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## **12. ENVIRONMENTAL MONITORING AND AUDIT REQUIREMENTS**

### **12.1 Introduction**

12.1.1 This section provides a summary of the requirements of Environmental Monitoring and Audit (EM&A) for the construction and operation phases of the Project based on the assessment results of the various environmental issues in the preceding sections. Details of the EM&A requirements are provided in a stand-alone EM&A Manual.

### **12.2 EM&A Manual**

12.2.1 A stand-alone EM&A Manual has been prepared for this Project as part of the EIA study. The EM&A Manual defines the mechanisms for implementing the EM&A requirements specific to each phase of the work. The EM&A Manual provides a description of the organisational arrangements and resources required for the EM&A programme based on the conclusions and recommendations of this EIA. It stipulates details of the construction monitoring required and actions that shall be taken in the event of exceedances of the environmental criteria. In effect, the EM&A Manual forms a handbook for the on-going environmental management during construction.

12.2.2 The EM&A Manual comprises descriptions of the key elements of the EM&A programme including:

- Appropriate background information on the construction of the Project with reference to relevant technical reports;
- Organisational arrangements, hierarchy and responsibilities with regard to the management of environmental performance during the construction phase. The EM&A team, the Engineering team, the Contractor(s) team and the project proponent's representatives are included;
- A broad construction programme indicating those activities for which specific mitigation is required and providing a schedule for their timely implementation;
- Descriptions of the parameters to be monitored and criteria through which performance will be assessed including: monitoring frequency and methodology, monitoring locations (typically, the location of sensitive receivers as listed in the EIA), monitoring equipment lists, event contingency plans for exceedances of established criteria and schedule of mitigation and best practice methods for reduced adverse environmental impacts;

- Procedures for undertaking on-site environmental performance audits as a means of ensuring compliance with environmental criteria; and
- Reporting procedures.

12.2.3 The EM&A Manual will be a dynamic document which will undergo a series of revisions, as needed, to accommodate the progression of the construction programme.

12.2.4 The objectives of carrying out EM&A for the Project include:

- Providing baseline information against which any short- or long-term environmental impacts of the Project can be determined;
- Providing an early indication should any of the environmental control measures or practices fail to achieve the acceptable standards;
- Monitoring the performance of the Project and the effectiveness of mitigation measures;
- Verifying the environmental impacts identified in the EIA;
- Determining Project compliance with regulatory requirements, standards and government policies;
- Taking remedial action if unexpected results or unacceptable impacts arise; and
- Providing data to enable an environmental audit to be undertaken at regular intervals.

12.2.5 The following sections summarise the recommended EM&A requirements and further details are provided in the EM&A Manual.

### **12.3 Air Quality**

#### **Introduction**

12.3.1 No specific air quality monitoring is necessary during construction phase. Monthly site inspections and audits should be conducted during the construction phase to ensure that the recommended mitigation measures are properly implemented to reduce the air quality impacts from the Project.

### **12.4 Noise**

12.4.1 Noise monitoring is recommended during the construction phase to ensure compliance with the noise criterion at the noise sensitive receivers (NSRs).

Weekly noise monitoring will be undertaken between 0700-1900 hours during working days at the representative NSRs. The noise monitoring locations are presented in the EM&A Manual.

12.4.2 Weekly site inspections and audits will be conducted to ensure that the recommended mitigation measures are properly implemented during the construction phase.

12.4.3 Details of the EM&A programme for noise are presented in the EM&A Manual.

## **12.5 Water Quality**

12.5.1 A water quality monitoring programme is proposed during the construction of the Project.

### **Construction Phase**

12.5.2 Baseline monitoring should be undertaken three times per week for a period of four weeks before commencement of the construction works to establish baseline water quality conditions of the area. Impact monitoring should be undertaken three times per week during the construction period to obtain water quality data of the area throughout the construction period for comparison with the baseline water quality data and hence determine any water quality impacts from the construction activities. Post Project monitoring should also be undertaken three times per week for four weeks after the completion of construction works.

12.5.3 Weekly site inspections and audits will be conducted to ensure that the recommended mitigation measures are properly implemented during the construction stage.

### **Operation Phase**

12.5.4 Unacceptable water quality impacts are not expected during the operation of the Project. Therefore, environmental monitoring and audit for water quality is not recommended for the operation phase of the Project.

12.5.5 Details of the EM&A programme for water quality are presented in the EM&A Manual.

## **12.6 Waste Management**

### **Construction Phase**

12.6.1 To facilitate monitoring and control over the contractors' performance on waste management, regular waste audit will be implemented throughout the construction phase and a Waste Management Plan (WMP) will be prepared and

implemented by the contractor in accordance with *ETWB TC(W) No. 19/2005*. The aims of the waste audit are:

- To review the WMP, which will form part of the Environmental Management Plan (EMP) in accordance with *ETWB TC(W) No. 19/2005*, including the quantities and types of construction and demolition (C&D) materials generated, reused and disposed of off-site; the amount of fill materials exported from/imported to the site and the quantity of timber used in temporary works construction for each process/activity;
- To monitor the implementation and achievement of the WMP on site to assess its effectiveness; and
- To monitor the follow-up actions on deficiencies identified.

12.6.2 Site inspections will be undertaken every week. Particular attention will be given to the contractor's provision of sufficient spaces, adequacy of resources and facilities for on-site sorting and temporary storage of C&D materials. The C&D materials to be disposed of from the site will be visually inspected to ensure the absence of non-inert materials (e.g. general refuse, timber, etc). The waste to be disposed of at landfills will as practicable contains no observable inert or reusable/recyclable C&D materials (e.g. soil, broken rock, metal, and paper/cardboard packaging, etc). Any irregularities observed during the site inspections will be raised promptly to the contractor for rectification.

12.6.3 The findings of the waste inspections will be reported in the monthly Environmental Monitoring and Audit Report.

### ***Operation Phase***

12.6.4 No monitoring and audit is required during operation of the Project.

## **12.7 Land Contamination**

12.7.1 To ensure that the construction contractor has implemented the recommended mitigation measures, regular site inspections and audits during construction phase should be conducted in accordance with the EM&A Manual. The visual inspections / audits should look at all aspects of construction activities that disturb soil.

**12.8 Ecology*****Construction Phase*****Egretry**

- 12.8.1 Prior to any construction activities, surveys of the Ping Che egrettry should be conducted to confirm its location and status.
- 12.8.2 During the construction phase, construction works within 100m radius from the egrettry will be avoided during breeding months (March – August). Also, monthly egrettry survey during breeding months in construction period will be conducted.

**Transplantation of Flora Species of Conservation Importance**

- 12.8.3 As a precautionary measure, it is recommended to conduct a vegetation survey within the works area prior to the commencement of drainage improvement works. The survey should be conducted by a qualified ecologist/ botanist. Should any rare/protected plant species be found within the area, the survey will record their conditions, numbers and locations. The survey will also determine the number and locations of the individuals to be affected and evaluate the suitability and/or practicality of transplantation, where identified plants could not be avoided.

**Translocation of Amphibian Species of Conservation Importance**

- 12.8.4 Monitoring surveys will be conducted for the translocated amphibians. The effectiveness of the translocation programme will be assessed through surveys in breeding habitats and determine whether breeding occurs. Evidence of breeding will include calling males, findings of eggs and tadpoles. At least three surveys will be conducted in each release site after the translocation. Surveys will be carried out during the breeding season of Chinese Bullfrog (March to September). In addition, the monitoring survey should also record presence of aquatic fauna species (if any).

***Operation Phase***

- 12.8.5 No monitoring and audit is required during operation of the Project.

**12.9 Fisheries**

- 12.9.1 As no direct or indirect fisheries impacts are anticipated during construction or operational phases, no specific monitoring programme for fisheries is required. Regular inspections and audits should be undertaken to ensure the effectiveness

of the mitigation measures and good site practices recommended during construction phase for further controlling the water quality impacts, as these measures also serve to protect fisheries resources. Details of the EM&A programme are presented in the EM&A Manual.

## **12.10 Cultural Heritage**

12.10.1 Special attention should be paid to avoid potential adverse physical impact arising from the proposed works to two Grade 3 historic buildings (GB-06 and GB-07). Design proposal, method of works and choice of machinery should be targeted to minimize potential adverse impacts to these heritage sites.

12.10.2 During pre-construction stage of the Project and implemented by the works contractor, a baseline condition survey and baseline vibration impact assessment be conducted for two Grade 3 historic buildings (GB-06 and GB-07) by a qualified building surveyor or qualified structural engineer to evaluate on the necessary construction monitoring and structural strengthening measures for AMO's consideration. If any vibration and building movement induced from the proposed works should be monitored to ensure no disturbance and physical damages made to the heritage sites during the course of works, 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. .

12.10.3 During pre-construction stage of the Project implemented by the works contractor, a baseline condition survey and baseline vibration impact assessment should be conducted for sixteen (16) built heritage items (HB-14, HB-15, HB-16, HB-40, HB-43, HB-44, HB-46, HB-48, HB-49, HB-50, HB-51, HB-53, HB-54, HB-55, HB-56 and HB-72) by a qualified building surveyor or qualified structural engineer to define the vibration limit (a vibration limit at 15mm/s could be adopted for the built heritage items) and to evaluate if construction vibration monitoring and structural strengthening measures are required during construction phase to ensure the construction performance meets with the vibration standard.

12.10.4 As a precautionary measure, it is recommended that during construction stage of the Project adjacent to six (6) built heritage items (HB-40, HB-51, HB-53, HB-54, HB-55 and HB-56), proper access and space shall be allowed to the shrines so that the local practice of rituals will not be affected.

12.10.5 Details of the EM&A programme are presented in the EM&A Manual.

## **12.11 Landscape and Visual**

### ***Construction Phase***

- 12.11.1 The landscape and visual mitigation measures proposed should be incorporated in the Construction Contract.
- 12.11.2 Site audits should be undertaken monthly during the construction phase of the Project to ensure that the proposed mitigation measures and good site practices proposed to manage and mitigate landscape and visual impacts, are implemented.

### ***Operation Phase***

- 12.11.3 A specialist landscape subcontractor should be employed for the implementation of tree and landscape works and subsequent maintenance operations during the establishment period.
- 12.11.4 Site audits should be undertaken bi-monthly for 12 months after operation begins, to ensure newly planted vegetation remain healthy.
- 12.11.5 After the 12-month establishment period for soft landscaping, standard maintenance will be required to ensure mitigation measures to retain their full efficacy.
- 12.11.6 Details of the EM&A programme for landscape and visual are presented in the EM&A Manual.

## **12.12 Implementation Schedule**

- 12.12.1 An Implementation Schedule of the environmental mitigation measures recommended in the EIA study has been prepared in form of a checklist. The Implementation Schedule is presented in *Appendix 12.1* and also attached to the EM&A Manual.

**END OF TEXT**