

# Environmental Management Plan

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December 2021

## Cambodia: Integrated Urban Environmental Management in the Tonle Sap Basin Project

### Pursat Drainage Subproject

Prepared by Ministry of Public Works and Transport for the Asian Development Bank. This is an updated version of the draft originally posted in July 2021 available on <https://www.adb.org/projects/documents/cam-42285-013-emp-3>.

## CURRENCY EQUIVALENTS

(as of 06 July 2021)

|               |   |            |
|---------------|---|------------|
| Currency unit | – | Riel (KR)  |
| KR 1.00       | = | \$ 0.00024 |
| \$1.00        | = | KR 4,067   |

## ABBREVIATIONS

|         |   |                                                          |
|---------|---|----------------------------------------------------------|
| ADB     | – | Asian Development Bank                                   |
| AP      | – | Affected People                                          |
| BOD     | – | Biochemical Oxygen Demand                                |
| CEMP    | – | Construction Environmental Management Plan               |
| C-EHSO  | – | Contractor Environmental Health and Safety Officer       |
| COD     | – | Chemical Oxygen Demand                                   |
| CSC     | – | Construction Supervision Consultant                      |
| DBST    | - | Double bitumen surface treatment                         |
| EA      | – | Executing Agency                                         |
| IESIA   | – | Initial Environmental and Social Impact Assessment       |
| EMP     | – | Environmental Management Plan                            |
| ESO     | – | Environmental Safeguard Office                           |
| GRM     | – | Grievance Redress Mechanism                              |
| GRC     | – | Grievance Redress Committee                              |
| IEE     | – | Initial Environmental Examination                        |
| IRC     | – | Inter-ministerial Resettlement Committees                |
| H&S     | – | Health and Safety                                        |
| MoE     | – | Ministry of Environment                                  |
| MPWT    | – | Ministry of Public Works and Transport                   |
| PIU     | – | Project Implementation Unit                              |
| PIU-ESC | – | PIU Environmental Safeguards Counterpart                 |
| PMIS    | – | Project Management and Implementation Support            |
| PMIS    | - | PMIS -International and National Environment Specialists |
| I/NES   |   |                                                          |
| PMU     | – | Project Management Unit                                  |
| PMU-ESO | – | PMU Environmental Safeguards Officer                     |
| PDPWT   | – | Provincial Department of Public Work and Transport       |
| PSC     | – | Project Steering Committee                               |
| PDOE    | – | Provincial Department of Environment                     |
| PPE     | – | Personal Protective Equipment                            |
| SPS     | – | Safeguards Policy Statement                              |
| TSS     | – | Total Suspended Solid                                    |
| VO      | - | Variation Order                                          |
| WHO     | – | World Health Organisation                                |
| WWTP    | – | Wastewater Treatment Plant                               |

## WEIGHTS AND MEASURES

|                 |   |                                                                                                                                                                                           |
|-----------------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| dBA             | – | A-weighted Decibel                                                                                                                                                                        |
| km              | – | Kilometer                                                                                                                                                                                 |
| km <sup>2</sup> | – | Square kilometer                                                                                                                                                                          |
| 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               | – | Meter                                                                                                                                                                                     |
| °C              | – | Degree Celsius                                                                                                                                                                            |
| PM10            | – | Particulate Matter 10 micrometers or less                                                                                                                                                 |
| PM 2.5          | – | Particulate Matter 2.5 micrometers or less                                                                                                                                                |

## NOTE

- (i) In this report, "\$" refers to US dollars.

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# I. INTRODUCTION

## 1.1 INTRODUCTION

### 1.1.1 Purpose

1. This document is the environmental management plan (EMP) for the Urban Drainage and Wastewater Treatment Plan subproject in Pursat city, Pursat Province for the Integrated Urban Environmental Management in The Tonle Sap Basin Project. The EMP for the subproject defines 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 preconstruction, construction, and operation of the subprojects in order to prevent, reduce, or mitigate adverse impacts.
2. This EMP is prepared for construction of Urban Drainage and Wastewater Treatment Plant. The EMP was updated (1) in July 2021 to integrate Variation Order (CW05/VO1)<sup>1</sup> to improve the integrity of the wastewater treatment plant, and a second Variation Order (CW05/VO2)<sup>2</sup> for Kaoh village embankment (2) in November 2021 to integrate Variation Orders 3 and 4 (CW05/VO3-4) which improve the pavement reinstatement for the drainage works (VO3 and VO4) and canal improvements (VO3). The EMP updates are based on the final Detailed Engineering Design (DED). This EMP supersedes all previously disclosed versions.
3. The other subprojects under the Integrated Urban Environmental Management in The Tonle Sap Basin Project have individual EMPs. The integrated Initial Environmental Examination (IEE) that covers all the subprojects is a separate document. The IEE was correspondingly updated to reflect CW05/VO1 to VO4.
4. An Initial Environmental Impact Assessment was completed under National law and approved by the Ministry of Environment 19th November 2019. The Variation Orders have not caused any updates to be conducted to the existing Pursat drainage and waste water Initial Environmental and Social Impact Assessment.

### 1.1.2 Budget

5. The costs for EMP implementation comprise:
  - Training and Capacity Building: \$10,000 (See Table 5)
  - Environmental Quality Monitoring: Pre-Construction \$4,000 (Included in domestic Initial Environmental and Social Impact Assessment (IESIA), During Construction per year \$15,800 (see Table 9) Note Bill of Quantities contains \$50,000 for 'Provision of Environmental Management Plan'.

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<sup>1</sup> The variation order included earthworks for raising the WWTP and road embankment next to the WWTP for flood protection, given the site flooded during construction.

<sup>2</sup> The repeated flooding events in Pursat during the month of October 2020 have damaged the river embankment along the Pursat river at the village of Kaoh. The village is included in the Project as a part of the Community Managed Environmental Improvements component of the project. Under this component sanitation improvements will be implemented in this village which include the installation of VIP latrines. These sanitation improvements cannot be successfully implemented without the repair of the damaged river embankment to protect the village from flooding during high water levels in the river. It has therefore been agreed to include the repair of the river embankment in the scope of the subproject

6. Other aspects of the EMP including mitigation measures, reporting, affected people consultation and EMP monitoring are included in other budgets depending on the organization responsible for the aspect e.g. PMU operational budget or included in contractor's bid price. CW05/VO1 to VO4 have not caused a change to EMP implementation budget.

### 1.1.3 Outline of technical approach

7. Urban Drainage investment will comprise 1942 manholes of specified varying sizes and the pipe network in Table 1.

Table 1: List of alignments for construction

| Pipe description                                | Unit | Length    |
|-------------------------------------------------|------|-----------|
| Reinforced Concrete Pipe, 600mm dia., Class B1  | m    | 5,192.00  |
| Reinforced Concrete Pipe, 800mm dia., Class B1  | m    | 14,080.18 |
| Reinforced Concrete Pipe, 1000mm dia., Class B1 | m    | 2,202.51  |
| Reinforced Concrete Pipe, 1200mm dia., Class B1 | m    | 1,098.32  |
| Reinforced Concrete Pipe, 1500mm dia., Class B1 | m    | 892.50    |

Source: DED team, Bill of Quantities

8. The WWTP sub-project will comprise:

#### WWTP Works:

- Primary Treatment: 6.4 m deep 20.25 m long and 12.7 m wide.
- Anaerobic tank: (total 4 tanks) 4.2 m deep 29.3 m long and 21.75 m wide.
- Anaerobic filter: 3.3 m deep 40 m long and 21.25 m wide.
- Horizontal Reed Bed (4 concrete tanks): 0.85 m deep 40 m long and 20 m wide.
- Chlorination Chamber: 2.8 m deep 13.6 m long and 5.4 m wide.

9. Ancillary works including:

- Equipment storage area
- Office Building
- Guard house
- Operations house
- Sludge drying bed
- Landscaping (trees) around WWTP perimeter

10. CW05VO1 includes:

- Embankment raising around WWTP
- Improvement to access road adjacent to canal with Double Bitumen Surface Treatment (DBST)
- Installation of 14 culverts along access road adjacent to canal.
- The ground level of the administration building will be raised from the current 14.6m to 15.7m.

- Change to cleaning techniques for the existing drainage system as high sediment levels make jetvac equipment unusable therefore an increase in labor is needed.
  -
11. CW05/VO2, Kaoh village embankment raising includes:
- Restoration of 1.5 km river embankment by soil filling and compaction,
  - Provision of embankment protection
  - Surfacing of the embankment road with laterite paving.
12. The layout of the embankment and typical cross sections are shown in figures 3 and 4.
13. CW05/VO3 includes:
- Construction of a pipe culvert for bypassing the road culvert at the end of the reshaped irrigation canal section.
  - Improvement of the junction of the canal and the natural
  - Installation of a flap gate on the outfall of the drainage system
  - Additional pavement reinstatement quantities and laterite pavement upgraded to DBST for 2,661 m
  - The upgrading of the pavement will include the reconstruction of the subbase and installation of an aggregate base course in addition to the DBST
  - Installation of an additional drainage line between street 102 and street 103
  - Construction of 43m retaining wall at WWTP site to guarantee the stability of the soil filling at the location of the administrative building
  - Generator building construction.
14. CW05/VO4 includes:
- Additional works for pavement reinstatement and drainage works
  - The concrete pavement be reinstated after the installation of the drainage line 554m with a pavement width of 4m
  - The existing DBST pavement will be upgraded to concrete pavement on over a total length of 1,531m with road widths varying between 6 to 12m
  - Pavement reinstatement will also include the repair and further extension of road curbs and gutters
  - Replace 210 damaged manhole covers and cover frames.

## 1.2 SUMMARY OF POTENTIAL RECEPTORS & IMPACTS

15. The impacts of the project are influenced by the presence of receptors in the sub-project area; without receptors, there will not be any impacts. The receptors are summarized in Table 2. The impact of CW05/VO1/VO3/VO4 on receptors is unchanged from the original contract as works are of a comparable scale and within the same construction area i.e. centre of Pursat and around the WWTP site and canal. The receptors for CW05/VO2 (Kaoh Village)



are reflected in the table below.

16. In addition to these site specific receptors, housing, businesses and access requirements are also considered impact receptors.

Table 2: Receptor Summary

| Receptors               | Description                                                                                                                                                     | GPS Co-Ordinate or STA            |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| Surface Water Receptors | Irrigation Canal (effluent receptor)<br>River Kaoh village                                                                                                      | 12°33'9.31"N, 103°54'36.33"E<br>- |
| Vegetation              | Small stand(s) of bamboo intermittently along embankment<br><br>Cultivated trees in Kaoh village are not within the embankment footprint and will remain intact | Kaoh Village                      |
| Socio-Economic          | Densely populated residential & commercial areas and low quality housing at WWTP site and rural residential area of Kaoh village                                | All                               |
|                         | Water supplies - in residential areas and commercial areas                                                                                                      | All                               |
|                         | Pursat Market                                                                                                                                                   | 12°32'19.20"N, 103°55'7.59"E      |
| Cultural Receptors      | Peal Nhek Pagoda                                                                                                                                                | 12°32'24.55"N, 103°55'6.19"E      |
| Hospital                | Sampov Meas Hospital                                                                                                                                            | 12°32'42.55"N, 103°55'12.16"E     |
| School                  | Pursat Secondary School                                                                                                                                         | 12°32'22.01"N, 103°54'37.67"E     |
| Centre                  | Orphanage Support Centre                                                                                                                                        | 12°32'51.08"N, 103°54'32.87"E     |

17. A summary of impacts on the receptors is presented below:

- **Air Quality.** Moderate temporary air quality impacts during the construction stage of the project are anticipated because of fugitive dust generation associated with all construction works, and earth works.
- **Noise.** Noise impacts will be temporary and localized at all construction sites as construction machinery and vehicles generate noise as they operate. Other noise sources include loading and unloading of equipment and materials.
- **Surface Water.** Short term construction impacts may be seen in terms of increasing turbidity of any water flowing across earthworks adjacent to the irrigation canal or drains leading currently to outfalls in the canal. Effluent discharge into irrigation canal may impact on water quality if effluent standards are not met.
- **Solid waste management.** Impacts on resource use and impacts associated with disposal will arise from waste generated during construction. This includes generation of inert wastes e.g. spoil, biodegradable wastes e.g. cleared vegetation, and hazardous wastes e.g. oily wastes. During operation, waste from the WWTP will include dried sludge and chemicals packaging.
- **Community and Occupational Health and Safety.** Construction sites and access roads will necessarily mean health and safety risks not only to construction workers, but also to people living and working around the WWTP and alignments. Community

risks come from unauthorized access to construction sites and construction traffic i.e. heavy vehicles which the community may not be used to on their neighborhood roads and changes in road priorities for traffic movements. Occupational risks come from a range of activities including the use of heavy machinery, earth moving, and use of chemicals during construction and operation of the WWTP.

18. The layout of the drainage is shown in Figure 1, noting that the drainage also include a new line added under CW06/VO3. The layout of the WWTP is shown in Figure 2:

Figure 1: Drainage line in Pursat town (original CW05 contract)

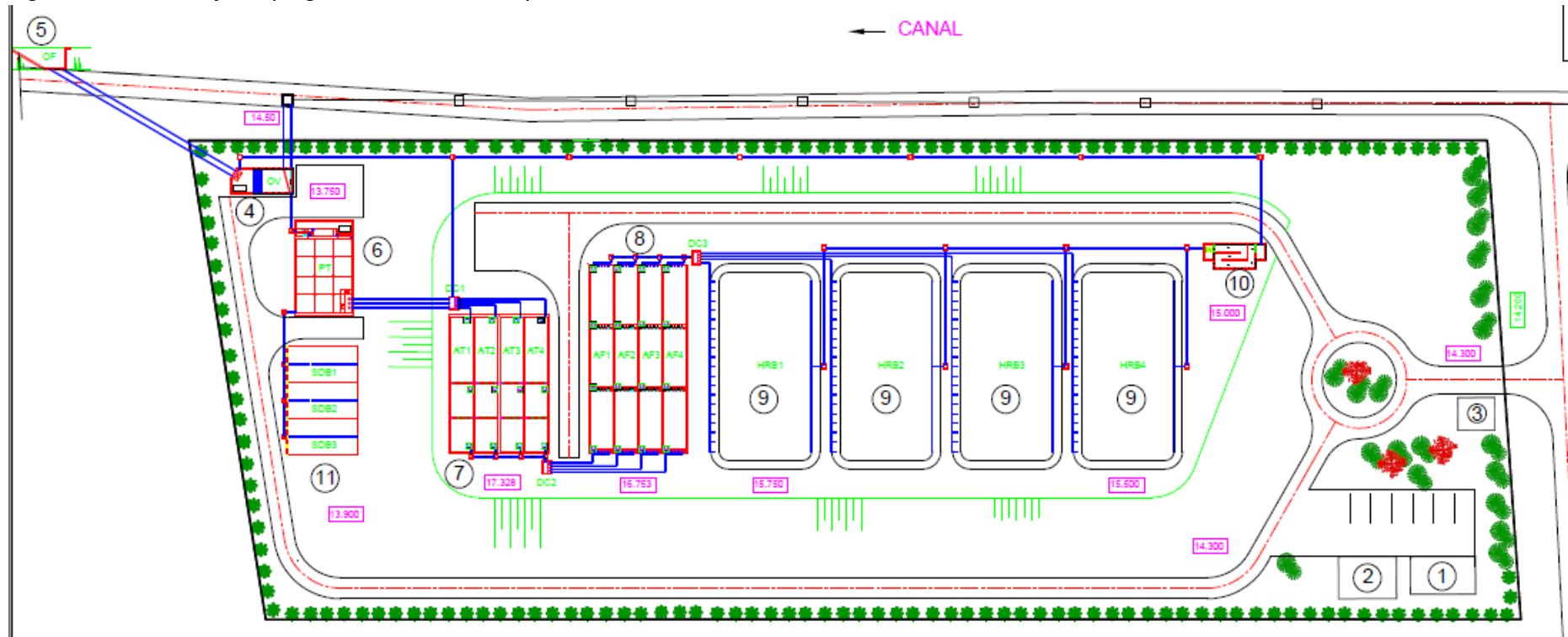


Source: DED team





Figure 2: WWPT layout (original CW05 contract)



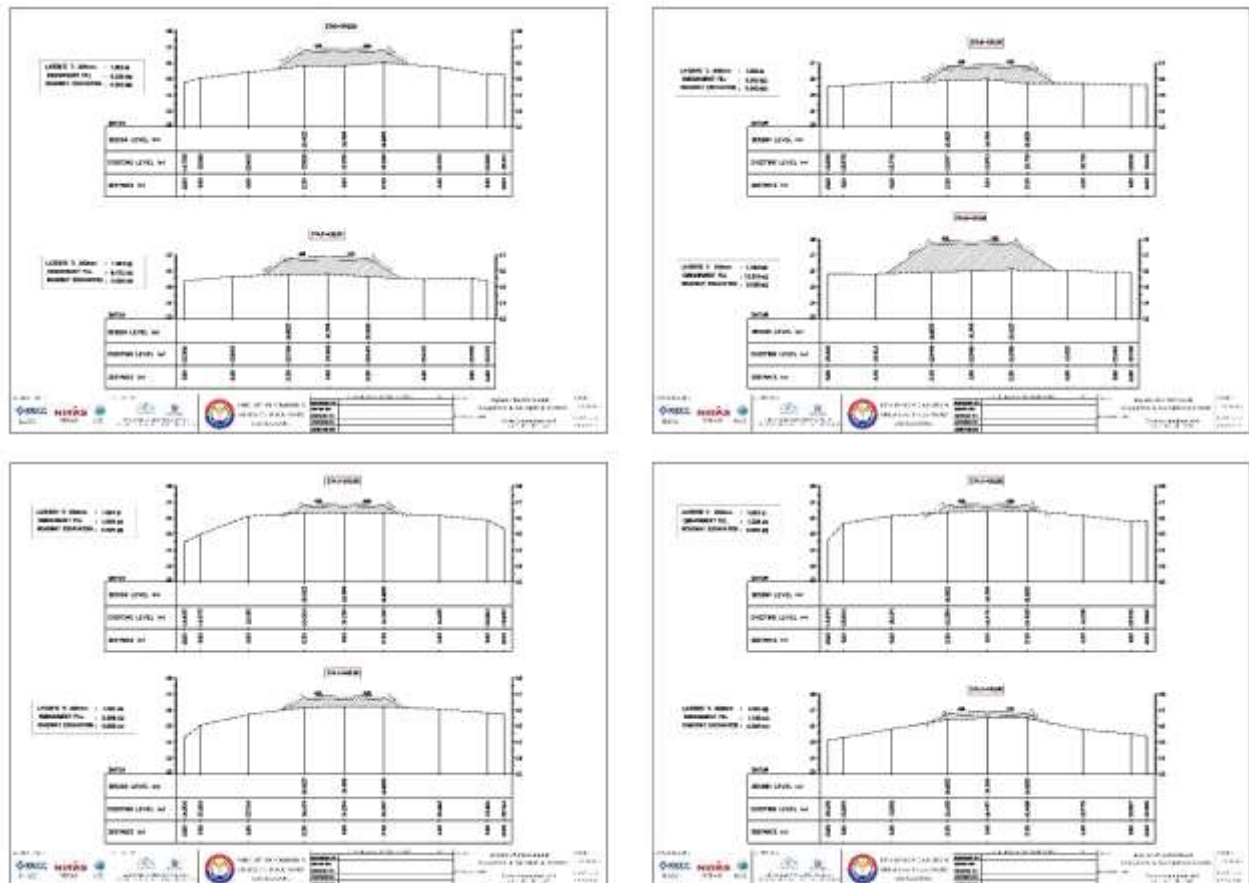
**Key** 1. Equipment store 2. Office Building 3. Guard House 4. Overflow chamber 5. Outlet to canal 6. Primary Treatment 7. Anaerobic Tank 8. Anaerobic Filter 9. Horizontal Reed Bed 10. Chlorination chamber.

Source: DED team

Figure 3: Layout Kaoh Village Embankment Repair CW05/VO2



Figure 4: Typical Cross Sections Kaoh Village Embankment Repair



## II. INSTITUTIONAL ARRANGEMENTS & RESPONSIBILITIES

20. The key institutions, organizations and stakeholders relevant to environmental safeguards are set out below.

21. The overall responsibility for EMP implementation and compliance with loan assurances lies with the Executing Agency, the Ministry of Public Works and Transport. The EA has established 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 the subproject city. The PDPWT has established a Project Implementation Unit (PIU) in each province, comprising relevant provincial government representatives including the Provincial Department of the Environment.

22. A summary of the key functions for project implementation and environmental safeguards is presented in Table 3 and detail on the responsibilities of each function is in Table 4:

Table 3: Key Functions for Project Implementation

| Role                                                      | Abbreviation | Location                    | Summary of Overall Function                                                                                                                                                                      |
|-----------------------------------------------------------|--------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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                        | PMU-ESO      | Phnom Penh within PMU       | Existing MPWT staff seconded/assigned to the PMU for the environmental management of the Project EMP compliance across the subprojects for environmental safeguards – Full Time                  |
| Project Implementation Unit                               | PIU          | Provinces within PDPWT      | Responsible for subproject implementation                                                                                                                                                        |
| PIU Environmental Safeguard Counterpart                   | PIU-ESC      | Provinces within PIU        | Nominated person responsible for subproject environmental monitoring and support to PMU-ESO                                                                                                      |
| Contractor Environmental, Health and Safety Officer       | C-EHSO       | Construction Site           | Mitigation measure implementation and reporting                                                                                                                                                  |
| Project Management and Implementation Support Consultants | PMIS         | Phnom Penh                  | Project final design and implementation, support and capacity development<br>Engineering supervision for all construction and reporting including Construction Supervision Consultant (PMIS-CSC) |
| International and National Environment Specialists        | PMIS -I/NES  | Phnom Penh within PMIS 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                                                                                                              |

Table 4 Responsibilities for Environmental Safeguards

| Institution      | Prior to Construction including Detailed Engineering Design                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | During Construction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | During Operation and Commissioning                                                                                                                                                                                                                                                 |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Executing Agency | <ul style="list-style-type: none"> <li>Ministry of Public Works and Transport responsible for ensuring the implementation of the mitigation in the EMP and for ensuring compliance with loan covenants</li> <li>Collaborate with the MoE for the Subproject's compliance with the Government's environmental safeguard requirements on IESIA and EMP implementation</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                    |
| PSC              | <ul style="list-style-type: none"> <li>Oversee implementation in conformity with the Project's development objectives and scope</li> <li>Assist in coordination among government agencies involved in Project implementation including MoE</li> <li>Ensure coordinated and efficient Project implementation activities including EMP implementation</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                    |
| DPWT             | Collaborate with PDoE & relevant provincial agencies on matters concerning the environmental management of the Subproject.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                    |
| PMU / PMU-ESO    | <ul style="list-style-type: none"> <li>Update IEE &amp; EMP</li> <li>Coordinate with Design Consultant to ensure the incorporation of updated findings &amp; mitigation measures in design &amp; bidding documents.</li> <li>Ensure EMP is part of the bidding documents, EMP clauses are incorporated in bidding documents, contracts.</li> <li>Ensure MoE approval of IESIA Report has been secured prior to awarding of civil works.</li> <li>Review and approve contractor's Construction EMP (CEMP) against ADB and IESIA requirements</li> <li>Conduct affected people consultation</li> <li>Participate in training provided by PMIS</li> <li>Establish GRM and making affected persons aware of GRM focal points, contacts and procedures'</li> </ul> | <ul style="list-style-type: none"> <li>Conduct inspections and spot checks to monitor the performance of the Contractor in implementing the CEMP/EMP</li> <li>Review Monthly Environmental Monitoring Reports (EMRs) of Contractor</li> <li>Review environmental quality monitoring results.</li> <li>Prepare the Project's Semi-Annual EMRs (SEMR) for submission to ADB with support from PMIS.</li> <li>Implement the GRM for environmental issues</li> <li>Conduct appropriate consultation and monitoring of effect of construction on affected people</li> <li>Participate in training provided by PMIS</li> </ul> | <ul style="list-style-type: none"> <li>Review relevant operator monitoring reports.</li> <li>Prepare the Project's Annual EMR for submission to ADB, until loan closure or as agreed.</li> <li>Ensure all GRM complaints are closed out to affect person's satisfaction</li> </ul> |
| PIU-ESC          | <ul style="list-style-type: none"> <li>Coordinate and collaborate relevant provincial agencies, as necessary</li> <li>Support PMU-ESO</li> <li>Conduct affected people consultation</li> <li>Establish health &amp; safety baseline conditions in affected villages.</li> <li>Establish GRM for Environmental Issues</li> <li>Participate in training provided by PMIS</li> </ul>                                                                                                                                                                                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>Collate monthly EMRs of Contractor, and submit to the PMU.</li> <li>Oversee the conduct of the environmental effects monitoring to be managed by the contractor and tested to be conducted by MoE Laboratory.</li> <li>Prepare the draft SEMR and submit</li> <li>Implement the GRM for environmental issues</li> <li>Conduct appropriate consultation and monitoring of effect of construction on affected people</li> <li>Participate in training provided by PMIS</li> <li>Spot checks to verify EMP implementation</li> </ul>                                                 | <ul style="list-style-type: none"> <li>Review relevant operator monitoring reports</li> <li>Support reporting requirements of PMU.</li> <li>Ensure all GRM complaints are closed out to affect person's satisfaction</li> </ul>                                                    |
| PMIS-N/IES       | <ul style="list-style-type: none"> <li>Provide technical advice/assistance, IEE/EMP update</li> <li>Review bidding documents, review CEMP against the EMP; confirm subproject readiness.</li> <li>Ensure environmental considerations included in Detailed Design</li> <li>Environmental related training for PMU, PIU, contractors and other stakeholders</li> <li>Incorporate mitigation measures in design &amp; bidding documents</li> <li>Incorporate EMP as part of bidding documents, EMP clauses in bidding documents, contracts</li> <li>Support PMU/PIU with appropriate consultation</li> </ul>                                                                                                                                                    | <ul style="list-style-type: none"> <li>Provide technical advice/assistance, e.g, preparation of Semi-Annual EMR for ADB, review of results of environmental effects monitoring.</li> <li>Environmental related training for PMU, PIU, contractors and other stakeholders</li> <li>Support PMU/PIU with appropriate consultation</li> <li>Site visits to check on construction, EMP implementation and affected people, in collaboration with PMU</li> </ul>                                                                                                                                                              | <ul style="list-style-type: none"> <li>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.</li> </ul>                     |

|                  |                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                 |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PMIS-CSC         |                                                                                                                                                                                                                                                                                                          | <ul style="list-style-type: none"> <li>Contribution to EMP and Health and Safety monitoring (CEMP compliance)</li> </ul>                                                                                                                                                                                                |                                                                                                                                                                                 |
| ADB              | <ul style="list-style-type: none"> <li>Review and clear updated IEE/EMP and disclose on the ADB Website</li> <li>Review bidding documents and confirm readiness of subproject.</li> </ul>                                                                                                                | <ul style="list-style-type: none"> <li>Review Project SEMRs and disclose on ADB's website.</li> <li>Carry out review missions</li> <li>Review project progress, compliance with covenants and advise on corrective actions</li> </ul>                                                                                   |                                                                                                                                                                                 |
| Contractor       | <ul style="list-style-type: none"> <li>Prepare a CEMP that addresses as minimum the requirements of the EMP, ensuring CEMP includes COVID-19 prevention and management requirements, defined according to national Ministry of Health protocols.</li> </ul>                                              | <ul style="list-style-type: none"> <li>Implement mitigation measures &amp; conduct internal EMP implementation monitoring.</li> <li>Conduct environmental quality monitoring as prescribed in SPS-compliant EMP. (If an independent Licensed Laboratory will not be engaged.)</li> <li>Prepare Monthly EMRs.</li> </ul> |                                                                                                                                                                                 |
| Operator         |                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>Implement mitigation measures &amp; conduct internal EMP implementation monitoring.</li> <li>Prepare Monthly and Annual EMRs.</li> </ul> |
| MoE/PDoE         | <ul style="list-style-type: none"> <li>Review, comment on approve IESIA Report</li> </ul>                                                                                                                                                                                                                | <ul style="list-style-type: none"> <li>Monitor compliance with approved IESIA &amp; EMP.</li> </ul>                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>Monitor compliance with environmental standards.</li> </ul>                                                                              |
| Municipality     | <ul style="list-style-type: none"> <li>Facilitate obtaining the necessary inputs from and/or participation/cooperation of, concerned communes and villages through collaboration with their Commune Councils.</li> <li>Facilitate (&amp; participate in) GRM dissemination and implementation</li> </ul> | <ul style="list-style-type: none"> <li>Participate in the monitoring of the performance of Contractor in EMP implementation.</li> <li>Review EMRs &amp; results of environmental effects monitoring</li> <li>Facilitate &amp; participate in GRM dissemination and implementation.</li> </ul>                           |                                                                                                                                                                                 |
| Commune Councils | <ul style="list-style-type: none"> <li>Facilitate &amp; participate in GRM dissemination and implementation</li> </ul>                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>Participate in the monitoring of the performance of Contractor in EMP implementation.</li> <li>Review EMRs &amp; results of environmental effects monitoring.</li> <li>Facilitate &amp; participate in GRM dissemination and implementation.</li> </ul>                          |                                                                                                                                                                                 |



### **1.1. Institutional Capacity Review and Needs**

23. Currently there is little experience of monitoring and implementing environmental mitigation measures particularly at a 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 centers (air quality).

24. During the update of this 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 project by project basis. The project will co-ordinate with this existing environmental safeguard office (ESO) in MPWT and will include ESO staff in training and reviews.

25. In addition, through understanding existing operations for drainage system in Pursat and WWTPs elsewhere in Cambodia, it is clear that there is 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; (ii) lack of staff and (iii) insufficient budget.

26. A training program is set out Table 5 which addresses the safeguard reporting and implementation requirements during construction, and the environmental and social risks from operations.

27. The PMIS-I/NES will perform key roles in supporting the PMU-ESO in implementing the EMP and ensuring the pre-construction requirements are in place.

Table 5: Capacity building and training requirement

| Subject / Content                                                                                                                                                 | Participants                                                                                                                                                                                     | Trainer/Organization                            | When/Frequency                                                                                | Days / event | # of participants | Cost (\$) USD |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-----------------------------------------------------------------------------------------------|--------------|-------------------|---------------|
| <b>EMP development and implementation</b><br>EMP function<br>Roles and responsibilities,<br>EMP monitoring (Site Visits)<br>Reporting on Environmental Safeguards | PMU, PIU,<br>contractors                                                                                                                                                                         | PMIS -I/NES                                     | Twice -<br>Once before, and<br>once 6 months after<br>construction starts                     | 2            | 10                | \$12,000      |
| <b>Consultation with Affected People</b><br>Consulting during construction,<br>types of consultation, methods                                                     | PMU, PIU                                                                                                                                                                                         | PMIS -I/NES                                     | Once before to<br>construction                                                                | 0.5          | 6                 |               |
| <b>Grievance Redress Mechanism –</b><br>roles, responsibilities and<br>implementation                                                                             | PMU, PIU,<br>contractors,<br>Commune<br>Councils<br>Village<br>Chief,<br>Municipality                                                                                                            | PMIS -I/NES                                     | Twice -<br>Once before, and<br>once 6 months after<br>construction starts in<br>each location | 1            | 24                |               |
| <b>Environmental protection</b><br>Pollution control on construction<br>sites (air, noise, wastewater, solid<br>waste)                                            | PMU, PIU,<br>contractors                                                                                                                                                                         | PMIS -I/NES                                     | Once (during project<br>implementation)                                                       | 2            | 10                |               |
| <b>Environmental monitoring -</b><br>Monitoring methods, data collection<br>and processing, reporting systems                                                     | PMU, PIU,<br>contractors,                                                                                                                                                                        | PMIS -I/NES<br>& MoE (environmental<br>analyst) | Once (at beginning of<br>project construction)                                                | 2            | 10                |               |
|                                                                                                                                                                   |                                                                                                                                                                                                  |                                                 |                                                                                               |              | <b>Total</b>      | <b>12,000</b> |
| Urban Drainage and WWTP                                                                                                                                           | The PMIS will prepare an O&M manual and assist the PMU and PIU in the development of specific Standard Operating Procedures and Standard Operating Guidance (SOP's or SOG's) for various systems |                                                 |                                                                                               |              |                   |               |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>within the plant and for the drainage/sewerage network. Combined, the O&amp;M Manual along with SOP's and SOG's should become the reference book for the entire system. Once completed, the O&amp;M Manual will support the development of Asset Management and Emergency Response Plans. Specific training will be provided for the operation of the jetvac equipment for cleaning of the drainage/sewer lines that will be provided by the project.</p> <p>O&amp;M Manual Source of Budget: PMIS</p> |
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### III. MITIGATION MEASURES

28. Mitigation measures for environmental impacts are shown in Table 6.

29. Construction Environmental Management Plans. The Contractor is expected to develop a specific Construction Environmental Management Plan (CEMP) for the subproject, which sets out the contractor's approach to implementing required mitigation measure.

Table 6: EMP Mitigation Measures

| Subproject Activity                                                | Potential Environmental Impacts   | Proposed Mitigation Measures                                                   | Estimated Cost <sup>3</sup> (\$) | Responsibility                |             |
|--------------------------------------------------------------------|-----------------------------------|--------------------------------------------------------------------------------|----------------------------------|-------------------------------|-------------|
|                                                                    |                                   |                                                                                |                                  | Implementation                | Supervision |
| PRE-CONSTRUCTION                                                   |                                   |                                                                                |                                  |                               |             |
| Confirmation of required resettlement, relocations, & compensation | No negative environmental impacts | 1. No Affected households                                                      | See resettlement plans           | Resettlement committees (IRC) | EA/IA       |
| Disclosure, & engagement of community                              | No community impacts              | 2. Initiate Information Disclosure and Grievance process of IEE at Pursat town | Include in project cost          | PMU                           | PMU         |

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<sup>3</sup> Costs will need to be updated during detailed design phase

| Subproject Activity                    | Potential Environmental Impacts | Proposed Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Estimated Cost <sup>3</sup> (\$) | Responsibility                  |             |
|----------------------------------------|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|---------------------------------|-------------|
|                                        |                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                  | Implementation                  | Supervision |
| GRM Dissemination                      |                                 | 3. Establish GRM and clarify roles and responsibilities (see GRM section of EMP)<br>4. Provide contractor with GRM contact details to be used for:<br>a) GRM sign boards<br>b) GRM Contact Cards for Affected People                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Included in Project cost         | PMU                             | PMU         |
|                                        |                                 | 5. Erect sign boards at the construction site entrance with:<br>6. A. Project details<br>7. B. GRM procedures and contact details<br>8. Print 'GRM Contact Cards' for all workers to give to complainants and keep cards with all vehicles, machinery and site managers/foremen<br>9. Affected People Training. 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'                                                                                                                                                                                                                                                                                                                                     | Included in Bid Price            | Contractor                      | PMU         |
| IEE and EMP Updated                    | All                             | 10. Update IEE and EMP to include:<br>a) A. final detailed design<br>b) B. further necessary environmental protection measures<br>c) C. approved national IESIA requirements & mitigation measures.<br>d) D. environmental quality baseline monitoring (water, air, noise)<br>e) IESIA approved by MoE prior to contract award                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Included in Project cost         | Local licensed Company and PMIS | ADB/ PMU    |
| Construction EMP (CEMP)                | All                             | 11. The contractor(s) will develop a Construction EMP (CEMP) that includes the mitigation measures set out in this table as a minimum and will include detailed individual management sub-plans for:<br>a) Solid and Liquid Waste Management;<br>b) Community Health and Safety and Access<br>c) Occupational Health and Safety and Emergency Response;<br>d) Construction Workers and Camp Management (if required).<br>12. The CEMP will include a map of each construction site, with copies held by the Contractor and PIU, showing as a minimum:<br>a). Access routes, b). storage areas for waste, c). storage area for chemicals such as fuels, d) concrete mixing, e) stockpile storage areas (on & off site), f) first aid kit and equipment used in emergency response, g) location of worker camps (if required) and construction staging areas and h) confirmation of borrow site. | Included in Bid price            | Contractor (C-EHS)              | PMU/ PMIS   |
| Obtain & activate permits and licenses | Compliance obligations          | 13. Contractors to comply with all statutory requirements set out by Government for use of construction equipment, and operation construction plants.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Include in bid price             | Contractor                      | PMU         |

| Subproject Activity                        | Potential Environmental Impacts              | Proposed Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Estimated Cost <sup>3</sup> (\$) | Responsibility |             |
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|                                            |                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                  | Implementation | Supervision |
|                                            |                                              | 14. Contractor to ensure all required permits including materials extraction permits are in place prior to construction.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                  |                |             |
| Construction EMP (CEMP) Approvals          | All                                          | 15. Approval of CEMP including site maps as required by CEMP before construction is allowed to start.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Include in Project cost          | PMU/ PMIS      | EA          |
| Bidding                                    |                                              | 16. Incorporate EMP into the bid and contract requirements, including Particular Conditions for Bidding Documents.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                  | PMU/ PMIS      | EA          |
| <b>CONSTRUCTION PHASE</b>                  |                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                  |                |             |
| Production, Transport and Use of materials | Air quality<br>Resource use<br>Water Quality | 17. Asphalt and concrete batching facilities will be located at least 500m downwind from the nearest dwellings in order to reduce the impact of fumes on humans and to be fitted with necessary equipment such as bag house filters to reduce fugitive dust emissions.<br>18. Water will be sprayed on material handling areas, and borrow pits where fugitive dust is generated if it will impact on workers or residents.<br>19. Trucks carrying dry construction materials such as earth will be covered with tarpaulins or other suitable cover.<br>20. Stockpiles and materials will be stored at least 50m from surface waters with drainage directed away from the irrigation canals or drainage channels<br>21. Driving on unmade roads, trucks will be limited to 15 kph. Warning sign to inform road users of turning heavy vehicles will be used where trucks cross or turn off National Road into Pursat town.<br>22. Construction traffic movements will be scheduled to avoid congested and/or sensitive periods<br>23. Speed limit of 15 kph for all construction vehicles at Kaoh village | Included in Bid Price            | Contractor     | PIU/ PMU    |
| Use of Machinery & Equipment               | Noise<br>Water Quality                       | 24. Maintain all exhaust systems in good working order; undertake regular equipment maintenance;<br>25. Restrict construction activities using heavy machinery work between 8am-6pm;<br>26. Provide advance warning to the community on timing of noisy activities. Seek suggestions from community members to reduce noise annoyance, particularly related to noise sensitive activities at receptors<br>27. Public notification of construction operations will incorporate noise considerations; information procedure of handling complaints through the Grievance Redress Mechanism will be disseminated.<br>28. Ensure noise monitoring is undertaken near sensitive receptors, particularly dwellings when construction machinery is operational                                                                                                                                                                                                                                                                                                                                                   | Included in Bid Price            | Contractor     | PIU/ PMU    |

| Subproject Activity                    | Potential Environmental Impacts                                                  | Proposed Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Estimated Cost <sup>3</sup> (\$) | Responsibility |                |
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|                                        |                                                                                  | 29. Construction vehicles and machinery will be maintained to a high standard to minimize emissions<br>30. All construction workers will use appropriate Personal Protective Equipment (PPE) including ear defenders when operating machinery;<br>31. No washing or repair of machinery within 50m of surface waters including irrigation canals.<br>32. Use Noise Barriers to protect receptors from excavation and demolition noises in Pursat town and at the WWTP site and at residential receptors at Kaoh village                                                                                                                                                                                                                                                                                                                                  |                                  |                |                |
| Excavations                            | Property damage (vibration) Flooding                                             | 33. The contractor will take and store Pre-Condition photographs of houses and other structures along the drainage network and make the photos available to MPWT should any dispute occur.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Included in Bid Price            | Contractor     | PMUEA          |
| WWTP Landscaping                       | Flora                                                                            | 34. Follow requirements in Technical Specification regarding tree size, planting and aftercare requirements<br>35. Native species only to be approved by PDoE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Included in Bid Price            | Contractor     | PIU/ PMU/ PDOE |
| Ground Works                           | Water quality<br>Air quality<br>Cultural heritage/<br>Chance Finds<br>Vegetation | 36. Provision of adequate short-term drainage away from construction sites and all excavations to prevent contaminated run off entering irrigation canals or other water bodies or residential properties at Kaoh village.<br>37. Installation of temporary storm drains or ditches for construction sites to manage and control the flow and direction of surface water run off<br>38. Spray water on areas being worked if fugitive dust is generated if it will impact on workers or residents.<br>39. If groundworks reveal cultural chance finds, the contractor will stop work immediately, fence off the area, and notify the PMU. Work will not commence until MPWT approval is given.<br>40. The contractor will ensure only bamboo is removed with prior approval from PMU. All other vegetation close to the right of way will remain intact. | Included in Bid Price            | Contractor     | PIU/ PMU       |
| Storage and Use of chemicals and fuels | Water quality<br>Soil quality                                                    | 41. Refuelling only in designated areas which are to be 200m from a water course and drip trays to be used when refuelling or topping up / changing machinery fluids<br>42. Construction fluids such as oils, and fuels should be stored and handled on a bunded impermeable surface; a bund will be provided around any above ground fuel storage tanks with a capacity of 110% of the largest single tank.<br>43. All chemicals and fuels will be labeled<br>44. Spill control measures will be included in emergency response measures                                                                                                                                                                                                                                                                                                                | Included in Bid Price            | Contractor     | PIU/ PMU       |



| Subproject Activity                                                   | Potential Environmental Impacts                    | Proposed Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Estimated Cost <sup>3</sup> (\$) | Responsibility |             |
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| Implementation of Spoil, Solid and Liquid Waste Management Sub-Plan A | Resource use<br>Natural resources<br>contamination | <p>45. Sub-plan will include measures to explain how the contractor will:</p> <ul style="list-style-type: none"> <li>a) Follow the waste hierarchy and demonstrate how waste will be prevented and recycled and will show effective management of materials on site through good house-keeping and work planning</li> <li>b) Clear arrangements for storage and transportation of all hazardous and non-hazardous waste to an authorized and approved disposal point (approved by Provincial Department of Environment).</li> <li>c) Recyclables to be separated at source and given/sold to recycler (plastic, metal, card, paper as a minimum)</li> <li>d) All solid waste to be stored in containers with lids.</li> <li>e) Prohibit burning of waste at all times;</li> <li>f) 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 drainage ditches</li> <li>g) Criteria for spoil disposal including levels of contamination and location for spoil disposal (to be approved by municipal authorities)</li> <li>a) No disposal of spoil on agriculturally productive land or within 50 m of a water course</li> <li>b) For <b>cleaning of the existing drainage system</b> the sub-plan will <ul style="list-style-type: none"> <li>A) determine the quantity of all debris, silt, and accumulated solids removed from the drainage. B) define how and where the debris will be transported and disposed C) provide the necessary authorizations or agreements for drainage debris disposal Under no circumstances shall the removed sewage or solids be dumped onto streets or into ditches, catch basins, storm drains, sanitary or combined drainage manholes, or otherwise improperly disposed.</li> </ul> </li> </ul> | Included in bid price            | Contractor     | PIU/ PMU    |
| Implementation of Community Health and Safety and Access Sub-plan B   | Human health and safety<br>Livelihoods             | <p>46. <b>Community H&amp;S and Access - measures</b> to be included in the management sub-plan will include:</p> <ul style="list-style-type: none"> <li>a) A Traffic Management Plan for city centre pavement reinstatement is required. To facilitate access, the pavement reinstatement will be in 200-300m long sections and by closing only one lane at a time. The plan will include how advance warning to affected people will be disseminated. A minimum of one week advance notice is required for all planned sections of pavement reinstatement.</li> <li>b) Traffic Management Plan to be approved by PMU within 20 days of EMP update provided to contractor</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Included in bid price            | Contractor     | PIU/ PMU    |

| Subproject Activity                                                                | Potential Environmental Impacts | Proposed Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Estimated Cost <sup>3</sup> (\$) | Responsibility |             |
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|                                                                                    |                                 | <ul style="list-style-type: none"> <li>c) Details of appropriate fencing, protective barriers, and buffer zones which will be provided around all construction sites including barriers where needed on access roads and populated (Pursat urban centre).</li> <li>d) Details of Warning signs which 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.</li> <li>e) Details of signage and speed controls if public roads are to be affected by construction traffic.</li> <li>f) Details of sufficient signage giving community in Kaoh village and Pursat dangers / warnings and information disclosure outside all construction sites including urban excavations</li> <li>g) Details of how safe access will be maintained for pedestrians and vehicles (motorbikes and cars) to schools, markets, houses, pagodas and commercial establishments during excavations for pipe network and WWTP construction.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                              |                                  |                |             |
| Implementation of Occupational Health and Safety and Emergency Response Sub-plan C | Human health and safety         | <p>47. <b>Occupational H&amp;S measures</b> to be included in the management sub-plan will include:</p> <ul style="list-style-type: none"> <li>h) Assurance that all workers are equipped with, and use Personal Protective Equipment (PPE).</li> <li>i) Specifications for the PPE to be used on site and the contractors' approach to enforcement of its use by workers</li> <li>j) Details of signage giving occupational health and safety warnings and information disclosure within all construction sites – sub-plan to include example warnings.</li> <li>k) Details of worker education and awareness seminars for construction hazards will be given. A construction site safety program will be developed and distributed to workers.</li> <li>l) Details of daily toolbox meetings (safety briefings)</li> <li>m) Details of the site accident record book which will be maintained where all major or minor accidents and incidents are recorded with actions taken.</li> <li>n) Details of safety precautions when using 220 to 240V Electric Power tools if the workers are likely to be working within wet or flooded environments.</li> <li>o) Details of safety precautions taken for working in trenches.</li> </ul> <p>48. <b>The Emergency Response Plan</b> will set out detailed Preventative Measures for all types of incidents covered in the Emergency Plan. This will include:</p> | Included in bid price            | Contractor     | PIU/ PMU    |

| Subproject Activity                                               | Potential Environmental Impacts                                  | Proposed Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Estimated Cost <sup>3</sup> (\$) | Responsibility |             |
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|                                                                   |                                                                  | <p>p) Prevention of Injury and Accidents – to include Personal Protective Equipment requirements for construction workers, training requirements</p> <p>q) Prevention of Spillage - All construction fluids such as oils, and fuels will be stored on hard standing with sealed drainage with a capacity of 110% of the largest fuel container, will include procedures on refueling and maintaining vehicles.</p> <p>r) Prevention of Fire – to include measures for Ignition Sources including prevention of smoking on construction site, management of flammable materials and liquid.</p> <p>s) Other Incidents – prevention measures relevant to other issues considered relevant by the contractor</p> <p>49. The Contractor will develop <b>Emergency Response Procedures</b> prior to construction. The procedures will cover actions to be taken in case of:</p> <p>t) Worker injury (e.g. construction or traffic accident)</p> <p>u) Spillage (e.g. fuel spillage)</p> <p>v) Fire (e.g. fuel or chemicals storage area); and</p> <p>w) Any other incidents anticipated by the contractor.</p> <p>50. COVID-19 Response: The contractor's Occupational Health and Safety plan will incorporate COVID-19 prevention and management protocols, defined according to national Ministry of Health requirements, and in consideration of ADB COVID-19 guidance:</p> <p><a href="https://www.adb.org/publications/safety-well-being-workers-communities-covid-19">https://www.adb.org/publications/safety-well-being-workers-communities-covid-19</a></p> |                                  |                |             |
| Implementation of Construction Workers Camp Management Sub-Plan D | Contamination of water, soil, waste production and social issues | <p>51. [if required] If a camp for construction workers is required the contractor will set out a management plan which includes:</p> <p>a) A map showing camp lay out, welfare facilities, and first aid kit locations. It will be at least 50m from the nearest house.</p> <p>b) Accommodation facilities including separate toilets for male and female workers, adequate drainage to prevent flooding, security including a no weapons policy and waste disposal areas.</p> <p>c) Pit latrines to be located at least 200m from surface waters, and in areas of suitable soil profiles and above the groundwater levels</p> <p>d) Schedule of HIV Aids education awareness to be given to workers.</p> <p>e) Training on relevant laws for foreign labor (including hunting, fishing and traffic rules);</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Included in bid price            | Contractor     | PIU/ PMU    |

| Subproject Activity            | Potential Environmental Impacts                                       | Proposed Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Estimated Cost <sup>3</sup> (\$) | Responsibility |             |
|--------------------------------|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|----------------|-------------|
|                                |                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                  | Implementation | Supervision |
|                                |                                                                       | 52. If a construction camp is not required, the contractor will not require a Management Plan but will:<br>f) Provide adequate waste disposal facilities including garbage cans for workers.<br>g) Provide welfare facilities including water for washing, drinking and include facilities for male and female workers<br>h) Provide toilets for male and female construction workers with a cleaning schedule<br>53. The contractor will give priority to local labor force and retain evidence of how local labor recruitment efforts were undertaken |                                  |                |             |
| Construction Staging Area      | Contamination of soil and waste disposal                              | 54. If staging area required (not within construction camp area) the contractor will:<br>a) Provide a layout map of staging area and its location which will not be within 100m of any surface waterbody and not in an area liable to flood<br>55. The site will not be at least 50m from a residential property                                                                                                                                                                                                                                        | Included in bid price            | Contractor     | PIU/ PMU    |
| Restoration and Rehabilitation | Contamination of soil and waste disposal, community health and safety | 56. Topsoil from construction areas (WWTP) will be retained and used for landscaping and rehabilitation<br>57. The contractor will provide a clear plan of how the following sites will be restored to their original condition following the end of construction;<br>a) Worker camp<br>b) Staging area<br>c) Road to WWTP site<br>58. Any damage shall be repaired as per the technical specification in the bidding documents<br>59. All waste will be removed, and compacted ground restored.                                                        | Included in bid price            | Contractor     | PIU/ PMU    |
| Utilities disruption           | Water supply loss                                                     | 60. Ensure planning and co-ordination with the water supply service provider<br>61. Early information for residents affected by any interruptions.<br>62. Significant receptors including healthcare facilities will require specific detailed co-ordination actions and consultation.                                                                                                                                                                                                                                                                  | Included in Bid Price            | Contractor     | PIU/PMU     |
| <b>POST-CONSTRUCTION</b>       |                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                  |                |             |
| Operation & Maintenance        | Environmental Protection                                              | 63. The operator will ensure adequate ring fenced budget for the operation and maintenance<br>64. The operator will develop operational plans to include:<br>a) clear methods and procedures for all aspects of the WWTP operation ;                                                                                                                                                                                                                                                                                                                    | O&M cost                         | DPWT           | MPWT        |

| Subproject Activity       | Potential Environmental Impacts | Proposed Mitigation Measures                                                                                                                                                                                                                                                                                                                                  | Estimated Cost <sup>3</sup> (\$) | Responsibility |             |
|---------------------------|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|----------------|-------------|
|                           |                                 |                                                                                                                                                                                                                                                                                                                                                               |                                  | Implementation | Supervision |
|                           |                                 | b) a network and WWTP maintenance schedule in accordance with the design and ensure all repairs are completed before the start of each rainy season<br>c) Environmental analysis program for regularly testing effluent and surface water quality<br>d) Procedures for emergency situations                                                                   |                                  |                |             |
|                           | Capacity Development            | 65. Ensure relevant staff attend training provided by the Capacity Development function of this project and disseminate knowledge to colleagues                                                                                                                                                                                                               |                                  |                |             |
|                           | Occupational Health and Safety  | 66. The operator will develop:<br>a) Specific health and safety procedures<br>b) A comprehensive H&S training program;<br>c) Undertake risk assessments for the use of calcium hypochlorite and other chemicals used on site<br>d) An approach to ensure the use of appropriate PPE;<br>e) Develop emergency procedures and<br>f) Provide access to first aid |                                  |                |             |
| Operation and sludge beds | Odor and Nuisance               | 67. The operator or operator's representative will meet twice per year or more often if there is an issue raised, to discuss nuisance issues with local representatives including village chief.                                                                                                                                                              | O&M cost                         | DPWT           | MPWT        |

## IV. MONITORING & REPORTING

30. The project monitoring required by the EMP and its costs are shown in Table 7:

Table 7: Monitoring Type and Cost

| Monitoring                                                   | Purpose                                                                                                                                                                                                                                                                                                                                | Estimated Cost or Source of Budget                                                                               |
|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| 1. <b>Project readiness monitoring</b>                       | Monitoring to check progress on project readiness and close gaps through corrective actions<br>See <b>Table 8</b>                                                                                                                                                                                                                      | No additional cost, part of project activities                                                                   |
| 2. <b>Project phase environmental quality monitoring</b>     | To be conducted by a competent authority or person appointed by the Contractor, involving the collection and analyses of air quality, noise and water quality data at designated monitoring locations for assessing compliance with applicable environmental quality and emission standards during construction<br>See <b>Table 10</b> | \$4,000 (pre-construction part of IESIA costs) and \$16,800 (construction per year)<br>see Table 9 PER YEAR COST |
| 3. <b>EMP compliance monitoring</b>                          | To be conducted by the PIU/PMIS- I/NES and construction supervisors CSC, to verify EMP compliance during project implementation. Contractor to provide Environmental Health and Safety monitoring reports.<br>See <b>Table 10</b>                                                                                                      | No additional cost, part of project implementation activities                                                    |
| 4. <b>Affected People monitoring</b>                         | A consultative approach. This is to be conducted by the PIU via consulting affected people on the impacts during construction.<br>See <b>Table 10</b>                                                                                                                                                                                  | No additional cost, part of project implementation activities                                                    |
| 5. <b>Operational phase environmental quality monitoring</b> | This is required as part of the operation of the WWTP and will be undertaken by the relevant government department<br>See <b>Table 9</b> .                                                                                                                                                                                             | Included in operator O&M costs                                                                                   |

31. 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.

32. The selected operators, private sector or government, will bear all environmental monitoring and reporting costs during the operational stage.

### 4.1 Project Readiness Monitoring

33. Before construction, the PMIS Consultant will monitor the project's readiness on environmental management based on a set of indicators and report it to ADB and PMU, see Table 8. 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 8: Project Readiness Assessment Indicators

| Indicator                         | Criteria                                                                                         | Are the Criteria met?<br>Yes/No | If No, What Corrective action is needed? | Date for Corrective Action Completion |
|-----------------------------------|--------------------------------------------------------------------------------------------------|---------------------------------|------------------------------------------|---------------------------------------|
| 1. EMP update                     | EMP updated after domestic IESIA approval and detailed design & approved by ADB/MoE              | Y/N                             |                                          |                                       |
| 2. Compliance with loan covenants | The borrower complies with loan covenants related to project design and environmental management | Y/N                             |                                          |                                       |
|                                   | Meaningful consultation completed                                                                | Y/N                             |                                          |                                       |

|                                                                  |                                                                                                                       |     |  |  |
|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-----|--|--|
| 3. Public involvement effectiveness                              | GRM established with entry points                                                                                     | Y/N |  |  |
| 4. Environmental supervision and monitoring in place             | Recruitment of MPWT staff as set out in the Institutional Arrangements for this EMP                                   | Y/N |  |  |
|                                                                  | Nomination of government staff for PIU roles as set out in the Institutional Arrangements for this EMP                | Y/N |  |  |
| 5. Bidding documents and contracts with environmental safeguards | Bidding documents and contracts incorporate the environmental activities and mitigation measures required by this EMP | Y/N |  |  |
|                                                                  | Bidding documents and contracts incorporate any specific particular conditions specified in the appendix to this EMP  | Y/N |  |  |
| 6. EMP financial support                                         | The required funds have been set aside for EMP implementation including training and capacity building                | Y/N |  |  |

## 4.2 Environmental Quality Monitoring

34. During construction, the impact on the sensitive environmental receptors will be monitored and compared against the relevant national standard. During operation, the relevant operator will be expected to maintain an adequate budget to ensure environmental monitoring can be undertaken as specified in Table 9.



### 4.3 Environmental quality monitoring

35. During construction, the impact on the sensitive environmental receptors will be monitored and compared against the relevant national standard, see Table 9.

Table 9: Environmental Quality Monitoring

| Aspects/Parameters to be Monitored                                                                                                                                                                          | Location                                                                                                              | Means of Monitoring                                                              | Frequency                         | Estimated Cost (USD)* | Responsibility            |                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|-----------------------------------|-----------------------|---------------------------|-----------------------|
|                                                                                                                                                                                                             |                                                                                                                       |                                                                                  |                                   |                       | Implement                 | Compliance Monitoring |
| A. Prior to Construction Phase (INCLUDED IN DOMESTIC IESIA COST)                                                                                                                                            |                                                                                                                       |                                                                                  |                                   |                       |                           |                       |
| 1 Ambient air quality<br>CO, NO <sub>2</sub> , SO <sub>2</sub> , TSP, O <sub>3</sub> , Pb, PM 10 &PM 2.5                                                                                                    | Near WWTP site                                                                                                        | Analytical methods outlined in the guideline of the MoE, or applied by MoE       | Once                              | 3,250                 | PMU/<br>(licensed Lab)    | PMIS                  |
| 2 Ambient noise levels<br>Lmax, Lmin, Leq                                                                                                                                                                   | Near WWTP site                                                                                                        | Analytical methods outlined in the guideline of the MoE, or applied by MoE.      | Once                              |                       |                           |                       |
| 3 Surface water quality<br>pH, TSS, Fe, BOD5, COD, Oil and Grease, Detergent, SO <sub>4</sub> , NH <sub>3</sub> , TN, TP, Pb, AS, Cd, Hg and Total Coliform.                                                | Point 1 Upstream<br>(1387711.00 m N 381990.00 m E);                                                                   | Analytical methods outlined in Cambodia's Drinking Water Quality Standards, 2004 | Once                              | 750                   |                           |                       |
| 4. Mine Clearance and Unexploded ordnance (4.4 ha)                                                                                                                                                          | Included in Urban Drainage Bill of Quantities                                                                         |                                                                                  |                                   |                       |                           |                       |
| Sub-Total (Prior to construction for baseline data)                                                                                                                                                         |                                                                                                                       |                                                                                  |                                   | 4,000                 |                           |                       |
| *Costs include laboratory analysis and associated costs of sampling such as transport and accommodation based on MoE quote                                                                                  |                                                                                                                       |                                                                                  |                                   |                       |                           |                       |
| B. Construction Phase                                                                                                                                                                                       |                                                                                                                       |                                                                                  |                                   |                       |                           |                       |
| 5. Ambient air quality<br>CO, NO <sub>2</sub> , SO <sub>2</sub> , TSP, O <sub>3</sub> , Pb, PM 10 &PM 2.5<br>(Monitor only when construction activities occur within 250 m of nearest residential receptor) | Housing near WWTP site and<br>Urban receptor in town (Market, Pagoda, Hospital) and residential receptor Kaoh village | Analytical methods outlined in the guideline of the MoE: or applied by. MoE.     | Every 6 month during construction | 9,000                 | Contractor (licensed lab) | PMU / PMIS            |

|                                                                                                                                                                                                           |                                                                                                                    |                                                                                                           |                                                                  |                                   |                                      |            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|-----------------------------------|--------------------------------------|------------|
| 6. Ambient noise levels<br>Lmax, Lmin, Leq<br>(Monitor only when construction activities occur within 100 m of nearest residential receptor)                                                              | Housing near WWTP site and Urban receptor in town (Market, Pagoda, Hospital) and residential receptor Kaoh village | Analytical methods outlined in the guideline of the MoE: or applied by. MoE.                              | Every 6 month during construction                                |                                   |                                      |            |
| 7. Surface water quality<br>pH, TSS, Fe, BOD5, COD, Oil and Grease, Detergent, SO <sub>4</sub> , NH <sub>3</sub> , TN, TP, Pb, AS, Cd, Hg and Total Coliform.<br><br>Surface water turbidity observations | Point 1 Upstream (1387711.00 m N 381990.00 m E); Pursat, canal<br><br>River, Kaoh village.                         | Analytical methods outlined in Cambodia's Drinking Water Quality Standards, 2004<br><br>Field observation | Quarterly during construction<br><br>Monthly during construction | 3,000<br><br>No cost - PIU budget | Contractor (licensed lab)<br><br>PIU | PMU / PMIS |
| 8. Field observation from related Ministry or department eg. MoE, DoE                                                                                                                                     | Project location                                                                                                   | Using field observation                                                                                   | Every 3 month                                                    | 4,800 <sup>4</sup>                | Contractor                           | MoE/DoE    |
| <b>Sub-Total (Construction) PER YEAR</b>                                                                                                                                                                  |                                                                                                                    |                                                                                                           |                                                                  | <b>16,800</b>                     |                                      |            |
| <b>C. Operation Phase</b>                                                                                                                                                                                 |                                                                                                                    |                                                                                                           |                                                                  |                                   |                                      |            |
| 9. Surface water quality<br>pH, TSS, Fe, BOD5, COD, Oil and Grease, Detergent, SO <sub>4</sub> , NH <sub>3</sub> , TN, TP, Pb, AS, Cd, Hg and Total Coliform.                                             | As per PMIS O&M Manual                                                                                             | Analytical methods outlined in Cambodia's Drinking Water Quality Standards, 2004                          | As per PMIS O&M Manual                                           | Included in O&M cost of Operator  | Operator/ (licensed lab)             | DPWT/MPW T |

#### 4.4 EMP compliance monitoring

36. In order for the EMP to be effective, all its mitigation measures in the EMP must be monitored to ensure they are implemented. Table 10 defines the responsibilities of the Construction Supervision Company to support the PMU in monitoring the monthly progress against the EMP during construction. Note this applies to construction only; during operation, it is the responsibility of the appropriate ministry or its line department to ensure monitoring of operational facilities is incorporated in the operations and maintenance manual and carried out routinely. Table 10 also

<sup>4</sup> Budgets for MoE staffs to monitor on environmental problem during construction stage.

shows the PIU/PMU responsibility for monitoring through consultation with affected people.

Table 10: EMP Compliance and Affected People Monitoring

| Environmental Indicators                                                                                                          | Location                                     | Method & Frequency                                                                                                     | Responsibility |                         | Estimated Costs (USD)    |
|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------|--------------------------|
|                                                                                                                                   |                                              |                                                                                                                        | Verification   | Implementation          |                          |
| Construction Phase – All Sub-Projects                                                                                             |                                              |                                                                                                                        |                |                         |                          |
| Air Quality & Noise                                                                                                               | Civil works sites in Pursat and Kaoh village | Monthly checking against mitigation measures specified in this EMP                                                     | PMIS -NES      | PMIS-CSC                | Included in CSC contract |
| Water Quality                                                                                                                     | Civil works sites in Pursat and Kaoh village | Monthly checking against mitigation measures specified in this EMP and visual check on water pollution in Kaoh village | PMIS -NES      | PMIS-CSC                | Included in CSC contract |
| Vegetation                                                                                                                        | Kaoh Village                                 | Monthly check no unauthorized impacts on domestic trees outside embankment footprint                                   | PMIS -NES      | PMIS-CSC                | Included in CSC contract |
| Resource use and natural resource contamination (Solid and Liquid Waste Management Sub-Plan)                                      | Civil works sites in Pursat and Kaoh village | Monthly checking against mitigation measures specified in this EMP                                                     | PMIS -NES      | PMIS-CSC                | Included in CSC contract |
| Community access (Community Health and Safety and Access Subplan)                                                                 | Civil works sites in Pursat and Kaoh village | Monthly checking against mitigation measures specified in this EMP                                                     | PMIS -NES      | PMIS-CSC                | Included in CSC contract |
| Human health and safety (Community Health and Safety and Access Subplan and Occupational Health and Safety and Emergency Response | Civil works sites in Pursat and Kaoh village | Monthly checking against mitigation measures specified in this EMP                                                     | PMIS -NES      | PMIS-CSC Contractor EHS | Included in CSC contract |

| Environmental Indicators                                                                                                                                                                                                                                                                                                                                                                                                              | Location | Method & Frequency                                                                                                                                                                         | Responsibility |                | Estimated Costs (USD)               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|-------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                       |          |                                                                                                                                                                                            | Verification   | Implementation |                                     |
| Sub-Plan) including COVID-19 measures                                                                                                                                                                                                                                                                                                                                                                                                 |          |                                                                                                                                                                                            |                |                |                                     |
| Community Issues - At all construction locations<br>Environmental impacts of civil works (e.g., solid & liquid waste, local flooding, pollution).<br>Any unforeseen impacts caused by accidentally e.g. through spillages<br>Civil nuisance (e.g., noise, disrupted business, social issues, community health and safety).<br>Impaired use of access roads (e.g. traffic issues and access).<br>GRM and its procedures & key contacts |          | Consultation interview with Affected People Using the form in Appendix 1 in Pursat and Kaoh village<br><br>4-6 weeks after construction starts<br>Every 2 months until end of construction | PMU-ESO        | PIU-ESC        | Included in PIU staff/travel budget |

#### 4.5 Environmental Policy and Standards

37. The construction and operation phases of the projects shall follow relevant environmental quality standards. These are presented in the Appendix 4 to this EMP for reference. These quality standards relate to i) air quality, ii) ambient surface water quality, iii) groundwater quality, vi) soil quality, v) effluent quality.

## V. PUBLIC CONSULTATION AND PARTICIPATION

38. The Consolidated IEE for this subproject contains details of the consultation undertaken during preparation of these sub-projects.

39. For CW05/VO2, under a separate Project component<sup>5</sup>, a team conducting training on Climate Change Adaptation (17-18<sup>th</sup> October 2018) became aware of the need for embankment improvements for flood protection. The local requests for the embankment came from a variety of local residents including farmers, the village chief, the deputy village chief, a school director and a police official. The project PIU team subsequently visited the village in March 2021, after it had flooded, to confirm the requirements with the village representatives. For CW05/VO2/VO3, public consultation and disclosure of an updated Public Information Booklet was undertaken in October 2021 (see updated IEE for consultation details).

40. In addition, consultation will take place during implementation. The PIU and PMU will collaborate to undertake consultation interviews with affected people within 4-6 weeks of construction starting and then again, every 3 months until the end of construction.

41. During implementation, 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 Appendix 1. This will contribute to project monitoring. All consultation activities will ensure compliance to national COVID-19 requirements throughout implementation, however it is recognized that any national restrictions on meetings and travel may impact on the ability of the PMU/PIU to conduct consultation. The health and safety of the project staff and beneficiaries is the priority.

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<sup>5</sup> Community Mobilising Environmental Improvements

## VI. GRIEVANCE REDRESS MECHANISM

### 6.1 Objective

42. A grievance redress mechanism (GRM), consistent with the requirements of the ADB Safeguard Policy Statement (2009) will be 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 and is free of charge.

43. The GRM is set out here in accordance with the approved approach established during Project Preparation, which remains valid. This is a separate grievance system to that managed by General Department of Resettlement which deals with resettlement issues only.

### 6.2 Approach

44. The following roles and responsibilities for the GRM are set out in Table 11.

Table 11: GRM Roles and Responsibilities

| Role                                                                                                                | Responsibilities in GRM                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MPWT / Executing Agency                                                                                             | <ul style="list-style-type: none"> <li>Establish the GRM</li> <li>Set up a Grievance Redress Committee (GRC)</li> </ul>                                                                                                                                                                                                                                                                                      |
| Grievance Redress Committee                                                                                         | <p><b>Members:</b></p> <ul style="list-style-type: none"> <li>Sangkat representative</li> <li>Village leaders or representative</li> <li>PIU-ESC</li> <li>PMU-ESO</li> <li>Municipality representatives</li> <li>Provincial representatives</li> </ul> <p><b>Function:</b></p> <ul style="list-style-type: none"> <li>GRM Access Point and Decision Making</li> <li>Monitor and record complaints</li> </ul> |
| PMU-ESO                                                                                                             | <ul style="list-style-type: none"> <li>Oversight of GRM implementation and use</li> <li>Co-ordination with PIU-ESC</li> <li>GRM Record keeping and document storage of all GRM complaints (Formal or Informal)</li> <li>Contact with ADB if Affected People appeal the process</li> <li>GRM reporting</li> </ul>                                                                                             |
| PIU-ESC                                                                                                             | <ul style="list-style-type: none"> <li>GRM implementation at the town level</li> <li>Responsible for keeping the PMU informed</li> </ul>                                                                                                                                                                                                                                                                     |
| Contractor                                                                                                          | <ul style="list-style-type: none"> <li>Entry point for affected people during construction</li> </ul>                                                                                                                                                                                                                                                                                                        |
| Local Government Institutions (Village representative, Sangkat representative, Municipal government representative) | <ul style="list-style-type: none"> <li>Entry point for affected people during construction</li> </ul>                                                                                                                                                                                                                                                                                                        |

### 6.3 Access to the Mechanism

45. The PMU-ESO and counterparts in the PIUs, will ensure that:
- the public, especially the residents and business owners, in the main areas of influence of the subprojects, are aware of their rights to access, and will have access to, the GRM free of administrative and legal charges;
  - the GRM is fully disclosed prior to construction: (a) in public consultations or social/community events, (b) through posters displayed in the offices of the PMU, PIU, Municipality and concerned Villages/Sangkats and at strategic places within the main areas of influence of subprojects (posters to include names and contact details of the PMU-ESO and PIU-ESC); and (c) sign boards at construction sites.
  - Access points will participate in GRM issues and will include:
    - (i) Village representative, e.g. Village Chief
    - (ii) Sangkat representative e.g. from Sangkat Committee
    - (iii) Municipal government representative
    - (iv) PIU-ESC and PMU-ESO

### 6.4 Communication on the GRM: Project Hotline

46. The GRM will be communicated to the public and affected people as a Project Hotline; this is considered to be more resonant with people than a 'grievance redress mechanism'. This will include a project hotline notice board to be located in each active construction site for all subprojects, including Kaoh village and Pursat city which must include three locations around the town in for the drainage and sewage network construction and construction camps and staging areas.

47. The project hotline notice board will include the following information and will require a designated telephone number which is for the project and not personal to individual members of staff



## Project Hotline

**Project:** Construction of [drainage and Wastewater Treatment Plant in [town]

**For suggestions, questions or problems related to the project, please contact any of these phone numbers: Call, SMS or Telegram**

| Name | Role or Company                                                                             | Phone Number |
|------|---------------------------------------------------------------------------------------------|--------------|
|      | Project Management Office, Ministry of Public Works and Transport, Phnom Penh,              |              |
|      | Project Implementation Office, Phnom Penh, Department of Public Works and Transport, [Town] |              |
|      | Sangkat [town]                                                                              |              |
|      | Village Chief, [village]                                                                    |              |
|      | Construction Contractor, [company name]                                                     |              |
|      | Construction Site Supervisor, Project Management and Implementation Consultants             |              |

You can also contact ADB directly:

ADB, Phnom Penh Office:  
[Name] and [Phone Number] and [email address]

ADB Southeast Asia Department of ADB, Manila, Philippines:  
[Name] and [Phone Number] and [email address]

## 6.5 Recording Project Hotline or GRM issues: Steps and Timeline

48. Complaints should be managed centrally by the PMU-ESO. Records should be kept of complaints made to the other access points, and the date they were passed to PMU for investigation but the main burden of recording detailed information should be on the PMU-ESO. All complaints should be compiled centrally by PMU-ESO to ensure none are missed and trends are identified. This should include all formal and informal complaints and their resolution.

49. For comments, suggestions or minor issues that can be managed within the construction area, the Hotline Access Point will record the following information, and will

inform the PMU:

Table 12: Project Hotline Informal Contact with Affected People

| TIMING | For Hotline Access Point Person                                                                                           |                                                                                           |
|--------|---------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| Day 1  | 1. Date of Contact to Hotline<br>[or verbal contact with GRM access point]                                                | <i>Example: 25-08-19</i>                                                                  |
|        | 2. Name of Person & Contact Details<br>[If Given]                                                                         | <i>K. Meng, 012 90129901</i>                                                              |
|        | 3. Construction Site / Project Activity<br>[relevant to person]                                                           | <i>Wastewater treatment site</i>                                                          |
|        | 4. Suggestion / Comment / Complaint:<br>[give detail]                                                                     | <i>Suggestion: Contractor moves broken concrete pile away from path to improve access</i> |
|        | 5. Date PMU (Phnom Penh) Informed:                                                                                        | <i>26-08-19</i>                                                                           |
|        | 6. Name of Person in PMU Informed:                                                                                        | <i>T. Pheap, PMU-ESO</i>                                                                  |
| Day 2  | 7. Action Taken:<br>[for suggestions / comments, for questions, for complaints]                                           | <i>Site Supervisor informed. Concrete moved the next day.</i>                             |
|        | <b>For PMU: Follow Up</b>                                                                                                 |                                                                                           |
| Day 4  | 8. Follow Up with Affected Person<br>[date of call, site visit, evidence e.g. photograph from AP or Hotline Access Point] | <i>Called K. Srey. Confirmed concrete moved and access is clear</i>                       |
|        | 9. Further action or resolved?<br>[describe if the problem is solved or action needed]                                    | <i>Resolved</i>                                                                           |

50. For issues that cannot be resolved on site, by discussion with the contractor, the PMU will use the following table to record and resolve the issue.

Table 13: Project Hotline Formal Contact with Affected People

| TIMING | For Hotline Access Point Person                                                 |                                                                |
|--------|---------------------------------------------------------------------------------|----------------------------------------------------------------|
| Day 1  | 1. Date of Contact to Hotline<br>[or verbal contact with GRM access point]      | <i>Example 20-03-19</i>                                        |
|        | 2. Name of Person & Contact Details<br>[If Given]                               | <i>D. Meng, 092 90129901</i>                                   |
|        | 3. Construction Site / Project Activity<br>[relevant to person]                 | <i>Drain excavation</i>                                        |
|        | 4. Suggestion / Comment / Complaint:<br>[give detail]                           | <i>Complaint: Contractor has cut off water supply to house</i> |
|        | 5. Date PMU (Phnom Penh) Informed:                                              | <i>20-03-19</i>                                                |
|        | 6. Name of Person in PMU Informed:                                              | <i>T. Pheap, PMU-ESO</i>                                       |
| Day 2  | 7. Action Taken:<br>[for suggestions / comments, for questions, for complaints] | <i>Site Supervisor informed. Contractor disagrees.</i>         |
|        | <b>For PMU: Follow Up</b>                                                       |                                                                |
|        | 8. Follow Up with Affected Person                                               | <i>Called D. Meng.</i>                                         |

|                                           |                                                                                                                                         |                                                                                             |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| Day 4                                     | [date of call, site visit, evidence e.g. photograph from AP or Hotline Access Point]                                                    | <i>Confirmed water supply not restored</i>                                                  |
|                                           | 9. Further action or resolved?<br>[describe if the problem is solved or action needed]                                                  | <i>Not resolved<br/>Contractor disagrees. Water supply was never connected.</i>             |
| <b>For PMU if Complaint Not Resolved:</b> |                                                                                                                                         |                                                                                             |
| Day 5                                     | 10. Complaint Screening:<br>[explain why it is valid/not valid]                                                                         | <i>Valid complaint. All houses in the road have a water supply.</i>                         |
|                                           | 11. Date Person informed of Screening<br>[tell affected person if PMU considers the complaint valid]                                    | <i>24-03-19</i>                                                                             |
| Day 6-7                                   | 12. Investigation & Agreement<br>[discuss on site with PMU, PIU, Contractor and others as required. Identify a solution]                | <i>Meeting on site. Contractor will replace the PVC water pipe. Agreed on 28-02-19</i>      |
|                                           | 13. Date for implementing resolution<br>[to be completed within 15 days of initial complaint]                                           | <i>28-03-19</i>                                                                             |
| Day 16                                    | 14. Implementation Follow Up<br>[Contact PIU/Contractor/Site Supervisor and get evidence from site e.g. photographs of completed works] | <i>PIU photos via Telegram of completed pipe work. Discussed with contractor by phone</i>   |
| Day 20                                    | 15. Solution Satisfaction Follow Up<br>[Contact Affected Person, obtain signed letter of satisfaction that complaint resolved]          | <i>Call to D. Meng. Water supply restored. Letter is signed. PIU sent copy via Telegram</i> |

51. **Informal Approach (minor issues).** Informally, an affected person (AP) can give a suggestion, comment, question or complaint through:

- Directly to the Contractor during construction;
- Directly to any other Access Point such as village chief; or
- Use the project hotline contact numbers.

52. During operation the affected people will be required to contact the operator as the project hotline approach and PMU, as an office, will no longer be operating.

53. The contractor will initially ensure its worker /staff member hands a GRM Contact Card (required by this EMP) to the complainant. The contractor will also immediately inform the PMU of the comment/question/complaint.

54. For minor issues, if possible the contractor, will rectify the problem within one day of any complaint or implementable suggestion. For more significant issues, that may require changes to construction practices, project design or additional budget, the PMU will use the formal approach to managing the affected persons comments/complaints.

55. **Formal Approach (significant issues).** If the issue cannot be resolved informally or the affected person is not satisfied with the resolution so far, the PMU will be required to screen the complaint and engage with other stakeholders as needed to find a solution. As set out in Table 13 the steps to be followed by the PMU are:

- **Complaint Screening.** Screening to check the complaint is valid i.e. is as a result of the project activities. Affected Person is immediately informed of the screening results.

If the complaint/issue is screened as non-Project-related and/or invalid, the affected person will be advised that he/she can raise his/her complaint to the second stage of the complaint process; and the PMU-ESO will formally forward the complaint to the District Office

- **Investigation & Agreement.** PIU, Contractor and affected person will discuss the complaint at the site within 2 days of screening. Agreement on actions and measures and a date for implementation of resolution will be agreed. Agreement will be documented using Table 13 and filed by PMU-ESO; PIU, AP, Contractor/Operator will have copies.
- **Implementation Follow Up.** PMU-ESO will follow up to check the implementation of the resolution. The PMU-ESO will obtain evidence on implementation through, site visit and /or photographs and will contact the contractor, PIU and Site Supervisor.
- **Solution Satisfaction Follow Up.** Four days after implementation of the solution the PMU-ESO will contact the affected person to confirm that the solution is working. PIU will secure a written confirmation of satisfaction from the affected person and will forward this to the PMU-ESO.

## 6.6 Managing Unresolved Complaints

56. **District Level.** For actions not taken within the agreed timeframe and when affected person is dissatisfied with the action taken at the First Stage, the person can raise a complaint to the District Office GRC Representative. The District Office has 15 days within which to resolve the complaint to the satisfaction of all concerned. If the complaint cannot be solved at this stage, the District Office will bring the case to the Provincial Grievance Redress Committee representative.

57. **Provincial Level Appeal.** If the affected person remains 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.

- Within 30 days of the submission of the grievance, the Provincial GRC representative must make a written decision and submit copies to the MPWT, GRC members and the affected person.
- If appeal is found not valid, the provincial authority shall write the affected person and declare the grievance closed. In the event of an appeal, the MPWT shall immediately report to the PMU. The PMU shall inform ADB immediately.

58. **ADB Intervention.** If a resolution is not found, affected people should be encouraged to contact the i) ADB Cambodia Resident Mission or ii) the Southeast Asia Department of ADB in Manila. Finally the Accountability Mechanism of the ADB can be used. The Affected Person should contact the Complaints Receiving Officer of the ADB via the following addresses which will be included in the subproject Hotline 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](mailto:amcro@adb.org)

Instructions available here: <http://www.adb.org/site/accountability-mechanism/how-file-complaint>.

59. **ADB 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

60. The Project's GRM should not impede access to the country's jurisdiction or administrative remedies. Accessing the country's legal system and GRM can be done at the same time. If efforts to resolve disputes using the grievance procedures remain unresolved or unsatisfactory, the AP has the right to directly discuss his/her concern/complaint with ADB.

61. The PMU-ESO will record all complaints, suggestions, comments including those dealt with within the project site and those elevated to the GRC. This will include all resolutions and satisfaction of affected people.

62. The number of grievances recorded and resolved, and the outcomes will be displayed at the offices of PIU, PMU and Municipality and reported in the monthly progress reports, semi-annual monitoring reports during construction and annual monitoring reports during operation, submitted to ADB.

63. All costs involved in resolving complaints (meetings, consultations, communication and reporting/information dissemination) will be borne by the PMU. In cases where affected people do not have the writing skills or are unable to express their grievances verbally, they may seek third-party assistance.

## VII. Reporting

65. Environmental monitoring reports will be prepared semi-annually for the EA by the Project Management and Implementation Support consultants in collaboration with PMU's Environmental Safeguard Officer and sent to MPWT's Environmental Safeguard Office, 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. Table 14 gives reporting requirements.

Table 14. Reporting Requirements

|   | Report                                                                           | Frequency                               | Purpose                                                                                     | From                                              | To                             |
|---|----------------------------------------------------------------------------------|-----------------------------------------|---------------------------------------------------------------------------------------------|---------------------------------------------------|--------------------------------|
| 1 | Contractors' Progress Report                                                     | Monthly                                 | Environment, Health and Safety Progress include COVID-19 issues                             | Contractor                                        | PMU                            |
| 2 | CSC EMP Monitoring Report                                                        | Monthly                                 | EMP Implementation Progress                                                                 | CSC                                               | PMU/PMIS                       |
| 3 | Site Visit report                                                                | Monthly                                 | Verify EMP implementation<br>Confirm EMP and GRM are working (consultation and observation) | National Env Specialist with PIU-ESC (PMU verify) | PMU/PMIS                       |
| 4 | Environmental quality Monitoring                                                 | Varies - as per monitoring table in EMP | Relevant environmental parameters,                                                          | Contractor (or laboratory)                        | PMU<br>(PMU-ESO to send to EA) |
| 5 | Environmental Monitoring Report (Integrated safeguards monitoring report format) | Semi-Annual                             | Full EMP Implementation and Adherence to Environmental Covenants/Conditions                 | PMU                                               | ADB                            |

### 1.2. 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 or update the IEE.

## VIII. CONCLUSIONS

68. 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 contractors. The implementation of this EMP will be closely monitored and reported on by the relevant stakeholders in the project.

69. The most significant impacts from the project will arise from WWTP operations. As a result, there is a comprehensive training and capacity building component to the project which is essential for ensuring the investment is financially and environmentally sustainable and beneficial.

70. A robust Grievance Redress Mechanism will be established. It will ensure that all unplanned impacts which cause grievances for affected people are managed swiftly and a satisfactory outcome brought about.

71. Overall, the project is anticipated to bring environmental benefits to Pursat city and its residents, and for Kaoh village, will enable the installation of latrines for residents without risk of flooding and will improve year round access to the village.

## APPENDICES

Appendix 1: Affected Person Monitoring Form Consultation / Interview Form

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

### Interview Discussion Points:

|                                                                                                                                                                                                                                                                                                                                                                           |                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| <b>1. NOISE</b>                                                                                                                                                                                                                                                                                                                                                           | <b>Record of Discussion</b> |
| <b>Before the project started, was the person disturbed by noise? If yes, explain how and when.</b><br><i>Where did the noise come from? E.g. traffic, machinery, people, music</i><br><i>When did it disturb the person? E.g. all day, at night, intermittently</i>                                                                                                      |                             |
| <b>During the construction, is the person disturbed by noise from the project? If yes, explain how and when.</b><br><i>What type of noise and where did the noise come from? All day, at night, intermittently?</i>                                                                                                                                                       |                             |
| <b>If noise from construction is a problem, what changes does the person suggest are made?</b>                                                                                                                                                                                                                                                                            |                             |
| <b>2. AIR QUALITY</b>                                                                                                                                                                                                                                                                                                                                                     | <b>Record of Discussion</b> |
| <b>Before the project started, was the person affected by air pollution or dust? If yes, explain how and when.</b><br><i>Where did the pollution or dust come from? E.g. traffic, machinery, construction, burning garbage, cooking stoves</i><br><i>When was the dust or pollution a problem? E.g. all day, at night, intermittently</i>                                 |                             |
| <b>During the project, is the person disturbed by dust or pollution? If yes, explain how and when.</b><br><i>What type of noise and where did the noise come from? E.g. increased traffic congestion, construction machinery, construction workers, burning construction garbage etc</i><br><i>When did it disturb the person? E.g. all day, at night, intermittently</i> |                             |
| <b>If dust or air pollution from the construction is a problem, what changes does the person suggest are made?</b>                                                                                                                                                                                                                                                        |                             |



|                                                                                                                                                                                                                                                                                                   |                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
|                                                                                                                                                                                                                                                                                                   |                             |
| <b>3. VEGETATION AND LAND USE</b>                                                                                                                                                                                                                                                                 | <b>Record of Discussion</b> |
| Before the project started, what was the vegetation like in the project area?<br><i>E.g. pasture land, trees, shrubs, rice fields.</i>                                                                                                                                                            |                             |
| 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?                                                                                                                                                                                                           |                             |
| <b>4 COMMUNITY SAFETY</b>                                                                                                                                                                                                                                                                         | <b>Record of Discussion</b> |
| Before the project started, can you describe the community safety situation in the project area?<br><i>E.g. no problems, some accidents, difficulty crossing the roads</i>                                                                                                                        |                             |
| During the project, has the person found the community safety situation has changed? If yes, explain how and when.<br><i>Slower traffic so easier to cross the roads, construction vehicles are making a crossing harder / easier, more accidents / less accidents, construction site dangers</i> |                             |
| If change in road safety is unacceptable, what changes does the person suggest are made?                                                                                                                                                                                                          |                             |
| <b>5. WATER QUALITY</b>                                                                                                                                                                                                                                                                           | <b>Record of Discussion</b> |
| Before the project started, was the person affected by poor water quality? If yes, explain how and when.<br><i>Ground water ? Surface Water ? which Water source ? How was it polluted ?</i>                                                                                                      |                             |
| During the project, is the person affected by water pollution? If yes, explain how and when.<br><i>Ground water ? Surface Water ? which Water source ? How is quality being affected ?</i>                                                                                                        |                             |
| If water quality from the construction is a problem, what changes does the person suggest are made?                                                                                                                                                                                               |                             |
| <b>6. ACCESS</b>                                                                                                                                                                                                                                                                                  | <b>Record of Discussion</b> |
| During the project, is the person affected by reduced access to their business, home or land ?<br>Access to what is limited, and how ?                                                                                                                                                            |                             |
| If access limitations are not acceptable, please suggest changes which can be made ?                                                                                                                                                                                                              |                             |
| <b>7. OTHER ISSUES</b>                                                                                                                                                                                                                                                                            | <b>Record of Discussion</b> |
| Any other issues about the construction sites that the person wants to discuss?<br><i>E.g. wastewater concerns, waste disposal, Other concerns, labor force,</i>                                                                                                                                  |                             |

## Appendix 2: Complaint Recording Form

|                                                  |  |
|--------------------------------------------------|--|
| <b>PIU Staff Responsible:</b><br>(name and role) |  |
| <b>Date:</b><br>(of this record)                 |  |

|                                                                                                                        |  |
|------------------------------------------------------------------------------------------------------------------------|--|
| <b>Date of Complaint:</b>                                                                                              |  |
| <b>Date Resolution Required by</b> (5-10 days from initial complaint):                                                 |  |
| <b>Complaint Made by:</b><br>(Name & Contact Details)                                                                  |  |
| <b>Method of Complaint:</b><br>(direct to PMU, via Contractor, Via Commune People's Council)                           |  |
| <b>Details of Complaint:</b><br>(issues, actions taken so far, when did it start – all details needed)                 |  |
| <b>PMU Actions:</b><br>(Next steps for PMU to resolve the issue or to move complaint to next level)                    |  |
| <b>Follow Up Actions Needed and Date:</b><br>(PMU to follow up on resolution if needed, e.g. check contractor actions) |  |

### Appendix 3: Particular Conditions (for Bidding Documents)

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

73. The contractor will undertake to develop and submit to the PMU/CSC for approval, a site specific Construction Environmental Management Plan with the following management sub-plans:

- A. Implementation of Spoil, Solid and Liquid Waste Management Sub-Plan
- B. Implementation of Community Health and Safety and Access Sub-plan
- C. Implementation of Occupational Health and Safety and Emergency Response Sub-plan including COVID-19 prevention and management protocols, defined according to national Ministry of Health requirements.
- D. Implementation of Construction Workers' Camp Management (if required).

74. The management sub-plans will be sufficiently detailed as to allow a clear understanding of the approach the contractor will take to mitigate environmental impacts during construction. The contractor will adhere to the management sub-plans at all times unless prior agreement has been given by the PMU under extenuating circumstances.

75. The Contractor will 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.

76. The Contractor will 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.

## Appendix 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 <sub>2</sub> ) | 24 hours         | mg /m <sup>3</sup> | 0.1   |
| Sulfur Dioxide (SO <sub>2</sub> )   | 24 hours         | mg /m <sup>3</sup> | 0.3   |
| Carbon Monoxide (CO)                | 8 hours          | mg /m <sup>3</sup> | 20    |
| PM 2.5 (use WHO value in Cambodia)  | 24 hours         | mg /m <sup>3</sup> | 0.025 |
| PM 10 (use WHO value in Cambodia)   | 24 hours         | mg /m <sup>3</sup> | 0.05  |

### (2) Ambient Noise Standards

Source: Sub-decree **No. 42 ANRK.BK** on Air Pollution Control and Noise Disturbance, MoE , 2000 and WHO. Bold highlights most stringent standard to be followed.

| Areas                                                                                                       | Time Period (24 hours)                | Standard                                      |                                                                                                               |
|-------------------------------------------------------------------------------------------------------------|---------------------------------------|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------|
|                                                                                                             |                                       | National Standard (dB(A))                     | WHO Community Noise (dB(A))                                                                                   |
| RES: Residential Area<br>MIX: Mixed Residential and Small Industries Area<br>I&C: Industrial and Commercial | Day time (from 6:00am to 6:00pm)      | (i) RES: 60<br>(ii) MIX: 75                   | RES: 55 (serious annoyance)<br><b>RES: 50 (moderate annoyance)</b><br><b>I&amp;C: 70 (hearing impairment)</b> |
|                                                                                                             | Evening Time (from 6:00pm to 10:00pm) | (iii) <b>RES: 50</b><br>(iv) MIX: 70          | v) RES: 55 (moderate annoyance)<br>(vi) <b>I&amp;C: 60 (hearing impairment)</b>                               |
|                                                                                                             | Night time (from 10:00pm to 6:00am)   | (vii) <b>RES: 45</b><br>(viii) <b>MIX: 50</b> | ix) RES: 45 (moderate annoyance)<br>(x) I&C: 60 (hearing impairment)                                          |

### (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  | BOD5 ( 5 days at 200 C )   | mg/l | < 30                                                    | < 80                        |
| 4  | COD                        | mg/l | < 50                                                    | < 100                       |
| 5  | Total Suspended Solids     | mg/l | < 50                                                    | < 80                        |
| 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                       |
| 10 | Nitrate (NO <sub>3</sub> ) | mg/l | < 10                                                    | < 20                        |
| 11 | Chlorine ( free )          | mg/l | < 1.0                                                   | < 2.0                       |

|    |                                 |      |         |        |
|----|---------------------------------|------|---------|--------|
| 12 | Chloride ( ion )                | mg/l | < 500   | < 700  |
| 13 | Sulphate ( as SO <sub>4</sub> ) | mg/l | < 300   | < 500  |
| 14 | Sulphide ( as Sulphur )         | mg/l | < 0.2   | < 1.0  |
| 15 | Phosphate ( PO <sub>4</sub> )   | 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 <sub>3</sub> )     | mg/l | < 5.0   | < 7.0  |
| 35 | DO                              | mg/l | >2.0    | >1.0   |
| 36 | Polychlorinated Byphenyl        | 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   |
| 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 |
| BOD <sub>5</sub> | 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 (ground and surface water) in public water areas for public health protection (not non-potable water)**

| 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        |

## (5) Effluent Quality Standard

(Effluent from WWTP)

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

| No | Parameter                       | Standard (Allowable limits for pollutant substance discharging) to |                                     |                                     |
|----|---------------------------------|--------------------------------------------------------------------|-------------------------------------|-------------------------------------|
|    |                                 | Unit                                                               | Value (Protected public water area) | Value (Public water area and sewer) |
| 1  | Temperature                     | 0C                                                                 | < 45                                | < 45                                |
| 2  | pH                              |                                                                    | 6 – 9                               | 5 - 9                               |
| 3  | BOD5 ( 5 days at 200 C )        | mg/l                                                               | < 30                                | < 80                                |
| 4  | COD                             | mg/l                                                               | < 50                                | < 100                               |
| 5  | Total Suspended Solids          | mg/l                                                               | < 50                                | < 80                                |
| 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                               |
| 10 | Nitrate (NO <sub>3</sub> )      | mg/l                                                               | < 10                                | < 20                                |
| 11 | Chlorine ( free )               | mg/l                                                               | < 1.0                               | < 2.0                               |
| 12 | Chloride ( ion )                | mg/l                                                               | < 500                               | < 700                               |
| 13 | Sulphate ( as SO <sub>4</sub> ) | mg/l                                                               | < 300                               | < 500                               |
| 14 | Sulphide ( as Sulphur )         | mg/l                                                               | < 0.2                               | < 1.0                               |
| 15 | Phosphate ( PO <sub>4</sub> )   | 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 <sub>3</sub> )     | 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                                |
| 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                                  |

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## (6) Soil Quality Standard

Source: Cambodia National Quality Standards for agriculture, Ministry of Agriculture, Forest, and Fishery (MAFF).

| Parameter                               | Standard |        |
|-----------------------------------------|----------|--------|
|                                         | Unit     | Value  |
| pH                                      |          |        |
| Salinity                                | ppt      | 6-8    |
| Oil & Grease                            | mg/kg    | -      |
| Chloride                                | mg/kg    | -      |
| Petroleum Hydrocarbons                  |          |        |
| Kerosene hydrocarbons (c10-c14)         | mg/kg    | -      |
| Diesel hydrocarbons (c15-c28) (mg/L)    | mg/kg    | -      |
| Heavy oil hydrocarbons (c29-c36) (mg/L) | mg/kg    | -      |
| BTEX                                    |          |        |
| Ethylbenzene                            | mg/kg    | 0.018  |
| Benzene                                 | mg/kg    | 0.0068 |
| Toluene                                 | mg/kg    | 0.08   |
| Xylene                                  | mg/kg    | 2.4    |
| Metals                                  |          |        |
| Nickel                                  | mg/kg    | 50     |
| Copper                                  | mg/kg    | 63     |
| Zinc                                    | mg/kg    | 200    |
| Arsenic                                 | mg/kg    | 12     |
| Cadmium                                 | mg/kg    | 1.4    |
| Lead                                    | mg/kg    | 70     |
| Iron                                    | mg/kg    | -      |
| Chromium                                | mg/kg    | 64     |
| Mercury                                 | mg/kg    | 6.6    |