the following information:

(i) Executive summary (1-2 pages):

(ii) Drawings showing the Project area, any environmental sensitive receivers and locations of monitoring 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 measure, as recommended in the EIA Report;
- Environmental impact hypotheses tested;
- Environmental quality performance limits (Action and Limit levels);
- All monitoring parameters; and
- Event and Action Plans.

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

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

- monitoring methodology;
- equipment used and calibration details;
- parameters monitored;
- monitoring locations (and depth); and
- monitoring date, time, frequency, and duration.

(vii) 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.

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

(ix) A review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate;

(x) A description of the actions taken in the event of non-compliance;

(xi) A summary record of all complaints received for each media, liaison and consultation undertaken, actions and follow-up actions taken and results;

(xii) A review of the validity of EIA predictions and identification of shortcomings in EIA recommendations;

(xiii) A summary record of notification of summons, successful prosecutions for breaches of environmental protection/pollution control legislation, and actions taken to rectify such breaches;

(xiv) Comments (for example, a review of the effectiveness and efficiency of the mitigation measures and of the performance of the environmental management system, that is, of the overall EM&A programme); and

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

15.5 Data Keeping

15.5.1 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 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 on magnetic media form or other agreed media, and the software copy must be available upon request. All documents and data shall be kept for at least one year following completion of the construction contract.

15.6 Interim Notifications of Environmental Quality Limit Exceedances

15.6.1 With reference to the Event and Action Plans, when the environmental quality performance limits are exceeded and if they are proven to be valid, the ET should immediately notify the IEC and EPD, as appropriate. The notification should be followed up with advice to the 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 notification is presented in **Appendix 15.1**.