

Environmental Management Plan

June 2021

Cambodia: Fourth Greater Mekong Subregion Corridor Towns Development Project

Wastewater Treatment Plant and Drainage System Subproject,
Kampong Cham Town, Kampong Cham Province

Prepared by the Ministry of Public Works and Transport for the Asian Development Bank.

ABBREVIATIONS

| | | |
|-----------|---|--|
| ADB | - | Asian Development Bank |
| BOD | - | Biochemical Oxygen Demand |
| CDIA | - | Cities Development Initiative for Asia |
| CEMP | - | Construction Environmental Management Plan |
| C-EHS | - | Contractor Environmental Health and Safety Officer |
| CMAC | - | Cambodia Maine Action Center |
| COD | - | Chemical Oxygen Demand |
| CRVA | - | Climate Risk Vulnerability Assessment |
| DDPP | - | Detailed Design and Project Preparation |
| EA | - | Executing Agency |
| EIA | - | Environmental Impact Assessment |
| EMP | - | Environmental Management Plan |
| FGD | - | Focus Group Discussion |
| GHG | - | Greenhouse Gas |
| GRM | - | Grievance Redress Mechanism |
| IEE | - | Initial Environmental Examination |
| IESIA | - | Initial Environmental and Social Impact Assessment |
| MAFF | - | Ministry of Agriculture, Forest, and Fishery |
| MoE | - | Ministry of Environment |
| MOWRAM | - | Ministry of Water Resources and Meteorology |
| MPWT | - | Ministry of Public Works and Transport |
| PDoE | - | Provincial Department of Environment |
| PMC-I/NES | - | PMC-International and National Environmental Specialists |
| PIU | - | Project Implementation Unit |
| PIU-SFP | - | PIU Safeguards Focal Point |
| PMC | - | Project Management Consultant |
| PMU | - | Project Management Unit |
| PMU-ESO | - | PMU Environmental Safeguards Officer |
| PSC | - | Project Steering Committee |
| RCP | - | Representative Concentration Pathway |
| SHC | - | Sewer Household Connection |
| SPS | - | Safeguards Policy Statement |
| TS-1 | - | Tonle Sap Urban Environmental Improvement Project |
| TSBR | - | Tonle Sap Biosphere Reserve |
| TSS | - | Total Suspended Solid |
| UXO | - | Unexploded Ordnance |
| WHO | - | World Health Organization |

CURRENCY EQUIVALENTS

(as of June 2020)

| | | |
|---------------|---|------------|
| Currency unit | – | riel (KR) |
| KR 1.00 | = | \$ 0.00025 |
| \$1.00 | = | KR 4,000 |

WEIGHTS AND MEASURES

| | | |
|-------------------|---|---|
| dB(A) | - | A-weighted Decibel |
| km | - | Kilometre |
| km ² | - | Square kilometre |
| LAeq | - | Equivalent Continuous Level 'A weighting' - 'A'-weighting = correction by factors that weight sound to correlate with the sensitivity of the human ear to sounds at different frequencies |
| m | - | Metre |
| °C | - | Degree Celsius |
| PM10 | - | Particulate Matter 10 micrometres or less |
| PM2.5 | - | Particulate Matter 2.5 micrometres or less |
| µg/m ³ | - | Microgram per cubic meter |

NOTE

In this report, "\$" refers to United States dollars.

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1 INTRODUCTION

1.1 Purpose

1. This document is the environmental management plan (EMP) for the Kampong Cham Wastewater Treatment and Drainage Subproject. The EMP covers the construction and operation of a Wastewater Treatment Plant, and construction and operation of separate wastewater and stormwater networks in Kampong Cham City.
2. The Kampong Cham Wastewater Treatment and Drainage Subproject is a subproject under the Fourth Greater Mekong Subregion Corridor Towns Development Project (GMS/CTDP-4 or the Project), which supports the Governments of Cambodia and the Lao People's Democratic Republic (PDR) in enhancing the competitiveness of selected towns located along the Central Mekong Economic Corridor in the Greater Mekong Subregion (GMS).
3. The objectives of the subproject are to (i) accelerate the development of Cambodia's second socioeconomic growth centre; and (ii) promote regional socioeconomic integration of provinces and towns along the GMS corridors (iii) support the scaling up for climate adaptation, public management reforms including use of ICT, expand regional connectivity and extend value-chains, and competitive, inclusive, and environmentally sustainable urban development.
4. The EMP defines the mitigation and monitoring measures and describes the institutions, responsibilities and mechanisms to monitor and ensure compliance. Such institutions and mechanisms will seek to ensure continuous improvement of environmental protection activities during pre-construction, construction, and operation of the subproject in order to prevent, reduce, or mitigate adverse impacts.
5. The environmental classification of the Subproject is confirmed as Category B. The EMP has been carried out in accordance with the Safeguard Policy Statement (2009) of the Asian Development Bank (ADB), and Cambodia's Law on Environmental Protection and Natural Resource Management (Preah Reach Kram/NS-PKM-1296/36) 1996, and its sub-decrees and implementing guidelines. The EMP is based on the separate Initial Environmental Examination (IEE) of June 2021 and both the IEE and EMP have been updated in conjunction with the finalization of the Detailed Engineering Design (DED) ensuring consistency between engineering designs and environmental mitigation measures. The EMP also incorporates the findings of the Initial Environmental and Social Impact Assessment (IESIA) approved by the Ministry of Environment (MoE) on 02 March 2021. The EMP will be further updated if necessary.

1.2 Objective of the EMP

6. The EMP describes how the mitigation and other measures to enhance the benefits of environmental protection to be implemented. It explains how the measures will be managed, who (agency) will implement them, when and where they will be implemented. The following elements will be described in the EMP: (i) implementation of mitigation measures during project design; (ii) implementation of mitigation measures during construction by contractors, and how impacts prevention will be incorporated in the materials procurement; (iii) social development program (e.g., resettlement plan, community training); (iv) contingency response plan for natural or other disasters, and project contingencies; and (v) environmental management and monitoring costs including mitigation costs.

2 Project Description and Technical Approach

2.1 Salient Project Data

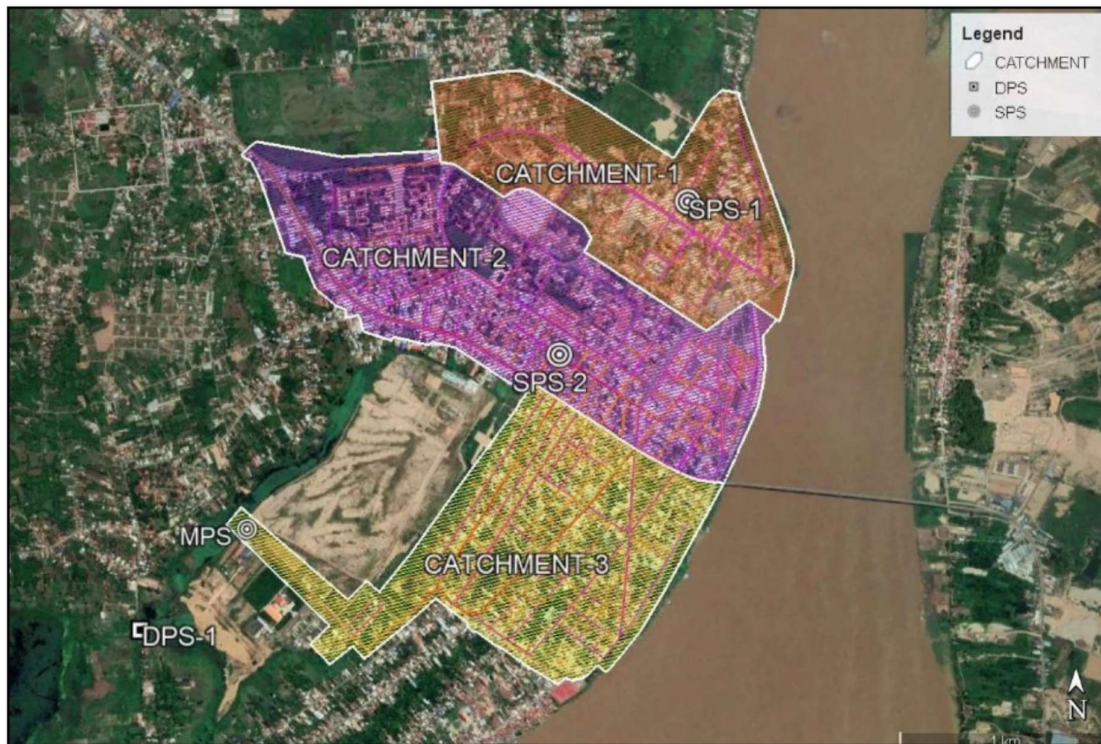
7. The main subproject components are listed below:

- Sewage Collection Network: 85.7 km gravity sewer network consisting of primary, secondary and tertiary (house service connections) sewer pipes.
- Three (3) Wastewater Pump Stations designed to collect wastewater flows from the sewer network and pump it to the WWTP.
- Rising Mains: 1.4 km of rising mains from the wastewater pump stations to the WWTP.
- Wastewater Treatment Plant with a 5,000 m³/d capacity designed to comply with the applicable effluent standards:
 - Total area: 11.26 ha;
 - Inlet Screening Structure with channels for an automatic screen and a manually cleaned screen bypass;
 - Septage Receiving Structure with manually cleaned screen;
 - Two (2) Anaerobic Ponds in parallel with dimensions of 30.35 m (width) and 55 m (length), each pond;
 - One (1) Wetland Zone-1 under facultative conditions with bamboo rafts with vetiver plants for further treatment, capacity volume 26,300 m³ and surface area 12,300 m²;
 - One (1) Wetland Zone-2 under maturation conditions with existing white lotus plant for additional treatment, capacity volume 20,800 m³ and surface area 16,200 m²;
 - One natural Wetland Zone-3/retention to DPS-1 (no construction), about 4.5 ha. Will function as a wetland to further reduce coliform bacteria and for polishing.
 - One (1) Sludge Treatment/ Drying Pond - dimensions of 24.75 m (width) and 50 m (length)
 - Geotechnical soil improvement works for the filled area.
- Storm Drainage: 4.2 km drainage lines consisting of primary reinforced concrete U drains, box drains, trapezoidal drains, pipes, manholes and outlet structure.
- One (1) Drainage Pump Station.

2.2 WWTP Location and Service Area

8. The service area for the sewerage and drainage collection networks covers the most densely populated central part of Kampong Cham City and includes the sangkats of Kampong Cham Town and Veal Vong and some parts of Sambuor Meas and Boeng Kok sankats. The service area is approximately 450 ha and has a population of about 22,000 – see Figure 1.

Figure 1: Wastewater and Drainage Service Area



9. The WWTP will be established in Boeng Snay, a 19 ha large wetland located in Sambuor Meas sangkat, Kampong Cham City. The original wetland covered about 107 ha of which about 88 ha was reclaimed between 2010 and 2013. The location is indicated in Figure 2.

Figure 2: Overview Map with the location of the Wastewater Treatment Plant

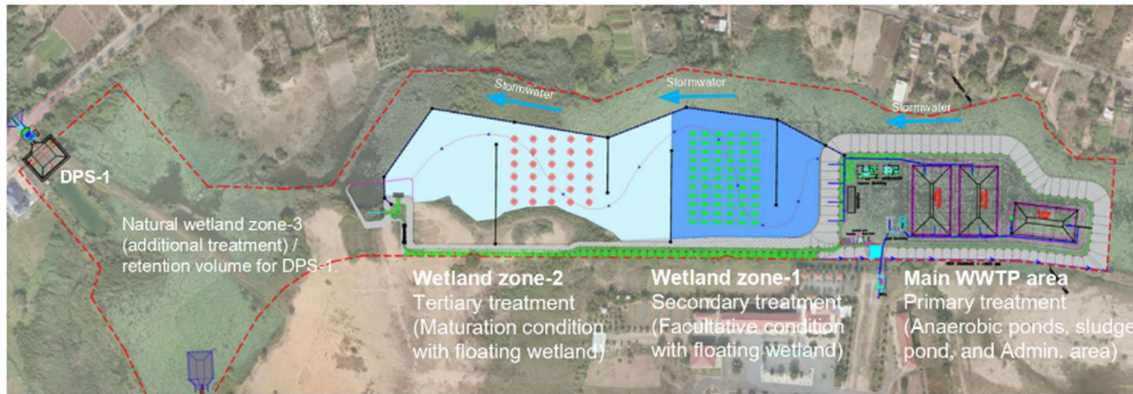


2.3 Technical Approach

10. The layout of the Wastewater Treatment Plant is displayed in Figure 3. The wastewater treatment process consists of a series of different types of waste stabilization ponds/wetlands (anaerobic, facultative, maturation) that rely entirely on natural processes by algae, water plants and bacteria with sunlight as the only energy source.
11. The slightly modified treatment technology and layout with two trains of anaerobic ponds followed by simulated facultative and maturation ponds with floating aquatic plants to

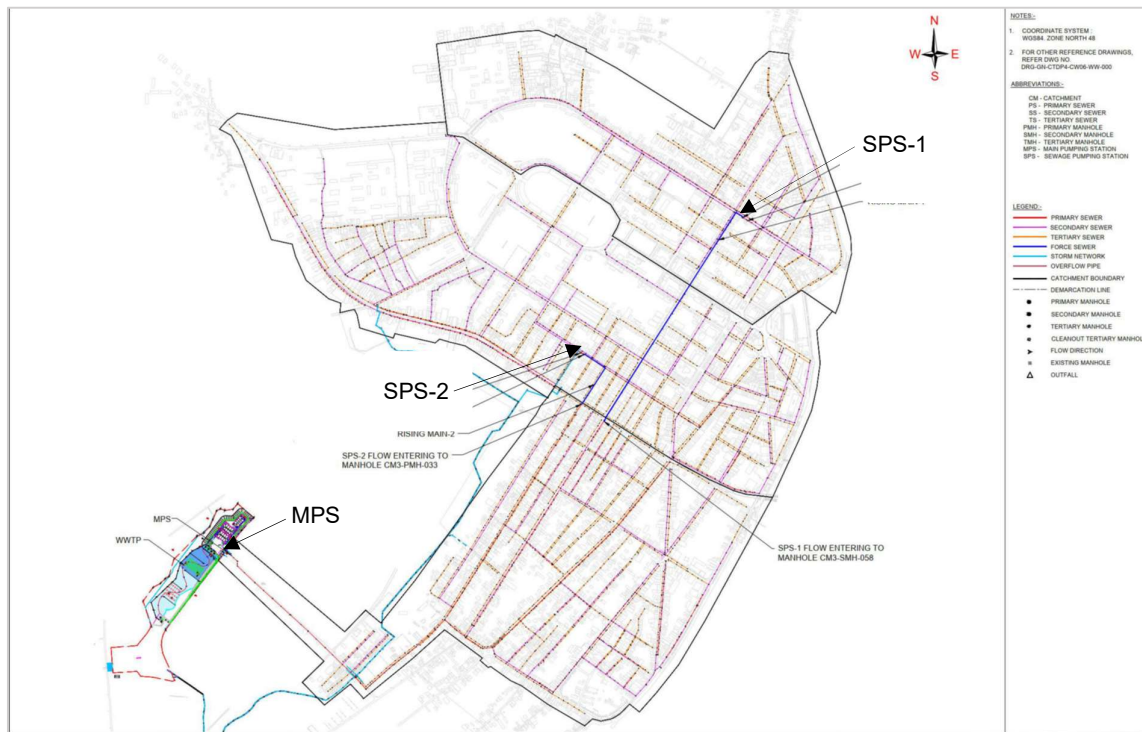
provide additional treatment, directly in the existing lake using a simple impermeable curtain/boom to separate the wetland from the parallel drainage corridor is considered to be the optimal sewage treatment solution for this very complex WWTP site, providing simple but very good levels of treatment with the lowest possible construction and operating costs.

Figure 3: The Wastewater Treatment Plant Layout



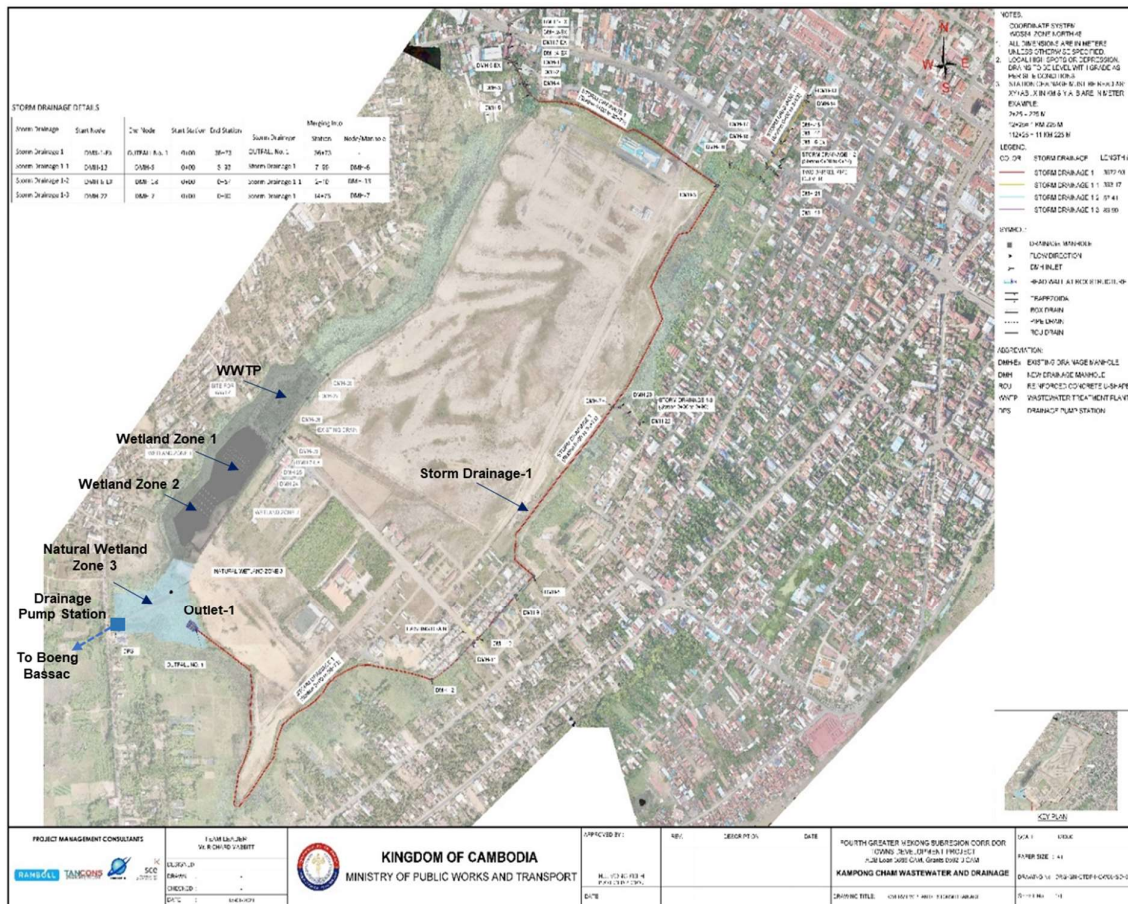
12. The wastewater collection network consists of gravity-based tertiary, secondary and primary sewers. The tertiary sewers connect the households with the secondary network, which conveys the wastewater to the primary sewers and on to three (3) pump stations (2 network Sewage Pump Stations, SPS, and one Main Pump Station, MPS), that will then pump the wastewater directly to the WWTP. The locating of the sewers has avoided private property.
13. The wastewater collection network is indicated in Figure 4.

Figure 4: Outline of the Wastewater Network



14. The new stormwater drainage is displayed in Figure 5. The network will overlap with the sewage service area. The primary objective of the drainage system is to mitigate flooding and resolve other drainage problems in the urban centre.

Figure 5: Outline of the drainage network



3 SUMMARY OF POTENTIAL RECEPTORS & IMPACTS

15. The key receptors and their proximity to the subproject components are shown in Table 1.

Table 1: Summary of Environmental Sensitive Receptors for WWTP Subproject

| Project Component | Surface Water Receptors | Socio-Economic & Cultural Receptors | Land Cover/ Ecological Receptors | Protected Area Status |
|--|---|---|---|--|
| Wastewater Treatment Plant | <ul style="list-style-type: none"> - Stream to Boeng Bassac and from there to the Mekong River (seasonally) via a 1.5 km long stream; and/or to Boeng Snous via 1 km long stream | <ul style="list-style-type: none"> - 50-70m to the nearest houses - 100 m to the border of Boeng Snay Pagoda - Bordering the compound of Kampong Cham University - 200 m from Boeng Bassac Primary School - About 1 km from National Road No. 7 - About 1 km from densely populated areas | <ul style="list-style-type: none"> - In Boeng Snay wetland area | <ul style="list-style-type: none"> - No protected areas or Key Biodiversity areas within a 10 km radius of site - Nearest KBI is 50 km from the WWTP |
| Wastewater and Drainage network | <ul style="list-style-type: none"> - The drainage network has the same recipient as the WWTP | <ul style="list-style-type: none"> - Network in dense urban area, where there are houses, 2 pagodas, market, business shop, schools, and university. - Presence of local utilities services: electric line/pole, water supply, cable line, and other social service structures | <ul style="list-style-type: none"> - Paved and unpaved urban roads - Some street trees and limited urban vegetation | <ul style="list-style-type: none"> - As above |
| Wastewater pump stations (SPS-1 and SPS-2) | <ul style="list-style-type: none"> - None | <ul style="list-style-type: none"> - Housing within a 20 m radius | <ul style="list-style-type: none"> - None | <ul style="list-style-type: none"> - None |

16. Table 2 summarizes the potential impacts associate with the WWTP and drainage subproject during construction and operation.

Table 2: Summary of Impacts from WWTP and drainage project

| Impact | Source | Receptors |
|------------------------------|---|--|
| Construction | | |
| Degradation of Air Quality | <ul style="list-style-type: none"> - Exhaust fumes from construction machinery and equipment, movement of haulage trucks - Fugitive dust from earth works, loading, unloading and haulage of construction materials | <ul style="list-style-type: none"> - Nearby residents - Workers |
| Noise and vibration nuisance | <ul style="list-style-type: none"> - Noise from construction equipment - Pile driving - Earthworks and breaking of rock | <ul style="list-style-type: none"> - Nearby residents - Boeng Snay Pagoda - Boeng Bassac Primary School - Kampong Cham University - Workers |
| Impacts on water quality | <ul style="list-style-type: none"> - Construction work in or near Boeng Snay wetland - Discharge of contaminated runoff (suspended material, oil spills) - Accidental spills - Waste littering | <ul style="list-style-type: none"> - Fauna and flora in Boeng Snay wetland - Groundwater |

| Impact | Source | Receptors |
|---|--|---|
| Erosion or degradation of soil and land | <ul style="list-style-type: none"> - Earthworks near the wetland - Accidental spills/ poor management of waste | <ul style="list-style-type: none"> - Boeng Snay wetland |
| Disturbance of fauna or flora | <ul style="list-style-type: none"> - Reduced size of the Boeng Snay wetland - Cutting or removal of street trees | <ul style="list-style-type: none"> - Boeng Snay wetland flora and fauna - Communities |
| Risk of infections | <ul style="list-style-type: none"> - Influx of labour force for the construction work | <ul style="list-style-type: none"> - Communities - Workers |
| Reduced / degraded accessibility | <ul style="list-style-type: none"> - Excavation works / trenches in public areas - Presence of equipment in public areas | <ul style="list-style-type: none"> - Communities |
| Operation | - | - |
| Impacts on water quality | <ul style="list-style-type: none"> - Non-compliant effluents | <ul style="list-style-type: none"> - Fauna and flora in wetlands in Kampong Cham - |
| Odours | <ul style="list-style-type: none"> - WWTP operations - Treatment of sludge | <ul style="list-style-type: none"> - WWTP operators - Boeng Snay Pagoda - Boeng Bassac Primary School - Kampong Cham University |
| Health and safety risks | <ul style="list-style-type: none"> - Use of equipment/maintenance of WWTP and networks - Presence of litter and pests in networks - Non-compliant effluents | <ul style="list-style-type: none"> - Workers - Communities |

4 INSTITUTIONAL ARRANGEMENTS & RESPONSIBILITIES

17. The framework for implementation of the environmental management plan (EMP) for the project is described in this section. The key institutions, organizations and stakeholders relevant to environmental safeguards are set out below.
18. The overall responsibility for EMP implementation and compliance with loan assurances lies with the Executing Agency (EA), the Ministry of Public Works and Transport. The EA will establish a Project Management Unit (PMU) based in Phnom Penh, responsible for general project implementation. The Implementing Agency is the Provincial Department of Public Works and Transport (PDPWT) in each sub-project city. The PDPWT will establish a Project Implementation Unit (PIU) in each province, comprising relevant provincial government representatives including the Provincial Department of the Environment.
19. A summary of the key functions for project implementation and environmental safeguards is presented in Table 3.

Table 3: Key Roles for Project Implementation

| Role | Abbreviation | Location | Summary of Overall Function |
|--|--------------|----------------------------|---|
| Ministry of Public Works and Transport | MPWT | Phnom Penh | Accountable towards the Royal Government of Cambodia and ADB for the implementation of the Subproject and for ensuring compliance with loan covenants |
| Project Steering Committee | PSC | Phnom Penh | Policy and technical guidance for subproject implementation |
| Project Management Unit | PMU | Phnom Penh within MPWT | Responsible for general project implementation and reporting |
| PMU Environment Safeguards Officer (funded through CTD4 Loan) | PMU-ESO | Phnom Penh within PMU | EMP compliance across the sub-projects for environmental safeguards - Full Time |
| Project Implementation Unit | PIU | Provinces within PDPWT | Responsible for sub-project implementation |
| PIU Safeguards Focal Point | PIU-SFP | Provinces within PIU | Responsible for sub-project environmental and social safeguard monitoring - Full Time |
| Contractor Environmental Compliance Officer | C-EHS | Construction Site | Mitigation measure implementation and reporting |
| Project Management Consultants | PMC | Phnom Penh | Project final design and implementation, support and capacity development. Engineering supervision for all construction and reporting |
| International and National Environment Specialists | PMC-I/NES | Phnom Penh within PMC team | Environmental safeguards and reporting support during design and implementation - Intermittent |
| Asian Development Bank | ADB | - | Review project progress, compliance with covenants and advise on corrective actions |
| Ministry of Environment (MOE)/ Provincial Department of Environment (PDoE) | MoE/PDoE | Phnom Penh province | Collaborate with project to provide policies or environmental standards and advise. Observer and conduct environmental monitoring of the project activities based on the mandate. |

20. A Project Steering Committee (PSC) has been established to provide policy and technical guidance for subproject implementation. The PSC is chaired by the EA and comprises relevant ministry of provincial departments representatives including the Ministry of Environment, General Department of Resettlement (GDR) and Ministry of Labour as a minimum.
21. External support to the Implementing Agency/PIU for EMP implementation during the project detailed design and implementation phase will be provided by the International and National Environment Specialists (I/NES) of the Project Management Consultants (PMC). An external Environmental Monitoring Institute (EMI) will be engaged to conduct the field sampling and laboratory analyses of environmental quality (e.g., water quality, air quality, noise) that cannot be performed by other functions within the project. In Cambodia, this can be performed by qualified staffs from the Ministry of Environment (MoE).
22. ADB is responsible for reviewing project progress reports and semi-annual environmental safeguards monitoring reports and undertaking review missions to ensure the project is implemented in line with the relevant environmental safeguard requirements, SPS (2009) and Royal Government of Cambodia regulations and guidelines.
23. The Executing Agency is accountable for project implementation and operation on behalf of the Royal Government of Cambodia. The responsibilities of the Executing Agency in relation to environmental safeguards requirements are summarized below:
 - a) Overall responsibility for subproject implementation and management of the Project Management Unit (PMU);
 - b) Recruit and manage qualified ESO for PMU;
 - c) Recruit and manage Project Management Consultants
 - d) Ensure compliance with Loan Covenants;
 - e) Approve procurement plans, bidding documents, bid evaluation and contract awards including EMP;
 - f) Submit regular quarterly and annual subproject reports to ADB including summary on EMP and GRM implementation;
 - g) Ensure compliance of subproject/component implementation with ADB and Government social and environmental policies, guidelines and plans;
 - h) Approve proposed corrective actions in the event of identified impacts or non-compliance issues identified in monitoring and evaluation reports.
24. The responsibilities of the Implementing Agency in relation to environmental safeguards requirements are summarized below:
 - a) Coordinate and monitor subproject implementation activities including all environmental safeguards activities;
 - b) Coordinate capacity development program for PIU;
 - c) Obtain necessary approvals from respective departments and other institutions prior to awarding of civil works contracts;
 - d) Support PMU-ESO in the implementation of EMP;
 - e) Coordinate regular reporting of PMU to EA on EMP implementation;
 - f) Undertake regular quality control inspection of subproject facilities;
 - g) Manage the handover of subproject facilities to agencies responsible for operation and maintenance; and
 - h) Ensure PIU engage with and follow the Grievance Redress Mechanism GRM.
25. Specific environmental safeguard responsibilities are set out for each project phase as shown in Table 4.

Table 4: EMP Responsibilities

| Responsible Entity | Engineering Detailed Design | Tendering & Pre-construction | Construction | Operation |
|--|---|---|--|-----------|
| Ministry of Public Works and Transport, Executing Agency | Accountable towards the Royal Government of Cambodia and ADB for the implementation of the Subproject and for ensuring compliance with loan covenants | | | |
| PMU / PMU-ESO | Update IEE/EMP | Engage PMC & PMU-ESO | Ensure EMP is implemented, and that the contractor(s) abide by the EMP | |
| | Review updated EMP | Coordinating the tendering process including overseeing incorporation of EMP clauses into the bidding documents | Supervising project construction (with support of PMC engineers) | |
| | Confirm that mitigation measures have been included in engineering detail design | Ensuring the procurement of environmentally responsible contractors and approve CEMP | Prepare and submit quarterly and annual reports including environmental safeguard reporting to ADB | |
| | | Ensuring that domestic EIA approvals by MoE have been secured prior to the awarding of civil works contracts | | |
| | | Dissemination and coordination of Grievance Redress Mechanism | Ensure EMP implementation and submit regular monitoring reports to Implementing Agency and EA | |
| | | | ensure PIU-SFPs undertake regular site inspections as part of progress reporting | |
| PIU-SFP | | Attend all pre-construction training courses regarding EMP implementation Establish GRM | Working closely with the contractors to ensure EMP implementation | |
| | | | Support GRM | |
| | | | Support Progress Monitoring and Reporting requirements working with PMU-ESO | |
| | | | | |

| Responsible Entity | Engineering Detailed Design | Tendering & Pre-construction | Construction | Operation |
|---|--|---|--|--|
| | | | Conduct consultation interviews with affected people | |
| Project Management Consultants PMC | Engage appropriate engineer and safeguards staff | See PMC-I/NES | See PMC-I/NES | Operator training and support as per ToR in PAM |
| | Finalise Detailed Engineering Design in accordance with Environmental Safeguard principles | | | |
| Project Management Consultants PMC (PMC-I/NES)] | Update IEE/EMP if needed | Provide training on EMP supervision and GRM to PMU, PIU and contractors | coordinate public consultation with PMU/ ESO/ PIU-SFP | Organize, prior to project completion report (PCR) mission, a survey to assess community satisfaction with project implementation and EMP implementation performance. Draft environment sections of the PCR. |
| | | setting up environmental management and internal monitoring systems at PUSO and civil works contracts level | preparing annual EMP progress reports | |
| | | review tender and contractor documents | identifying environment-related implementation issues and necessary corrective actions | |
| | | review the Contractor's Environmental Management Plan | Training of PMU, PIU and other stakeholders GRM and EMP implementation | |
| | | Ensure grievance redress mechanism established | | |
| | | regular EMP and implementation monitoring | | |
| | | assess the subproject's readiness in terms of environmental management (see Table 10) | | |
| | | coordinate public consultations | | |

| Responsible Entity | Engineering Detailed Design | Tendering & Pre-construction | Construction | Operation |
|-------------------------------|-----------------------------|---|--|--|
| | | | Organize, prior to project completion report (PCR) mission, a survey to assess community satisfaction with project implementation and EMP implementation performance. Draft environment sections of the PCR. | |
| Contractor | | Prepare Contractor's Environmental Management Plan and provide environmental track record in bid response Seek approval of the CEMP from PMU before starting any works at site | Ensure sufficient funding and human resources for proper and timely implementation of required mitigation and monitoring measures in the EMP throughout the construction phase | Ensure handover of sites is in accordance with EMP and any corrective actions identified in Project Completion Report are completed. |
| | | | Appoint an Environment, Health and Safety (EHS) officer to oversee EMP implementation related to environment, occupational health and safety on construction site | |
| | | | Ensure health and safety | |
| | | | Implement mitigation measures | |
| | | | Act as a local entry point for the project GRM and collaborate with PMU on all GRM issues | |
| External Monitoring Institute | | Undertake specialised environmental monitoring as contracted by PMU | Undertake specialised environmental monitoring as contracted by PMU | Undertake specialised environmental monitoring as contracted by Operator |
| Operator | | | Testing prior to commissioning to ensure discharge standards can be met | Ensure proper operation of project facilities according to design standards & monitoring |
| | | | | Allocation of budget for O&M |

4.1 Institutional Capacity Review and Needs

26. Currently there is little experience of monitoring and implementing environmental mitigation measures particularly at provincial level. There is little enforcement of environmental or health and safety legislation and routine environmental monitoring is not undertaken apart from in major urban centres (air quality) or major rivers (water quality).
27. During the preparation of the EMP, the team checked the capacity and experience at MPWT and found that there are a number of people who have fulfilled the role of 'focal point' for safeguards on a project-by-project basis, and there is an established Safeguards team within the ministry of six people. This team has experience of working on highway projects but have not to date been involved in urban development projects and are willing to be involved in any training and site visits required during project implementation. They will be provided with copies of relevant monitoring reports, the EMP and other relevant safeguard documents.
28. In addition, through understanding existing operations for the wastewater treatment in Phnom Penh, it is clear that there is still limited ability for operation and maintenance. The limiting factors affecting the operators' ability to maintain adequate standards are likely to be a function of (i) a lack of technical capacity and experience; and (ii) insufficient budget.
29. A training program is set out in Table 5, **Error! Reference source not found.** which addresses the safeguard reporting and implementation requirements during construction, and the environmental and social risks from operations.
30. The engagement of a National Environmental Specialist for 10 months spread throughout implementation will be critical to ensuring the capacity of the PIU staff and to ensuring monitoring and reporting are managed effectively during implementation. This person will also work closely with the PMU Environment Safeguards Officer (PMU-ESO) in order to ensure safeguards are implemented and monitored.
31. **Training for EMP implementation.** The proposed training required for project implementation is set out in Table 5. For budgeting purposes, refer to Feasibility Report Volume 5, Institutional Strengthening and Capacity Building. Specifically, the training requirements for the project set out in the relevant Terms of Reference include to train PIUs, contractors, municipalities, and other relevant stakeholders on the implementation of the EMP.
32. To ensure that the subproject will be duly and properly operated and maintained, operation and maintenance equipment is included in the construction contract and the contractor is required to prepare an operation and maintenance manual and conduct training of the operator. In addition, at the end of the commissioning period, there shall be a six (6) months operations and maintenance period where the contractor shall provide an operations and maintenance manager and relevant operations and maintenance staff to operate the WWTP and the wastewater and drainage networks. During this period, the contractor shall provide on-the-job training for operator's employees. The on-the-job training shall include:
 - Training on achievement and compliance with regulatory standards and monitoring of the performance of the facilities;
 - Training on operation and maintenance, of the wastewater system, odour control, discharging of effluent, sludge disposal and other environmental controls related to the WWTP;
 - Troubleshooting typical issues with wastewater treatment performance;
 - Occupational health and safety;
 - Emergency preparedness and response procedures.

Table 5: Capacity Building and Training Requirements

| Subject / Content | Participants | Trainer/ Organization | When/ Frequency | Duration (days / event) | Participants | Cost (\$) USD |
|--|--|--|---|-------------------------------|--------------|------------------------------|
| EMP adjustment and implementation - Development and adjustment of the EMP, roles and responsibilities, monitoring, supervision and reporting | PMU, PIU, contractors | I/NES of Project Management Consultant | Twice - Once prior to, and once after 6 months of construction | 2 | 10 | in project construction cost |
| Grievance Redress Mechanism (GRM)-roles and responsibilities | PMU, PIU, contractors, Commune Councils | I/NES of Project Management Consultant | Twice - Once prior to, and once after 6 months of construction | 1 | 10 | |
| Environmental protection Pollution control on construction sites (air, noise, wastewater, solid waste) | PMU, PIU, contractors | I/NES of Project Management Consultant | Once (during project implementation) | 2 | 10 | |
| Environmental monitoring - Monitoring methods, data collection and processing, reporting systems | PMU, PIU, contractors, Operators of the WWTP and wastewater and drainage network | I/NES of Project Management Consultant & MoE (environmental analyst) | Once (at beginning of project construction) | 2 | 10 | |
| WWTP Management | Included as part of the subproject investment management training budget | | | | | |

5 IMPACT MITIGATION MEASURES PLAN

5.1 Overview of Mitigation Measures

33. The Impact Mitigation Plans for the Subproject are presented in **Table 7**: Pre-Construction Phase Mitigation Measures, **Table 8**: Construction Phase Mitigation Measures, and

34. **Table 9:** Operational Phase Mitigation Measures.

5.2 Contractor's Environmental Management Plan

35. The contractor is required to prepare the Contractor's Environmental Management Plan (CEMP) for review and approval by the PMU and PMC. The CEMP shall be prepared in accordance with the IEE and EMP for the Subproject approved by ADB and any other requirements stipulated in the bidding documents.

36. PMC has developed a CEMP template to guide the preparation of the CEMP.

5.2.1 CEMP Subplans

37. The CEMP for this Subproject shall include the following subplans:

- Noise and Vibration Management (including specific sheet piling noise and vibration mitigation measures)
- Spoil and Borrow Site Management
- Solid and Liquid Waste Management
- Traffic Management
- Labour Camp Management
- Occupational Health and Safety (including trenching safety measures and COVID-19 prevention measures)
- Emergency Response

5.2.2 Borrow Pit and Spoil Disposal Site Selection

38. The contractor shall include the site selection criteria stipulated in Table 6 when proposing sites for borrow pits and spoil disposal.

Table 6: Site Selection Criteria for Borrow Pits and Spoil Disposal Sites

| Site Selection Criteria | Proposed Site Conditions |
|---|--------------------------|
| Preferably on degraded or lower value land such as grasslands, land devoid of forest or with highly degraded forest cover, or land with poor soil quality | |
| Not in ecological sensitive area (e.g. Protected Area or Key Biodiversity Area or on land that hosts Threatened (IUCN Red List) plant or animal species | |
| Not in wetlands, waterways or in riparian zones | |
| Not in agricultural productive land | |
| Not in land with spiritual, cultural, historical or archaeological value | |
| On lower slope land, so that stable landforms can be created. If possible, land with a slope more than 10% shall generally not be used for spoil disposal, where possible | |
| Not on unstable slopes, where the added weight could trigger mass movement | |
| Not where groundwater emerges or a thick organic layer is present | |
| Above the 0.05 (5%) Annual Exceedance Probability flood line | |
| Backfilling of excavation voids (for spoil disposal) | |

Table 7: Pre-Construction Phase Mitigation Measures

| Sub-Project Activity | Environmental Risk or Impact | Pre-Construction Phase Mitigation Measures | Implemented by | Supervised by | Cost (\$) |
|---|---|--|-------------------------------------|---------------|--|
| National IESIA Approval | All | 1. The IESIA has been prepared and it was approved by the MoE on 02 March 2021 | PMU-PMC Local Firm | MoE | Included in project cost |
| Design | Surface water pollution | 2. The final detailed engineering design of the WWTP ensures that the applicable effluent standards will be complied with | PMC-NIES | PMU | Part of Contract Cost |
| Disclosure and engagement of community through consultation | Any community related risks or impacts | 3. Inform and consult with local communities about the final design, mitigation measures and the Grievance Redress Mechanism | PMU-ESO/ PIU-SFP | EA | Included in PMC cost package |
| Unexploded Ordnance (UXO) survey, & removal | Risk of injuries or fatalities among workers or members of the public | 4. Ensure national military is consulted to confirm that all relevant areas are clear from UXO. This includes: a) All land designated for resettlement purposes (residential/businesses/ farmland) b) All construction sites including 50 m either side of any access roads c) All associated areas including borrow sites. 5. Cambodian Mine Action Centre to clear areas where necessary and provide evidence of clearance to PMU in advance of construction. 6. As evidence, submit a certificate of UXO clearance and attach it as annex to the subsequent monitoring report to ADB once the certificate of clearance has been awarded. | Cambodian Mine Action Centre PIU | PMU/PMC | To be confirmed as required |
| Tree survey for protection or cutting | Loss of trees | 7. Survey for trees higher than 3 m within the construction area for protection or removal. Ensure DWPT and the local authorities have been informed and obtain a permit for tree removal. Addition replantation shall be sought upon completion of the work | Contractor | PMU/PMC | |
| Final Design | Flooding/ Climate Change | 8. The final design to incorporates adequate flood protection considerations also considering climate change risks | PMC | EA | Included in consultancy contract price |
| Final Design | Emergency | 9. The CEMP shall include an Emergency Response Plan 10. The operation and maintenance plan to be prepared prior to start operations shall include an emergency response plan | PMC | EA | Included in consultancy contract price |
| IEE and EMP Updated | All | 11. The IEE and EMP have been updated reflecting the final detailed engineering design and incorporate appropriate mitigation measures. | I/NES | PMU | Included in project cost |

| Sub-Project Activity | Environmental Risk or Impact | Pre-Construction Phase Mitigation Measures | Implemented by | Supervised by | Cost (\$) |
|---|---|---|----------------|---------------|--------------------------|
| Contractor's Environmental Management Plan (CEMP) | All construction related risks and impacts | 12. The contractor shall prepare the CEMP for review and approval by PMC and PMU | Contractor | PMC, PMU / EA | Included in project cost |
| GRM | Any risk or impact as perceived by affected persons | 13. Erect sign boards with project details and GRM procedures/contact details at the entrance to each construction site/camp or at strategic locations. 14. PMU to provide contractor with GRM contact details which the contractor will use to print 'GRM Contact Cards' for its staff to hand to complainants and will keep cards with all vehicles, machinery and site managers/foremen. 15. Contractor to raise awareness of all workers on how to respond when an affected person or member of the public has a complaint i.e. direct the person to the most senior site manager present at the time and provide a 'GRM Contact Card'. | Contractor | PMU/ PIU/ PMC | Included in bid price |

Table 8: Construction Phase Mitigation Measures

| Sub-Project Activity | Environmental Risk or Impact | Construction Phase Mitigation Measures | Implemented by | Supervised by | Cost (\$) |
|----------------------|------------------------------|---|----------------|---------------|-----------------------|
| Civil works | Air quality | 1. Batching facilities will be located at least 500 m from the nearest dwellings in order to reduce the impact of fumes on humans and to be fitted with necessary emission control equipment such as bag house filters to reduce fugitive dust emissions. 2. Water will be sprayed at construction sites, material handling areas, unpaved transport routes and borrow pits where fugitive dust may be generated. 3. Trucks carrying dry and loose construction materials such as earth will be covered with tarpaulins or other suitable cover. 4. Construction vehicles and machinery will be maintained to a high standard to minimize emissions. 5. Vehicle speed will be limited to max 30 km/hour in City and village areas 6. All open burning of construction and demolition waste material and refuse will be prohibited. 7. Areas in which road excavations are required for sewage and drainage pipe works will be notified adequately 1 month in advance of works starting. | Contractor | PMU/PMC | Included in bid price |
| Civil Works | Noise | 8. Maintain all exhaust systems which generate noise in good working order and undertake regular equipment maintenance. 9. Ensure that noise control options such as silencers and mufflers are fitted to exhausts, compressors and fans for construction equipment (such as hydraulic excavator, bulldozer, front loader, backhoe and trucks). | Contractor | PMU/PMC | Included in bid price |

| Sub-Project Activity | Environmental Risk or Impact | Construction Phase Mitigation Measures | Implemented by | Supervised by | Cost (\$) |
|----------------------------|------------------------------|---|----------------|---------------|-----------------------|
| | | <ul style="list-style-type: none"> 10. Implementation of operating and maintenance practices of equipment and machinery to ensure that they are well-maintained. 11. Restrict construction working hours using heavy machinery to daytime between 07:30-18:00 on weekdays. 12. Collaborate with local authorities, school administrations, pagoda managers and affected people to define proper working hours to mitigate the impact of noise (including in streets or near sensitive receptors like hospitals, schools, places of worship). 13. Provide advance warning to the nearby communities on timing of noisy activities and seek suggestions from community members to reduce noise annoyance particularly related to noise sensitive activities at receptors such as periods of worship at pagodas. Public notification of construction operations will incorporate noise considerations; information procedure of handling complaints through the Grievance Redress Mechanism will be disseminated. 14. Use of mobile noise barriers in densely populated areas where excavations are taking place, if necessary, fence-off construction zones. 15. Ensure noise monitoring is undertaken near sensitive receptors (hospitals, schools, places of worship) when construction machinery is in operation. 16. The contractor shall provide all construction personnel working in the vicinity of noisy construction activities (defined as those activities generating noise levels greater than 80 dB(A)), or any construction personnel who requests hearing protection, with hearing protection equipment. 17. As part of a traffic management plan, speed limits should be set for trucks and other work machinery when passing through residential areas where vehicle speed will be reduced to max 30 km/hour. Engines should be turned off when not in use. | | | |
| Civil Works – Sheet Piling | Noise and Vibration | <ul style="list-style-type: none"> 18. Prior to start of sheet piling, the contractor shall carry out baseline noise measurements to establish the background noise levels (at least for a period of 72 consecutive hours) in accordance with internationally recognized standards. 19. As part of the CEMP, the contractor shall prepare and submit a noise and vibration subplan (including specific measures for sheet piling) describing the construction methods, construction equipment and the proposed noise and vibration abatement methods. The subplan shall: (1) Include a reasoning for the proposed construction method based on indicative assessments of the noise and vibration impacts of various alternatives also taking background noise levels into account, (2) include description of sheet pile driving tests with monitoring of noise and vibrations to calibrate the initial assessment and determine site specific methods and practices that generate less intrusive noise and vibrations, (3) consider using temporary | Contractor | PMU/PMC | Included in bid price |

| Total Cost | Construction Phase Mitigation Measures | Implemented by | Supervised by | Cost (\$) |
|---------------|--|-------------------|------------------|-----------------------|
| | <p>moveable noise barriers or other forms of noise attenuation measures (4) include a detailed noise and vibration monitoring programme, and (5) include a community information and consultation programme.</p> <p>20. The contractor shall conduct property condition surveys and assessments of nearby structures prior to start of sheet piling, during sheet piling and after completion of the piling to identify potential vibration impacts from pile driving and differentiate that from existing damages. The contractor shall obtain permission from property owners and administrators prior to undertaking inspections.</p> <p>21. The contractor shall carry out noise and vibration monitoring at sensitive receptors during sheet piling.</p> | | | |
| | <p>22. In accordance with the permit to cut or remove trees (to be obtained prior to start construction), all trees over 3 m in construction sites or access areas shall be preserved, if they are not required and permitted to be removed. The cutting and removal of trees shall be informed to DPWT and the local authorities.</p> <p>23. An inventory shall be held of trees to be cut and addition replantation shall be sought upon completion of the work</p> | Contractor | PMU/PMC | Included in bid price |
| | <p>24. Minimize the area of disturbed surfaces and sequence and schedule work to minimize the duration of time that large erodible surfaces are exposed.</p> <p>25. Where practicable reuse stormwater for various purposes to reduce the amount of water that would otherwise have to be treated and discharged, and to reduce consumption of water from other sources.</p> <p>26. Design and construct non-erodible channels or bunds to prevent runoff from eroding batter faces or entering excavations.</p> <p>27. Ensure that runoff is channelled safely over batter slopes and onto stable areas.</p> <p>28. Ensure that pump outfalls and outfalls from any temporary treatment do not cause or generate erosion of land, banks or beds.</p> <p>29. Pumps for dewatering of trenches or pits should be placed on a gravel base in a sump or inside a large diameter perforated pipe or manhole ring.</p> <p>30. If found necessary, install silt fences or other forms of filters to contain the sediment load in Boeng Snay wetland.</p> <p>31. Install adequate short-term drainage to collect potentially contaminated runoff or process water and provide settlement ponds or tanks with the appropriate design to ensure sufficient time for the particles to settle.</p> <p>32. All chemicals and hydrocarbon products used on construction sites will be stored on an impervious surface, under cover, in adequate tanks or containers and within secondary containment. A bund will be provided around any above ground fuel storage tanks with capacity of 110% of the</p> | Contractor | PMU/PMC | Included in bid price |

| Sub-Project Activity | Environmental Risk or Impact | Construction Phase Mitigation Measures | Implemented by | Supervised by | Cost (\$) |
|----------------------|--|---|----------------|---------------|-----------------------|
| | | <p>at least 50 m from surface water bodies with no direct drainage to surface water.</p> <p>33. All maintenance and refuelling of vehicles and machinery must take place in designated areas, within retention bunds (mobile retention bunds if necessary).</p> <p>34. Similarly, all wastes, especially hazardous waste shall be collected and stored on an impervious surface, under cover and in adequate tanks or containers and within secondary containment for liquid hazardous waste.</p> <p>35. Stockpiles and materials will be stored at least 50 m from surface waters with drainage directed away from the canals or drainage channels and streams or water sources.</p> <p>36. No washing or repair of machinery within 50 m from surface waters.</p> <p>37. There shall be no disposal of spoil on agriculturally productive land or within 50 m of a water course.</p> <p>38. Measures to rehabilitate borrow sites shall be included in the CEMP and will involve contouring of the slopes within each site and replanting sites with native species.</p> <p>39. Topsoil present on construction sites will be removed and stockpiled in labelled areas for later use in rehabilitation of the construction sites including borrow sites.</p> <p>40. Construction working areas will be clearly demarcated and encroachment onto adjacent areas avoided.</p> <p>41. Portable toilets and small wastewater treatment units will be provided on construction sites and construction camps for the workers and canteens. All sanitary facilities should be located at least 50 m from surface water bodies. All workers must be instructed to use these facilities, which shall be kept clean at all times.</p> <p>42. Pit latrines and septic tanks should be placed at least 2 m above the groundwater table must be located at least 50 m from surface water bodies and water wells and in areas of suitable soil profiles.</p> <p>43. Monitoring shall be conducted on effluents and on receiving water bodies.</p> | | | |
| Civil Works | Interruption of power supply, water supply and any other utilities | <p>44. Based on the pre-construction assessment of power and water supply locations, if the contractor identifies a risk to supplies from construction activities, the contractor will:</p> <p>45. Liaise with power or water supplier to identify an approach to minimise inconvenience to residents</p> <p>46. Provide advance warning to residents (minimum 2 weeks in advance) that power/water supplies will be interrupted</p> <p>47. Provide alternatives for residents if the supply interruption exceeds 2 days for water</p> | Contractor | PMU/PMC | Included in bid price |

| Sub-Project Activity | Environmental Risk or Impact | Construction Phase Mitigation Measures | Implemented by | Supervised by | Cost (\$) |
|----------------------------------|--|---|----------------|---------------|-----------------------|
| Excavation | Unanticipated finding of artifacts | 48. Upon a chance find of an artifact, all work will be stopped immediately, find left untouched, and the PIU will be notified to determine the next step and contact the responsible authority, if necessary. | Contractor | PMU/PMC | |
| Spoil and Borrow Site Management | Flora and Fauna Soil and land resources | <p>49. Where possible existing borrow pits or spoil disposal sites shall be used. If new sites are needed, the contractor shall obtain approval from the relevant authorities and from PMU/PMC to ensure that sensitive habitats are avoided and that appropriate mitigation and rehabilitation measures will be implemented.</p> <p>50. obtain and document agreement with the landowner;</p> <p>51. ensure minimisation of vegetation and habitat loss and limit land clearance to only the land required for the borrow pit / spoil disposal;</p> <p>52. Set out the site boundaries and ensure that the surrounding land is not disturbed;</p> <p>53. prohibit the use of burning to clear and control vegetation;</p> <p>54. ensure that spoil is disposed of only at the designated disposal sites and that no material is side tipped along roads or down slopes, dumped on private or public land, or dumped in water bodies;</p> <p>55. ensure that all necessary disposal site preparation activities are completed prior to the start of the related spoil generation, handling and disposal;</p> <p>56. The contractor shall install erosion and sediment controls such as sedimentation ponds, non-erodible channels or bunds at each site and progressively adjust the measures as the landform changes, to minimise on-site erosion and prevent off-site sedimentation;</p> <p>57. ensure that only inert waste is disposed of at spoil disposal sites;</p> <p>58. ensure that roots and stumps and other vegetation debris are separated from the spoil materials prior to disposal and either mulched on-site for reuse in landscaping or ground stabilization works, left to decompose naturally, or otherwise safely disposed;</p> <p>59. conduct routine inspections, not less frequently than once a week, of water pollution, erosion and sediment control measures, and promptly undertake necessary maintenance, repair and upgrading works to ensure that the design capacity is maintained;</p> <p>60. undertake inspections within 24 hours of a heavy rainfall event;</p> <p>61. undertake progressive rehabilitation of disturbed areas taking into consideration what the final land use will be;</p> <p>62. conserve topsoil for later site rehabilitation;</p> <p>63. recontour the sites, fill depressions and revegetate the sites to create a final surface that is consistent with the original topography of the area;</p> <p>64. design the final landforms and slopes to protect groundwater quality, to prevent surface water ponding, to facilitate revegetation, to convey runoff in a non-erosive manner, and to account for long term settlement;</p> | Contractor | PMU/PMC | Included in bid price |

| Sub-Project Activity | Environmental Risk or Impact | Construction Phase Mitigation Measures | Implemented by | Supervised by | Cost (\$) |
|------------------------------------|---|---|----------------|---------------|-----------------------|
| | | <p>65. revegetate the sites in such a way as to establish a diverse, effective, and long-lasting vegetative cover that is capable of self-regeneration without continued dependence on irrigation, soil amendments or fertilizer, and is at least equal in extent of cover to the natural vegetation of the surrounding area;</p> <p>66. use appropriate native and non-invasive plant species for re-vegetation and rehabilitation work.</p> | | | |
| Solid and Liquid Waste Management | Resource use and natural resource contamination | <p>67. Preparation of a Solid and Liquid Waste Management subplan as part of the CEMP, which applies the waste hierarchy to ensure efficient use and management of resources with a priority to prevent waste at source as much as possible;</p> <p>68. Effective management of materials on site through good housekeeping and work planning.</p> <p>69. Clear arrangements for storage and transportation of all hazardous and non-hazardous waste to an authorized and approved disposal point as set out in the Waste Management Plan.</p> <p>70. The wastes, especially hazardous waste shall be collected and stored in safety tanks and provide to license sub-contractor to dispose in local license dumping site.</p> <p>71. Prohibit burning of waste at all times and at illegal disposal areas.</p> <p>72. Provide all vehicles/drivers with plastic bags for waste collection and prevent any unauthorized waste disposal with particular attention paid to prevention of waste entering water ways including irrigation canals.</p> | Contractor | PMU/PMC | Included in bid price |
| Community Health and Safety | Human health and safety | <p>73. Appropriate fencing, protective barriers, and buffer zones will be provided around all construction sites including barriers where needed on access roads and populated.</p> <p>74. The construction campsites should be located outside and distance from residential area and fencing campsites with safety barriers and safety zones.</p> <p>75. Sufficient signage giving health and safety warnings and information disclosure at all sites.</p> <p>76. Develop Traffic Management Plan together with provision of safety signs, traffic safety control and regular monitoring the public safety or traffic safety management on construction sites on the streets in urban area.</p> <p>77. Limited the driving speed in village/urban areas and other sensitive areas. Provide watering to reduce dust pollution in village and urban areas, when and where is dusty.</p> | Contractor | PMU/PMC | Included in bid price |
| Occupational Health and Safety and | Human health and safety | <p>78. Prepare a health and safety plan containing site-specific precautions in accordance with relevant occupational health and safety guidelines.</p> <p>79. Appoint an Environment, Health and Safety Officer who is a qualified engineer.</p> <p>80. Adequate first aid equipment will be made available on site.</p> | Contractor | PIU/PMU/PMC | Included in bid price |

| Sub-Project Activity | Environmental Risk or Impact | Construction Phase Mitigation Measures | Implemented by | Supervised by | Cost (\$) |
|----------------------|------------------------------|---|----------------|---------------|-----------|
| Emergency Response | | <p>81. Inspect and check the relevant construction equipment to ensure that it meets the applicable mechanical and safety requirements.</p> <p>82. Inspect the worksite to ensure that the equipment can be safely mobilized and operated, and that there are no unmitigated risks (typical factors to consider include: proximity and physical condition of nearby structures, soil classification, soft ground, surface and ground water).</p> <p>83. Conduct training of workers on work practices, health and safety measures, use of personal protective equipment and emergency response.</p> <p>84. A supervised danger zone will be established around the pile driving rig.</p> <p>85. At least one lifesaving skiff will be immediately available at locations where employees are working over or adjacent to water.</p> <p>86. Provide fall protection when workers are exposed to unguarded platforms or walkways higher than 2 m.</p> <p>87. Guard against danger to persons at work from falling objects (earth, rock or other material) by suitable sloping, shielding or shoring.</p> <p>88. Ensure there are safe ways to enter and exit the excavation.</p> <p>89. Trenches will have cave-in protection such as sloping, shielding or shoring.</p> <p>90. Materials will be kept at least 0.6 m away from the edge of a trench.</p> <p>91. Adequate ventilation will be secured at all workplaces so as to maintain an atmosphere fit for respiration.</p> <p>92. Excavations will be kept dry.</p> <p>93. Provision will be made for safety precautions when using high voltage electric power tools.</p> <p>94. The health and safety measures at the worksite will be inspected at least once in every day during which persons are at work there, and after any event likely to have affected the strength or stability of the excavation or the shoring.</p> <p>95. Daily toolbox meetings (safety briefings) will be carried out.</p> <p>96. An accident record book will be maintained where all major or minor accidents and incidents are recorded with actions taken.</p> <p>97. Worker education and awareness events for construction hazards will be given. A construction site safety program will be developed and distributed to workers.</p> <p>98. The contractor shall appoint an Environment, Health and Safety Officer who is qualified engineer.</p> <p>99. Adequate first aid equipment will be made available on site.</p> <p>100. Training and awareness will be provided to the workers on safety management and HIV-AIDS.</p> <p>101. Ensure that all workers are equipped with and use Personal Protective Equipment (PEE).</p> | | | |

| Sub-Project Activity | Environmental Risk or Impact | Construction Phase Mitigation Measures | Implemented by | Supervised by | Cost (\$) |
|---|----------------------------------|--|----------------|---------------|-----------------------|
| | | <p>102. Warning signs will be set up if mud is likely on public roads. Mud will be removed at the end of each day. Other spillages on public roads will be removed immediately.</p> <p>103. The Contractor will set out an Emergency Response Plan</p> | | | |
| Protection against the COVID-19 disease | Transmission of SARS-CoV-2 virus | <p>104. Plan and execute work in compliance with country-specific COVID-19 risk management regulations and directives including directions of the General Department of Labour, MoLVT.</p> <p>105. Conduct workplace risk assessment to identify low, medium or high exposure risk to COVID-19. Prepare an action plan for prevention and mitigation of the spreading of COVID-19.</p> <p>106. Monitor the implementation of COVID-19 measures and apply the checklists in Annex 6.</p> <p>107. Conduct Risk communication, training, and education. Training of workers in infection prevention and control practices.</p> <p>108. Dissemination about COVID-19 prevention and mitigation measures to staff and workers through orientation or distributing leaflet/poster at information/safety board at each construction and camp site.</p> <p>109. Daily checking temperature of staff and workers prior starting the works.</p> <p>110. Staff and workers have to wear masks all the time and properly.</p> <p>111. Do not share personal items or supplies such as phones, pens, notebooks, tools, etc.</p> <p>112. Avoid common physical greetings, such as handshakes.</p> <p>113. Maintain a minimum physical distance of one metre from others if possible.</p> <p>114. Wash hands often with soap and water for at least 20 seconds after using the washroom, before handling food, after blowing nose, coughing, or sneezing, and before smoking. If hands are not visibly soiled, and soap and water are unavailable, alcohol-based hand sanitizer can be used.</p> <p>115. All offices and jobsites implement additional cleaning measures of common areas. All door handles, railings, ladders, switches, controls, eating surfaces, shared tools and equipment, taps, toilets, and personal workstation areas are wiped down at least twice a day with a disinfectant, such as disinfectant wipes. Individuals are responsible for cleaning and disinfecting their workstations.</p> <p>116. Commonly touched surfaces on vehicles and equipment are thoroughly cleaned and disinfected at the end of shifts and between users.</p> <p>117. Coughing or sneezing into a tissue or the bend of your arm, not your hand; And dispose of any tissues you have used as soon as possible in a lined waste basket and wash your hands afterwards.</p> <p>Responding measures if there is a COVID-19 case:</p> <p>118. Individuals who have been potentially exposed to the virus, or who are exhibiting flu-like symptoms such as fever, tiredness, coughing, or congestion are instructed to: Not come to work; Contact their supervisor</p> | Contractor | PMU/PMC | Included in bid price |

| Sub-Project Activity | Environmental Risk or Impact | Construction Phase Mitigation Measures | Implemented by | Supervised by | Cost (\$) |
|---------------------------|--|---|----------------|---------------|-----------------------|
| | | <p>and/or human resources department; Stay at home and self-isolate; and Contact local health authorities for further direction.</p> <p>119. Such individuals are required to follow the directions of the local health authority and may not return to work until given approval by the proper health authorities.</p> <p>120. Individual who begin to display flu-like symptoms on site are instructed to avoid touching anything, take extra care to contain coughs and sneezes, and return home immediately to undergo self-isolation as directed by the local health authority.</p> <p>121. All areas on site potentially infected by a confirmed or probable case are barricaded to keep individuals two meters away until the area is properly cleaned and disinfected.</p> | | | |
| Labour Camp Management | Contamination of water, soil, waste production and social issues | <p>122. If a camp for construction workers is required, the contractor will set out a camp management plan in the CEMP together with a location map and a site layout map indicating the site facilities and infrastructure.</p> <p>123. The camp will have adequate and separate accommodation and sanitation facilities for male and female workers, and the facilities will meet good standards of health, hygiene and comfort.</p> <p>124. There will be adequate supply of clean and safe water, adequate waste and wastewater disposal systems, appropriate protection against heat, cold, noise, damp, fire and disease-carrying or poisonous animals (e.g. insects)</p> <p>125. Relevant training on camp management will be provided to all staff.</p> <p>126. Priority will be given to employ local labour and retain evidence of how local labour recruitment efforts were undertaken.</p> <p>127. At the end of the construction phase, all camp facilities, structures, installations and pavements (above ground and below ground, fixed and moveable) will be dismantled or demolished and removed (reused, sold/recycled, disposed of as waste) from the site.</p> <p>128. All chemicals, waste and pollution will be removed and safely disposed of.</p> <p>129. Septic tanks and other sanitary/waste disposal systems will be emptied, and the content disposed of in accordance with local regulations. The installations will be excavated and removed.</p> <p>130. The site will be recontoured, depressions backfilled. Topsoil will be applied, and the site will be revegetated</p> | Contractor | PMU/PMC | Included in bid price |
| Pipe Network Installation | Socio-Economic (Accessibility) | <p>131. Warning given to residents 4 weeks in advance of any excavations</p> <p>132. Implement traffic management procedures to ensure smooth traffic. Provide traffic signs, control vehicle speeds and be able to warn drivers in advance for any changes to road surface or traffic direction</p> <p>133. Provide adequate and safe pedestrian and vehicular (motorbike) access to enter and exit buildings across any open trenches</p> | Contractor | PMU/PMC | Included in bid price |

| Sub-Project Activity | Environmental Risk or Impact | Construction Phase Mitigation Measures | Implemented by | Supervised by | Cost (\$) |
|-------------------------------------|------------------------------|---|----------------|---------------|-----------------------|
| | | <p>134. Temporary restoring/rebuilding the impacted assets or relocation of shops and stalls through cooperation, between construction contractor, HHs and PIU</p> <p>135. Define and adjust suitable working hours in urban areas or at sensitive sites. Open access road for entry and exit for business sites. Remove the unsuitable soil and materials (spoils) from construction sites which are in front of houses and shops</p> <p>136. Restoration or compensation of any damage to properties at an expense of the contractor</p> <p>137. Consideration and management of potential localized flood impacts.</p> | | | |
| Emergency Preparedness and Response | Emergencies | <p>138. Preparation of an Emergency Preparedness and Response Plan.</p> <p>139. The Emergency Preparedness and Response Plan will contain:</p> <ul style="list-style-type: none"> a. Emergency preparedness and response responsibilities b. Identification of hazards that may lead to an emergency situation c. Identification of people at risk d. Emergency response procedures e. Detection, evaluation and emergency level determination f. Notification and communication g. Emergency action h. Termination and follow-up i. Prevention and preparedness j. Training and exercises k. Emergency contacts <p>140. The Emergency Preparedness and Response Plan will address the following emergencies:</p> <ul style="list-style-type: none"> a. Traffic accident b. Serious injuries c. Fall in water d. Trench collapse or cave-in e. Fire f. Explosion g. Flooding h. Electrocution i. Chemical spill j. Structural collapse k. Poisoning | Contractor | PMU/PMC | Included in bid price |

Table 9: Operational Phase Mitigation Measures

| Sub-Project Activity | Environmental Risk or Impact | Operational Phase Mitigation Measures | Implemented by | Supervised by | Cost (\$) |
|---|------------------------------|---|----------------|---------------|-------------------------------|
| Start-up Phase Operation of the WWTP and networks | All | <ol style="list-style-type: none"> 1. The contractor shall develop an operation and maintenance manual for approval by the PMU and PMC. 2. The contractor shall operate the WWTP over a 6-month period. The contractor shall provide an operations and maintenance manager and relevant operations and maintenance staff to operate the WWTP and the wastewater and drainage networks. During the 6-month period, the contractor shall and conduct on-the-job training of the operator's staff. | Contractor | MPWT MoE | Included in bid price |
| Operation of WWTP | Surface Water | <ol style="list-style-type: none"> 3. Remove screenings and grit from the inlet and outlet works; 4. Cut grasses on the embankment, and remove it so that it does not fall in the ponds; 5. Remove floating scum and floating macrophytes from the surface of the maturation and facultative ponds. This will be done to maximise the light energy reaching the pond algae, increase surface re-aeration, and prevent fly and mosquito breeding; 6. Spray scum on the surface of the anaerobic ponds and not removing it, since this will help the treatment processes; 7. Remove any accumulated solids in the inlet and outlet works; 8. Repair any damaged embankment as soon as possible; and repairing any damage of the fences or gates. 9. Sludge management including treatment, disposal. 10. Operational water testing and control procedures to timely identify and troubleshoot operational problems. 11. Maintenance of wetland plants. 12. Emergency procedures including schedule for testing and upgrading procedures. 13. Regularly monitor the wastewater system structures and provide maintenance or corrective actions. 14. Regular inspect the sewage system structures and provide maintenance or corrective actions 15. Conduct monitoring and reporting on water quality of receiving water after discharge from WWTP. The discharge of wastewater quality from WWTP shall always comply with discharged standards specified in sub-decree on Water Pollution Control 1999 for Public water area and sewer. | Operator | MPWT MoE | Included in operational costs |
| Operation of WWTP and wastewater network | Odour | <ol style="list-style-type: none"> 16. Regular monitoring and maintenance of the WWTP, pipelines and pump stations. 17. Quarterly meetings between operator and DPWT with residents and / or their representatives to identify odour or nuisance issues; 18. Movement of any sludge materials off site on days of low wind speed; 19. The sludge loading trucks shall be covered; | Operator | MPWT MoE | Included in operational costs |

| Sub-Project Activity | Environmental Risk or Impact | Operational Phase Mitigation Measures | Implemented by | Supervised by | Cost (\$) |
|--|--------------------------------|---|----------------|---------------|-------------------------------|
| | | 20. Provide tree plantings (tree screen) around the WWTP site to reduce propagation of odours; 21. Conduct air quality monitoring inside and near the WWTP. The air quality shall comply with national standards of Sub-decree on Air Pollution and Noise Disturbance 2000; 22. Use quick-disconnect fittings between pumper truck and receiving station to minimize exposure of septage to the atmosphere. 23. Wash-down facilities to clean up any spills, with drainage into the holding tank 24. Avoid free fall of septage by extending receiving pipes below the water surface 25. Introduce septage at slow controlled rates to avoid turbulence or agitation. 26. Ventilate the air from the tank to an odour biofilter. 27. Clean tanks, trucks and equipment daily. 28. Pump stations: To avoid septic conditions and generation of toxic gases in the pump stations' wet wells, a venting system will be installed to provide air circulation. If necessary, ventilation stacks with odour filter treatment (carbon filters, biofilter) will be added. 29. Conduct routine hosing and debris removal at the pumping station wet wells to remove accumulated solids. | | | |
| Operation of WWTP and wastewater network | Community Health and Safety | 30. Community outreach initiatives, such as consultations, meetings and information campaigns regarding contact with wastewater. 31. Coordinate with local public health officials to monitor incidence of water and air-borne sickness or disease in the local community and worker that could be caused by the operation of WWTP. 32. Review emergency preparedness plans | | | |
| Operation of WWTP and wastewater network | Occupational Health and Safety | 33. Preparation and implementation of a health and safety plan containing: (1) procedures to eliminate or minimize the risk of exposure to biological agents, (2) personal hygiene practices, (3) instructions in proper use of personal protective equipment, (4) emergency procedures. 34. Provide a lifesaving skiff at the wetland ponds. 35. Conduct regular education of workers/staff on the health and safety plan. 36. Conduct safety training sessions at the beginning of each shift. 37. Avoid direct contact with sewage. 38. Avoid aerosolizing wastewater or minimizing exposure time in areas where aerosolizing is occurring. 39. Provide first aid services, supplies and equipment. 40. Undertake regular health checks of workers/staff. 41. Use appropriate protective clothing at work (coveralls) and personal protective equipment (safety boots, gloves, plastic face shields, lifejacket) and, where required wearing respiratory protective equipment. | Operator | MPWT MoE | Included in operational costs |

| Sub-Project Activity | Environmental Risk or Impact | Operational Phase Mitigation Measures | Implemented by | Supervised by | Cost (\$) |
|---|----------------------------------|---|----------------|---------------|-------------------------------|
| Protection against the COVID-19 disease | Transmission of SARS-CoV-2 virus | 42. Conduct workplace risk assessment to identify low, medium or high exposure risk to COVID-19. Prepare an action plan for prevention and mitigation of the spreading of COVID-19. 43. Conduct Risk communication, training, and education. Training of workers in infection prevention and control practices 44. Adopt engineering, organizational and administrative measures, plan work so employees can keep distance from each other and minimise contact. 45. Provide clear and visible guidelines on how to prevent infection at the construction site and initiatives taken. 46. Regularly clean and disinfect toilet and bathrooms 47. Promote personal hygiene (including hand and respiratory hygiene), make wash basins and sanitizers available 48. Screen on entry the temperature of each person entering the work site and record their contact details to facilitate tracking of infected persons should there be a need. | Operator | MPWT MoE | Included in operational costs |

6 MONITORING PLAN

39. The project monitoring conducted under the EMP includes:

- (i) **Project readiness monitoring.** Monitoring to follow up progress on project readiness and close gaps through corrective actions.
- (ii) **Environmental quality monitoring.** To be conducted by a competent authority and/or persons or agency/organization approved by the Project Owner, involving the collection and analyses of air quality, noise and water quality data at designated monitoring locations for assessing compliance with applicable ambient environmental quality standards and emission standards during construction and operation.
- (iii) **EMP compliance monitoring.** To be conducted by the PMC-NES (contracted via the Project Management Consultants) to verify EMP compliance during project implementation.
- (iv) **Affected People monitoring (consultation).** To be conducted by the PIU-SFP by consulting affected people on the impacts during construction and operation.
- (v) **Operational monitoring.** This is required as part of the operations of the subproject and will be undertaken by the relevant government departments or a nominated private sector operator.

40. The engagement of a National Environmental Specialist for some months will be critical to ensuring the capacity and monitor of the PIU and contractor staffs and to ensuring monitoring is effective and that corrective actions are promptly identified and implemented.

6.1 Project Readiness Monitoring for Sub-Project

41. Before construction, the Project Management Consultant (PMC) will monitor the project readiness on environmental management based on a set of indicators as shown in Table 10 and report it to ADB and PMU. This assessment will formally demonstrate that environmental commitments are being carried out and environmental management systems are in place before construction starts or suggest corrective actions to ensure that all requirements are met.

Table 10: Project Readiness Assessment Indicators

| Indicator | Criteria | Are the Criteria met? | If No, What Corrective action is needed? | Date for Corrective Action Completion |
|--|---|-----------------------|--|---------------------------------------|
| | | Yes/No | | |
| 1. EMP update | EMP updated after detailed design & approved by ADB | Y/N | | |
| 2. Compliance with loan covenants | The borrower complies with loan covenants related to project design and environmental management | Y/N | | |
| 3. Public involvement effectiveness | Meaningful consultation completed | Y/N | | |
| | GRM established with entry points | Y/N | | |
| 4. Environmental supervision and monitoring in place | Recruitment of external staff as set out in the Institutional Arrangements for this EMP | Y/N | | |
| | Nomination of government staff for PMU and PIU roles as set out in the Institutional Arrangements for this EMP | Y/N | | |
| 5. Bidding documents and contracts with | Bidding documents and contracts incorporate the environmental activities and mitigation measures required by this EMP | Y/N | | |

| Indicator | Criteria | Are the Criteria met? | If No, What Corrective action is needed? | Date for Corrective Action Completion |
|--------------------------|--|-----------------------|--|---------------------------------------|
| | | Yes/No | | |
| environmental safeguards | Bidding documents and contracts incorporate the Particular Conditions for bidding (see Annex 3) | Y/N | | |
| 6. EMP financial support | The required funds have been set aside for EMP implementation including training and capacity building | Y/N | | |

6.2 Environmental Quality Monitoring

42. During construction, the impact on the sensitive environmental receptors will be monitored and compared against the relevant national or international recognized environmental standards. The environmental quality monitoring programme for the construction phase is outlined in Table 11.
43. During operation, the PIU and the operator are expected to allocate an adequate budget to ensure environmental monitoring. The environmental quality monitoring programme for the operational phase is summarised in Table 12.
44. The applicable ambient environmental quality standards and effluent standards are referenced in Annex 4.

Table 11: Construction Phase Environmental Quality Monitoring

| Environmental Indicators | Location | Frequency | Responsibility | | Estimated Costs (USD) | |
|---|---|---|----------------|----------------|-----------------------|---------------------|
| | | | Supervision | Implementation | Per Sample | Total per site/year |
| Air Quality: PM10, NO ₂ , SO _x | Kampong Cham University compound Nearest residential area west of the WWTP | 1 day (24-hr) per 3 months. More often if standards are exceeded or complaints are filed Means in accordance with national standard | CSC/PIU | Contractor | \$1000 | \$8000 |
| Baseline Noise: 1. LAeq(1-hour) 2. LAmax 3. LAeq(daytime) 4. LAeq(evening) 5. LAeq(night-time) | 2 representative locations in the City Nearest residential area west of the WWTP Kampong Cham University compound | Once prior to start construction work: 72 consecutive hours on weekdays | CSC/PIU | Contractor | \$300 | \$1200 |
| Pile Driving Noise Test: 1. LAeq(1-hour) 2. LAmax | Nearest residential area west of the WWTP Kampong Cham University compound | During pile driving testing | CSC/PIU | Contractor | \$300 | \$600 |
| Pile Driving Vibration Test: Ground peak particle velocity (mm/s) | Boeng Snay Pagoda Nearest residential area west of the WWTP | During pile driving testing | CSC/PIU | Contractor | \$300 | \$600 |
| Construction Noise: 3. LAeq(1-hour) 4. LAmax 5. LAeq(daytime) 6. LAeq(evening) 7. LAeq(night-time) | At one of the representative locations in the City where construction work is on-going Nearest residential area west of the WWTP Kampong Cham University compound | 1 day (24 hours) per 3 months. More often if standards are exceeded or complaints are filed | CSC/PIU | Contractor | \$300 | \$3600 |
| Vibrations: Ground peak particle velocity (mm/s) | Boeng Snay Pagoda Nearest residential area west of the WWTP | Continuous during pile driving | CSC/PIU | Contractor | - | 2000 |

| Environmental Indicators | Location | Frequency | Responsibility | | Estimated Costs (USD) | |
|--|--|---|----------------|----------------|-----------------------|---------------------|
| | | | Supervision | Implementation | Per Sample | Total per site/year |
| Water Quality: Temp, pH, DO, EC, and TSS or Turbidity | In Boeng Snay upstream and downstream the construction work site | Monthly during piling and dewatering of the area for the primary treatment facilities In-situ measurements | CSC/PIU | Contractor | \$100 | \$2400 |
| Water Quality: Temp, pH, DO, BOD, COD, EC, TSS, NH3-N, Total nitrogen, Total Phosphorus, Oil and Grease, <i>E.coli</i> , Total Coliform | In Boeng Snay upstream and downstream the construction work site | Every 3 months during the construction phase When construction is on-going | CSC/PIU | Contractor | \$100 | \$800 |

Table 12: Operational Phase Environmental Quality Monitoring

| Environmental Indicators | Location | Method & Frequency | Responsibility | | Estimated Costs (USD) | |
|--|------------------------------------|--|----------------|----------------|--|-------------------|
| | | | Supervision | Implementation | Per Sample | Total per site/yr |
| Treatment process monitoring: Inlet and outlet flow rates, Temp, pH, DO, BOD5, COD, total N, total P, TSS, TDS, <i>E.coli</i> , total coliform bacteria | Each step in the treatment process | Weekly during the first 6 months of operations, thereafter monthly or more often in case of performance problems | PIU | Operator | Included in operational costs – O&M Budget | |
| Effluent Quality: Temp, Colour, Odour, DO, pH, EC, TSS, BOD5, COD, total P, N total, As, Fe, Cu, Pb, Cd, Zn, Oil and Grease, <i>E.coli</i> , Total Coliform | Effluent outfall | Every 6 months More often if standards are exceeded or complaints are filed | MoE MPWT | Operator | Included in operational costs – O&M Budget | |

| Environmental Indicators | Location | Method & Frequency | Responsibility | | Estimated Costs (USD) | |
|--|--|--|---|----------------|--|-------------------|
| | | | Supervision | Implementation | Per Sample | Total per site/yr |
| Effluent Quality: Temp, pH, DO, BOD5, COD, NH3-N, TSS, TDS, <i>E.coli</i> | Effluent outfall | Monthly | MoE MPWT | Operator | Included in operational costs – O&M Budget | |
| Odour | Site boundary (upwind and downwind) Nearest residential area west of the WWTP Kampong Cham University compound | Weekly during the first 6 months of operations thereafter monthly or more often in case of complaints Systematic use of the human nose (summary of procedures in Annex 6) | MoE MPWT | Operator | Included in operational costs – O&M Budget | |
| Ambient Water Quality: Temp, DO, pH, Colour, Odour, TSS, BOD5, COD, NH3-N, total P, total N, As, Fe, Cu, Pb, Cd, Zn, Oil and Grease, <i>E.coli</i> , total Coliform | Stormwater corridor upstream the WWTP Discharge from Drainage Pump Station Boeng Bassac | Quarterly More often if the ambient water quality standards or the effluent water quality standards are exceeded, or if complaints are filed | MoE MPWT | Operator | Included in operational costs – O&M Budget | |
| Worker & public injury associated with WWTP operations | On property of WWTP | Regular record keeping | MPWT Ministry of Labour and Vocational Training (MLVT) | Operator | Included in operational costs – O&M Budget | |

6.3 Recommended Field Monitoring Standards

6.4 Noise

- IEC 61672-1 Electroacoustics - Sound Level Meters - Part 1: Specifications
- IEC 61672-2 Electroacoustics - Sound level meters - Part 2: Pattern evaluation tests
- IEC 60942 IEC 60942 - Electroacoustics - Sound calibrators

6.5 Vibrations

- German Standard DIN 4150-3:1999 Structural vibration, Effects of vibration on structures (<https://www.din.de/de>)
- ISO 4866:2010(en), Mechanical vibration and shock, Vibration of fixed structures, Guidelines for the measurement of vibrations and evaluation of their effects on structures (<https://www.iso.org/>)

6.6 Odour

- Environmental Protection Agency (Ireland), Office of Environmental Enforcement, Odour Emissions Guidance Note (Air Guidance Note AG9), September 2019¹. See also Annex 6 with a summary of the odour impact assessment procedures

6.7 Wastewater Sampling

- USEPA Region 4, Operating Procedures, Wastewater Sampling, 2017²

6.8 Surface Water Quality

- USGS National Field Manual for the Collection of Water-Quality Data³
- ISO 5667-3:2018, Water quality — Sampling — Part 3: Preservation and handling of water samples
- ISO 5667-4:2016, Water quality — Sampling — Part 4: Guidance on sampling from lakes, natural and man-made

6.9 EMP Compliance Monitoring

45. In order for the EMP to be effective, all its mitigation measures must be monitored to ensure they are implemented. Note this applies to construction only; during operation, it is the responsibility of the appropriate ministries or its line departments to ensure monitoring of operational facilities is incorporated in the operations and maintenance manual and carried out routinely. Compliance monitoring requirements are summarized in Table 13.

¹ <https://www.epa.ie/pubs/advice/air/emissions/Odour%20Emissions%20Guidance%20Note%20AG09.pdf>

² <https://www.epa.gov/quality/procedures-collecting-wastewater-samples>

³ https://www.usgs.gov/mission-areas/water-resources/science/national-field-manual-collection-water-quality-data-nfm?qt-science_center_objects=0#qt-science_center_objects

Table 13: Construction Phase EMP Compliance Monitoring

| Environmental Indicators | Location | Method & Frequency | Responsibility | | Estimated Costs (USD) |
|---|--|---|----------------|-----------------------------|-------------------------------------|
| | | | Verification | Implementation | |
| Air Quality | Construction sites and surroundings | Monthly checking against mitigation measures specified in this EMP | PMC-NES | CSC | Included in CSC contract |
| Noise | Construction sites and surroundings | Monthly checking against mitigation measures specified in this EMP | PMC-NES | CSC | Included in CSC contract |
| Flora | Construction sites | Monthly checking against mitigation measures specified in this EMP | PMC-NES | CSC | Included in CSC contract |
| Water Quality | Construction sites and recipients | Monthly checking against mitigation measures specified in this EMP | PMC-NES | CSC | Included in CSC contract |
| Soil and land resources | Quarries, Borrow and Spoil Disposal Sites and their surroundings | Monthly checking against mitigation measures specified in this EMP | PMC-NES | CSC | Included in CSC contract |
| Resource use and natural resource contamination | Construction sites | Monthly checking against mitigation measures specified in this EMP | PMC-NES | CSC | Included in CSC contract |
| Human health and safety | Construction sites Labour camp | Monthly checking against mitigation measures specified in this EMP | PMC-NES | CSC/Contractor H&S engineer | Included in CSC contract |
| Contamination of water, soil, waste production and social issues | Construction sites Labour camp | Monthly checking against mitigation measures specified in this EMP | PMC-NES | CSC | Included in CSC contract |
| Community Issues <ul style="list-style-type: none"> • Environmental impacts of civil works (e.g., solid & liquid waste, erosion, local flooding, pollution). • Any unforeseen impacts caused by accidentally e.g. through spillages • Civil nuisance (e.g., noise, disrupted business & farming activity, social issues, community health and safety). | Construction sites | Consultation interview with Affected People Using the form in Annex 1. 4-6 weeks after construction starts Every 2 months until end of construction | PMU-ESO | PIU-SFP | Included in PIU staff/travel budget |

| Environmental Indicators | Location | Method & Frequency | Responsibility | | Estimated Costs (USD) |
|---|--|---|----------------|----------------|-------------------------------------|
| | | | Verification | Implementation | |
| <ul style="list-style-type: none"> • Impaired use of access roads (e.g. traffic issues and access). • GRM and its procedures & key contacts | | | | | |
| Socio-Economic (accessibility) | All sites of pipe excavations in urban areas | Visual inspection and record. 4-6 weeks after construction starts Every 2 months until end of construction | PMU-ESO | PIU-SFP | Included in PIU staff/travel budget |

7 PUBLIC CONSULTATION

46. The Consolidated IEE for this sub-project contains details of the consultation undertaken during preparation of these sub-projects. In addition, consultation will take place during implementation. The PIU Safeguard Focal Point (PIU-SFP) will undertake consultation after detailed designs are completed and will conduct consultation interviews within 4-6 weeks of construction starting and then again, every 3 months until the end of construction. This is set out in the Environmental Monitoring Plan which is provided in the Environmental Management Plan for each sub-project.
47. Informal monitoring interviews with affected people will focus on complaints about community disturbance from construction activities, such as construction noise, dust, solid waste and wastewater, as well as public concerns about ecological protection, soil / land concerns and access issues. A sample Environmental Monitoring Interview Form is given in Annex 1 which will contribute to project monitoring.
48. The IEE for these sub-projects also includes information on consultation undertaken during preparation of this EMP and can be consulted or discussed for reference.

8 GRIEVANCE REDRESS MECHANISM

8.1 GRM Objective

49. A grievance redress mechanism (GRM), consistent with the requirements of the ADB Safeguard Policy Statement (2009) has been established to prevent and address community concerns, reduce risks, and assist the project to maximize environmental and social benefits. In addition to serving as a platform to resolve grievances, the GRM has been designed to help achieve the following objectives: (i) open channels for effective communication, including the identification of new environmental issues of concern arising from the project; (ii) demonstrate concerns about community members and their environmental well-being; and (iii) prevent and mitigate any adverse environmental impacts on communities caused by project implementation and operations. The GRM is accessible to all members of the community.

8.2 Proposed GRM System

50. In Cambodia, there is currently no existing legally established system to resolve environmental concerns and complaints. The MPWT, as the EA of the Tonle Sap II will establish the GRM. The establishment shall be made before commencement of site works and have members from the PMU, district authority and commune councils. Grievances can be filed in writing or verbally with any entry point of the GRM. The committee will have 15 days to respond with a resolution. The PMU's Environment Safeguards Officer (PMU-ESO) will oversee/manage the implementation/observance of the mechanism and will be responsible for keeping the PMU informed. The PIU Safeguards Focal Point (PIU-SFP) will be responsible for ensuring GRM implementation at the sub-project level.
51. The GRM will accommodate both informally and formally lodged eligible, grievances. Informally lodged grievances are those received by the contractor during construction. Formally lodged grievances are those received at District and Commune Council offices or direct to the PIU. Commune Councils evaluate complaints for eligibility and then report to PDPWT. The PDPWT and PMU maintain record of all grievances, informally and formally lodged, eligible and ineligible. The PMU will inform the MPWT, as necessary, and report on the observance/implementation of the GRM in the monthly progress reports and in the periodic Environmental Monitoring Report that will be submitted to the MPWT.

8.2.1 Access to the Mechanism

52. Any person who has environmental issues pertaining to the subproject during detailed design, construction and operation phases will have access to the mechanism free of charge. The PMU, through its Environment Safeguards Officer (PMU-ESO) and staff in the MPWT, will ensure that:
- (i) The public and all stakeholders are aware of their rights to access, and will have access to, the GRM free of administrative and legal charges; and
 - (ii) The GRM is fully disclosed prior to construction: (a) in public consultations, (b) through posters displayed in the commune office (posters to include names and contact details of the PIU-SFP).
53. The Access Points to the GRM are critical for ensuring it is useable for affected people (APs). The GRM Access points for this project, as set out in this GRM Mechanism will be:
- The Contractors
 - District and Commune Councils
 - The PIU office
 - The Provincial Department of Public Works and Transport (PDWT).

8.2.2 GRM Steps and Timeframe

54. Grievances raised on environmental impacts are critical to the health and safety of APs. Hence, the proposed mechanism intends to be easily accessible and promptly responsive to APs' complaints.

8.3 Informal Approach

55. Informally, APs can lodge complaints directly to the contractor during construction. PMU to provide contractor with GRM contact details which the contractor will use to print 'GRM Contact Cards' for its staff to hand to complainants and will keep cards with all vehicles, machinery and site managers/foremen.
56. Contractor to raise awareness of all workers on how to respond when an AP or member of the public has a complaint i.e. direct the person to the most senior site manager present at the time and/or Contractor GRM focal point and prepare a 'GRM Contact Card'.
57. The contractor shall document and assess the complaint immediately. If assessment validates the complaint as within the scope of the GRM/eligible, the contractor shall act on the complaint within three days from receipt of complaint. MPWT shall obtain a written confirmation of satisfaction from the AP after 7 days from completion of resolution by the contractor
58. If assessment invalidates the complaint (i.e., reveals the complaint as ineligible or not associated with the project's environmental performance), the contractor shall direct the AP to the Commune Council and shall report the complaint to MPWT within 2 days from receipt of complaint, stating reasons for ineligibility.

8.4 Formal Approach

59. If complaint is eligible but is not acted on within three days from receipt of complaint, or if AP is not satisfied with the resolution undertaken by the contractor, he/she can access the formal mechanism, as shown in Table 14.

Table 14: GRM Steps

| Step | Action |
|---|---|
| Step 1: Lodging a Complaint (Day 1) | AP lodges complaint, by him/herself or with assistance from the village chief or district council, at the access point with the Commune Council. The complaint may also be lodged with the PIU or PDPWT, |
| Step 2: Documentation & Registration of Complaint (Day 1) | Commune Council, PIU/PMU or PDPWT documents/registers lodged complaint, makes sure these are referenced and provides AP with a copy of referenced complaint. The commune forwards complaint document to the MPWT. A copy of a proposed GRM Complaint Form is in Annex 3 |
| Step 3: Assessment and Discussion (Day 1 to 3) | <p>AP shall be informed if the grievance is eligible or ineligible. If it is ineligible, AP shall be directed to the district. If complaint is eligible, AP shall be informed of the expected action timelines as set out in the established mechanism</p> <p>If both of the AP and contractor/operator are available, the complaint shall be immediately reviewed, investigated and discussed. If not, both parties should agree to undertake the review, investigation and discussion within 3 days. The discussion will centre on the cause and action/measure to implement and will engage the PIU/PMU.</p> <p>After review and investigation, agreement on actions and measures and time involved shall be made with the AP. Agreement shall be properly documented and filed; MPWT, PIU/PMU, Commune Council and AP shall have copies</p> |
| Step 4: Implementing the Agreed Resolution | <p>(Day 3 to Day 4) If complaint is minor, i.e., not requiring further investigation and would be easy to resolve, the contractor/operator shall immediately implement agreed on action/resolution. (To be implemented by Day 8)</p> <p>If further investigation and/or procurement of supplies/parts would be necessary, the contractor/operator shall:</p> <ul style="list-style-type: none"> (i) immediately provide the most suitable interim measure to reduce the magnitude of the impact; and (ii) start work on the final measure within 15 days from the day the complaint is lodged. |
| Step 5: Acceptance of Resolution (1 week after completion of action/measure taken) | If, according to the AP, the impact has been resolved satisfactorily, MPWT shall obtain a written confirmation of satisfaction from the AP. This confirmation will signify closure of grievance and will form part of the grievance documentation. The PIU, Commune Council and AP shall retain their copies of the confirmation. |
| Step 6: Monitoring and Evaluation (for 1 week after closure of grievance) | <p>The MPWT shall monitor the effectiveness of the resolution for at least a week after closure of grievance (that is, when action implemented has been satisfactorily confirmed in writing by the complainant).</p> <p>Monitoring and evaluation shall be properly documented and included in the Environmental Monitoring Report</p> |
| Step 7: Appeal for Dissatisfied AP | When dissatisfied (or, in the event the issue/impact persists despite actions undertaken), AP can appeal for assistance from the district in the elevation of his/her complaint to the provincial authority. The provincial authority shall call all parties concerned to review the history of the grievance and resolution process taken and assess the validity of the appeal. |

60. **Appeals.** If appeal is found not valid, the provincial authority shall write the AP and declare the grievance closed. In the event of an appeal, the MPWT shall immediately report to the PMU. The PMU shall ensure that the ADB is immediately informed.
61. If appeal is assessed to be valid, provincial authority and the parties discuss and agree on the quick resolution of the issue. The PMU requires the contractor and operator to implement

the agreed resolution. Should the issue continue to persist despite the second action, or the AP remain dissatisfied, the following steps will be taken:

62. **Special Mission or Judicial System.** If the complainant is still unsatisfied, the PMU/EA will inform ADB to convene a special mission to attempt a resolution prior to use of the Cambodian judicial system.
63. **Accountability Mechanism of the ADB.** In addition, affected people may always contact the Complaints Receiving Officer of the ADB via the following addresses which will be included in the sub-project signboard:
 - Complaints Receiving Officer, Accountability Mechanism
Asian Development Bank
ADB Headquarters, 6 ADB Avenue, Mandaluyong City 1550, Metro Manila, Philippines
(+632) 632-4444 loc. 70309, (+632) 636 2086, amcro@adb.org
Instructions available here: <http://www.adb.org/site/accountability-mechanism/how-file-complaint>.
64. Sufficient communication on the GRM including signs containing contact details of the GRM access points will be displayed at strategic locations to sustain the effective implementation of the mechanism.

9 REPORTING

65. Environmental monitoring reports (using ADB's integrated safeguards monitoring report format) will be prepared semi-annually for the EA by the Project Management Consultants in collaboration with PMU-ESO and sent to the MoE and ADB. The reports will table all indicators measured with the monitoring plan of EMP including performance monitoring indicators and will include relevant national environmental quality standards. The reporting requirements are summarised in Table 15.

Table 15: Reporting Requirements

| Report | Frequency | Purpose | From | To |
|--|-------------|---|---|-----|
| Contractors' Progress Report | Monthly | EMP Implementation Progress and Monitoring Results | Contractor | PMU |
| EMP Progress and Compliance Report | Monthly | Confirm Mitigation Measures | International National Env Specialists with PIU-SFP | PMU |
| Environmental Monitoring | Quarterly | Relevant environmental parameters | PMU-ESO | EA |
| Environmental Monitoring Report (Integrated safeguards monitoring report format) | Semi-Annual | Full EMP Implementation and Adherence to Environmental Covenants/Conditions | PMU | ADB |
| WWTP Operation | Quarterly | Surface and groundwater Quality. Effluent quality, sludge disposal, health and safety | Operator | EA |

9.1 Mechanisms for Feedback and Adjustment

66. Based on environmental monitoring and reporting systems in place, the PMU shall assess whether further mitigation measures are required as corrective action, or improvement in environmental management practices are required. The effectiveness of mitigation measures and monitoring plans will be evaluated by a feedback reporting system. The PMU will play a critical role in the feedback and adjustment mechanism. If the PMU identifies a substantial deviation from the EMP, or if any changes are made to the project scope that may cause significant adverse environmental impacts or increase the number of affected people, then the PMU shall immediately consult MoE, MPWT and ADB to get approval and identify EMP adjustment requirements.

10 ESTIMATED COST OF EMP

67. The total cost for EMP implementation comprises the following:
- The costs of mitigation measures (Table 7, Table 8 and

- Table 9) shall be included in the construction contract and the operations budget.
 - Environmental quality monitoring during the estimated 36 months long construction phase (Table 11) is estimated to \$50,800.
 - The budget for environmental quality monitoring during the operational phase (Table 12) shall be determined under the Operation and Maintenance budget.
 - EMP Compliance Monitoring (including public consultation) (Table 13), no additional cost.
68. Excluded from the EMP budget as separate items are measures required as part of good construction practice. This includes provision of PPE for workers working at site. Cost estimate for such provision for 100 workers are as follows:
- Hard hat (@ 3 USD) 300 USD
 - Glove (@ 0.25USD) 25USD for 10 units/person/year =250 USD/year
 - Mask (50 pcs) @7 USD for 20 units/person/year=280 USD/year
 - Ear plug @1 USD for 5 units/person/year= 500USD
 - Safety Glass @ 1.5 USD for 5 units/person/year =750 USD/year
 - Boot @ 13 USD for 2 pairs/person/year =2600 USD/year
 - Total = 4680 USD/year with 15% contingency then= 5382 USD/year
69. The annual machinery maintenance cost is, in general, 10 % of machinery cost while mobile noise barriers can be custom designed and built on site for temporary use.
- Remuneration and associated costs for Project Management Consultants and staff within PMU and PIU is covered elsewhere in the project budget.
 - The cost for Project Management Consultant includes a National and an International Environmental Safeguards specialist.
 - Training covered elsewhere including WWTP operator training which is covered under the feasibility study for each specific subproject.
70. Contractors will bear the costs for all mitigation measures during construction, including those specified in the tender and contract documents as well as those to mitigate unforeseen impacts due to their construction activities.
71. The selected operator, private sector or government, will bear all environmental monitoring and reporting costs during the operational stage. EMP operational environmental mitigation and monitoring measures will be incorporated in the operations and maintenance manual.

11 CONCLUSION

72. The EMP, if implemented as directed, will mitigate impacts on the natural environment and affected people to an acceptable level. The key parties for mitigation measure implementation are the construction contractor and the plant operator. The implementation of the EMP will be closely monitored and reported on by the relevant stakeholders in the project.
73. The most significant impacts from the project will arise from facility operation. A comprehensive training and capacity building component is therefore incorporated into the subproject. This is essential for ensuring that the investment is both financially and environmentally sustainable and beneficial.

74. A robust Grievance Redress Mechanism will be established, as outlined in the EMP. The GRM will ensure that grievances associated with the subproject implementation are managed swiftly and to the reasonable satisfaction of all parties.
75. Overall, the project is anticipated to bring environmental benefits to the residents and visitors to Kampong Cham City. It will serve to improve the current wastewater and drainage problems and will provide long term environmental improvements.

Annex 1: Affected Person Monitoring Form

| Date of Interview | | Interviewer Name | |
|--|--|--|--|
| Interview Site: Where is the interview held? In school, on the road, in shop | | Stakeholder Name & Status: Full name, status is business owner, schoolteacher, religious leader, resident | |
| Construction Site & Date Construction Started Which road, GPS location if available | | Has this stakeholder been interviewed before? Yes (when were they interviewed) No | |

Interview Discussion Points:

| 1. NOISE | Record of Discussion |
|--|----------------------|
| Before the project started, was the person disturbed by noise? If yes, explain how and when. Where did the noise come from? E.g. traffic, machinery, people, music When did it disturb the person? E.g. all day, at night, intermittently | |
| During the construction, is the person disturbed by noise from the project? If yes, explain how and when. What type of noise and where did the noise come from? All day, at night, intermittently? | |
| If noise from construction is a problem, what changes does the person suggest are made? | |
| 2. AIR QUALITY | Record of Discussion |
| Before the project started, was the person affected by air pollution or dust? If yes, explain how and when. Where did the pollution or dust come from? E.g. traffic, machinery, construction, burning garbage, cooking stoves When was the dust or pollution a problem? E.g. all day, at night, intermittently | |
| During the project, is the person disturbed by dust or pollution? If yes, explain how and when. What type of noise and where did the noise come from? E.g. increased traffic congestion, construction machinery, construction workers, burning construction garbage etc When did it disturb the person? E.g. all day, at night, intermittently | |
| 3. VEGETATION AND LAND USE | Record of Discussion |
| Before the project started, what was the vegetation like in the project area? E.g. pastureland, trees, shrubs, rice fields. | |

| | |
|--|-----------------------------|
| During the project, has the person found the vegetation situation has changed? If yes, explain how and when. | |
| If impact on vegetation is unacceptable, what changes does the person suggest are made? | |
| 4 COMMUNITY SAFETY | Record of Discussion |
| Before the project started, can you describe the community safety situation in the project area? E.g. no problems, some accidents, difficulty crossing the roads | |
| During the project, has the person found the community safety situation has changed? If yes, explain how and when. Slower traffic so easier to cross the roads, construction vehicles are making a crossing harder / easier, more accidents / less accidents, construction site dangers | |
| If change in road safety is unacceptable, what changes does the person suggest are made? | |
| 5. WATER QUALITY | Record of Discussion |
| Before the project started, was the person affected by poor water quality? If yes, explain how and when. Ground water? Surface Water? which Water source? How was it polluted? | |
| During the project, is the person affected by water pollution? If yes, explain how and when. Ground water? Surface Water? which Water source? How is quality being affected? | |
| If water quality from the construction is a problem, what changes does the person suggest are made? | |
| 6. ACCESS | Record of Discussion |
| During the project, is the person affected by reduced access to their business, home or land? Access to what is limited, and how? | |
| If access limitations are not acceptable, please suggest changes which can be made? | |
| 7. OTHER ISSUES | Record of Discussion |
| Any other issues about the construction sites that the person wants to discuss? E.g. wastewater concerns, waste disposal, Other concerns, labour force, | |

Annex 2: GRM – Complaint Recording Form

| | |
|--|--|
| PIU Staff Responsible: (name and role) | |
| Date: (of this record) | |

| | |
|--|--|
| Date of Complaint: | |
| Date Resolution Required by (15 days from initial complaint): | |
| Complaint Made by: (Name & Contact Details) | |
| Method of Complaint: (direct to PMU, via Contractor, Via Commune People's Council) | |
| Details of Complaint: (issues, actions taken so far, when did it start – all details needed) | |
| PMU Actions: (Next steps for PMU to resolve the issue or to move complaint to next level) | |
| Follow Up Actions Needed and Date: (PMU to follow up on resolution if needed, e.g. check contractor actions) | |

Annex 3: Particular Conditions (For Bidding Documents)

The following clauses shall be added to the Bidding Document, Section 8 Particular Conditions in relation to the Environmental Safeguards for the Project:

- a) The contractor will undertake to develop and submit to the PMU/CSC for approval, a Contractor's Environmental Management Plan with the following management sub-plans:
 - Noise and Vibration Management
 - Spoil and Borrow Site Management
 - Solid and Liquid Waste Management
 - Traffic Management
 - Labour Camp Management
 - Occupational Health and Safety
 - Emergency Response
- b) The subplans shall be sufficiently detailed as to allow a clear understanding of the approach the contractor will take to mitigate environmental impacts during construction. The contractor shall adhere to the management subplans at all times unless prior agreement has been given by the PMU under extenuating circumstances.
- c) The Contractor shall commit to ensuring a full-time environmental health and safety officer on site who is competent, nominated to manage health and safety risks, and who can implement the EMP requirements for occupational health and safety and ensure relevant health and safety legislation is followed.
- d) The Contractor shall commit to enabling the project staff or consultants tasked with monitoring, full access to all information and data required in order that the Environmental Management Plan can be fully monitored.

Annex 4: Environmental Quality Standards

(1) Ambient Air Quality Standards

Source: Sub-decree No. 42 ANRK.BK on Air Pollution Control and Noise Disturbance, MoE 2000.

| Parameter | Averaging Period | Standard | |
|---|------------------|--------------------|-------|
| | | Unit | Value |
| Nitrogen Dioxide (NO ₂) | 24 hours | mg /m ³ | 0.1 |
| Sulfur Dioxide (SO ₂) | 24 hours | mg /m ³ | 0.3 |
| Carbon Monoxide (CO) | 24 hours | mg /m ³ | 20 |
| PM 2.5 WHO Ambient Air Quality Guidelines (2005) | 24 hours | µg/m ³ | 25 |
| PM 10 WHO Ambient Air Quality Guidelines (2005) | 24 hours | µg/m ³ | 50 |

(2) Ambient Noise Standards

Source: Sub-decree No. 42 ANRK.BK on Air Pollution Control and Noise Disturbance, MoE, 2000.

| Area | 06:00-18:00 dB(A) | 18:00-22:00 dB(A) | 22:00-06:00 dB(A) |
|--|----------------------|----------------------|----------------------|
| Quiet area (hospital, school) | 45 | 40 | 5 |
| Residential area | 60 | 50 | 45 |
| Commercial area | 70 | 65 | 50 |
| Area with factories mixed with housing | 75 | 70 | 50 |

(3) Surface Water Quality Standard

Referring to Sub-decree, No. 27 ANRK.BK on Water Pollution Control, MoE, 1999, the standards of water quality are divided as follows:

Annex 2 of Sub-decree on Water Pollution Control

Effluent standard for pollution sources discharging wastewater to public water areas or sewer

| No | Parameters | Unit | Allowable limits for pollutant substance discharging to | |
|----|------------------------------------|------|---|-----------------------------|
| | | | Protected public water area | Public water area and sewer |
| 1 | Temperature | 0C | < 45 | < 45 |
| 2 | pH | | 6 – 9 | 5 - 9 |
| 3 | BOD ₅ (5 days at 200 C) | mg/l | < 30 | < 80 |
| 4 | COD | mg/l | < 50 | < 100 |
| 5 | Total Suspended Solids | mg/l | < 60 | < 120 |
| 6 | Total Dissolved Solids | mg/l | < 1000 | < 2000 |
| 7 | Grease and Oil | mg/l | < 5.0 | < 15 |
| 8 | Detergents | mg/l | < 5.0 | < 15 |
| 9 | Phenols | mg/l | < 0.1 | < 1.2 |

| No | Parameters | Unit | Allowable limits for pollutant substance discharging to | |
|----|--------------------------------|------|---|-----------------------------|
| | | | Protected public water area | Public water area and sewer |
| 10 | Nitrate (NO ₃) | mg/l | < 10 | < 20 |
| 11 | Chlorine (free) | mg/l | < 1.0 | < 2.0 |
| 12 | Chloride (ion) | mg/l | < 500 | < 700 |
| 13 | Sulphate (as SO ₄) | mg/l | < 300 | < 500 |
| 14 | Sulphide (as Sulphur) | mg/l | < 0.2 | < 1.0 |
| 15 | Phosphate (PO ₄) | mg/l | < 3.0 | < 6.0 |
| 16 | Cyanide (CN) | mg/l | < 0.2 | < 1.5 |
| 17 | Barium (Ba) | mg/l | < 4.0 | < 7.0 |
| 18 | Arsenic (As) | mg/l | < 0.10 | < 1.0 |
| 19 | Tin (Sn) | mg/l | < 2.0 | < 8.0 |
| 20 | Iron (Fe) | mg/l | < 1.0 | < 20 |
| 21 | Boron (B) | mg/l | < 1.0 | < 5.0 |
| 22 | Manganese (Mn) | mg/l | < 1.0 | < 5.0 |
| 23 | Cadmium (Cd) | mg/l | < 0.1 | < 0.5 |
| 24 | Chromium (Cr+3) | mg/l | < 0.2 | < 1.0 |
| 25 | Chromium (Cr+6) | mg/l | < 0.05 | < 0.5 |
| 26 | Copper (Cu) | mg/l | < 0.2 | < 1.0 |
| 27 | Lead (Pb) | mg/l | < 0.1 | < 1.0 |
| 28 | Mercury (Hg) | mg/l | < 0.002 | < 0.05 |
| 29 | Nickel (Ni) | mg/l | < 0.2 | < 1.0 |
| 30 | Selenium (Se) | mg/l | < 0.05 | < 0.5 |
| 31 | Silver (Ag) | mg/l | < 0.1 | < 0.5 |
| 32 | Zinc (Zn) | mg/l | < 1.0 | < 3.0 |
| 33 | Molybdenum (Mo) | mg/l | < 0.1 | < 1.0 |
| 34 | Ammonia (NH ₃) | mg/l | < 5.0 | < 7.0 |
| 35 | DO | mg/l | >2.0 | >1.0 |
| 36 | Polychlorinated Byphemyl | mg/l | <0.003 | <0.003 |
| 37 | Calcium | mg/l | <150 | <200 |
| 38 | Magnesium | mg/l | <150 | <200 |
| 39 | Carbon tetrachloride | mg/l | <3 | <3 |
| 40 | Hexachloro benzene | mg/l | <2 | <2 |
| 41 | DTT | mg/l | <1.3 | <1.3 |

| No | Parameters | Unit | Allowable limits for pollutant substance discharging to | |
|----|------------------------|------|---|-----------------------------|
| | | | Protected public water area | Public water area and sewer |
| 42 | Endrin | mg/l | <0.01 | <0.01 |
| 43 | Dieldrin | mg/l | <0.01 | <0.01 |
| 44 | Aldrin | mg/l | <0.01 | <0.01 |
| 45 | Isodrin | mg/l | <0.01 | <0.01 |
| 46 | Perchloro ethylene | mg/l | <2.5 | <2.5 |
| 47 | Hexachloro butadiene | mg/l | <3 | <3 |
| 48 | Chloroform | mg/l | <1 | <1 |
| 49 | 1,2 Dichloro ethylene | mg/l | <2.5 | <2.5 |
| 50 | Trichloro ethylene | mg/l | <1 | <1 |
| 51 | Trichloro benzene | mg/l | <2 | <2 |
| 52 | Hexachloro cyclohexene | mg/l | <2 | <2 |

Remark: The Ministry of Environment and the Ministry of Agriculture, Forestry and Fishery shall collaborate to set up the standard of pesticides which discharged from pollution sources.

Annex 4 of Sub-decree on Water Pollution Control

Water Quality Standard in public water areas for bio-diversity conservation

Source: Sub-decree No. 42 ANRK.BK on Water Pollution Control, MOE, 1999.

a) River

| Parameter | Standard | |
|------------------|-----------|-----------|
| | Unit | Value |
| pH | mg/l | 6.5 – 8.5 |
| BOD5 | mg/l | 1 – 10 |
| Suspended Solid | mg/l | 25 – 100 |
| Dissolved Oxygen | mg/l | 2.0 - 7.5 |
| Coliform | MPN/100ml | < 5000 |

b) Lakes and Reservoirs

| Parameter | Standard | |
|------------------|-----------|--------------|
| | Unit | Value |
| pH | mg/l | 6.5 – 8.5 |
| COD | mg/l | 1 – 8 |
| Suspended Solid | mg/l | 1 – 15 |
| Dissolved Oxygen | mg/l | 2.0 - 7.5 |
| Coliform | MPN/100ml | < 1000 |
| Total Nitrogen | mg/l | 1.0 – 0.6 |
| Total Phosphorus | mg/l | 0.005 – 0.05 |

Annex 5 of Sub-decree on Water Pollution Control:

Water Quality Standard in public water areas for public health protection. Source: Sub-decree No. 42 ANRK.BK on Water Pollution Control, MOE, 1999

| No | Parameter | Unit | Standard Value |
|----|-----------------------|------|----------------|
| 1 | Carbon tetrachloride | µg/l | < 12 |
| 2 | Hexachloro-benzene | µg/l | < 0.03 |
| 3 | DDT | µg/l | < 10 |
| 4 | Endrin | µg/l | < 0.01 |
| 5 | Dieldrin | µg/l | < 0.01 |
| 6 | Aldrin | µg/l | < 0.005 |
| 7 | Isodrin | µg/l | < 0.005 |
| 8 | Perchloroethylene | µg/l | < 10 |
| 9 | Hexachlorobutadiene | µg/l | < 0.1 |
| 10 | Chloroform | µg/l | < 12 |
| 11 | 1,2 Trichloroethylene | µg/l | < 10 |
| 12 | Trichloroethylene | µg/l | < 10 |
| 13 | Trichlorobenzene | µg/l | < 0.4 |
| 14 | Hexachloroethylene | µg/l | < 0.05 |
| 15 | Benzene | µg/l | < 10 |
| 16 | Tetrachloroethylene | µg/l | < 10 |
| 17 | Cadmium | µg/l | < 1 |
| 18 | Total mercury | µg/l | < 0.5 |
| 19 | Organic mercury | µg/l | 0 |
| 20 | Lead | µg/l | < 10 |
| 21 | Chromium, valent 6 | µg/l | < 50 |
| 22 | Arsenic | µg/l | < 10 |
| 23 | Selenium | µg/l | < 10 |
| 24 | Polychlorobiohenyl | µg/l | 0 |
| 25 | Cyanide | µg/l | < 0.005 |

(4) Drinking Water Quality Standard

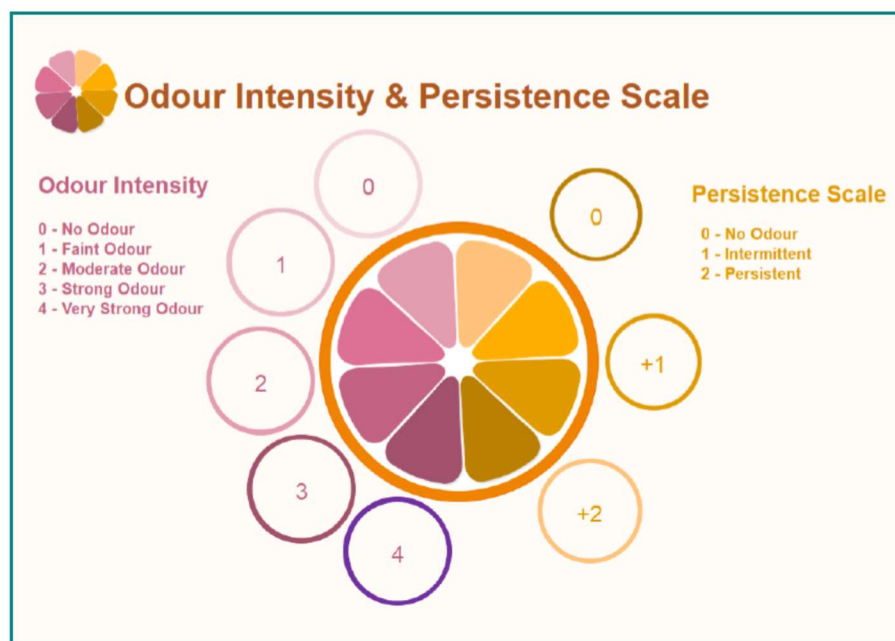
| No | Parameter | Drinking Water Quality Standard | |
|----|------------------------------|---------------------------------|---------|
| | | Unit | Value |
| 1 | pH | - | 6.5-8.5 |
| 2 | Turbidity | NTU | 5.0 |
| 3 | Dissolved Oxygen (DO) | mg/l | NV |
| 4 | Total Suspended Solid (TSS) | mg/l | NV |
| 5 | Chloride (Cl-) | mg/l | 250 |
| 6 | Nitrate (NO ₃) | mg/l | 50 |
| 7 | Phosphate (PO ₄) | mg/l | NV |

| No | Parameter | Drinking Water Quality Standard | |
|----|-----------------------------|---------------------------------|-------|
| | | Unit | Value |
| 8 | Sulphate (SO ₄) | mg/l | 250 |
| 9 | (BOD) ₅ | mg/l | NV |
| 10 | (COD) Mn | mg/l | NV |
| 11 | Aluminum (Al) | mg/l | 0.2 |
| 12 | Arsenic (As) | mg/l | 0.05 |
| 13 | Copper (Cu) | mg/l | 1.0 |
| 14 | Iron (Fe) | mg/l | 0.3 |
| 15 | Lead (Pb) | mg/l | 0.01 |
| 16 | Manganese (Mn) | mg/l | 0.1 |
| 17 | Mercury (Hg) | mg/l | 0.001 |
| 18 | Zinc (Zn) | mg/l | 3.0 |
| 19 | Total Coliform | MPN/100mlml | 0 |

Annex 5: Odour Impact Assessment Procedures

The odour impact assessment at nearby sensitive receptors will be performed in accordance with the following standard procedures⁴:

- Staff will only undertake the odour impact assessment prior to coming to work as staff are likely to be desensitised to the odour generated onsite, termed odour adaptation, and thus might be unable to objectively assess odour in the surrounding environment.
- Prior to the test, the wind conditions will be confirmed, and an initial odour impact assessment taken upwind of the facility prior to moving to downwind locations.
- The surveyors will record both the intensity of the odour and its persistence at each location assessed using the terminology outlined in the Figure below.
- The surveyors should not smoke, chew gum, drink coffee / tea nor be experiencing a medical condition (such as a cold / flu) which could interfere with the test.
- Surveys will be conducted on at least several occasions over varying days of the week. The time of day when odour complaints are made and the wind direction which leads to most complaints should be considered also.
- Where an odour is detected, an inspection of the facility must be carried out directly by the odour investigator, to determine whether any observed odour can be linked to the site and to evaluate any potential odour producing activities or locations. Understanding the actual process conditions onsite at the time of the complaint will help to locate the issue and isolate the problem.



⁴ Adapted from Environmental Protection Agency (Ireland), Office of Environmental Enforcement, Odour Emissions Guidance Note (Air Guidance Note AG9), September 2019
<https://www.epa.ie/pubs/advice/air/emissions/Odour%20Emissions%20Guidance%20Note%20AG09.pdf>

Annex 6: COVID-19 Monitoring Checklists

1. Prevention Measures

Below is a checklist for prevention measures.

| No. | COVID-19 Preventive Measures | Yes | No |
|-----|--|-----|----|
| 1 | Dissemination of COVID-19 prevention measures to staff and workers through orientation or distributing leaflet/poster at information/safety board at each construction and camp site | | |
| 2 | Daily checking temperature of staff and workers prior to start working | | |
| 3 | Staff and workers are wearing masks all the time | | |
| 4 | Do not share personal items or supplies such as phones, pens, notebooks, tools, etc. | | |
| 5 | Avoid common physical greetings, such as handshakes | | |
| 6 | Maintain a minimum physical distance of one metre from others if possible | | |
| 7 | Wash hands often with soap and water for at least 20 seconds after using the washroom, before handling food, after blowing nose, coughing, or sneezing, and before smoking. If hands are not visibly soiled, and soap and water are unavailable, alcohol-based hand sanitizer can be used | | |
| 8 | All offices and jobsites implement additional cleaning measures of common areas. All door handles, railings, ladders, switches, controls, eating surfaces, shared tools and equipment, taps, toilets, and personal workstation areas are wiped down at least twice a day with a disinfectant, such as disinfectant wipes. Individuals are responsible for cleaning and disinfecting their workstations | | |
| 9 | Commonly touched surfaces on vehicles and equipment are thoroughly cleaned and disinfected at the end of shifts and between users | | |
| 10 | Coughing or sneezing into a tissue or the bend of your arm, not your hand; dispose of used tissues you have as soon as possible in a lined waste basket and wash your hands afterwards | | |
| 11 | Complying with any instructions announced by the Ministry of Health | | |

2. Response to Possible Cases of COVID-19

Below is a checklist on proper response to possible cases of COVID-19 disease.

| No. | Measures in case of COVID-19 | Yes | No |
|-----|--|-----|----|
| 1 | <p>Individuals who have been potentially exposed to the virus, or who are exhibiting flu-like symptoms such as fever, tiredness, coughing, or congestion are instructed to:</p> <ul style="list-style-type: none"> ▪ Not come to work; ▪ Contact their supervisor and/or human resources department; ▪ Stay at home and self-isolate; and | | |

| | | | |
|---|---|--|--|
| | ▪ Contact local health authorities for further direction. | | |
| 2 | Such individuals are required to follow the directions of the local health authority and may not return to work until given approval by the proper health authorities; | | |
| 3 | Individuals who begin to display flu-like symptoms on site are instructed to avoid touching anything, take extra care to contain coughs and sneezes, and return home immediately to undergo self-isolation as directed by the local health authority; | | |
| 4 | All areas on site potentially infected by a confirmed or probable case are barricaded to keep individuals two meters away until the area is properly cleaned and disinfected. | | |

Note: Additional COVID-19-related checklist/form, please go to this link:

<http://www.cdcmoh.gov.kh/resource-documents/covid-19-documents/494-2019-ncov-documents-management>