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13 Environmental Monitoring and Audit (EM&A) Requirements

13.1 Introduction

13.1.1.1 This section summarizes the requirements on environmental monitoring and audits for the construction and operation of the Project based on the assessment results of various environmental issues. Details of the Environmental Monitoring and Audit (EM&A) programme can be referred to the separate EM&A Manual.

13.2 EM&A Manual

13.2.1.1 EM&A is an important aspect in the EIA process which specifies the timeframe and responsibilities for the implementation of environmental mitigation measures. The requirements on environmental monitoring (including baseline and impact monitoring) are given in the EM&A Manual.

13.2.1.2 A project specific EM&A Manual to the Project has been prepared as part of the EIA deliverables based on the latest design information available and Environmental Protection Department (EPD)'s generic EM&A Manual. The project specific EM&A Manual highlights the following issues:

- Organisation, hierarchy and responsibilities of the Contractor, the Project Manager (PM) or Project Manager's Representative (PMR), Environmental Team (ET) and Independent Environmental Checker (IEC) with respect to the EM&A requirements during construction phase of the Project;
- Information on project organisation and programming of construction activities for the Project;
- Requirements with respect to the construction schedule and necessary EM&A programme to track the varying environmental impacts;
- Full details of methodologies to be adopted, including all field, laboratory and analytical procedures, and details on quality assurance;
- Procedure for undertaking on-site environmental audits;
- Definition of Action and Limit Levels;
- Establishment of Event and Action Plans;
- Requirements for reviewing pollution sources and working procedures required in the event of non-compliance of environmental criteria and complaints;
- Requirements for reviewing the implementation of mitigation measures, and effectiveness of environmental protection and pollution control measures adopted; and
- Presentation of requirements for EM&A data and appropriate reporting procedures.

- 13.2.1.3 The Contractor shall be requested to review and adhere to the mitigation measures and Environmental Mitigation Implementation Schedule (EMIS) with respect to the design developments and construction methodology. 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.

13.3 Environmental Mitigation Implementation Schedule

- 13.3.1.1 An EMIS has been prepared alongside the EM&A of this EIA to summarise all the mitigation measures required to be implemented during the design, the construction and operational phases of the Project. The implementation responsibilities have also been identified in the EMIS. The EM&A Manual has also presented the requirements for environmental monitoring and audit (e.g. monitoring and audit frequency) throughout the construction phase.

13.4 EM&A Programme

- 13.4.1.1 The Contractor and Project Proponent will be requested to implement an environmental monitoring programme throughout the Project. In case exceedance is found, the Contractor, Project Proponent and ET should take immediate actions to implement remediation measures following the procedures specified in the EM&A Manual.

- 13.4.1.2 Detailed requirements of the EM&A programme have been described in the EM&A Manual. Measurements and activities that shall be conducted in accordance with the requirements in the EM&A Manual are summarised as follows:

- Baseline monitoring (noise, etc.);
- Impact monitoring (construction dust, noise, etc.);
- Remedial actions in accordance with the Event and Action Plans within the timeframe in case the specified criteria in the EM&A Manual were exceeded;
- Logging and keeping records of monitoring results; and
- Preparation and submission of Baseline, Monthly and Final EM&A Reports.

13.4.2 Air Quality

Construction Phase

- 13.4.2.1 With the implementation of the dust suppression measures and good site practices, no adverse construction dust impact is anticipated during the construction phase. However, construction dust monitoring should be conducted continuously at comprehensive monitoring locations throughout the construction phase, while regular site environmental inspections should be carried out at least once per week during construction phase to ensure that the dust level will comply with the relevant criterion and the recommended best practices as recommended in this EIA Report and the EM&A Manual are properly implemented by the Contractor.

Operational Phase

- 13.4.2.2 It is anticipated that there would be no adverse air quality impact during operational phases, and thus monitoring and audit are not required. Nevertheless, during the subsequent design stage and the operational stage, the ventilation engineer should conduct reviews on the ventilation scheme covering different periods of a day, taking into account the contemporary circumstance such as latest traffic forecast, traffic composition, update on the ambient air quality, etc., and then review and update the air quality assessment as necessary to demonstrate full compliance of the AQO. These reviews would allow the designer and operator to optimize the operation of the ventilation system without compromising the compliance of AQO. The planned air sensitive uses within the operation area of the TMB shall be properly designed such that any openings, openable windows, and/or fresh air intakes will be located and avoided from the predicted exceedance zone at 1.5mAG. Further review of the layout and design of operation area will be conducted in Detailed Design Stage to ensure compliance of the AQOs.

13.4.3 Noise

Construction Phase

- 13.4.3.1 With proper implementation of noise control measures, adverse construction noise impact is unlikely. Nevertheless, noise monitoring is recommended as part of the EM&A programme for the construction phase of the Project to check compliance with the daytime construction noise criterion. The implementation of the recommended mitigation measures for daytime construction activities should also be audited as part of the EM&A programme, with reference to the latest implementation schedule in the Construction Noise Management Plan (CNMP) to be submitted and agreed with Director of Environmental Protection (DEP).

Operational Phase

- 13.4.3.2 Road traffic noise levels should be monitored at representative NSRs, which are in the vicinity of the recommended direct mitigation measures, during the first year after road opening. The purpose of the monitoring is to ascertain that the recommended mitigation measures are effective in reducing the noise levels.
- 13.4.3.3 With proper implementation noise control measures, adverse fixed noise impact from the ventilation buildings and administrative buildings is unlikely. Nevertheless, as part of the design process, monitoring of operational noise from the proposed fixed plants during the testing and commissioning stage would be recommended to verify the compliance of the EIAO-TM criteria. The specification and mitigation measures shall make reference to the latest implementation schedule in the Fixed Noise Source Management Plan (FNMP) to be submitted and agreed with DEP.

13.4.4 Water Quality

Construction Phase

- 13.4.4.1 With the implementation of good site practices, recommended mitigation measures and enhancement measures to control construction site runoff, no adverse water quality impact for land-based works is anticipated during the construction phase. Nevertheless, regular water quality impact monitoring for land-based works is required to ensure compliance with criteria as stipulated in EIAO-TM.

- 13.4.4.2 For marine works, adverse water quality impact is not anticipated with implementation of mitigation measures. In addition, enhancement measure (i.e. deployment of silt curtain) has been proposed for reclamation works, such as dredging activities and construction of mud pit. Nevertheless, regular water quality impact monitoring for marine works is required to ensure compliance with criteria as stipulated in EIAO-TM.
- 13.4.4.3 Regular environmental site inspections at least once per week shall be carried out during construction phase to ensure that the recommended best management practices, mitigation measures and enhancement measures as recommended in this EIA Report and the EM&A Manual are properly implemented by the Contractor.

Operational Phase

- 13.4.4.4 Potential water quality impacts due to surface and tunnel run-off, sewage effluent from proposed administrative buildings and wastewater generated from washing and maintenance operations are likely. With proper connection to the public drainage and sewerage systems and the implementation of mitigation measures, no adverse impact is anticipated during the operational phase. Hence, no environmental monitoring and audit is required.

13.4.5 Waste Management Implications

Construction Phase

- 13.4.5.1 During the construction period, the Contractor shall ensure that all the waste produced during the construction of the Project are handled, stored and disposed of in accordance with good waste management practices, relevant legislation and waste management guidelines.
- 13.4.5.2 Waste materials generated during construction activities, such as C&D materials, chemical waste, marine sediment, general refuse and floating refuse, are recommended to be audited at biweekly intervals to ensure that proper storage, transportation and disposal practices are implemented. This measure ensures the proper disposal of waste. The Contractor would be responsible for the implementation of any mitigation measures to minimize waste or mitigate problems arisen from waste materials.
- 13.4.5.3 A Waste Management Plan (WMP), as part of the Environmental Management Plan should be prepared in accordance with ETWB TC(W) No.19/2005 and submitted to the Project Manager for approval. The recommended mitigation measures should form the basis of the WMP. The monitoring and auditing requirement stated in ETWB TC(W) No.19/2005 should be followed with regard to the management of C&D materials.

Operational Phase

- 13.4.5.4 It is expected that limited quantities of waste would be generated from the operation of the Project and adverse environmental impacts would not be anticipated with the implementation of good waste management practices. Waste monitoring and audit programme for the operation phase of the Project is not required.

13.4.6 Land Contamination

- 13.4.6.1 The land contamination issues in the Project Site have been reviewed and assessed. 15 potential land contamination sites were identified within the Project. However,

some sites are not accessible for visual inspection during site survey, while some sites are not suitable for site investigation during the EIA stage. Also, there could be changes in the operation or land use within the Project Site, which may cause further contamination issues, before commencement of the construction. Detailed land contamination assessment could only be conducted when access is available.

- 13.4.6.2 Site re-appraisal for the whole project areas would be recommended by the Project Proponent to assess the latest site situation, and conduct subsequent land contamination assessment and remediation works if required prior to the commencement of the construction.

13.4.7 Hazard to Life

Construction Phase

- 13.4.7.1 With the implementation of good site practices and design measures for the overnight storage, transport and use of explosives, the requirements as stipulated in EIAO-TM could be complied. Nevertheless, the blasting related activities regarding overnight storage, transport and use of explosives shall be supervised and audited by competent site staff to ensure strict compliance with the blasting permit conditions. In addition, subject to the liaison of the three concurrent projects R11, Tuen Mun Bypass (TMB) and Lam Tei Underground Quarrying (LTUQ), a Hazard Management Plan would be formulated with a view to aligning the understanding of the risk of the three projects so that all the working populations at Lam Tei Quarry area, which includes the workforce induced under the construction and operational stage of three projects, could be considered as on-site populations in the quantitative risk assessment for all the three projects. The measures stipulated in the Hazard Management Plan may include, but not limited to, the adjustment of the blasting schedules of the three projects to minimize the potential cumulative impact, provision of common trainings and drills to the workforce of all the three projects, etc. The Hazard Management Plan, which would be agreed among the three projects, would be submitted to EPD for agreement prior to the tender invitation of construction phases of R11, TMB and LTUQ, whichever is earlier.

13.4.7.2 Operational Phase

- 13.4.7.3 It is anticipated that there would be no potential hazard to life impact during operational phase, and thus monitoring and audit are not required.

13.4.8 Ecology

Construction Phase

- 13.4.8.1 Potential direct ecological impacts arising from the Project during the construction phase are mostly of minor or minor to moderate magnitude and comprises permanent and temporary habitat loss (including permanent and temporary loss of mixed woodland and permanent loss of watercourses, which will be mitigated by compensatory woodland planting in case reinstatement of temporary mixed woodland to be lost is infeasible, and provision of watercourse diversion and green channel design as appropriate), and potential direct impact on flora/wildlife, including those of conservation importance. Pre-construction detailed vegetation survey, detailed survey for aquatic and water-dependent fauna species of conservation importance and a detailed reconnaissance dive survey, as well as

preservation, transplantation and/or compensatory planting of flora species of conservation importance and/or translocation of aquatic and water-dependent fauna species of conservation importance and coral, will be undertaken, if necessary and feasible. Monitoring and site auditing will also be performed. With implementation of mitigation measures, no adverse direct ecological impact during the construction phase is anticipated.

- 13.4.8.2 Potential indirect ecological impacts arising from the construction phase are also mostly of minor or minor to moderate magnitude, including but not limited to ground-borne vibration disturbance to the roosting bats inside Tai Lam Chung (TLC) Catchwater Tunnel Nos. 1, 5, 6, 7 and 8, shading impact on part of a fung shui woodland in So Kwun Wat and potential groundwater drawdown. With the implementation of mitigation measures, no adverse indirect ecological impact during the construction phase is anticipated. Following the Detailed Bat Monitoring and Remedial Plan to be submitted to relevant authorities before the commencement of the construction phase to 1) infer up to date information about roosting bats, confirm bat usage and record the variation in the diversity and number of roosting bats inside TLC Catchwater Tunnel Nos. 1, 5, 6, 7 and 8 during the pre-blasting, blasting, post-blasting and operational phases; 2) The information collected in 1) will be used to evaluate the impacts on the roosting bats inside TLC Catchwater Tunnel Nos. 1, 5, 6, 7 and 8, and provide grounded basis for adaptive review of the Alert, Action and Limit Levels of ground-borne vibration based on the monitoring data, including ground-borne vibration and bat monitoring data to be collected for TLC Catchwater Tunnel Nos. 6 and 8 during pre-blasting and blasting phases, which will take up to date information about bat roosts into account (Should TLC Catchwater Tunnel No. 5 be found to be occupied by roosting bats during the pre-blasting and blasting phases, the monitoring results related to TLC Catchwater Tunnel No. 5 should also be taken into account when reviewing the Alert, Action and Limit Levels.); 3) to ensure effectiveness of the proposed mitigation measures and to avoid impacts on the bats roosting catchwater tunnels during the construction and operational phases of the Project and 4) to help formulate of remedial actions in case of need, monitoring on the level of ground-borne vibration at and roosting bats inside TLC Catchwater Tunnel Nos. 1, 5, 6, 7 and 8 will be performed and summarized in Bat Monitoring Reports to be submitted during the pre-blasting, blasting and post-blasting phases. Regular site audits will also be conducted. Ground-borne vibration and bat roost monitoring, and adaptive review on the Alert, Action and Limit Levels of ground-borne vibration, and tunnelling method will be conducted during the tunnelling works. Besides, site audit and monitoring will also be performed to ensure that all aboveground works will be located outside TLCP. In addition, monitoring on surface water level of natural watercourses in TLCP and in the vicinity of the tunneling works will be performed during the construction phase.

Operational Phase

- 13.4.8.3 During the operational phase, monitoring on ground-borne vibration and roosting bats, covering the overwintering season, breeding season and time gap between the overwintering and breeding seasons, will be conducted at TLC Catchwater Tunnel Nos. 1, 5, 6, 7 and 8 for at least 9 months within the first year of the operational phase, according to the Detailed Bat Monitoring and Remedial Plan to be submitted before commencement of construction. The results of monitoring on ground-borne

vibration and roosting bats will be summarized in the Bat Monitoring Report to be submitted during the operational phase. Besides, monitoring of the compensatory woodland planting site and flora, and aquatic and water-dependent fauna species of conservation importance to be transplanted and/or translocated respectively will be performed. Besides, monitoring on surface water level of natural watercourses in TLCP and in the vicinity of the tunnel sections of Route 11 during the operational phase will also be performed.

- 13.4.8.4 While no direct ecological impact will occur during the operational phase, indirect ecological impacts during the operational phase are considered minor or insignificant. No further ecological mitigation measures, monitoring and site audits are required.

13.4.9 Fisheries

Construction Phase

- 13.4.9.1 There will be direct fisheries impacts arising from the proposed reclamation site at Tsing Lung Tau for Tsing Lung Bridge of the Project during the construction phase, including permanent loss of about 4.1ha of fishing habitats and fishing ground due to 2.2ha of reclamation and 1.9ha of seawall construction, and temporary loss of about 13ha of fishing ground due to marine works areas. Considering the permanent and temporary fisheries habitats and fishing ground loss is small compared to Hong Kong marine waters, and no other fisheries sensitive receivers will be encroached upon due to the Project, the direct fisheries impact is evaluated and ranked as minor.
- 13.4.9.2 Potential indirect fisheries impacts arising during the construction phase include deterioration of water quality caused by marine works, increased marine traffic and underwater noise are evaluated and all considered negligible in nature. With the implementation of good site practices and recommended mitigation measures, no unacceptable impacts on fisheries are anticipated during the construction phase. No specific fisheries monitoring and audit programme is required.

Operational Phase

- 13.4.9.3 During the operational phase, the proposed reclamation site at Tsing Lung Tau for Tsing Lung Bridge of the Project will arise direct fisheries impacts, including permanent loss of about 4.1ha of fisheries habitats and fishing ground due to 2.2ha of reclamation site and 1.9ha of seawall construction, the direct fisheries impact is evaluated and ranked as minor. Other indirect impact to fisheries, such as the change of hydrodynamic and marine water quality are evaluated and considered negligible in nature. It is anticipated that there would be no unacceptable impacts on fisheries during operational phases, and therefore fisheries specific monitoring and audit are not required.

13.4.10 Landscape and Visual

Construction Phase

- 13.4.10.1 Mitigation measures such as tree preservation, tree transplanting, advance planting reinstatement, provision of site hoarding, optimization of construction area and lighting control should be adopted during the construction phase. Regular site environmental inspections should be undertaken during the construction period to

ensure that the mitigation measures recommended in this EIA Report and EM&A Manual are properly implemented by the Contractor.

Operational Phase

- 13.4.10.2 Mitigation measures to be implemented, such as compensatory tree planting, post-planting monitoring, greening works on slopes and associated structures, design of tunnel portals and landscape treatment, design of an elegant bridge structure and approach roads, provision of visually pleasing aesthetic treatment of noise mitigation measures, and provision of green roof at the proposed buildings.

13.4.11 Cultural Heritage

Construction Phase

- 13.4.11.1 No sites of archaeological interest would be affected by the Project and associated works. An archaeological field survey should be undertaken within an area of some archaeological potential identified at east of Area A at the lower slopes to the north of Lam Tei Quarry within the works area when access is available before the site formation and construction phase.
- 13.4.11.2 The identified built heritage sites are located separated from the proposed and associated works by some distances, with the exception of Grade 3 Former Perowne Barracks, Gurkha Temple. Mitigation measures required during and after the construction phase include a condition survey before and after the construction phase, ongoing vibration, tilting and settlement monitoring, any other measures identified in the condition survey, and a buffer zone to provide physical separation between the heritage site from the works.
- 13.4.11.3 With reference to previous marine archaeological investigation (MAI) under “Route 10 – North Lantau to Tsing Lung Tau Section” project in the vicinity of the proposed reclamation, there were no marine archaeological resources identified within the respective study area, which partially overlapped with the Study Area of the Project. Geophysical surveys were conducted under the Project, and numbers of anomalies were identified. However, marine diver survey could not be conducted during the EIA stage due to safety issue and time implication, it is recommended to conduct the marine diver survey during the detailed design stage when fencing off of the diving area can be safely implemented but prior to any reclamation works. The Contractor shall engage a qualified marine archaeologist to conduct the MAI. The “Licence to Excavate and Search for Antiquities” shall be obtained before the commencement of excavation and search for antiquities. Should there be any marine archaeological resources identified during the MAI, the project proponent should inform AMO immediately for discussion of appropriate mitigation measures to be agreed by AMO before implementation by the project proponent to the satisfaction of AMO and before the reclamation works.
- 13.4.11.4 Marine ground investigation (GI) works would be required prior to the reclamation works and bridge foundation works at the newly reclaimed land. If it is required prior to the diver survey, it is recommended that the marine GI works shall be arranged to avoid all the anomalies identified by the geophysical survey conducted, by allowing sufficient setback distance (around 50m) from the anomalies. In case of discovery of any antiquities or supposed antiquities in the course of marine GI works, the project proponent is required to inform AMO immediately for discussion of appropriate mitigation measures to be agreed by AMO before

implementation by the project proponent to the satisfaction of AMO. Besides, any marine GI works at the anomalies is required to be conducted after confirming their nature by MAI and seeking agreement with AMO.

- 13.4.11.5 If, however, antiquities / supposed antiquities, or buildings / structures both at-grade and underground with potential heritage value that would likely be affected by the development are identified during the construction work, the works should be suspended, and the project proponent should notify AMO immediately for discussion of appropriate mitigation measures to be agreed by AMO before implementation by the project proponent to the satisfaction of AMO.

Operational Phase

- 13.4.11.6 Terrestrial archaeology, built heritage and marine archaeology would not be affected by the operational phase of the Project. Hence, mitigation measure as well as impact monitoring and audit are not required.