Environmental Management Plan

August 2021

Cambodia: Provincial Water Supply and Sanitation Project − West Battambang Wastewater Treatment and Collection System Subproject

Prepared by the Ministry of Public Works and Transport.

CURRENCY EQUIVALENTS

(as of August 2021)

Currency unit	–	riel (KHR)
KHR 1.00	=	$ 0.000245
$1.00	=	KHR 4,079

NOTE

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

ABBREVIATIONS

ADB	-	Asian Development Bank
AP	-	affected person
BOD	-	biochemical oxygen demand
CEMP	-	construction environmental management plan
CMAC	-	Cambodian Mines Action Centre
COD	-	chemical oxygen demand
EMP	-	environmental management plan
FAO	-	Food and Agriculture Organization
GRM	-	grievance redress mechanism
HDPE	-	high-density polyethylene (pipe)
H&S	-	health and safety
IEE	-	initial environmental examination (as per ADB)
IESIA	-	initial environmental and social impact assessment (as per MOE)
IFC	-	International Financing Corporation
LAS	-	linear alkyl-benzene sulfonate (detergent)
MOE	-	Ministry of Environment
MPN	-	most probable number
MPWT	-	Ministry of Public Works and Transport
O&M	-	operation and maintenance
PDOE	-	Provincial Department of Environment
PDPWT	-	Provincial Department of Public Works and Transport
PIAC	-	project implementation assistance consultant
PIB	-	public information booklet
PIU	-	project implementation unit
PM_{10}	-	particulate matter 10 micrometers or less
$PM_{2.5}$	-	particulate matter 2.5 micrometers or less
PMU	-	project management unit
PPE	-	personal protective equipment
TPS	-	terminal pumping station
PWSSP	-	Provincial Water Supply and Sanitation Project
UPVC	-	Un-plasticized polyvinyl chloride
UXO	-	unexploded ordnance
TSS	-	total suspended solid
WB	-	The World Bank
WHO	-	World Health Organization
WWTP	-	wastewater treatment plant

WEIGHTS AND MEASURES

°C	-	degree Celsius
cm	-	centimeter
dS/m	-	decisiemen per meter
ha	-	hectare
km	-	kilometer
L	-	liter
m	-	meter
m^3	-	cubic meter
m^3/d	-	cubic meter per day (flow measurement)
mg/kg	-	milligram per kilogram (concentration)
mL	-	milliliter
mg/L	-	milligram per liter
mg/m^3	-	milligram per cubic meter
$\mu g/m^3$	-	microgram per cubic meter
mm	-	millimeter
MPN/g	-	most probable number per gram
MPN/100 mL	-	most probable number per 100 milliliters (coliform count)
NTU	-	nephelometric turbidity unit

GLOSSARY

district	–	sub-divisions of the 24 provinces in Cambodia
commune	–	sub-divisions of districts, referred to as sangkats in urban areas
prakas	–	Ministerial decision

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1. INTRODUCTION

1.1. Purpose

1. This document is the environmental management plan (EMP) for the West Battambang Wastewater Subproject Treatment and Collection System (the West Battambang subproject) under the Provincial Water Supply and Sanitation Project – Sanitation Component. The EMP defines mitigation and monitoring measures and describes the responsibilities and mechanisms for implementing the mitigation measures, to monitor and ensure compliance and continuous improvement of environmental protection activities during construction and operation of the subproject in order to prevent, reduce, or mitigate adverse impacts.

2. The EMP is part of the contract in Volume 4 – Supplementary Information of the bidding invitation document for the subproject and has the purpose to prescribe required mitigation and monitoring requirements for potential environmental impacts, institutional responsibilities for implementation of the EMP, and provide the needed guidance for the contractor to prepare and cost its construction environmental management plan (CEMP).

1.2. Outline of the Subproject

1.2.1. General

3. This West Battambang subproject aims to extend and improve existing sanitation facilities in Battambang City in order to increase the capacities to handle projected sewage generated in the area for which service coverage is proposed up to 2040, containing the densely populated areas of the city center to the west of the Sangkae River, and most of the intermediately populated areas just outside the center. Locality maps of the overall project area, is presented in Figure 1 The subproject comprises three components:

- Wastewater collection system
- Wastewater treatment plant
- Stormwater drainage network

1.2.2. Wastewater Collection System

4. The wastewater collection system will be a separate pipe network and a pumping station on the west bank of the Sangkae River as shown in Figure 2 and Figure 3 respectively. Detailed design will include all of the 415 ha Phase I area shown as Phase 1A and Phase 1B in Figure 1, but the priority work package under this project will cover only the central core area of 200 ha (Phase 1A). See Figure 3.

Figure 1 Overall Locality Map

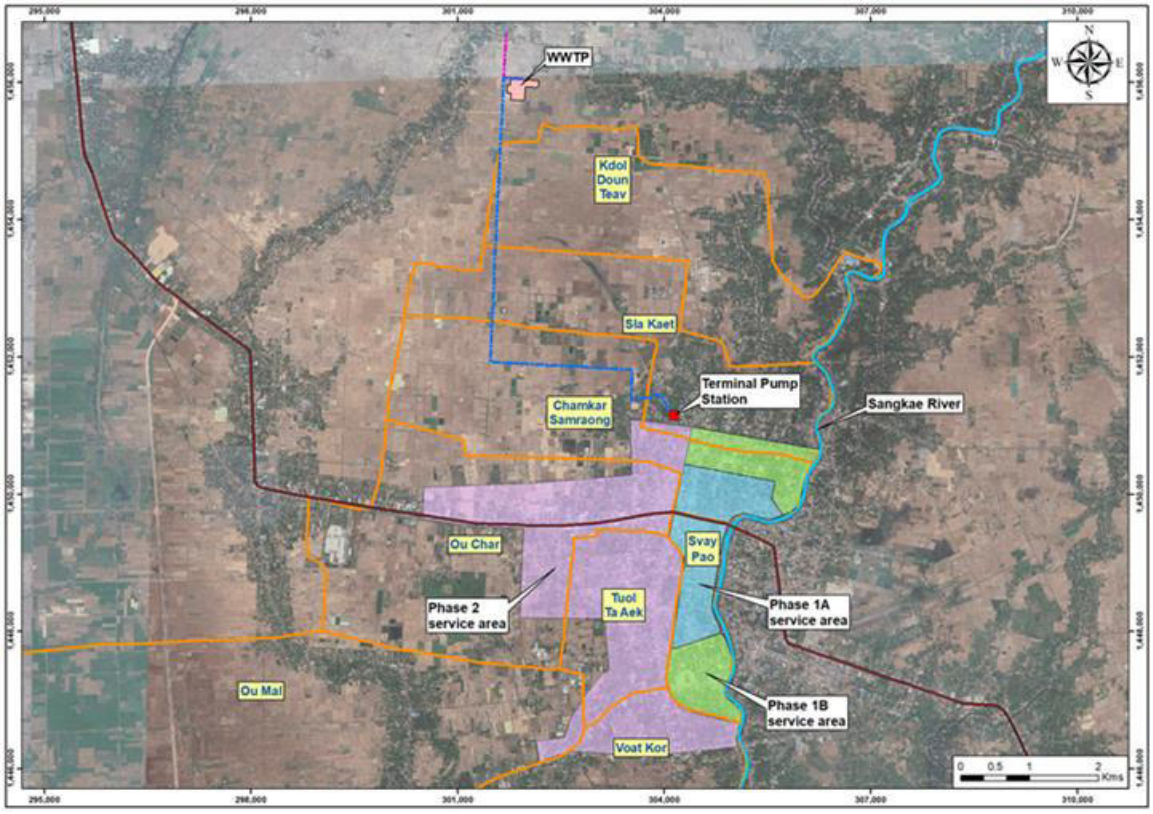


Image date: 31 March 2020

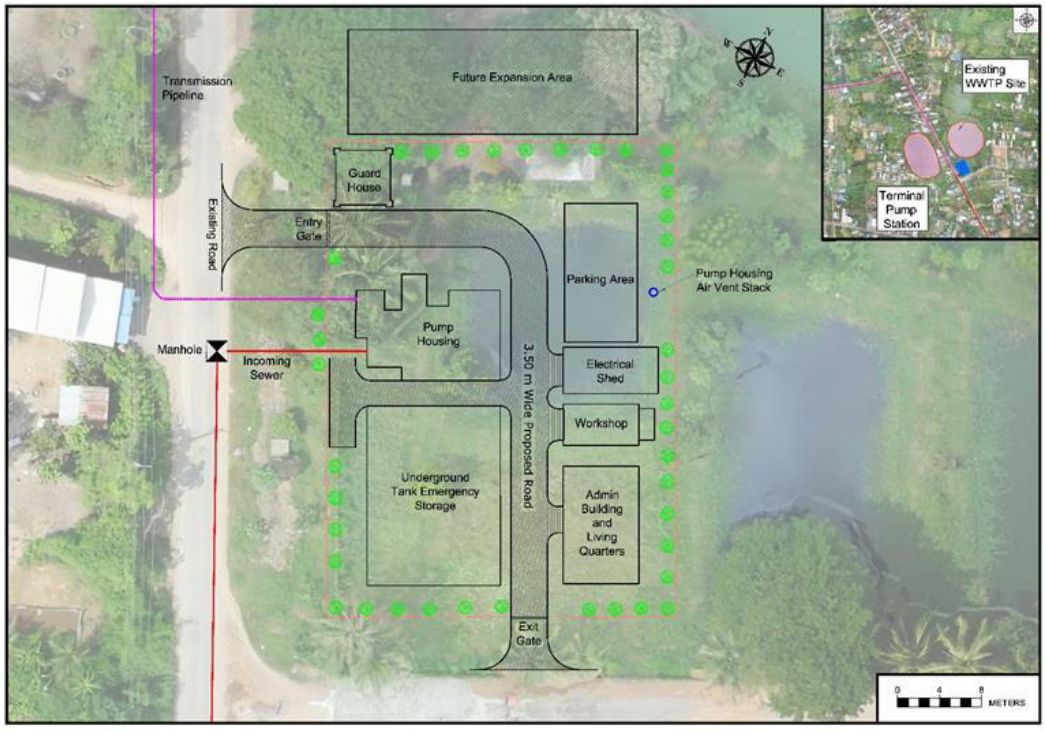
5. The key elements of the collection system will be as follows:

- Pipe network will be all gravity with a central deep interceptor sewer to approximately 10 m depth (see map for location). For depths up to 5 m, the construction method will be open trench and for 5 m to 10 m deep sections the construction method will be using micro-tunneling and pipe jacking (trenchless technology). This will reduce the disruption to traffic flow and will enable faster construction progress. More importantly, it will eliminate the need for pump stations which will reduce operating costs, and from an environmental perspective, the risk of overflow from malfunctioning pump stations and potential odor nuisance to nearby residents.
- The collector sewers will be of high-density polyethylene (HDPE) material typically 200 mm to 355 mm diameter. Shallow rider sewers of 150 mm diameter unplasticized polyvinyl chloride (UPVC) will be used to facilitate property connection. The deep interceptor sewer main will be of 450 mm and 600 mm diameter glass reinforced plastic. The use of these pipes will minimize the infiltration into, and exfiltration at times from, the sewer thus reducing groundwater contamination risks. Manhole covers will be solid steel and therefore this should minimize the inflow into the system during rainfall events.
- The collection system will include one major terminal pump station (TPS) at the site of the existing wastewater treatment plant (WWTP). The pumping units will all be below ground at a depth of 10 m, and will include three submersible pumps in a two

duty and one standby configuration, and a diaphragm pump to remove grit and rock. The underground location of the pumps will minimize noise emanating from the station. To reduce the odor emissions from the facility, air and gases from the pump wells will be piped to a 10 m high vent stack located at the back of the station. Other structures on the site will be an administration building, electrical workshop, generator and guard house. The pump station will be manned at all times.

- Wastewater from the TPS will be conveyed to the WWTP via an 8 km long, 630 mm diameter HDPE force main.
- The project will also include the installation of 4,200 house connections and on-site plumbing to ensure flow into the system at commissioning and sustainability of operations. This will be important from an environmental point of view because the biological process at the WWTP depends on a steady flow of nutrients, and consistent plant performance is essential to maintaining a good quality of treated effluent discharged to the environment.
- All construction will be confined to the public road reserve.
- Geotechnical investigations carried out in May 2020 indicate that soils are mostly sandy clay and water table is typically at 3 m depth. Boreholes logs were obtained along the deep sewer pipeline route and the data indicate that risk of fracking of the overlying strata is low thus should not pose an environmental hazard.

Figure 2 Location of new Terminal Pumping Station



Terminal pump station in the south side of the existing WWTP site (see inset), Ref: PIAC, 2020 detailed design

Figure 3 Priority Service Area

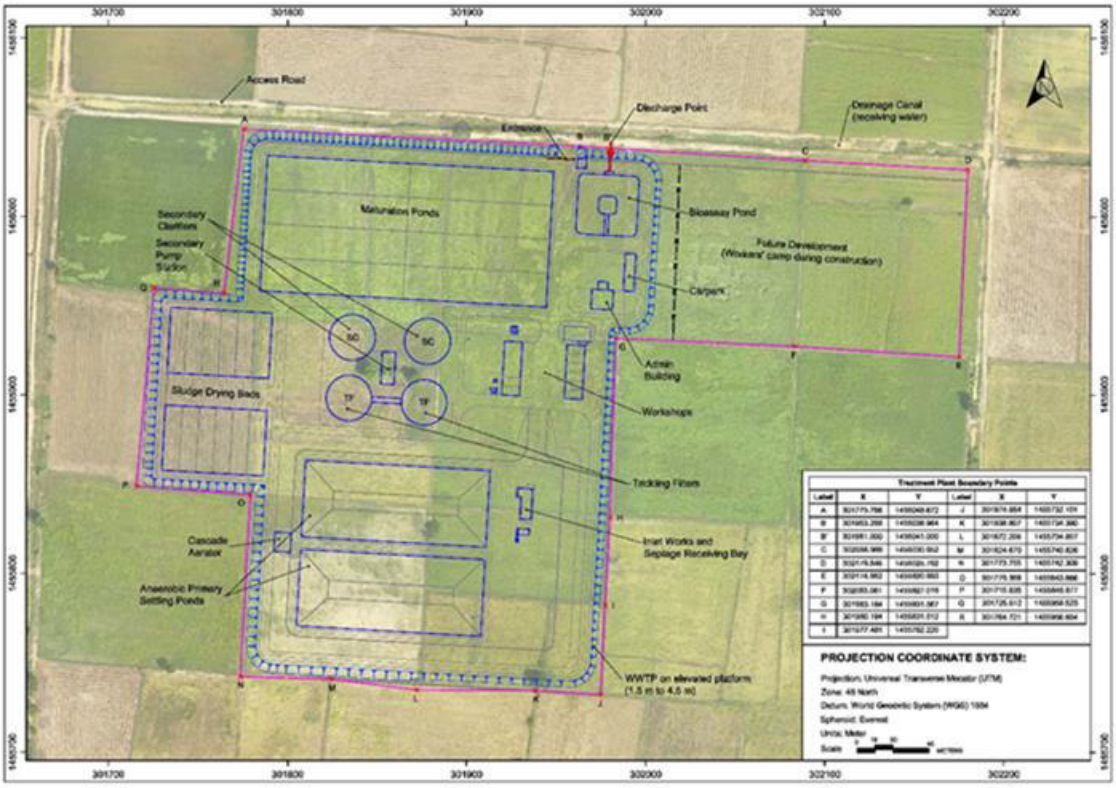
Priority sewerage network 200 ha area defined by boundary shown in light turquoise, Image date 31 March 2020

1.2.3. Wastewater Treatment System

6. The new WWTP will be located some 8 km north, north-northwest of the existing treatment facility and will be accessible from the sealed road located to the north of the site. The location of the WWTP and access road are shown in Figure 4 *and* Figure *5* respectively. The 8.9 ha site is currently a rice paddy field, with no nearby buildings.
    - Access is via a dirt road which will be upgraded and raised to provide all-year round access to the site under flood conditions with an average recurrence interval of 5 years (annual exceedance probability of 20%) in accordance with national road design standards.
    - The site earthworks will include site clearing and general level raising to a height of 1.5 m to 4.5 m above existing ground levels to provide a platform at an elevation of 12 m above mean sea level which will ensure the plant can function and discharge under 1 in 25-year average recurrence interval flood conditions. Surface runoff from wash down areas will be directed to the treatment ponds, and general site rainwater drainage system will discharge to the canals and water ways in the surrounding area.
    - The treatment plant design capacity will be 12,000 m^3/d which is the projected wastewater load generated in the service area in the year 2040 (design horizon). Flow at start up in 2023 will be around 3,700 m^3/d.
    - The treatment process train will include primary treatment for physical removal of coarse solids, secondary treatment using biochemical processes and tertiary treatment for further polishing and disinfection of the treated effluent before discharge to the receiving waters. The facilities will be constructed as two parallel process streams which will enable taking one line or parts of one line offline for maintenance and keeping the plant in operation at all times.
    - Primary treatment phase will include an inlet works comprising manually operated screens, and covered anaerobic primary settling ponds with cover for biogas capture. The biogas will be flared off. The main environmental benefit will be a significant reduction in greenhouse gas emissions. In the future consideration will be given to converting the biogas to energy. In addition, a septage receiving area will be constructed to accept septage from desludged septic tanks in the city. The septage will be discharged into the anaerobic ponds.
    - Secondary treatment will involve passing: the effluent from the anaerobic primary settling ponds through the secondary pump station into the cross-flow high rate trickling filters where the primary effluent will be biologically oxidized to lower the organic content, especially biochemical oxygen demand and ammonia, through the development of a biological film on the media in which bacteria consumes the organic material. The top of the trickling filters will be approximately 4-5 m above ground. This will enable the effluent from the trickling filter to be transferred to the secondary clarifiers via gravity flow thus optimizing energy use. In the secondary clarifiers the fine biosolids are separated from the liquid through a settling process. The effluent from the secondary process is transferred to the tertiary treatment system and the humus sludge from the clarifiers are returned to the anaerobic ponds for storage. The secondary pump station includes the pumping of primary influent and also sludge draw off pumps.

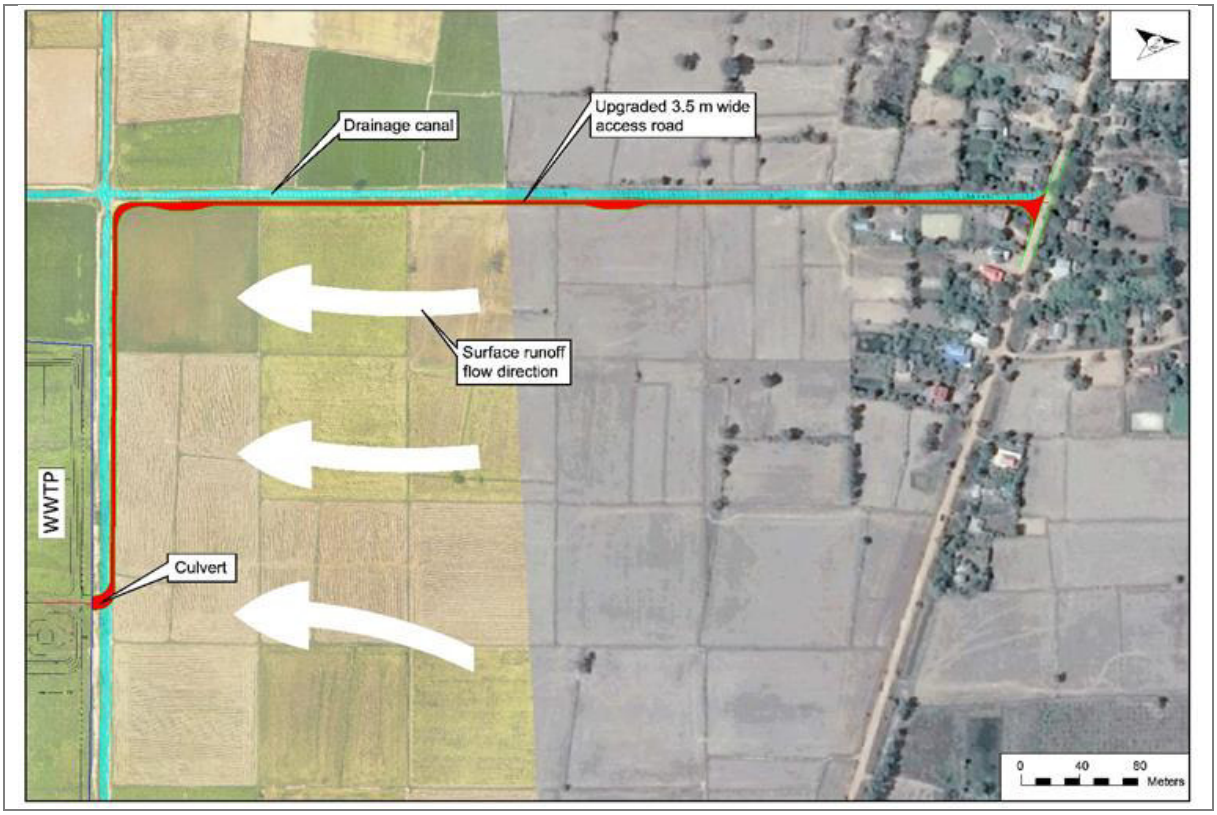
- Tertiary treatment comprises maturation ponds which will polish and disinfect the secondary effluent from the clarifiers. The pond system will include baffle walls to attain the desired hydraulic retention time necessary to microbiological removal. Treated effluent from the maturation ponds will be passed through a bioassay pond prior to ultimate discharge to the irrigation canal in front of the north boundary of the WWTP. The anticipated effluent water quality will include 28 mg/L biochemical oxygen demand (BOD), 40 mg/L suspended solids and fecal coliform count of less than 1,000 MPN/100 mL.
- Sludge management will be in the form of storage of the primary and secondary sludges in the anaerobic primary sedimentation ponds throughout the year where they will stabilized and digested into stabilized biosolids. Dewatering of the sludge will take place in the dry season. The dried biosolids could then be recycled as soil conditioner or used as layer cover instead of soil in the city landfill operation.
- Treated effluent from the plant will be discharged to the adjacent irrigation canal. As this water still has some valuable nutrients (P, N and K) it could be potentially beneficial for agricultural reuse. As a precaution to reduce any contamination risks, the canal will be fenced off on both sides of the canal to prevent public access for about 400 m (full site width of along the north side of the WWTP). It is noted that at present the canal is typically dry during the dry season (December to June).

Figure 4 Wastewater Treatment Plant Site Layout



Source: PIAC, 2020. *Detailed engineering design*

Figure 5 Wastewater Treatment Plant Access Road



Source: PIAC, 2020. *Detailed engineering design*

1.2.4. Stormwater Drainage System

7. Service area coverage and priority works packaging will be the same as for the wastewater collection system.

- Existing combined sewer will be integrated into new separate stormwater drainage system subject to a condition assessment which is currently in progress
- The network will include a combination of covered open drains (channels) up to a depth of 1.2 m and pipelines for depths of 2 m to 5 m. Layout will be typically on either side of the road carriageways. Conduit material will be reinforced concrete.
- In market areas a perimeter drain will be directed to the wastewater system with a high level overflow (at 5 times average dry weather flow from the area) to the drainage system to minimize the organic matter being discharged to the river.
- The drainage system will be operating under gravity and has been designed to pass the surface runoff from a 1-hour storm event of a storm event with an average recurrence interval of 1 in 10 year and a river water level with similar exceedance probability.
- The three existing discharge points from the existing system to the Sangkae River will be retained and upgraded to discharge below the average dry season river water level.

- Discharge points will be fitted with gross pollutant traps to intercept rubbish which will be carted away for disposal at the landfill site.
- The inability to discharge under gravity during very high river levels will necessitate the construction of retention basin to store water for periods (yet to be quantified). The locations of these basins are still under discussion with the Project Implementation Unit (PIU) and as such retention basins are not part of the first stage work package (Phase 1A area).

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2. SUMMARY OF POTENTIAL RECEPTORS AND IMPACTS

8. 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 1. In addition to facility-specific receptors, there are housing, businesses and access requirements that are also considered impact receptors at all locations of construction of wastewater collection system and stormwater drainage network.

Table 1. Summary of Receptors in Sub-Project Area

Component	GPS	Surface Water Receptors	Socio-Economic and Cultural Receptors	Land Cover/ Ecological Receptors	Protected Area Status
WWTP	13° 9'46.66"N, 103°10'19.53"E	Irrigation channel north of WWTP running east-west with bi-directional flow: wet season east to the west (away from the river), dry season towards the river located 6.1 km to the east.	Farmers/agricultural users of the irrigation channel 1-2 km downstream of the discharge point (no downstream potable uses of canal water and no downstream water abstraction points other than for agriculture) Nearest housing area: 450 m north-east of WWTP, Houses adjacent to access road from the north 13°10'13.22"N, 103°10'13.56"E, Distance to town: 7.0 km	Agricultural land used for paddy rice fields	None
Terminal pumping station	13°7'13.02"N, 103° 11'36.06"E	Discharges to the WWTP. In case of failure, pump out to on-site ponds	Housing across the road (<50 m).	Peri-urban, gardens, some cultivation, shrubs, trees	None
Sewage and rainwater networks	West side of the Sangkae River	Sewerage network discharges to TPS and. overflows to drainage system. Drainage system will discharge to the Sangkae River	Residential areas, school, hospital, offices, businesses, markets, shops, and pagodas	Urban area	None

9. A summary of adverse impacts on the receptors during construction and operation stages of project development is presented Table 2.

Table 2. Summary of Receptors in Sub-Project Area

Impact Type	Construction Phase	Operations Phase
Air quality	Moderate temporary impacts are anticipated because of fugitive dust generation associated with all construction works, earth works and waste movements	Greenhouse gasses, which will be the only potential adverse air quality effects will be flared initially. Therefore there should no adverse atmospheric impacts.
Noise	Noise impacts will be temporary and localized at all construction sites as construction machinery and vehicles generate noise while in operation.	Should not be a nuisance as pumps at the TPS are below ground and the WWTP is remote from the community.

Impact Type	Construction Phase	Operations Phase
	Other noise sources include loading and unloading of equipment and materials	Noise emanating from the onsite generators during power outages will be the main source of noise at the TPS.
Water source (ground and surface)	Construction will take place in areas which have a network of irrigation canals, used for both household water requirements such as laundry and bathing as well as for fishing. Short term impacts from construction may be seen in terms of increased turbidity, during upgrading of the access road and construction of the force main is taking place adjacent to the canals. Also some construction activity will be required at the river bank where outfalls for the drainage system will be rehabilitated. Groundwater could be at risk from drilling fluid leakage during micro-tunneling, accidental oil spills during maintenance or improper disposal of construction waste. However, groundwater is not known to be used for drink or cooking purposes.	While treated effluent discharges will have a benefit during the dry season as the nutrient-rich water will be available to nearby farmers for irrigation, adverse impact on farmers could arise if the effluent quality drops below the discharge standards. Therefore, ongoing periodic monitoring of effluent quality will be required. As the river flow even during the dry season is more than 30 times the treated effluent discharge rate in the early years of operation, the effect on river water quality will be minimal. Groundwater impacts should be negligible as all water retaining structures will be lined thus preventing seepage
Biodiversity (flora and fauna)	The WWTP is located in an area dominated by agricultural land (paddy fields) and no tree cover, and the sewerage and stormwater drainage systems are located in the city with intense economic activities. The subproject area is therefore located in a highly modified landscape, not considered of particular biodiversity value. Therefore, the impact on natural flora and fauna will be negligible	There will be no impact on biodiversity. The project area is located within the outer transition zone of the Tonle Sap Biodiversity Reserve with the nearest high-value core zone more than 40 km away. As such, development activity is allowed provided environmental safeguards and active monitoring is put in place.
Soil and land	While soil erosion is not anticipated given the nature of the subproject and the location, borrow pits will cause local impacts to the land. It is noted that the use of borrow pits to build new housing subdivisions to the north of the city is wide practiced at present. The WWTP is in fertile agricultural area and fertile top soil is a valuable resource which requires protection measures, particularly for construction areas which are located in and around rice fields where encroachment from inappropriate spoil disposal could have detrimental agricultural and economic impacts.	No adverse impact on soils or land foreseen during the operations phase. However, before full-scale reuse of the treated effluent and/or biosolids are put in place, considerable research by stakeholder agencies is required on long-term effects on soil and crop yields. Piloting a small area should be carried out first.
Solid waste management	Impacts on resource use and effects associated with disposal will arise from waste generated during construction. This includes disposal of inert wastes such as excavated material from the micro-tunneling and excavations, biodegradable wastes (cleared vegetation), and	During operations the main potential adverse impact will be of spillage of septage or dried biosolids onto roads. from hauling trucks. Disposal of screened solids and grit form the inlet works will likely to be buried onsite initially.

Impact Type	Construction Phase	Operations Phase
	hazardous wastes such as oily wastes from spills from construction machinery,	
Community and occupational health and safety (H&S)	Construction sites and access roads will necessarily mean H&S risks not only to construction workers, but also to people living and working around the sites. Community risks arise from unauthorized access to construction sites, excavation and trench work, and construction traffic i.e. heavy vehicles which the community may not be used to on their neighborhood roads. Occupational risks come from a range of activities including the use of heavy machinery, excavation and trench work, earth moving, and use of chemicals. The risk of sexually transmitted diseases in the community will also likely to increase with a significant influx of migrant workers.	There will be ongoing occupational H&S risks to workers at the TPS and WWTP, however these will be much reduced from the construction phase. Community risk attributable to the operation of the system should be negligible.
Odor	None expected. The worker's camp at the WWTP or nearby the TPS, will be in a remote location and therefore will not affect adjoining residents.	During the operations phase odor generation at the TPS and WWTP will be inevitable and may cause occasional temporary social nuisance. The WWTP will be in an open paddy field with a buffer of over 600 m to the nearest houses located to the north, north-west of the plant and therefore odor perception should occur rarely. At the TPS, houses are within 50 m of the gas releasing vent stack facility and therefore they are likely to experience odor nuisance on occasions. Therefore, the frequency and duration of odorous events will need to be closely monitored post commissioning and during the 12 months of system operation under the contract
Socio-economic (accessibility)	The installation of sewage and drainage pipe networks will require the excavation of parts of the roads and footpaths. This is in urban areas where businesses and other activities take place. The community in and around these areas will be disrupted by the noise and dust, as described above, and also by potentially impaired access (for themselves and their customers) to their properties and businesses. The construction may affect local utilities: water supply, electric poles/lines, telecommunication, and other local services	No adverse impact anticipated.

3. INSTITUTIONAL ARRANGEMENTS & RESPONSIBILITIES

3.1. Management Framework

10. The management framework overseeing the implementation of the EMP is defined as below. The Ministry of Public Works and Transport (MPWT) is the implementing agency for the West Battambang Subproject. A project management unit (PMU) formed in the General Department of Public Works within MPWT for the project has full-time staff to execute and manage the project, and oversees the implementation of PWSSP including this subproject. The PIU is established in the Provincial Department of Public Works and Transport (PDPWT) at Battambang with responsibility for daily oversight and supervision of subproject implementation.

11. The roles and responsibilities for environmental management for the subproject and incorporating those as defined in the Project Administration Manual are summarized in Table 3 below.

Table 3. Roles and Responsibilities for Environmental Management

Entity	Environmental Roles and Responsibilities
PMU	i. Appoint environmental safeguards officer for the project; ii. Responsible for project management, coordination, monitoring and supervision, including ensuring implementation of environmental mitigation and monitoring measures; iii. Ensure timely submission for Government approvals related to environmental management; iv. Ensure that the project's EMP is incorporated in the bidding documents and contract documents for all civil works; v. Review and approval of designs prepared by the contractor; vi. Ensure EMPs are updated following detailed engineering design, as necessary; vii. Review the CEMP prepared by the contractor for compliance with standards set in the EMP, instruct revisions as necessary, and approve prior to commencement of construction viii. Ensure public disclosure of relevant project information and ongoing public consultation as per the EMP requirements; ix. Co-ordinate and report on the project specific safeguards grievance redress mechanism, ensure that necessary actions to resolve complaints are taken, documented and reported; x. Ensure monitoring of environmental parameters are specified in the EMP; xi. Ensure compliance with loan covenants in accordance with agreed formats and frameworks; xii. Oversee monthly environmental monitoring of the project and submit semi-annual environmental monitoring reports to ADB for disclosure on ADB's website; xiii. Oversee project compliance with relevant national and provincial requirements and co-ordinate with the relevant agencies;

Entity	Environmental Roles and Responsibilities
	xiv. Review and validate semi-annual environmental monitoring reports prepared with the assistance of the project implementation assistance consultant (PIAC); xv. Lead follow-up consultation meetings with relevant institutions, stakeholders and affected persons on environmental issues; xvi. With the assistance of the PIAC, undertake regular construction site inspections and oversee implementation of the CEMP by contractor;
PIU	i. Appoint social and environmental safeguards officer for the subproject; ii. Monitoring and reporting monthly to PMU on project progress; iii. Contract supervision; iv. Liaison with PIAC and PMU in implementation of training programs; v. Coordinating with other provincial agencies; vi. Community communication.
PIAC	i. Mobilize national and international environment specialist; ii. Review designs in detail, checking for compliance with requirements in the EMP, and advise PMU of any necessary revisions to the initial environmental examination (IEE) and EMP prior to approval; iii. Support the PMU with update of IEE/EMP following detailed engineering design; iv. Check the bill of quantities to ensure the contractor made adequate provisions for environmental mitigation and monitoring; v. On behalf of the PMU, and working with the PIU, supervise the civil works packages and implementation of the EMP mitigation and monitoring measures. vi. Commissioning and handover of the works.
PIAC Environment Specialists (international and national)	i. Review the detailed designs prepared for each subproject for compliance with the EMP prepared during the feasibility study. Update the IEE and EMP to reflect changes, modifications and additions that have potential impacts during construction and operation phases of the subproject. ii. Examine the CEMP prepared by the contractor for compliance with the EMP and advise PMU of revisions that need to be incorporated prior to approval and commencement of civil works; iii. Ensure that all associated project facilities have the required permits prior to commencement of civil works; iv. Brief PIAC engineering and PIU supervision staff on EMP provisions and provide checklists and training pitot to the start of construction to ensure that they will be able to adequately supervise on a day-to-day basis the contractor and subcontractors about proper and timely implementation of mitigation measures specified in the EMP; v. Monitor implementation of environmental mitigation measures and environmental performance of the contractor based on the EMP schedule and assist MPWT in the preparation of semi-annual environmental monitoring reports for submission to ADB; vi. Undertake training for the MPWT/PMU and PIU staff on environmental management and monitoring, to build their capacity in these areas. The training will be implemented through on-the-job training and workshops based on the provisions of the EMP; and vii. Ensure that the affected stakeholders and sensitive receptors (e.g. hospitals, schools, and temples) are regularly updated on project activities and are aware of the multiple entry points to the project safeguards GRM.

Entity	Environmental Roles and Responsibilities
Construction Contractor	i. Appoint an environment, H&S officer to manage, monitor and report on EMP implementation who is competent, nominated to manage H&S risks, and who can implement the EMP requirements for occupational H&S and ensure relevant H&S legislation is followed; ii. Appoint a contractor's GRM focal point; iii. Prepare site-specific CEMP containing the method statements for compliance with environmental management standards in the EMP; iv. Allocate sufficient funding for proper and timely implementation of environmental mitigation and monitoring measures; v. Conduct daily inspection of the site and ensure the implementation of the CEMP during the construction phase; vi. Prepare/submit monthly reports on mitigation and monitoring activities to the PMU through the PIAC; vii. Act as the local entry point for the project GRM, conduct immediate investigation of any complaint, report all complaints and their resolution to the PMU. Ensure the timely and appropriate resolution of the complaint or incident in accordance with the GRM; viii. Ensure H&S of workers and community; ix. Enable the project staff or consultants tasked with monitoring, full access to all information and data required in order that the EMP can be fully monitored.
Operator	i. Appoint an environment, H&S officer to manage, monitor and report on EMP implementation who is competent, nominated to manage H&S risks; ii. Testing prior to commissioning to ensure discharge of treated effluent from the WWTP meets the standards iii. Ensure proper operation of project facilities according to design standards & monitoring iv. Allocation of budget for operation and maintenance (O&M)
ADB	v. Monitor and supervise the overall environmental performance of the project, review the semi-annual environmental monitoring reports and disclose the reports on ADB website in accordance with ADB Public Communications Policy (2011); and vi. Conduct missions to review environmental compliance and provide advice on corrective actions.

3.2. Institutional Capacity Review and Needs

12. During the institutional capacity review the following observations were made: 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 (H&S) legislation and routine environmental monitoring is not undertaken apart from in major urban centers (air quality) or major rivers (water quality).

13. At MPWT a number of people have fulfilled the role of 'focal point' for safeguards on project by project basis, and there is an established safeguards team. The PMU team members have experience working on highways projects and limited experience with urban development projects particualrly wastewater infrastrcurture projects which are relatively new to Cambodia, but are

willing and keen to be involved in any training and site visits required during project implementation and will be issued copies of relevant monitoring reports, EMPs and other relevant safeguards documents.

14. In addition, review of the three existing wastewater treatment operations in the country indicate that there is limited capacity for operation and maintenance (O&M). The limiting factors affecting the operators' ability to maintain adequate standards are likely to be a function of (i) a lack of technical capacity and experience; and (ii) insufficient budget.

15. A training program is set out in Table 4 which addresses the safeguard reporting and implementation requirements during construction, and the environmental and social risks from operations.

Table 4. Capacity Building and Training Requirements

Subject / Content	Participants	Trainer/ Organization	When/ Frequency	Duration (days / event)	Nº of participants
EMP adjustment and implementation - Development and adjustment of the EMP, roles and responsibilities, monitoring, supervision and reporting	PMU, PIU, contractor	PIAC	Twice - Once prior to, and once after 6 months of construction	2	10
GRM – roles and responsibilities	PMU, PIU, contractor, commune councils	PIAC	Twice - Once prior to, and once after 6 months of construction	1	10
Environmental protection Pollution control on construction sites (air, noise, wastewater, solid waste)	PMU, PIU, contractor	PIAC	Once (during project imple-mentation)	2	10
Environmental monitoring - Monitoring methods, data collection and processing, reporting systems	PMU, PIU, contractor, operator	Ministry of Environment's (MOE) (environmental analyst) / PIAC	Once (at beginning of project construction)	2	10

16. The mobilization of the national environmental specialists during the implementation will be critical to ensuring the capacity of the PIU staff and to ensuring monitoring and reporting are managed effectively during implementation. The specialist will work closely with the PMU environment safeguards officer in order to ensure safeguards are implemented and monitored.

17. **Training for EMP implementation**. The proposed training required for project implementation is set out in **Error! Reference source not found.**. Specifically, the training r equirements for the project set out in the relevant terms of reference include: the need to ensure that capacity development in environmental management is carried out through “hands on” training during the implementation of the environmental assessment review framework and EMP, through lectures, seminars and other activities on the implementation of the framework and EMP.

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18. **Training for investment sustainability**. The importance of training in operations and management should be emphasized if the investment is to be sustainable and adequate operations are maintained as per design. The technical specifications include requirements for preparation of O&M manuals and training programs including during start-up, at commissioning, and in trial operation as well as development of maintenance programs.

4. MITIGATION MEASURES PLAN

19. Comprehensive mitigation measures are set out for the subproject in Table 5 covering pre-construction and construction, and Table 6 covering operation.

20. **Construction Environmental Management Plans**. The contractor is expected to develop project-specific CEMP which is a detailed plan that sets out the contractor's approach to mitigating and managing environmental risks and impacts.

Table 5. EMP Mitigation Measures for Pre-Construction and Construction

Sub-Project Activity	Environ-mental Impact / Issue	Mitigation measures	Imple-mented by	Super-vised by	Cost ($)
Pre-Construction Phase					
National IESIA approval	All	1. Ensure the national initial environmental and social impact assessment (IESIA) approval is in place for the sub-project and include baseline environmental surveys as required by MOE Status: completed, letter included in Annex 6 of this report	PMU / PIAC and local firm	MOE	Included in project cost
Unexploded ordnance (UXO) survey, and removal	Injured worker or public	2. Ensure national military is consulted to confirm all relevant areas are clear from UXO. This include: • All construction sites including 50 m either side of any access roads • All associated areas including borrow sites. 3. Cambodian Mine Action Centre (CMAC) to clear areas where necessary and provide evidence of clearance to PMU in advance of construction and Certificate of UXO Clearance obtained. Status: completed	CMAC / PIU	PMU	To be con-firmed as required
Disclosure, engagement of community through consultation	No community impacts	4. Initiate information disclosure and grievance redress mechanism of IEE 5. Consultation of community based on final detailed designs Status: completed	PMU / PIU	PMU	Included in project cost
Design	Effluent discharge	6. Design wastewater treatment process to enssure treated effluent can comply with the applicable Cambodian national water quality standards for discharge (refer Annex 5 and Annex 4 of this document for the treated effluent discharge standards).	PIAC	PMU	Part of contract cost

Sub-Project Activity	Environ-mental Impact / Issue	Mitigation measures	Imple-mented by	Super-vised by	Cost ($)
		7. Ensure treated effluent quality is such that the absorptive capacity of the receiving waterway is not exceeded and health risks to users of the waterways are minimized[1]. Status: completed			
Design	Sludge manage-ment	8. Design includes appropriately sized sludge drying facilities. Issue of reuse/disposal of dried biosolids will be confirmed before plant commisioning. Status: completed	PIAC	PMU	Part of contract cost
Final design	Flooding / climate change	9. Design of WWTP access road to be passsable all year around under 1 in 5 year flood as per national standards – a benefit to local farmers. Lesser floods will flow to irrigation canal for dispersion. Larger floods not affected[2]. Status: completed	PIAC	PMU	Included in consul-tancy contract price
Final design	Emergency Response Plan	10. Ensure the operational and maintenance plan for each facility includes an emergency response plan considering flooding. Status: to be done before commissioning	PIAC	PMU	Included in consul-tancy contract price
IEE and EMP updates	All	11. Update IEE and EMP to reflect final detailed design and integrate further environmental protection measures, as necessary. Status: ongoing	PIAC	PMU	Included in project cost
Incorpoate environment requirement s in bid and contract documents	All	12. Ensure EMP and Particular Conditions for Bidding Documents (see Annex 3) are included in the bid and contract requirements. Status: completed	PIAC	PMU	Included in project cost
CEMP	All	13. The Contractor will develop a CEMP that nominates: • Contractor environment, H&S officer(s) • Contractor GRM focal point 14. The CEMP will include individual management sub-plans for: • Materials spoil, borrow site management; • Solid and liquid waste management;	Contrac-tor	PMU	Included in bid price

[1] During the construction stage the receiving water should be sampled (preferably minimum three consecutive non-rainfall days) to at least get an indication of the ambient water quality (in particular coliforms, BOD, nutrients – nitrogen and phosphorus). Based on that, an indicative estimate should be made of the absorptive capacity of the waterway that is commensurate with its primary use (e.g. rice paddies, vegetable farming, ablutions, etc.) and to stay within the safe limits recommended in the WHO or similar guidelines for water quality.

[2] Except at the transition off the main highway (northern end), the access road will be raised by around 460 mm on the north-south section and 270 mm on the east-west section.to enable vehicular access any time. The canal network in the area is such that any banked up water from the raised road will easily find alternative drainage paths. Thus the surface runoff flow will not be impeded nor exacerbate flooding of the area.

Sub-Project Activity	Environ-mental Impact / Issue	Mitigation measures	Imple-mented by	Super-vised by	Cost ($)
		• Community and occupational H&S[3] and emergency response; • COVID-19 response plan • Construction workers camp management (if required). 15. The CEMP will include a map of each construction site, showing as a minimum: Access routes, storage areas for waste, storage area for chemicals such as fuels, refuelling locations for vehicles, concrete mixing, stockpile storage areas (on & off site), first aid kit and equipment used in emergency response, location of worker camps (if required) and borrow sites. Status: in progress			
Survey of trees for protection or cutting	Impacts to flora and fauna	16. Survey for trees higher than 3 m within the construction area for protection or removal. Ensure PDPWT and local authority have been informed and obtain permit for tree cutting. Status: yet to be conducted	Contrac-tor	PIAC / PMU	Included in bid price
Obtain permits and licenses	Prevent or minimize impacts	17. Contractor to comply with all statutory requirements set out by Government for use of construction equipment and plant. 18. Contractor to ensure all required permits including materials extraction permits are in place prior to construction. Status: not yet started	Contrac-tor	PIU and PIAC	Included in bid price
CEMP Approvals	All	19. Approval of CEMP including site maps as required by CEMP. Status: in progress	PIAC	PMU	Included in project cost
GRM	Dissemina-tion	20. Contractor to nominate 'Contractor focal point' for GRM and develop complaints register and complaints form. 21. Erect sign boards with project details and GRM procedures/contact details at the entrance to each construction site/camp. 22. PMU to provide contractor with GRM contact details which the contractor will use to print 'GRM contact cards' for its staff to hand to complainants and will keep cards with all vehicles, machinery and site managers/foremen. 23. 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'. Status: in progress, partially completed	Contrac-tor	PMU, PIU and PIAC	Included in bid price

[3] The Contractor may refer the WB Group EHS Guidelines for Construction and Decommissioning for the preparation of the health and safety sub-plans, available at: www.ifc.org/ehsguidelines

Sub-Project Activity	Environ-mental Impact / Issue	Mitigation measures	Imple-mented by	Super-vised by	Cost ($)
Construction Phase					
Pipe network installation	Public information	1. Warning given to residents 4 weeks in advance of any excavations for sewage and drainage pipes	PIU (PDPWT)	PIAC and PIU	Included in bid price
Pipe network installation	Socio-economic (Acces-sibility)	2. Adequate pedestrian and vehicular access to enter buildings and properties across any open trenches ensured, particularly commercial premises during open hours. 3. The contractor to maintain uninterrupted traffic access by keeping at least one lane open. 4. Contractor to open trench equivalent to one-day's work at any one the time and cover the trenches at night for safety so as to provide access to properties. 5. Work at markets will be carried out during hours that the market is closed (typically night time) 6. Restoration of any damage will be at the expense of the contractor. 7. Contractor responsible to reinstate, repair damages or compensate owners for any damages in connection with construction of property connection, estate sewers, on-site plumbing network and agree this directly with the owners. 8. Consideration and management of potential localized flood impacts.	Contrac-tor	PIAC and PIU	Included in bid price
Pipe network installation	Community (traffic)	9. The contractor will develop a traffic management plan in conjunction with the PDPWT in order to ensure routes for vehicles are not blocked and signage is provided to reduce speeds and show drivers in advance of any changes to road surface or traffic direction and detour directions to improve traffic flow. 10. Where risks occur given changes to traffic lanes or road closures, additional lighting will be provided to allow visibility of the changes at night.	Contrac-tor	PIU and PIAC	Included in bid price
Civil works	Air quality	11. Asphalt and concrete batching facilities will be located at least 500 m 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. 12. Earthen and uncovered road surfaces and other exposed construction sites, material handling areas, and borrow pits where fugitive dust is generated will be sprayed with water regularly during dry periods to keep dust down. 13. Trucks carrying dry construction materials, such as soil, will be covered with tarpaulins or other suitable cover.	Contrac-tor	PIU and PIAC	Included in bid price

Sub-Project Activity	Environ-mental Impact / Issue	Mitigation measures	Imple-mented by	Super-vised by	Cost ($)
		14. Construction vehicles and machinery will be maintained to a high standard to minimize emissions. 15. Monitoring is conducted in line with Table 8 of this report near sensitive receptors.			
Civil works	Noise	16. Maintain all exhaust systems in good working order; undertake regular equipment maintenance; 17. Restrict construction activities using heavy machinery work between 8 am – 6 pm; 18. 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 such as periods of worship for pagodas 19. Public notification of construction operations will incorporate noise considerations; information procedure of handling complaints through the GRM will be disseminated. 20. Ensure noise monitoring is conducted in line with Table 8 of this report near sensitive receptors, particularly dwellings when construction machinery is operational; 21. All construction workers will use appropriate personal protective equipment (PPE) including ear defenders when operating machinery; 22. Ensure mobile noise barriers are available for use in populated areas where excavations are taking place	Contrac-tor	PIU and PIAC	Included in bid price
Civil Works	Flora	23. All trees over 3 m in height on construction sites to be protected from construction activities if they are not required to be removed. Cutting of trees require prior approval of PDPWT and local authorities. 24. Where possible, material from existing licensed borrow and quarry sites will be used. If new sites are needed, they will be subject to due diligence and approval by the Provincial Department of Environment (PDOE) to ensure that sensitive habitats are avoided and that an appropriate restoration plan using native species following re-contouring.	Contrac-tor	PIU / and PIAC	Included in bid price
Civil Works	Water quality and access	25. Use silt fences/curtains around piles of excavated materials. 26. Contain any spill immediately and clean up rapidly. Contractor to keep spill kits on site for the purpose. 27. Provision of adequate short-term drainage away from construction sites (on-site cut-off and interceptor drains) to prevent	Contrac-tor	PIU and PIAC	Included in bid price

Sub-Project Activity	Environ-mental Impact / Issue	Mitigation measures	Imple-mented by	Super-vised by	Cost ($)
		contaminated run off entering water bodies including canals. 28. Use of dewatering bags or socks whilst pumping water out of trenches and jacking pits to the nearest waterway. 29. Stockpiles and materials will be stored at least 50 m from surface waters with drainage directed away from the irrigation canals or drainage channels 30. All construction fluids such as drilling mud, oils, and fuels should be stored and handled on a bunded impermeable surface and a bund will be provided around any above-ground fuel storage tanks with a capacity of 110% of the largest single tank. 31. No washing or repair of machinery within 50 m of surface waters including irrigation canals. 32. Refueling only in designated areas which are to be 50 m from a water course and drip trays to be used when refueling or topping up/changing machinery fluids. 33. During dry season works within or around irrigation canals ensure that irrigation water supplies are unaffected. Seek suggestions from water users if supply may be affected. 34. Ensure monitoring is conducted in line with Table 8 downstream at nearest water body.			
Civil works	Power and water supply interruption	The contractor will conduct an assessment of power and water supply locations prior to construction. If the contractor identifies a risk to supplies from construction activities, the contractor will: 35. Liaise with power or water supplier to identify an approach to minimize inconvenience to residents; 36. Provide advance warning to residents (minimum 2 weeks in advance) that power/water supplies will be interrupted; 37. Provide alternatives for residents if the supply interruption exceeds 2 days for water	Contrac-tor	PIU and PIAC	Included in bid price
Implemen-tation of Sub-plan A - Materials spoil and borrow site manage-ment plan	Soil and land resources	Site specific materials, spoil and borrow site management plan will be developed and approved by the relevant municipal authority which will include as a minimum: 38. Assess source and impacts of all materials proposed for construction. 39. A map of all borrow sites and top soil piles will be developed and maintained with copies held by the contractor, PIAC and PIU;	Contrac-tor	PIU and PIAC	Included in bid price

Sub-Project Activity	Environ-mental Impact / Issue	Mitigation measures	Imple-mented by	Super-vised by	Cost ($)
		40. Define and schedule how materials are extracted from borrow pits, transported, handled and stored at sites. 41. Measures to rehabilitate the borrow sites include contouring of the slopes within each site and replanting sites with native species. 42. Top soil present on construction sites will be removed and stockpiled in a labelled area for use on rehabilitation of the site post-construction or rehabilitation of borrow sites. 43. Criteria for spoil disposal including levels of contamination and location for spoil disposal (to be approved by municipal authorities). 44. No disposal of spoil or dredged material on agriculturally productive land or within 50 m of a water course.			
Implemen-tation of Sub-plan B - Solid and liquid waste manage-ment plan	Resource use and natural resource contami-nation	Measures to be included in the management sub-plan will include measure to explain how the contractor will: 45. 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 46. Clear arrangements for storage and transportation of all hazardous and non-hazardous waste to an authorized and approved disposal point (approved by PDOE). 47. Recyclables to be separated at source and given/sold to recycler (plastic, metal, card, paper as a minimum) 48. No waste will be stored within 20 m of a water course including irrigation channels and all solid waste to be stored in containers with lids. 49. Prohibit burning of waste at all times; 50. Provide all vehicles/drivers with bags for waste collection and prevent any unauthorized waste disposal with particular attention paid to prevention of waste entering water ways including irrigation canals.	Contrac-tor	PIU and PIAC	Included in bid price
Implemen-tation of Sub-plan C-Community and Occupa-tional H&S and emergency response plan	Human H&S	51. Community H&S measures to be included in the management sub-plan will include: • Nomination of 'contractor's focal point' for GRM, complaints register and complaints form. • Details of appropriate protective barriers, fencing, lighting, and buffer zones which will be provided around all construction sites, at excavations and trenches, including barriers where	Contrac-tor	PIU and PMU	Included in bid price

Sub-Project Activity	Environ-mental Impact / Issue	Mitigation measures	Imple-mented by	Super-vised by	Cost ($)
		needed on access roads and populated areas. • Details of measures to safeguard vulnerable structures close by due to vibration / differential settlement from deep excavation works. • Details of safety measures, if required, to prevent access by members of the public and livestock to any borrow site excavations • 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. • Formulate and implement an information, education and communication campaign for workers and drivers about avoidance behavior with respect to sexually transmitted diseases and infections, HIV/AIDS, • Details of signage and speed controls if public roads are to be affected by construction traffic. • Details of sufficient signage giving community dangers/warnings and information disclosure outside all construction sites, include example warnings. 52. Occupational H&S measures to be included in the management sub-plan will include: • Assurance that all workers are equipped with- and use PPE. • Specifications for the PPE to be used on site and the contractor's approach to enforcement of its use by workers. • Sufficient signage giving occupational H&S warnings and information disclosure within all construction sites – sub-plan to include example warnings. • Specify measures for protection of excavation and trenches through sloping, shoring, shielding, and Larssen sheet piles; trench access and egress; trench inspection procedures after rainstorm and at start of shift; storage of heavy equipment and surcharge loads kept away from trench edges. • 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. • Details of daily toolbox meetings (safety briefings)			

Sub-Project Activity	Environ-mental Impact / Issue	Mitigation measures	Imple-mented by	Super-vised by	Cost ($)
		• Details of periodic training on working in confined spaces; • Log book of job safety environmental analyses (prior to entry to confined space) • Details of the site accident record book which will be maintained where all major or minor accidents and incidents are recorded with actions taken. • An environment, H&S qualified engineer will be engaged for the contract and adequate first aid equipment made available on site. • Warning signs will be set up if mud is likely on public roads. Mud will be removed at the end of each day. Other spillages on public roads will be removed immediately • Provision will be made for safety precautions when using mains electric power tools if the workers are likely to be working within wet or flooded environments. 53. The emergency response plan will set out detailed preventative measures for all types of incidents covered in the emergency plan. This will include: • Prevention of Injury and Accidents – to include PPE requirements for construction workers, training requirements • Prevention of Spillage – storing of construction fluids such oils, and fuels including their containment, and procedures on refueling and maintaining vehicles. • Prevention of Fire – to include measures for flammable sources including prevention of smoking on construction site, management of flammable materials and liquid. • Other Incidents – prevention measures relevant to other issues considered relevant by the contractor. 54. The contractor will develop emergency response procedures prior to construction. The procedures will cover actions to be taken in case of: • Worker injury (e.g. construction or traffic accident) • Spillage (e.g. fuel spillage) • Fire (e.g. fuel or chemicals storage area); and • Any other incidents anticipated by the contractor.			

Sub-Project Activity	Environ-mental Impact / Issue	Mitigation measures	Imple-mented by	Super-vised by	Cost ($)
Implemen-tation of Sub-plan D - COVID-19 response manage-ment plan	COVID-19	55. Plan and execute work in compliance with country-specific COVID-19 risk management regulations and directives including directions of the General Department of Labor, Ministry of Labor, and Vocational Training. 56. Conduct workplace risk assessment to identify low, medium or high exposure risk to COVID-19. Prepare an action plan for prevention and mitigation of the spreading of COVID-19. 57. Risk communication, training, and education. Training of workers in infection prevention and control practices. 58. Adopt engineering, organizational and administrative measures, plan work so employees can keep distance from each other and minimize contact. 59. Provide clear and visible guidelines on how to prevent infection at the construction site and initiatives taken. 60. Regularly clean and disinfect. 61. Screen on entry the temperature of each person entering the work site and record their contact details to facilitate tracking of infected persons should there be a need 62. Promote personal hygiene (including hand and respiratory hygiene), make wash basins and sanitizers available at entry, break area, and washrooms. 63. Provide PPE and inform workers of its correct use. 64. Health surveillance and insurance. 65. Consider other hazards, including psychosocial. 66. Review emergency preparedness plans. 67. Review and update preventive and control measures as the situation evolves. Involve workers/ occupational H&S groups in the review.	Contrac-tor	PIU, PMU and PIAC	Included in bid price
Implemen-tation of Sub-plan E - Construc-tion workers camp; manage-ment	Contami-nation of water, soil, waste production and social issues	68. If a camp for construction workers is required the contractor will set out a management plan which includes: • A map showing camp lay out, welfare facilities, and first aid kit locations. • Accommodation facilities including toilets for male and female workers, adequate drainage to prevent flooding, security including a no weapons policy and waste disposal areas. • An assessment of compliance of proposed camp with the workers' camp siting and management - mitigation measures for H&S and COVID-19 (refer Annex 7 of this report) • Schedule of HIV/AIDS education awareness to be given to workers.	Contrac-tor	PIU and PMU	Included in bid price

Sub-Project Activity	Environ-mental Impact / Issue	Mitigation measures	Imple-mented by	Super-vised by	Cost ($)
		• Plan of how camp areas will be restored to original condition after construction completed. 69. If a construction camp is not required, the contractor will not require a management plan but will: • Provide adequate waste disposal facilities including garbage cans for workers. • Provide welfare facilities including water for washing, drinking and include facilities for male and female workers • Provide toilets for male and female construction workers with a cleaning schedule 70. The contractor will give priority to local labor force and retain evidence of how local labor recruitment efforts were undertaken			
Construc-tion and completion	Site mainte-nance, clean-up and restoration	71. The contractor is responsible for adequate maintenance of the site and structures and site clean-up and restoration. Materials and equipment shall be located, stored and loaded in a manner that decreases disturbances and interruptions of the local activities. The contractor shall take all necessary measures to prevent dumping of mud or other waste by the vehicles on roads and pavements, and he shall immediately remove any such materials lost/spilt. Sites should be cleaned up and restored to its state before construction or compatible with its intended use after construction.	Contrac-tor	PIAC	Part of contract cost
Project Completion	All	72. Site visit in order to develop project completion report to assess community views on project and EMP implementation overall and state of project at contractor' handover	PIAC	PIU and PMU	Part of contract cost

CEMP = constructon environmental maangement plan; CMAC = Cambodian Mine Action Center; EMP = environmental maanagement plan; GRM = grievance redress mechanism; H&S = health and safety; IEE = intial environmrntal examination; IESIA – initial environmental and social impact assessment; MOE = Ministry of Environment; PDOE = Provincial Department of Environmennt; PDPWT = Provincial Department of Public Works and Transport; PIAC = project implementation asssistance consultant; management PIU = project implementation unit; PMU = project management unit; PPE = personal protection equipment; UXO = unexploded ordinanace; WWTP = wastewater treatment plant

Table 6. EMP Mitigation Measures for Operation Phase

Sub-Project Activity	Aspect	Mitigation measures	Imple-mented by	Super-vised by	Cost ($)
Operations discharge permits	Legal compliance	1. Owner of WWTP to start process of obtaining permit for discharge of effluent. Status: permit obtained (see Annex 6)	MPWT	MOE	-
Operation of WWTP	All	2. Commissioning phase of WWTP to ensure design discharge standards can be met. 3. Discharge to be tested prior to release into the environment. 4. Provision of adequate budget for O&M to ensure regular effluent and surface water quality monitoring. 5. If the treated effluent consistently fails to meet discharge standards, operator to discuss and agree with MPWT and MOE on a way forward to return to compliance. Refer also to discussions in Section 5.5	Operator	MPWT and PDOE	Included in oper-ational costs
Operation of WWTP and TPS	Occupa-tional H&S	6. The contractor will develop and implement a H&S manual as part of the O&M manual which will include the following: • A signed commitment from the operator to a) understand and b) comply with IFC Environmental Health and Safety guidelines (2007) • A training program for workers in workplace safety of WWTP operation • Provide all operational staff with appropriate PPE • Prevent public access to the WWTP and pumping station with fencing and appropriate signage. • Conduct safety orientation trainings including regular safety drills for workers. • Provision of appropriate and adequate PPE for workers (including regular training and drills on the use of PPE and other emergency equipment).	Operator	PIAC whilst under contract thence MPWT	Included in oper-ational costs – O&M budget
Operation of WWTP	Community H&S	7. Cover as much standing water as possible and regularly treat for mosquitoes during seasons of high incidence of mosquito-borne diseases such as dengue fever	Operator	PDPW and MPWT	Included in oper-ational costs – O&M budget
Operation of WWTP	land and surface water pollution, occupa-tional H&S	8. As part of O&M manual provide clear methods and procedures for all aspects of the WWTP and TPS operation, including the following key issues[4]: • Biosolids management including treatment, disposal and emergency situations	Operator	PIAC, MPWT and PDOE	Included in oper-ational costs – O&M budget

[4] The contractor may refer the applicable WB Group EHS Guidelines for WWTP operation, which are available at: www.ifc.org/ehsguidelines - The https://www.ifc.org/wps/wcm/connect/0d8cb86a-9120-4e37-98f7-cfb1a941f235/Final%2B-%2BWater%2Band%2BSanitation.pdf?MOD=AJPERES&CVID=jkD216C

Sub-Project Activity	Aspect	Mitigation measures	Imple-mented by	Super-vised by	Cost ($)
		• Monitoring/ testing procedures and schedule for treated effluent and sludge, with approval by MOE. Work with MOE and MPWT to establish biosolids reuse quality requirements. • Emergency procedures including schedule for testing and upgrading procedures • Procedures for storing, transporting and disposing of solid waste generated by the operations			
Operation of WWTP and TPS	Odor	9. Odor monitoring and procedures for recording and managing complaints from the public. Consult with residents to identify record odor or nuisance issues – preferably date, time and duration of odorous events.	operator	PIAC initially, then PDPWT, PDOE	Included in oper-ational costs – O&M budget
End-product disposal	Agricultural yield impact	10. Establish record on effluent and biosolids constituents and receiving water body monitoring data. While submission of the data to PDOE is required under the discharge permit it should also be shared with the Provincial Department of Agriculture, Forestry and Fisheries to enable assessment of effects of applying treated effluent and biosolids on crop yields	Operator	PDOE and Provin-cial Dept of Agri-culture, Forestry and Fish-eries.	Included in oper-ational costs – O&M budget

H&S = healthh and sssafety; IFC = International Finance Corporaton; MOE = Ministry of Environment; MPWT = Ministry of Public Works and Transport; O&M = operation and maintenance; PDOE = Provincial Department of Environment; PPE = personal protection equipment; TPS = terminal pump station; WWTP = wastewater treatment plant

5. MONITORING PLAN

5.1. Monitoring Scope

21. The subproject monitoring conducted in the EMP includes:

- **Project readiness monitoring**. Monitoring to check progress on project readiness and close gaps through corrective actions.
- **Environmental quality monitoring**. 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.
- **EMP compliance monitoring**. To be conducted by the PIAC in order to verify EMP compliance during project implementation.
- **Affected people monitoring (consultation)**. This is to be conducted by the PIU via consulting affected people on the impacts during construction.
- **Operational monitoring**. This is required as part of the operations of the subproject and will be undertaken by the relevant government department (PDOE and PDPWT) or nominated operator.

5.2. Project Readiness Assessment

22. Before construction, the PIAC will assess the subproject's readiness on environmental management based on a set of indicators (Table 7) and report it to ADB and PMU. This assessment will formally demonstrate that environmental commitments are being carried out and environmental management systems are in place before construction starts or suggest corrective actions to ensure that all requirements are met.

5.3. Environmental Quality Monitoring

23. During construction, the contractor will be expected to maintain an adequate budget to ensure environmental monitoring can be undertaken as specified in Table 8. Impact on sensitive environmental receptors will be monitored and compared against the relevant national standard. The estimated cost of monitoring is $46,800 over the 36 months period.

24. During operation, the operator will be expected to maintain an adequate budget to ensure environmental monitoring can be undertaken as specified in Table 8.

5.4. EMP Compliance Monitoring

25. In order for the EMP to be effective, all its mitigation measures must be monitored to ensure they are implemented. Compliance monitoring requirements are summarized in Table 9. Note this applies to construction only; during operation, it is the responsibility of the appropriate ministry (MPWT and MOE) or its line department (PDPWT and PDOE) to ensure monitoring of operational facilities is incorporated in the operations and maintenance manual and carried out routinely.

Table 7. Project Readiness Assessment Indicators

Indicator	Criteria	Are the criteria met?	If No, What corrective action is needed?	Date for corrective action completion
		Yes/No		
1. EMP update	EMP updated after detailed design and approved by ADB	Y/N		
2. Compliance with loan covenants	The borrower complies with loan covenants related to project design and environmental management	Y/N		
3. Public involvement effectiveness	Meaningful consultation completed	Y/N		
	GRM established with entry points	Y/N		
5. Environmental supervision and monitoring in place	Recruitment of external staff as set out in the institutional arrangements for this EMP	Y/N		
	Nomination of government staff for PMU and PIU roles as set out in the institutional arrangements for this EMP	Y/N		
5. Bidding documents and contracts with environmental safeguards	Bidding documents and contracts incorporate the environmental activities and mitigation measures required by this EMP	Y/N		
	Bidding documents and contracts incorporate the Particular Conditions for bidding (see Annex 3)	Y/N		
6. EMP financial support	The adequate funds have been set aside in the contract for EMP implementation including training and capacity building	Y/N		
7. Completion of CEMP including associated sub-plans*	Required preparation of CEMP including associated sub-plans by contractor as indicated in Table 5 have been completed and get approval from PIAC	Y/N		

Note: * CEMP includes waste management plan, traffic management plan, material spoils and borrow pit management plan, emergency response plan, occupational, health and safety plan, campsite management plan, COVID-19 response management plan.

Table 8. Environmental Quality Monitoring

Environmental Indicators	Location	Method & Frequency	Responsibility		Estimated Costs ($)	
			Supervision	Implementation	Per Sample	Total per site/yr
Construction Phase						
Air quality – dust	Construction sites	Visual assessment during the works – daily	PIAC-site engineer and PIU	Contractor	N/A	N/A
Noise	Construction sites and nearest sensitive receptor (e.g. residential receptor) (2 locations)	Inspection through rough assessment by answering the question: "Do you have to raise your voice to talk to someone respectively 1 m and 2 m away?" - daily	PIAC-site engineer and PIU	Contractor	N/A	N/A
Water quality	Upstream and downstream at nearest water body (canal or river) to construction sites	Visual inspection during the works – daily Monitor when and where construction active	PIAC-site engineer and PIU	Contractor	N/A	N/A
Water quality (parameters: pH, BOD_5, COD, TSS, oil and grease, turbidity (NTU)	Upstream and downstream at nearest water body (canal or river) to construction sites – two samples per site (Monitor when construction active)	Every 3 months during construction period. Assume 3 sites (WWTP, TPS and service area (i.e. 6 samples per episode) In response to complaint not resolved after application of (additional) mitigation measures Means in accordance with national standard	PIAC - environmental specialist	Contractor	$1,200 (per episode)	$4,800
Air quality - including TSP, PM_{10}, CO, NO_2, SO_x	Nearest residential receptors (2 locations)	1 day (24-hour) per quarter per location In response to complaint not resolved after application of (additional) mitigation measures Method in accordance with national standard	PIAC and PDOE	Contractor	$1,000	$8,000
Noise	Nearest residential receptors (2 locations)	1 day (daytime only) each quarter per location In response to complaint not resolved after application of (additional) mitigation measures Method in accordance with national standard	PIAC and PIU	Contractor	$350	$2,800

Environmental Indicators	Location	Method & Frequency	Responsibility		Estimated Costs ($)	
			Supervision	Implementation	Per Sample	Total per site/yr
Operations Phase						
Influent quality:	Influent	Weekly 24-hour sampling Parameters to be tested: pH, TSS, oil and grease, BOD_5, COD, detergents – LAS, total nitrogen, total – phosphorus, Ammonia-N, coliform	PDOE	Operator	Included in operational costs – O&M budget	
Effluent quality:	Effluent outfall	Weekly 24-hour sampling Parameters to be tested: pH, TSS, oil and grease, BOD_5, COD, detergents – LAS, total nitrogen, total – phosphorus, Ammonia-N, coliform	PDOE	Operator	Included in operational costs – O&M budget	
Odor	Site boundary of TPS and WWTP	Odor boundary monitoring method to be established within operational plan	MPWT	Operator	Included in operational costs – O&M budget	
Receiving water body:	Sangkae River – upstream and downstream the city to estimate environmental benefit of project Irrigation canal – upstream and downstream of point of discharge and into the canal (when flow)	Preferably monthly in initial 12 months then quarterly and every time effluent quality failure is recorded Parameters to be tested: pH, TSS, oil and grease, BOD_5, COD, detergents – LAS, total nitrogen, total – phosphorus, ammonia-N, coliform	PDOE	Operator	Included in operational costs – O&M budget	
Worker and public injury associated with WWTP and TPS operations	On property of WWTP and TPS	Regular record keeping	Ministry of Labor and Vocational Training	Operator	Included in operational costs – O&M budget	

BOD_5 = 5-day biochemical oxygen demand; COD = (total) chemical oxygen demand; LAS = linear alkylbenzene sulfonate (surfactant detergent); PM_{10} = particulate matter 10 micrometers or less; TPS = terminal pump station; TSS = total suspended solids; WWTP = wastewater treatment plant

Table 9. EMP Compliance Monitoring

Environmental Indicators	Location	Method and Frequency	Responsibility		Estimated Costs ($)
			Verification	Implementation	
Construction Phase					
Air quality	Civil works sites	Monthly checking against mitigation measures specified in this EMP	PIAC-Env specialist	PIAC-Site engineer	Included in contract
Noise	Civil works sites	Monthly checking against mitigation measures specified in this EMP	PIAC-Env specialist	PIAC-Site engineer	Included in contract
Flora	Civil works sites	Monthly checking against mitigation measures specified in this EMP	PIAC-Env specialist	PIAC-Site engineer	Included in contract
Water quality	Civil works sites	Monthly checking against mitigation measures specified in this EMP	PIAC-Env specialist	PIAC-Site engineer	Included in contract
Soil and land resources	Quarries, borrow and spoil disposal sites	Monthly checking against mitigation measures specified in this EMP	PIAC-Env specialist	PIAC-Site engineer	Included in contract
Resource use and natural resource contamination	Implementation site of solid and liquid waste management sub-plan B	Monthly checking against mitigation measures specified in this EMP	PIAC-Env specialist	PIAC-Site engineer	Included in contract
Human health and safety	Implementation of community and occupational H&S and emergency response sub-plan C	Monthly checking against mitigation measures specified in this EMP	PIAC-Env specialist	PIAC-Site engineer /Contractor's H&S officer	Included in contract
Contamination of water, soil, waste production and social issues	Implementation of construction workers management sub-plan E	Monthly checking against mitigation measures specified in this EMP	PIAC-Env specialist	PIAC-Site engineer	Included in contract
Community Issues • Environmental impacts of civil works (e.g., solid and liquid waste, erosion, local flooding, and pollution).	At construction locations	Consultation with community and distribution of public information booklet (PIB) prior to start of construction in a section. Consultation interview with affected people using the form in Annex 1 4-6 weeks after construction starts Every 3 months until end of construction	PMU	PIU	Included in PIU staff/travel budget

Environmental Indicators	Location	Method and Frequency	Responsibility		Estimated Costs ($)
			Verification	Implementation	
• Any unforeseen impacts caused accidentally e.g. through spillages • Civil nuisance (e.g., noise, disrupted business and farming activity, social issues, community health and safety). • Impaired use of access roads (e.g. traffic issues and access). • GRM and its procedures & key contacts • Accessibility	Accessibility – at all sites of pipe excavations in urban areas				

EMP = environmental management plan; ENV = environmental; GRM = grievance redress mechanism; H&S = health and safety; PIAC = public implementation assistance consultant; PIB = project information booklet; PIU = project implementation unit; PMU = project management unit;

5.5. Environmental Policy and Standards

5.5.1. Applicable National Standards

26. The construction and operation phases of the subproject will follow the applicable national environmental quality standards; these are:

- Sub-decree No. 42 ANRK.BK, *on air pollution control and noise disturbance*, MOE (2000) covers:
  - ambient air quality
  - ambient noise
- Sub-decree No. 27 ANRK.BK, *on water pollution control*, MOE (1999), covers:
  - Surface water quality standard in public water areas for bio-diversity conservation, in Annex 4 of the sub-decree
  - Effluent standards for general discharges to receiving waters in Annex 2 of the sub-decree
- Sub-decree No. 36 ANRK.BK *on solid waste management*, MOE (1999) covers:
  - Definition of classification of sludge and conditions for disposal at landfill site

27. In addition the following international guidelines have been included for comparison:

- WHO. Ambient Air Quality Guidelines (2005).
- WB/IFC EHS Guidelines (2007), referring WHO Community Noise Guidelines (1999).

28. Details of the limits stipulated on various the parameters are summarized in Annex 4, and the ruling on the applicable effluent standards is included in Annex 6.

5.5.2. Discharge License Compliance

29. The existing treatment plants in the country are all simple stabilization pond systems. A new treatment process, unfamiliar in Cambodia, will be used in the West Battambang WWTP. This will need running in at start up and will involve a learning curve for the operators, during which the plant effluent may not comply with the limits stipulated in the discharge permit. In addition, there is no knowledge of the raw wastewater characteristics in Battambang.

30. On the other hand, the national standards are based on adopted limiting values for various parameters which do not take into account treatment process capabilities. Some parameters, such as BOD, are quite lax and easily achieved by the plant, and others like the ammonia and phosphorus limits are quite strict and attention will be needed to ensure compliance with these parameters.

31. Put together, there are many unknown factors and therefore, a meaningful review of conditions and setting of realistic discharge water quality limits will require collection of reliable data. It is for this reason that MOE will review the performance and license conditions 12 months after the plant running-in period. During this period, it is highly desirable that the effluent quality be measured on a monthly basis with each sampling episode consisting of taking a daily sample on three consecutive days to ensure consistency. The parameters of interest are included in Table 8. It is noted that the biological treatment processes will take around three months or so to settle once commissioning begins as the biomass will need to build up.

5.5.3. Preparations for Reuse of Effluent and Biosolids

32. If reuse of the effluent for crop irrigation or the dry biosolids as soil conditioners is envisioned by MOE or Ministry of Agriculture, Forestry and Fisheries, then data on receiving water and soil absorptive capacities are needed to determine sustainable application rates. Such data is not available for soils nor the Sangkae River. Therefore, an intensive data collection program is required before meaningful limits could be set on effluent and biosolids constituent parameters. As reference on the type of quality required, the Australian, Food and Agriculture Organization (FAO) and International Financing Corporation (IFC) guidelines are include in Annex 5.

- Department of Environment and Conservation New South Wales (Australia), 2004. *Use of Effluent by Irrigation,* as reference on reuse of effluent in agriculture.
- Environment Protection Authority Victoria (Australia), 2004. *Guidelines for Environmental Management – Biosolids Land Application,* as benchmark cross-reference for biosolids reuse
- IFC EHS Guidelines, 2007. *Wastewater and Ambient Water Quality*, as indicative treated effluent quality.
- FAO, 2016 . Recommended microbiological quality guidelines for wastewater use in agriculture http://www.fao.org/3/t0551e/t0551e04.htm

33. Prior to reuse of the treated effluent and dried biosolids some investigations for medium to long term effects will be required. This is beyond the scope of this EMP and the project, and will be undertaken by the stakeholder agencies such as MOE and Ministry of Agriculture, Forestry and Fisheries. However, apart from the regular sampling of the treated effluent as outlined in Table 8, sampling and testing of the sludge should be conducted after plant commissioning and during the defects liability period under the subproject at 6 months intervals (3-4 events). °C

6. PUBLIC CONSULTATION

34. As part of the IEE and EMP preparation, site visits were conducted that included several meetings with key stakeholders in proposed sub-project areas, including provincial and district officials and village office holders. The list of consulted stakeholders in included in Annex 8. The meetings covered social and resettlement issues as well as environmental issues. In addition, the project preparation conducted an extensive socio-economic survey which included four beneficiary villages of Battambang, during which community meetings were held to explain the purpose and scope of the project.

35. The PDPWT is a key stakeholder that holds the interests of the community to be its primary mission. The subproject concept and design are driven by the need for rehabilitation of system elements within the constraints of the available budget. Furthermore, during detailed design stage the draft IEE was reviewed by MPWT and concurrence was reached on the contents of the draft EMP. Similar process was followed for the final IEE and EMP.

36. The draft EMP was disclosed on the ADB website as included in the bid invitation and construction contract documents. The final IEE and EMP will be disclosed after review and clearance by ADB. Public meetings were conducted to consult with affected persons during subproject preparation. Copies of the disclosed IEE and EMP will be provided to concerned ministries and implementing agencies and the public.

37. The national initial environmental and social impact assessment (IESIA) conducted by a registered third party consulting firm undertook public consultation and can be contacted for reference. During preparation of the IEE the PIAC conducted additional consultations and details of these are included in the IEE. The PIAC can be consulted for reference.

38. During construction, communities in and around the subproject area will be kept informed of construction activities that are likely to cause noise and dust nuisance, or disruption to roads and pathways. This EMP includes a plan for ongoing consultation during project implementation.

39. The PIAC prepared public information booklets which it will distribute with the support of the prior to the start of construction in each work section. The PIAC will also undertake consultation interviews within 4-6 weeks of construction starting and then again, every 3 months until the end of construction. This is set out in the EMP compliance monitoring plan.

40. Informal monitoring interviews with affected people will focus on complaints about community disturbance from construction activities, such as construction noise, dust, solid waste and wastewater, as well as public concerns about ecological protection, soil/land concerns and access issues. A sample environmental monitoring interview form is given in Annex 1. This will contribute to project monitoring.

41. Public consultation will be undertaken in compliance with national regulation and legislation in force, including those put in place to prevent the spread of COVID-19 (details included in Annex 7).

7. GRIEVANCE REDRESS MECHANISM

7.1. Grievance Redress Mechanism Objective

42. A grievance redress mechanism (GRM), consistent with the requirements of the ADB Safeguard Policy Statement (2009) needs to 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, which is accessible to all members of the community, is designed to help achieve the following objectives:

- Open channels for effective communication, including the identification of new environmental issues of concern arising from the project;
- Demonstrate concerns about community members and their environmental well-being; and
- Prevent and mitigate any adverse environmental impacts on communities caused by project implementation and operations.

7.2. Mechanism Set up and Functioning

43. The requirement is that the GRM be setup before commencement of site works and have members from the PMU, district authority and commune councils. Grievances can be filed in writing or verbally with any entry point of the GRM. The GRM was established on 11 August 2020.

44. The GRM, which is functioning since 20 August 2020, accommodates both informally and formally lodged eligible, grievances. Informally lodged grievances are those received by the contractor or PIAC during construction. Formally lodged grievances are those received at district and commune council offices or direct to the PIU. Commune councils evaluate complaints for eligibility and then report to PDPWT. The PDPWT and PMU maintain record of all grievances, informally and formally lodged, eligible and ineligible. The PMU will inform the MPWT, as necessary, and report on the observance/implementation of the GRM in the progress reports and in the periodic environmental monitoring report.

7.3. Access to the Mechanism

45. Any person who has environmental issues pertaining to the subproject during detailed design, construction and operation phases will have access to the mechanism free of charge. The PMU and staff in the MPWT, will ensure that:

- The public and all stakeholders are aware of their rights to access, and will have access to, the GRM free of administrative and legal charges; and
- The GRM is fully disclosed prior to construction: (a) in public consultations, (b) through the public information booklet (PIB) displayed in the commune office and distributed. Note, PIB will include names and contact details of the access points.

46. The access points to the GRM are critical for ensuring it is useable for affected people (AP). The GRM access points for this subproject will be:

- The contractor and PIAC
- District and commune councils
- The PIU office
- The PDPWT

47. The GRM should be easily accessible and promptly responsive to complaints lodged by APs. Therefore, will be two approaches available for the AP to use; informal and formal. These are discussed in the following Section 7.4.

7.4. GRM Steps and Timeframe

7.4.1. Informal Approach

48. Informally, the AP can lodge complaints directly to the contractor or PIAC (ass supervision engineers) during construction. The PMU is to provide the contractor with GRM contact details which the contractor will use to print 'GRM contact cards' for its staff to hand to complainants and will keep cards with all vehicles, machinery and site managers/foremen.

49. The contractor is to raise awareness of all workers on how to respond when an AP or member of the public has a complaint i.e. direct the person to the most senior site manager present at the time and/or contractor‘s GRM focal point and prepare a 'GRM contact card'. The contractor shall appoint a GRM focal point.

50. The contractor shall document and assess the complaint immediately utilizing the complaints register and complaints form. If assessment validates the complaint as within the scope of the GRM/eligible, the contractor shall act on the complaint within three days from receipt of complaint. MPWT shall obtain a written confirmation of satisfaction from the AP after 7 days from completion of resolution by the contractor.

51. If assessment invalidates the complaint (i.e., reveals the complaint as ineligible or not associated with the project’s environmental performance), the contractor shall direct the AP to the commune council and shall report the complaint to MPWT within two days from receipt of complaint, stating reasons for ineligibility.

7.4.2. Formal Approach

52. If complaint is eligible but is not acted on within three days from receipt of complaint, or if the AP is not satisfied with the resolution undertaken by the contractor, he/she can access the formal mechanism, as shown in Table 10.

53. **Appeals**. If an appeal is found not valid the provincial authority shall write to the AP and declare the grievance closed. In the event of an appeal (Step 7 in Table 10), the MPWT shall immediately report to the PMU. The PMU shall ensure that the ADB is immediately informed.

54. If the appeal is assessed to be valid, provincial authority and the parties discuss and agree on the quick resolution of the issue. The PMU requires the contractor and operator to implement the agreed resolution. Should the issue continue to persist despite the second action, or the AP remain dissatisfied, the AP has two more avenues for appeal:

- the PMU will inform ADB to convene a special mission to attempt a resolution;
- if the complainant is still unsatisfied after the ADB special mission, the complainant can turn to the Cambodian judicial system

Table 10. Grievance Redress Mechanism Steps

Step	Action
Step 1: Lodging a complaint (Day 1)	AP lodges complaint, by him/herself or with assistance from the village chief or district council, at the access point with the commune council. The complaint may also be lodged with the PIU or PDPWT.
Step 2: Documentation and registration of complaint (Day 1)	Commune council, PIU/PMU or PDPWT documents/registers lodged complaint, makes sure these are referenced and provides AP with a copy of referenced complaint. The commune forwards complaint document to the MPWT. A copy of an proposed GRM Complaint Form is in Annex 2 Annex 2 GRM – Complaint Recording Form
Step 3: Assessment and discussion (Day 1 to 3)	AP shall be informed if the grievance is eligible or ineligible. If it is ineligible, AP shall be directed to the district. If complaint is eligible, AP shall be informed of the expected action timelines as set out in the established mechanism
	If both of the AP and contractor/operator are available, the complaint shall be immediately reviewed, investigated and discussed. If not, both parties should agree to undertake the review, investigation and discussion within 3 days. The discussion will center on the cause and action/measure to implement and will engage the PIU/PMU. After review and investigation, agreement on actions and measures and time involved shall be made with the AP. Agreement shall be properly documented and filed; MPWT, PIU/PMU, commune council and AP shall have copies
Step 4: Implementing the agreed resolution (Days 3 to 8 typically, but not exceeding 15 days from lodgment date))	(Day 3 to Day 4) If complaint is minor, i.e., not requiring further investigation and would be easy to resolve, the contractor/operator shall immediately implement agreed on action/resolution. (To be implemented by Day 8)
	If further investigation and/or procurement of supplies/parts would be necessary, the contractor/operator shall: • immediately provide the most suitable interim measure to reduce the magnitude of the impact; and • start work on the final measure within 15 days from the day the complaint is lodged.
Step 5: Acceptance of resolution (1 week after completion of action/measure taken)	If, according to the AP, the impact has been resolved satisfactorily, MPWT shall obtain a written confirmation of satisfaction from the AP. This confirmation will signify closure of grievance and will form part of the grievance documentation. The PIU, commune council and AP shall retain their copies of the confirmation.
Step 6: Monitoring and evaluation (for 1 week after closure of grievance)	The MPWT shall monitor the effectiveness of the resolution for at least a week after closure of grievance (that is, when action implemented has been satisfactorily confirmed in writing by the complainant). Monitoring and evaluation shall be properly documented and included in the periodic environmental monitoring report
Step 7: Appeal for dissatisfied AP	When dissatisfied, or in the event the issue/impact persists despite actions undertaken, AP can appeal for assistance from the district in the elevation of his/her complaint to the provincial authority. The provincial authority shall call all parties concerned to review the history of the grievance and resolution process taken and assess the validity of the appeal.

55. **Accountability Mechanism of the ADB.** In addition, persons who are, or in the future may be, adversely affected by the project may submit complaints to ADB's accountability mechanism. The accountability mechanism provides an independent forum and process whereby people adversely affected by ADB-assisted projects can voice, and seek a resolution of their problems, as well as report alleged violations of ADB operational policies and procedures. The accountability mechanism is a last resort mechanism. Project-affected persons are encouraged to first address the issue with available GRM at the project level, and they are required to make good faith efforts to address the issue with the relevant ADB operations department prior to submitting complaints to the Accountability Mechanism. The complaints receiving officer of the ADB can be reached at the following address:

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

56. Instructions for accessing the accountability mechanism is available at the following website: http://www.adb.org/site/accountability-mechanism/how-file-complaint.

57. Sufficient communication on the GRM including signs containing contact details of the GRM access points will be displayed at strategic locations to sustain the effective implementation of the mechanism.

8. REPORTING

58. Environmental monitoring reports (using ADB's integrated safeguards monitoring report format) will be prepared semi-annually for the executing agency by the PIAC in collaboration with the PMU and sent to the 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. Reporting requirements are given in Table 11.

Table 11. Reporting Requirements

Report	Frequency	Purpose	From	To
Contractor's progress report	Monthly	EMP implementation progress and monitoring results	Contractor	PMU
CEMP and EMP compliance report	Monthly	CEMP and EMP compliance	PIAC - Site engineer	PIAC – Environmental specialists
CEMP and EMP progress and compliance report	Quarterly	CEMP / EMP Implementation and compliance	PIAC – National environmental specialist	PIAC – International environmental specialist
Environmental monitoring report (environmental safeguards monitoring report format)	Semi-annual	Full CEMP and EMP implementation and adherence to environmental covenants/conditions	PMU	ADB
WWTP	Quarterly	Effluent quality, sludge disposal, H&S	Operator	EA

8.1. Mechanism for Review and Adjustment

59. An EMP review may be conducted to improve the project's environmental management and to improve the effectiveness of the EMP. The need for an EMP review will be undertaken if there is a change in scope of the project, or following a significant environmental or H&S incident, or in case of unsatisfactory environmental performance.

9. ESTIMATED COST OF EMP

60. The total cost for EMP implementation for the West Battambang subproject comprises the following:

- The cost of mitigation measures (Table 5 and Table 6) is to be included in construction contract and operations budget – hence no additional cost. The amount estimated is about $132,000 over the 36 months construction period.
- The cost of environmental quality monitoring, detailed in Table 8, is to be included in construction contract and operations budget – for construction this cost is estimated at $46,800 for a period of 36 months;
- EMP preparation, implementation monitoring and compliance monitoring (including public consultations) as shown in Table 9 – covered under the PIAC contract, hence no additional cost. The amount estimated is about $75,000 over the 36 months construction period.
- Contractor's environment, H&S officer(s) including contractor's GRM focal point, for construction – this cost is included in the construction contract price and to be estimated by the contractor. The amount estimated for one environment H&S officer is $36,000 ($1,000/month for 36 months).

61. Therefore, the overall cost of preparing and implementing the EMP including measures during construction and supervision is estimated to be approximately $290,000 of which 25% is for supervision and compliance monitoring and 75% is for putting in place and mitigating impacts.

62. Excluded from the EMP budget as separate items are:

- Measures required as part of good construction practice. This includes provision of PPE for workers working at site. Cost estimate for such provisions is $15,000 over three years based on 100 workers and covers PPE such as hard hats, gloves masks, ear plugs, safety glasses, and safety boots.
- Clean up of spills from machinery maintenance cost and mobile noise barriers which are included in the general overhead of the construction contractor.
- Remuneration and associated costs for the PMU and PIU as this is covered elsewhere in the overall project budget.
- Cost for the PIAC which includes national and international environmental safeguards specialists.
- Training covered elsewhere including WWTP operator training.

63. The contractor 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.

64. The selected operator will bear all environmental monitoring and reporting costs during the operational stage. The EMP operational environmental mitigation and monitoring measures will be incorporated in the operations and maintenance manual.

10. CONCLUSION

65. The EMP, if implemented as directed, will mitigate impacts on the natural environment and affected people to an acceptable level. The key parties for mitigation measure implementation are the construction contractor and the operator. The implementation of this EMP will be closely monitored and reported on by the relevant stakeholders in the project.

66. A robust GRM has been established, as outlined in this EMP. It will ensure that all unplanned impacts which cause grievances for affected people are managed swiftly and a satisfactory outcome brought about.

67. Overall, the subproject is anticipated to bring environmental benefits to the people of Battambang City. It will serve to improve the current wastewater and stormwater management situation and will provide long-term environmental improvements.

Annex 1 Affected Person Monitoring Form

Consultation / Interview Form

Date of Interview		**Name of Interviewer**	
Interview site: *Where is the interview held? In school, on the road, in shop?*		**Stakeholder name and status:** *Full name, status is business owner, school teacher, religious leader, resident*	
Construction site and date construction started *Which road, GPS location if available*		**Has this stakeholder been interviewed before?** *Yes/No (if yes, when were they interviewed?)*	

Interview Discussion Points:

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

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

Annex 2 GRM – Complaint Recording Form

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

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

Annex 3 Particular Conditions (for bidding document)

68. The following clauses should be added to the bid invitation document, Section 8 Particular Conditions in relation to the environmental safeguards for the project.

69. The contractor shall undertake to develop and submit to the PMU/PIAC for approval, a site-specific construction environmental management plan with the following management sub-plans:

    A. Spoil and borrow site management;
    B. Solid and liquid waste management;
    C. Community and occupational health and safety and emergency response;
    D. COVID-19 response management plan;
    E. Construction workers' camp management (if required).

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

71. The contractor shall commit to ensuring a full time environmental health and safety officer on site who is competent, nominated to manage health and safety risks, and who can implement the construction environmental management plan requirements for occupational health and safety and ensure relevant health and safety legislation is followed.
72. The contractor shall commit to enabling the project staff or consultants tasked with monitoring, full access to all information and data required in order that the construction environmental management plan can be fully monitored.

Annex 4 Environmental Quality Standards

Table A4-1 Ambient Air Quality Standards

Parameter	Averaging Period	Sub-decree No. 42 ANK.BK[1/] (Value/Unit)	WHO Ambient Air Quality Guidelines (2005)[2/] (Value/Unit)
Nitrogen dioxide (NO_2)	1 hour	300 µg/m^3	200 µg/m^3
	24 hours	100 µg/m^3	-
Sulfur dioxide (SO_2)	1 hour	500 µg/m^3	-
	24 hours	300 µg/m^3	20 µg/m^3
Carbon monoxide (CO)	1 hour	40 mg/m^3	-
	8 hours	20 mg/m^3	10 mg/m^3
Total suspeended particles (TSP)	24 hours	330 µg/m^3	-
$PM_{2.5}$	24 hours	-	25 µg/m^3
PM_{10}	24 hours	-	50 µg/m^3

Sources: 1. Sub-decree **No. 42 ANK.BK** on Air Pollution Control and Noise Disturbance, MOE 2000;
2. **WHO**. Ambient Air Quality Guidelines (2005) – included for reference only.

Table A4-2 Ambient Noise Standards

No.	Areas	Sub-decree No. 42 ANK.BK[1]			WB/IFC EHS[2]	
		Period of time			Period of time	
		6 am to 6:00 pm	6 pm to 10:00 pm	10:00 pm to 6:00 am	Day time 7 am-10 pm	Night time 10 pm- 7 am
1	Quiet Areas – hospitals, libraries, school, kindergarten	45	40	35	-	-
2	Residential Areas - hotels - administrative office - villa, flat	60	50	45	55	45
3	Commercial and service areas and area of multiple business	70	65	50	70	70
4	Small industrial factories mingling in residential area	75	70	50	-	-

Sources: 1. Sub-decree **No. 42 ANK.BK** on Air Pollution Control and Noise Disturbance, MOE, 2000 - ANNEX 6 Maximum Standard of Noise Level Allowable in the Public and Residential Areas (dB(A))

2. **WB/IFC EHS Guidelines**, 2007, referring WHO Community Noise Guidelines (1999) – included as reference only

Receiving Waters Quality Standards

Water quality limits applicable to public water areas for bio-diversity conservation are presented in Table A4-3.

Table A4-3 Surface Water Quality Standards

Parameter	Standard		
	Unit	Sub-decree 27	WHO Guidelines
A. Rivers			
pH		6.5 – 8.5	6.5 – 8.0
BOD_5	mg/L	1 – 10	
Suspended solids	mg/L	25 – 100	
Dissolved oxygen	mg/L	2.0 - 7.5	
Coliform	MPN/100 mL	< 5000	
B. Lakes and Reservoirs			
pH		6.5 – 8.5	6.0 – 8.0
COD	mg/L	1 – 8	
Suspended solids	mg/L	1 – 15	
Dissolved oxygen	mg/L	2.0 - 7.5	90% - 110%
Coliform	MPN/100 mL	< 1000	
Total nitrogen	mg/L	1.0 – 0.6	0.30
Total phosphorus	mg/L	0.005 – 0.05	0.01

Source: 1. Sub-decree **No. 27 ANRK.BK** on Water Pollution Control, Annex 4, MOE, 1999.
2. WHO guidelines for effluent

Treated Effluent Quality Standards

There are two sub-decrees that include reference and limits on discharges of effluent, treated or untreated, to the environment; Sub-decree 27 (1999) and Sub-decree 235 (2017).

Sub-decree 27 (April 1999) is a general sub-decree applicable to all sources of pollution, including WWTP (Articles 2, 3b and 3c), and activities that cause pollution of public waterways, such as streams, irrigation canals, groundwater (Article 3a). Effluent quality limits may be varied through agreement with the MOE and such modifications will be included in the discharge permit issued by MOE (Articles 5 and 7). This sub-decree is about to be amended (draft released for comments on 29 June 2021).

Sub-decree 235 (December 2017) is applicable to treated effluent discharges from commercial buildings, boreys (housing complexes), satellite city, and resort or recreation centers directly discharging to public water body or drainage/sewerage system. Although primarily this effluent standard is targeted at small-scale onsite or neighborhood WWTPs discharging to public water bodies, Article 24 includes discharge of treated effluent from centralized municipal WWTPs.

MOE gave a ruling on 7 October 2020 that the applicable standard for compliance of the treated effluent discharged from the West Battambang Wastewater Treatment Plant shall be Annex 2 of Sub-decree 27, ANRK.BK December 199 (refer letter on ruling in Annex 6). The irrigation canal is not a protected water area by definition under Sub-decree 27, Therefore, during the operations after plant commissioning the effluent must comply with the limits specified for public water areas The full standards from Annex 2 of Sub-decree 27, December 1999 is included in Table A4-4.

Table A4-4 General Effluent Quality Standards for Discharge to Public Water Areas

Nº	Parameter	Allowable Discharge Limits for Pollutant Substance		
		Unit	Protected Public Water Area	Public Water Area and Sewer
1	Temperature	°C	< 45	< 45
2	pH		6 – 9	5 - 9
3	BOD_5 (5 days at 20 °C)	mg/L	< 30	< 80
4	Chemical oxygen demand (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_3)	mg/L	< 10	< 20
11	Chlorine (free)	mg/L	< 1.0	< 2.0
12	Chloride (ion)	mg/L	< 500	< 700
13	Sulfate (as SO_4)	mg/L	< 300	< 500
14	Sulfide (as sulfur)	mg/L	< 0.2	< 1.0
15	Phosphate (PO_4)	mg/L	< 3.0	< 6.0
16	Cyanide (CN)	mg/L	< 0.2	< 1.5
17	Barium (Ba)	mg/L	< 4.0	< 7.0
18	Arsenic (As)	mg/L	< 0.10	< 1.0
19	Tin (Sn)	mg/L	< 2.0	< 8.0
20	Iron (Fe)	mg/L	< 1.0	< 20
21	Boron (B)	mg/L	< 1.0	< 5.0
22	Manganese (Mn)	mg/L	< 1.0	< 5.0
23	Cadmium (Cd)	mg/L	< 0.1	< 0.5
24	Chromium $(Cr)^{+3}$	mg/L	< 0.2	< 1.0
25	Chromium $(Cr)^{+6}$	mg/L	< 0.05	< 0.5
26	Copper (Cu)	mg/L	< 0.2	< 1.0
27	Lead (Pb)	mg/L	< 0.1	< 1.0
28	Mercury (Hg)	mg/L	< 0.002	< 0.05
29	Nickel (Ni)	mg/L	< 0.2	< 1.0
30	Selenium (Se)	mg/L	< 0.05	< 0.5
31	Silver (Ag)	mg/L	< 0.1	< 0.5

Nº	Parameter	Allowable Discharge Limits for Pollutant Substance		
		Unit	Protected Public Water Area	Public Water Area and Sewer
32	Zinc (Zn)	mg/L	< 1.0	< 3.0
33	Molybdenum (Mo)	mg/L	< 0.1	< 1.0
34	Ammonia (NH_3)	mg/L	< 5.0	< 7.0
35	DO	mg/L	>2.0	>1.0
36	Polychlorinated biphenyl	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	Hexaxhloro cyclohexene	mg/L	<2	<2

Source: Sub-decree **No. 27 ANRK.BK** on Water Pollution Control, MOE, 1999, Article 4 and Annex 2

For comparison purposes the abridged key water quality standards under sub-decree 27 (April 1999, being the applicable standard), Sub-decree 235 (December 2017) and the amended Annex 2 of Sub-decree 27 (draft released June 2021) are presented in Table A4-5.

Table A4-5 Wastewater Treatment Plant Effluent Quality Standards

Ref	Parameter	Unit	Limit Value		
			SD235[1]	SD27 Applicable[2]	SD27 Amended[3]
1	pH		6-8	5-9	6-9
2	Total suspended solids	mg/L	<80	<80	<50
3	Oil and grease	mg/L	<5	<15	<5
4	BOD_5	mg/L	<30	<80	<30
5	COD	mg/L	<50	<100	<60
6	Detergents – LAS	mg/L	<7	<15	<5
7	Total nitrogen	mg/L	<6	N/D	<20
7a	Nitrate (NO_3)			<20	<10
8	Total - phosphorus	mg/L	<0.5	N/D	<4
8n	Phosphate-P			<6.0	<2
9	Ammonia-N	mg/L	<5	<7	<7
10	Coliform	MPN/100 mL	500 – 2,500	N/D	N/D

Sources:

1. **Sub-decree 235 ANRK.BK** MOE Dec 2017 on the management of drainage system and wastewater treatment system, Article 24 and Annex 2.
2. **Sub-decree 27 ANRK.BK**, MOE Apr 1999 on Water Pollution Control, Article 4 and Annex 2;. Discharge To public water area and sewer
3. **Sub-decree 27 ANRK.BK**, MOE Jun 2021 amendments to Annexes 2 to 5 of the original 1999 sub-decree. Type 1 protected public waterways classification would apply. This document has been released in draft version for comments.
4. N/D=not defined

Annex 5 Wastewater Characterization

The sewage characteristics adopted for design purposes and the applicable effluent discharge standards as per MOE ruling (Sub-decree 27 (1999)), and IFC wastewater and ambient water quality guidelines together with the Australian guidelines for effluent reuse, and typical dried sludge constituents and reuse guidelines are tabulated in this annex. International standards, where presented, are for comparison purposes only and are intended to serve a guideline for discussion where parameter limits do not exist in the Cambodian national standards.

Table A5-1 Wastewater Quality and Effluent Standards

Effluent Quality Parameter	Unit	Design Wastewater Characteristics[1/]		Effluent Discharge Standards		
		Raw Influent	Treated Effluent	Cambodia[3/] (applicable	For Reused	
					IFC[4/]	Australia[5/]
pH		6.5-7.5	6.5-7.5	5-9	6-9	6-8
BOD_5	mg/L	375[2/]	28	<80	30	<20
COD	mg/L	750	50	<100	125	<30
Total suspended solids (TSS)	mg/L	300	40	<80	50	
Total nitrogen (TN)	mg/L	30	4	<20[7/]	10	10[6/]
Ammonia nitrogen (NH_4-N)	mg/L	22	3.5	<7		
Total phosphorus (TP)	mg/L	6	2.4	<6[7/]	2	5-10[6/]
Detergent (LAS)	mg/L	TBC[8/]	TBC[8/]	<15		
Oil and grease	mg/L	TBC[8/]	TBC[8/]	<15	10	
Total coliform	MPN/100 mL	$1x10^6 – 1x10^7$	1,000	Not defined	400	1,000

Notes"

1. Wastewater characteristics have been assumed for design purposes in absence of actual data on the raw influent. Treated effluent characteristics calculated using well established treatment process performance criteria, the PIAC team's experience with similar plants and the assumed raw influent.
2. Design BOD concentration of septage is 5,000 mg/L
3. Applicable effluent discharge standards for this project are those from Annex 4, Table A4-5.
4. IFC Environmental Health and Safety Guidelines, 2007, *Wastewater and Ambient Water Quality*,
5. Natural al Resource Ministerial Management Council, 2006. *National water quality management strategy – Australian guidelines for water recycling: managing health and environmental risks, Part 1*, Included for guideline only in case of reuse of the treated effluent
6. No guideline values are given for N and P, as maximum application rate is dependent on soil and plant uptake capacity if effluent is applied to land. Typical effluent concentrations are shown in the table.
7. Total nitrogen and total phosphorus are not defined, instead limits for nitrate-N and phosphate-P are stipulated ad indicated
8. TBC – to be confirmed as it is highly local habits and culture dependent.

Table A5-2 Microbiological Quality Guidelines for Wastewater Use in Agriculture[5]

Category	Reuse condition	Exposed group	Intestinal nematodes[b] (arithmetic mean no. of eggs per litre[c]	Fecal coliforms (geometric mean no. per 100 mL[c])	Wastewater treatment expected to achieve the required microbiological quality
A	Irrigation of crops likely to be eaten uncooked, sports fields, public parksd	Workers, consumers, public	≤ 1	≤ 1000[d]	A series of stabilization ponds designed to achieve the microbiological quality indicated, or equivalent treatment
B	Irrigation of cereal crops, industrial crops, fodder crops, pasture and treese	Workers	≤ 1	No standard recommended	Retention in stabilization ponds for 8-10 days or equivalent helminth and fecal coliform removal
C	Localized irrigation of crops in category B if exposure of workers and the public does not occur	None	Not applicable	Not applicable	Pretreatment as required by the irrigation technology, but not less than primary sedimentation

Notes:

[a] In specific cases, local epidemiological, socio-cultural and environmental factors should be taken into account, and the guidelines modified accordingly.
[b] *Ascaris* and *Trichuris* species and hookworms.
[c] During the irrigation period.
[d] A more stringent guideline (<200 fecal coliforms per 100 ml) is appropriate for public lawns, such as hotel lawns, with which the public may come into direct contact.
[e] In the case of fruit trees, irrigation should cease two weeks before fruit is picked, and no fruit should be picked off the ground. Sprinkler irrigation should not be used.
Source: WHO (1989)

Setting guidelines values for the various constituent in wastewater treatment residuals depends on a number of factors, most importantly;

- Health risk for pathogen levels (degree of contact of the biosolids with users and whether plant is eaten raw or processed);
- Uptake capacity of the soil for each chemical element); and
- Toxicity level (heavy metals) in the soil.

Data on sludge and soil characteristics is virtually non-existent in Battambang City (and indeed Cambodia) at present. Typical constituents for dried and digested sludge from Australia and Brazil are presented in Table A5-2.

The international guideline values for biosolids shown in Table 5.3 may be suitable an interim reference until better understanding and more data are obtained for the conditions in Battambang and national guidelines can be established based on measured local data.

[5] http://www.fao.org/3/t0551e/t0551e04.htm

In Table A5-3 Grade A dried biosolids refers to unrestricted use, safe to be handled. Grade B has restrictive use including handling and type of crop to which it can be applied. Grade C less restrictions and generally may be suitable only for forest application and landfill. The pathogen grades are assessed independently of the other contaminant grades.

Table A5-3 Sludge Characteristics

Sludge Quality Parameter	Unit	Typical Digested Sludge[1/]		Australian Guideline[1/]		
		Australia	Brazil	Grade A	Grade B	Grade C
pH		7.2	7.3	7.3	7.3	7.3
Phosphorus (P)	%	1.0	1.8	10[2/]		
Nitrogen (N)	%	1.5	5.8	5[2/]		
Potassium (K)	%	0.5	0.4	10[2]		
Organic carbon (TOC)	%	5.2	28			
Sulfur (S)	%	0.7	0.3			
Calcium (Ca)	%	3.5	4.3			
Manganese (Mn)	%	0.8				
Electrical conductivity ($EC_{1:5}$)	dS/m	6.0	0.4			
coliforms	MPN/g	6	20,300	<100	<1,000	$<2x10^6$
Arsenic (As)	mg/kg	6	15	20	20	60
Cadmium (Cd)	mg/kg	3	11	1	11	20
Copper (Cu)	mg/kg	800	255	100	750	2,500
Lead (Pb)	mg/kg	150	80	200	300	420
Mercury (Hg)	mg/kg	1.5	2.3	1	9	15
Nickel (Ni)	mg/kg	60	42	60	145	270
Zinc (Zn)	mg/kg	900	690	200	1,400	2,500

Notes"

1. UN-Habitat, 2008, *Global atlas of excreta, wastewater sludge, and biosolids management: Moving forward the sustainable and welcome uses of a global resource*.
2. Typical chemical fertilizer values, source Metcalfe and Eddy/Aecom, 2014. *Wastewater engineering – treatment and resource recovery*.

Annex 6 Discharge Permit and Ruling

IESIA APPROVAL FROM MINISTRY OF ENVIRONMENT

MOE Logo

Ministry of Environment

Ref. 1615 ស.ជ.ណ ប.ស្ត

To

H.E. Senior Minister, Minister of Public Works and Transport

Objective: Evaluation of the initial environmental and social impact assessment (IESIA) of the Provincial Water Supply and Sanitation Project – subproject: Wastewater Treatment Plant and Collection System in Battambang city (west side of the Sangkae River) of the Ministry of Public Works and Transport in Battambang province.

References: - Royal degree no. នស/រកម/1296/36 issued on 24 December 1996 on the Environmental Protection and Natural Resources Management.

- Sub-degree no. 72 □□□□□.បក issued on 11 August 1999 on the Environmental Impact Assessment Process.

- Letter no. 3763 [illegible] issued on 27 October 2020 by the Ministry of Public Works and Transport

- Letter no. 3340 [illegible] issued on 22 November 2020 by the Ministry of Public Works and Transport

- Letter no. 2566 [illegible] issued on 16 July 2020 by the Ministry of Public Works and Transport

- Letter no. 1384 [illegible] issued on 23 October 2020 by the Ministry of Environment

- Letter no. 1161 [illegible] issued on 27 August 2020 by the Environmental Impact Assessment Department of the Ministry of Environment

As stated in the objective and references above, we would like to inform **H.E. Senior Minister**, that the Ministry of Environment has agreed on the initial environmental and social impact assessment (IESIA) for the Provincial Water Supply and Sanitation Project – Subproject: Battambang Wastewater Treatment Plant and Collection System in Battambang city (west side of the Sangkae River) located in Thmar Kol district and Battambang City of the Ministry of Public Works and Transport (project owner) in which the project owner shall abide by the Environmental Protection Contract no. 4046 [illegible] (conditions of agreement) issued on 19 November 2020 by the Ministry of Public Works and Transport.

Therefore, **H.E. Senior Minister** please apply and arrange as need.

Please, **H.E. Senior Minister** accepts my sincere respect.

Phnom Penh, 01 December 2020

For. Minister

Secretary of State

Copy to:
- Office of the Council of Ministers
- Ministry of Economic and Finance
- Ministry of Land Management, Urban Planning, and Construction
- Ministry of Water Resource and Meteorology
- Battambang Provincial Administration
- Provincial Department of Environment of Battambang
- Archives

KINGDOM OF CAMBODIA
NATION-RELIGION-KING

Ministry of Public Works and Transport
No. ....សក.សធក

Respectfully yours,
His Excellency, the Minister of Environment

Project Owner represented by **Senior Minister of Ministry of Public Works and Transport** is located at Norodom Blvd., Daun Penh District, Phnom Penh.

Make an environmental protection contract

To ensure environmental sustainability in the national development, I would like to make an environmental contract with the Ministry of Environment for Provincial Water Supply and Sanitation Project, Sub-Project: Wastewater Treatment Plant and Sewage System in Battambang City (West of the Sangkae River), which is located at Thmor Koul District, Battambang City, Battambang Province of the Ministry of Public Works and Transport subject to the conditions detailed in the articles below:

Article 1

Take responsibility for, and implementation of, the contents described in the Initial Environmental and Social Impact Assessment Report (IESIA) for the Provincial Water Supply and Sanitation Project, Sub-Project: Wastewater Treatment Plant and Sewage System in Battambang City (West of the Sangkae River) of the Ministry of Public Works and Transport of Battambang Province, agreed by the Ministry of Environment.

Article 2

Provide environmental monitoring reports once a year (annually) during the construction phase, and also during the project implementation phase to Environmental Impact Assessment Department of Ministry of Environment for its review and evaluation.

Article 3

Provide a summary detailed design report for Provincial Water Supply and Sanitation Project, Sub-Project: Wastewater Treatment Plant and Sewage System in Battambang City (West of the Sangkae River) of Ministry of Public Works and Transport of Battambang Province, which is not included in the Initial Environmental and Social Impact Assessment Report (IESIA) and to submit it to the Ministry of Environment for its review and comment.

Article 4

In case the Ministry of Environment requires the project owner to modify any process or method of operation because of non-compliance with the guidelines and environmental standards that apply from time to time, the project owner shall make the necessary modifications to fully comply with those guidelines and standards.

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Article 5

In the future, if the project owner plans to expand or change or revise the Feasibility Study Report or suspend the projects, the project owner will report to the Ministry of Environment one month in advance.

Article 6

Allow officers from the Ministry of Environment or the Battambang Provincial Department of Environment to inspect the project site upon showing a formal letter of request for inspection.

Article 7

In case the project owner does not comply with any of the articles in this contract, willfully disregards the conditions of contract, or improperly implements other applicable regulations and standards, the project owner shall be held legally responsible and may face prosecution.

Phnom Penh, Date 19 November 2020

Minister of Public Works and Transport

Seen and Respected

His Excellency the Minister of Environment kindly reviewed and decided
No: .....ត.ប.ឧ.ស

Phnom Penh, Date.....
Director of Environment Impact Assessment Department

See and Agree
Phnom Penh, Date.....
Minister of Environment
Secretary of State

ព្រះរាជាណាចក្រកម្ពុជា
ជាតិ សាសនា ព្រះមហាក្សត្រ

ក្រសួងបរិស្ថាន
លេខ: [illegible] ប.ស្ត

សូមគោរពជូន

ឯកឧត្តមទេសរដ្ឋមន្ត្រី រដ្ឋមន្ត្រីក្រសួងសាធារណការ និងដឹកជញ្ជូន

កម្មវត្ថុ ៖ ករណីពិនិត្យ និងផ្តល់យោបល់លើរបាយការណ៍វាយតម្លៃហេតុប៉ះពាល់បរិស្ថាន និងសង្គមដំបូង (IESIA) សម្រាប់គម្រោងផ្គត់ផ្គង់ទឹកស្អាត និងអនាម័យក្រុង អនុគម្រោង៖ ស្ថានីយប្រព្រឹត្តកម្មទឹកកខ្វក់ និងប្រព័ន្ធលូក្នុងក្រុងបាត់ដំបង (ផ្នែកខាងលិចស្ទឹងសង្កែ) របស់ក្រសួងសាធារណការ និងដឹកជញ្ជូន នៅខេត្តបាត់ដំបង

យោង ៖
- ព្រះរាជក្រមលេខ នស/រកម/១២៩៦/៣៦ ចុះថ្ងៃទី២៤ ខែធ្នូ ឆ្នាំ១៩៩៦ ដែលប្រកាសឱ្យប្រើច្បាប់ស្តីពីកិច្ចការពារបរិស្ថាន និងការគ្រប់គ្រងធនធានធម្មជាតិ
- អនុក្រឹត្យលេខ ៧២ អនក្រ.បក ចុះថ្ងៃទី១១ ខែសីហា ឆ្នាំ១៩៩៩ ស្តីពីកិច្ចដំណើរការវាយតម្លៃហេតុប៉ះពាល់បរិស្ថាន
- លិខិតលេខ ៣៧៦៣ សក.អមក ចុះថ្ងៃទី២៧ ខែតុលា ឆ្នាំ២០២០ របស់ក្រសួងសាធារណការ និងដឹកជញ្ជូន
- លិខិតលេខ ៣៣៤០ សក.អមក ចុះថ្ងៃទី២២ ខែកញ្ញា ឆ្នាំ២០២០ របស់ក្រសួងសាធារណការ និងដឹកជញ្ជូន
- លិខិតលេខ ២៥៦៦ សក.អមក ចុះថ្ងៃទី១៦ ខែកក្កដា ឆ្នាំ២០២០ របស់ក្រសួងសាធារណការ និងដឹកជញ្ជូន
- លិខិតលេខ ១៣៨៤ សជណ ប.ស្ត ចុះថ្ងៃទី២៣ ខែតុលា ឆ្នាំ២០២០ របស់ក្រសួងបរិស្ថាន
- លិខិតលេខ ១១៦១ វ.ហ.ប.ស្ត ចុះថ្ងៃទី២៧ ខែសីហា ឆ្នាំ២០២០ របស់នាយកដ្ឋានវាយតម្លៃហេតុប៉ះពាល់បរិស្ថាននៃក្រសួងបរិស្ថាន

សេចក្តីដូចមានចែងក្នុងកម្មវត្ថុ និងយោងខាងលើ ខ្ញុំសូមគោរពជម្រាបជូន **ឯកឧត្តមទេសរដ្ឋមន្ត្រី** មេត្តាជ្រាបថា ក្រសួងបរិស្ថានឯកភាពលើរបាយការណ៍វាយតម្លៃហេតុប៉ះពាល់បរិស្ថាន និងសង្គមដំបូង (IESIA) សម្រាប់គម្រោងផ្គត់ផ្គង់ទឹកស្អាត និងអនាម័យក្រុង អនុគម្រោង៖ ស្ថានីយប្រព្រឹត្តកម្មទឹកកខ្វក់ និងប្រព័ន្ធលូក្នុងក្រុងបាត់ដំបង (ផ្នែកខាងលិចស្ទឹងសង្កែ) ដែលមានទីតាំងស្ថិតនៅស្រុកថ្មគោល និងក្រុងបាត់ដំបង ខេត្តបាត់ដំបង របស់ក្រសួងសាធារណការ និងដឹកជញ្ជូន (ម្ចាស់គម្រោង) ដោយម្ចាស់គម្រោងត្រូវគោរពតាមកិច្ចសន្យាការពារបរិស្ថានលេខ ៤០៤៦ សក.អមក ចុះថ្ងៃទី១៩ ខែវិច្ឆិកា ឆ្នាំ២០២០ របស់ក្រសួងសាធារណការ និងដឹកជញ្ជូន។

អាស្រ័យដូចបានគោរពជម្រាបជូនខាងលើ សូម **ឯកឧត្តមទេសរដ្ឋមន្ត្រី** មេត្តាអនុវត្ត និងចាត់ចែងដោយសេចក្តីអនុគ្រោះ។

សូម **ឯកឧត្តមទេសរដ្ឋមន្ត្រី** មេត្តាទទួលនូវសេចក្តីគោរពពីខ្ញុំ។

ថ្ងៃ[illegible] ខែ[illegible] ឆ្នាំជូត ទោស័ក ព.ស. ២៥៦៤
រាជធានីភ្នំពេញ ថ្ងៃទី [illegible] ខែ [illegible] ឆ្នាំ២០២០

ឧ.រដ្ឋមន្ត្រី
រដ្ឋលេខាធិការ

សៅ_សុភាព

ចម្លងជូន៖
- ទីស្តីការគណៈរដ្ឋមន្ត្រី
- ក្រសួងសេដ្ឋកិច្ច និងហិរញ្ញវត្ថុ
- ក្រសួងរៀបចំដែនដី នគរូបនីយកម្ម និងសំណង់
- ក្រសួងធនធានទឹក និងឧតុនិយម
- រដ្ឋបាលខេត្តបាត់ដំបង
- មន្ទីរបរិស្ថានខេត្តបាត់ដំបង
- ឯកសារ កាលប្បវត្តិ

អាគារមរតកតេជោ ជីឡូលេខ503 ផ្លូវកោះពេជ្រ សង្កាត់ទន្លេបាសាក់ ខណ្ឌចំការមន ភ្នំពេញ ទូរស័ព្ទ: 023 235 004 / 023 235 006

ព្រះរាជាណាចក្រកម្ពុជា
ជាតិ សាសនា ព្រះមហាក្សត្រ

ក្រសួងសាធារណការ និងដឹកជញ្ជូន
លេខ:.....សក.អមក

គោរពជូន
ឯកឧត្តមរដ្ឋមន្ត្រីក្រសួងបរិស្ថាន

ម្ចាស់គម្រោង តំណាងដោយ **ឯកឧត្តមទេសរដ្ឋមន្ត្រី រដ្ឋមន្ត្រីក្រសួងសាធារណការ និងដឹកជញ្ជូន** មានអាសយដ្ឋាន មហាវិថីព្រះនរោត្តម ខណ្ឌដូនពេញ រាជធានីភ្នំពេញ។

សូមធ្វើកិច្ចសន្យាការពារបរិស្ថាន

ដើម្បីរួមចំណែកធានានូវនិរន្តរភាពបរិស្ថានក្នុងកិច្ចដំណើរការអភិវឌ្ឍប្រទេសជាតិ ខ្ញុំសូមធ្វើកិច្ចសន្យាការពារបរិស្ថានចំពោះក្រសួងបរិស្ថាន សម្រាប់គម្រោងផ្គត់ផ្គង់ទឹកស្អាត និងអនាម័យខេត្ត អនុគម្រោង៖ ស្ថានីយប្រព្រឹត្តកម្មទឹកកខ្វក់ និងប្រព័ន្ធលូក្នុងក្រុងបាត់ដំបង (ផ្នែកខាងលិចស្ទឹងសង្កែ) ដែលមានទីតាំងស្ថិតនៅស្រុកថ្មគោល និងក្រុងបាត់ដំបង ខេត្តបាត់ដំបង របស់ក្រសួងសាធារណការ និងដឹកជញ្ជូន តាមប្រការដូចខាងក្រោម៖

ប្រការ១.-

ជានាទទួលខុសត្រូវ និងអនុវត្តនូវខ្លឹមសារដែលបានរៀបរាប់នៅក្នុងរបាយការណ៍វាយតម្លៃហេតុប៉ះពាល់បរិស្ថាន និងសង្គមដំបូង (IESIA) សម្រាប់គម្រោងផ្គត់ផ្គង់ទឹកស្អាត និងអនាម័យខេត្ត អនុគម្រោង៖ ស្ថានីយប្រព្រឹត្តកម្មទឹកកខ្វក់ និងប្រព័ន្ធលូក្នុងក្រុងបាត់ដំបង (ផ្នែកខាងលិចស្ទឹងសង្កែ) របស់ក្រសួងសាធារណការ និងដឹកជញ្ជូន នៅខេត្តបាត់ដំបង ដែលក្រសួងបរិស្ថានបានឯកភាព។

ប្រការ២.-

ជានាផ្តល់របាយការណ៍អង្កេតតាមដានបរិស្ថាន (Environmental Monitoring Report) ០១ដង/ឆ្នាំ នៅក្នុងដំណាក់កាលសាងសង់ ០១ដង/ឆ្នាំ នៅដំណាក់កាលប្រតិបត្តិគម្រោងជូននាយកដ្ឋានវាយតម្លៃហេតុប៉ះពាល់បរិស្ថាននៃក្រសួងបរិស្ថាន ដើម្បីពិនិត្យ និងវាយតម្លៃ។

ប្រការ៣.-

ជានាផ្តល់របាយការណ៍សង្ខេបនៃការសិក្សាលម្អិត (Summary Detailed Design Report) សម្រាប់គម្រោងផ្គត់ផ្គង់ទឹកស្អាត និងអនាម័យខេត្ត អនុគម្រោង៖ ស្ថានីយប្រព្រឹត្តកម្មទឹកកខ្វក់ និងប្រព័ន្ធលូក្នុងក្រុងបាត់ដំបង (ផ្នែកខាងលិចស្ទឹងសង្កែ) របស់ក្រសួងសាធារណការ និងដឹកជញ្ជូន នៅខេត្តបាត់ដំបង ដែលមិនបានលម្អិតនៅក្នុងរបាយការណ៍វាយតម្លៃហេតុប៉ះពាល់បរិស្ថាន និងសង្គមដំបូង (IESIA) ដើម្បីដាក់ជូនក្រសួងបរិស្ថានពិនិត្យ និងផ្តល់យោបល់។ ๒๑

មហាវិថីព្រះនរោត្តម ភ្នំពេញ ទូរស័ព្ទ ទូរសារ (៨៥៥) ២៣ ៤២៦ ៦៤០,(៨៥៥) ២៣ ៤២៧ ៤៦២

ប្រការ៤.-

ក្នុងករណីក្រសួងបរិស្ថានតម្រូវឱ្យម្ចាស់គម្រោងធ្វើការកែប្រែនូវបច្ចេកទេសបរិស្ថានណាមួយ ដើម្បីឱ្យសមស្របទៅតាមគោលការណ៍ណែនាំ និងកម្រិតបទដ្ឋានបរិស្ថាន ម្ចាស់គម្រោងនឹងទទួលអនុវត្តទៅតាមគោលការណ៍ណែនាំនោះទាំងស្រុង។

ប្រការ៥.-

ទៅថ្ងៃអនាគត បើម្ចាស់គម្រោងមានគម្រោងពង្រីកបន្ថែម ឬផ្លាស់ប្តូរ ឬកែសម្រួលរបាយការណ៍សិក្សាសមទិលទ្ធភាព (Feasibility Study Report) ឬផ្ទាកសកម្មភាព ម្ចាស់គម្រោងនឹងរាយការណ៍ជូនក្រសួងបរិស្ថានឱ្យបានមុន ០១ខែ។

ប្រការ៦.-

អនុញ្ញាតឱ្យមន្ត្រីជំនាញពីក្រសួងបរិស្ថាន ឬមន្ទីរបរិស្ថានខេត្តបាត់ដំបង ដែលមានលិខិតបញ្ជាបេសកកម្មត្រឹមត្រូវ ដើម្បីធ្វើការត្រួតពិនិត្យនៅទីតាំងតំបន់គម្រោង។

ប្រការ៧.-

ក្នុងករណីដែលម្ចាស់គម្រោងពុំបានគោរពតាមប្រការណាមួយ ឬអនុវត្តផ្ទុយពីកិច្ចសន្យានេះ ឬលិខិតបទដ្ឋានគតិយុត្ត ចូលជាធរមានផ្សេងៗទៀត ម្ចាស់គម្រោងនឹងទទួលខុសត្រូវចំពោះមុខច្បាប់ជាធរមាន។

ថ្ងៃព្រហស្បតិ៍ ៤កើត ខែមិគសិរ ឆ្នាំជូត ទោស័ក ព.ស.២៥៦៤
រាជធានីភ្នំពេញ ថ្ងៃទី ១៩ ខែ វិច្ឆិកា ឆ្នាំ២០២០
ជ.រដ្ឋមន្ត្រីក្រសួងសាធារណការ និងដឹកជញ្ជូន

ស៊ុយ_សាន

បានឃើញ និងគោរពជូន
ឯកឧត្តមរដ្ឋមន្ត្រីក្រសួងបរិស្ថាន មេត្តាពិនិត្យ និងសម្រេច
លេខ: ១៦២១ វ.ហ.ប.ស
ថ្ងៃព្រហស្បតិ៍ ៤កើត ខែមិគសិរ ឆ្នាំជូត ទោស័ក ព.ស.២៥៦៤
រាជធានីភ្នំពេញ ថ្ងៃទី ១៩ ខែ វិច្ឆិកា ឆ្នាំ២០២០
ប្រធាននាយកដ្ឋានវាយតម្លៃហេតុប៉ះពាល់បរិស្ថាន

ជាញ់_សេរី

បានឃើញ និងឯកភាព
ថ្ងៃ អង្គារ ១កើត ខែមិគសិរ ឆ្នាំជូត ទោស័ក ព.ស.២៥៦៤
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Kingdom of Cambodia

Nation Religion King

Ministry of Environment

No: 1309 SCN.BS

Yours Respectfully

Senior Minister, Minister of Public Works and Transport

Subject: Refer to the second request to review on the derogation the effluent standard

Reference: - Letter No. 2674 SK/ABTK dated 28 July 2020 of the Ministry of Public Works and Transport

- Report of the Meeting between Ministry of Environment and Ministry of Public Works and Transport dated 8 September 2020

As mentioned in the above subject and reference, I have the pleasure to inform H.E Senior Minister that the treated effluent from the wastewater treatment plant will not implement with the compliance to the Annex 2 of the sub-decree no. 235 ANKR.BK dated 25 December 2017 on the Management of Sewerage and Wastewater Treatment System because centralized wastewater treatment plant is under jurisdiction of sub-decree no. 27 date 26 April 1999 on the Water Pollution Control in which the treated effluent standard shall comply with the table of Annex 2 of this sub-decree itself.

In this regard to the request made by the Ministry of Public Works and Transport to review the derogation the effluent parameters standard from the centralized wastewater treatment plant, is already below the allowable effluent standard.

As mentioned above, please H.E Senior Minister kindly be informed.

Please accept, H.E Senior Minister, the assurances of my highest consideration.

Phnom Penh, 7 October 2020

Minister

Signature and stamp

Say Sam Al

Annex 7 COVID-19 Protection and Mitigation Measures

1 Construction Site Working Conditions Mitigation Measures for COVID-19	
1. Form a joint team to plan and organize return to work	• Develop or convene a joint occupational safety and health committee with members representing the employer and workers. • Train team members on the basic principles for the formulation and implementation of occupational safety and health preventive and control measures. • Develop and communicate a work plan on safe working for COVID-19. Such plan should be fully aligned with any government regulations and guidelines on COVID-19 prevention and control, or in the absence thereof, with international good practice guidelines as may be updated from time to time.
2. Risk assessment to decide when to work, who works	• Undertake a risk assessment to determine the preventive and control measures. • Ensure preventative measures are in place before resuming or beginning construction work.
3. Adopt engineering, organizational and administrative measures	• Avoid physical interaction and maintain physical distancing requirements as prescribed by national policy, or in the absence thereof, international good practice. • Ventilate enclosed workplaces including work camps and communal spaces. • Avoid concentration of workers - limit the capacity of common areas such as work camp dining rooms and changing rooms to allow the minimum separation of 2 m and organize one-way systems. This includes sleeping areas which must be a minimum of 2 m between beds. • Put in place training and information on COVID-19 and measures required for its management. • The construction site is to be segregated to the extent possible in zones or other methods to keep different crews physically separated at all time. • Stagger break and lunch schedules to minimize the number of people in close proximity to one another.
4. Regularly clean and disinfect	• Increase the frequency of cleaning and disinfection, in particular heavily trafficked areas and common areas, including work camps. • All door handles, railings, ladders, switches, controls, eating surfaces, shared tools and equipment, taps, toilets, and personal areas are wiped down at least twice a day with a disinfectant. • Discourage the sharing of items such as cups, glasses, plates, tools.
5. Promote personal hygiene	• Provide workers with the conditions and means necessary for frequent hand washing (soap, water or alcohol gel) with a posted hand washing protocol at site entries, exits, bathrooms, communal areas, offices, and any other areas with commonly touched surfaces. • Inform workers of the need to avoid physical contact when greeting, and avoid touching eyes, nose and mouth. • Inform workers of the need to cover the mouth and nose with a disposable handkerchief when coughing or sneezing or the crook of their arm. • Dispose of tissues in a lined and covered waste bin and wash hands afterwards.

1 Construction Site Working Conditions Mitigation Measures for COVID-19	
6. Provide PPE and inform workers of its correct use	• Identify appropriate PPE related to the tasks and health and safety risks faced by workers according to the results of risk assessment and the level of risk, and provide it to workers free of charge and in sufficient number, along with instructions, procedures, training and supervision. • Non-medical face-coverings (such as homemade cloth masks) should be worn as mitigation for catching and transmitting the virus, but are not to be treated as substitutes for proper handwashing.

7. Health surveillance and insurance	• Before entering the site, staff and visitors must confirm that they are not currently exhibiting flu-like symptoms.
	• Monitor the health status of workers, develop protocols for cases of suspected and confirmed COVID-19. The protocol will state that:
	  • Workers with symptoms or confirmed cases must be isolated within the construction camp or stay at home for 7 days after symptoms started.
	  • If symptoms persist after 7 days the person must isolate until the symptoms stop.
	  • People who have been in close contact with the person with confirmed COVID-19 be quarantined for 14 days.
	• All workers in quarantine or isolation must be provided with adequate food, water, medical assistance and sanitation.
	• Identify workers who have had close contact with people infected with
	• COVID-19 and follow national medical guidance.
	• Communicate confirmed cases of COVID-19 infection to the appropriate authorities.
	• All workers should be provided with health insurance that includes
	• COVID-19 treatment

8. Consider other hazards, including psychosocial	• Promote a safe and healthy working environment free from violence and harassment. • Encourage health promotion and wellbeing in the workplace through enough rest, balance of physical and mental activity and adequate work- life balance. • Implement prevention and control measures for the use and storage of chemicals, particularly those used for disinfection during COVID-19.
9. Review emergency	• Develop an emergency plan adapted to COVID-19 and regularly review it.
10. Review and update preventive and control measures as the situation evolves	• Periodically monitor prevention and control measures to determine whether they have been adequate to avoid or minimize risk, and identify and implement corrective actions for continuous improvement. • Establish and maintain records related to work-related injuries, illnesses and incidents, worker exposures, monitoring of the work environment and workers' health.

Source: Adapted from: ILO, WHO, Canada Construction Association, and UK Government.

2 Worker Camp Siting and Management Mitigation Measures for H&S and COVID-19	
1. Siting	• Not in area liable to flooding, landslide or other natural disaster • Not in area affected by construction dust, noise, sewage or other pollution • Not in a residential area.
2. Minimum housing standards	• A separate bed for each worker • Beds should not be arranged in tiers of more than two; • Separate accommodation of the sexes or to accommodate couples • Adequate natural light during the daytime and adequate artificial light • Adequate ventilation to ensure sufficient movement of air • Adequate supply of safe potable water • Adequate sanitary facilities (see below); • Adequate drainage • Adequate furniture for each worker to secure his or her belongings, such as a locker. • Common dining rooms, canteens or mess rooms, located away from the sleeping areas • Appropriately situated and furnished laundry facilities • Reasonable access to plug sockets for charging telephones and other devices • Rest and recreation rooms and health facilities, where not available in the community.
3. Minimum accommodation sizes	• Sleeping space • Inside dimensions over 198 ° by 80 cm; sleeping room: • headroom of over 203 cm allowing full free movement • Beds minimum 2 m apart for COVID-19 risk management
4. Sanitation Facilities	• One toilet, one tap / basin, one toilet for every 6 people • Convenient location to accommodation • Provision of soap • Separate facilities for men and women • Ventilation to open air • Fresh cold running water • Clean and hygienic • Septic tank / sewage treatment facility, or pit latrines located at least • 200 m from surface waters, and in areas of suitable soil profiles and above the groundwater levels
5. H&S within worker accommodation	• Separate area for sick workers to prevent transmission of disease • Smoke detector in sleeping area • Fire safety throughout accommodation such as fire extinguishers, fire alarms, fire blankets • Worker training in fire prevention and procedures • Fire exit sign, adequate means of escape and clearly maintained exit • Security lighting within camp and for sanitation block and lighting for route from sleeping area to sanitation block. • Electrical cables to be in safe condition, elevated and not in areas liable to flood
6. Inspection	• 2 weekly inspect to inspect for cleanliness, state of repair of building, accommodation and fire equipment. • Record inspection results and retain for review

Source: Adapted from ILO Workers' Housing Factsheet No. 6.

Annex 8 Summary of Consultations

The consultation meeting was at the Battambang Provincial Hall on 17 June 2020 at 8:30 am. The meeting was chaired by the Provincial Governor, Excellency Ngoun Vathanak. Attendees were mostly from relevant stakeholder provincial and city departments. The list of participants is presented in Table A7-1. .

Table A7-1 Consulted Local Government Officers

No	Name	Sex	Agency	Position	Phone
1	Kem Sokuntheary	F	DPWT/PIU	Deputy director	092 818 017
2	Chea Vongnarith	M	DoE	Deputy director	092 626 698
3	Khai Soda	M	DOWRAM	Deputy director	
4	Chhum One	F	DoT	Deputy director	
5	Kim Saophoen	M	DCFA	Director department	
6	Phork Poa	M	DLMUPC	Officer	
7	Poa Sarith	M	DoLVET	Deputy director	
8	Chhim Kimhuot	M	DoH	Deputy chief office	
9	Mao Solhanna	M	DRD	Deputy director	
10	Lim Hemeng	M	Provincial Hall	Deputy chief office	
11	Kun Sambat Niroth	M	DoCR	Director department	
12	Noum Chhairoum	M	Provincial; Hall	Chief of Mine Action Plan Unite	
13	Poa Thavuth	M	Provincial Police	Deputy director	
14	Ing Vanorin	M	DoP	Deputy director	
15	Ae Vanna	M	Office PWT in Town	Deputy office	

Legend

DCFA	Department of Culture and Fine Arts
DoT	Department of Tourist
DLMUPC:	Department of Land Management Urban Planning and Construction
DoLVET:	Department of Labor and Vocational Training
DoCR:	Department of Culture and Religion
DoP	Department of Planning
DOWRAM:	Department of Water Resources and Meteorology

Consultations were also held with heads and leaders of communes, and communities. The list of people met is presented in Table A7-2. In addition, had discussions with the MOE reviewing team, during its field visit on 25 July 2020 as part of the IESIA process. The persons met are listed in Table A7-3.

Table A7-2 Consulted Commune and Community Heads

No	Name	Sex	Agency	Position	Phone	Date
1	Peng Sethy	M	Battambang City	Governor		11 Jun 2020
2	Hing Bunthan	M	Thmar Koul District	Governor		11 Jun 2020
3	Bo Kan	M	Peam Aek Commune	Commune Chief	088 715 3173	12 Jun 2020
4	Ouk Kim	M	Svay Por Commune	Commune Chief	012 395 479	16 Jun 2020
5	Kea Yuong	M	Aek Phnom Commune	Village Chief		12 Jun 2020
6	Kok Han	M	Chamkar Samrong	Commune Chief	092 565 116	16 Jun 2020
7	Tout Lin	M	Sla Ket Commune	Commune Chief	012 912 844	10 Jun 2020
8	San Soth	F	O Taki Commune	Village Chief		10 Jun 2020

Table A7-2 Consulted Commune and Community Heads

No	Name	Sex	Agency	Position	Phone
1	Chea Leng	M	IEA Department, MoE	Deputy director	012 249 798
2	Chhrin Narun	M	--	Chief office	086 266 629
3	Yim Sothan	M	--	--	012 494 900
4	Saren Sokhom S.Somaly	F	--	Officer	085 309 222
5	Kim Sokunthea	F	DPWT-PIU	PIU Director	092 818 017
6	Bo Kan	M	Peam Aek Coomune	Commune Council	088 715 3173
7	Pang Nab	M	O Taki Commune	Commune Leader	012 862 247
8	Kok Han	M	Chamkar Samrong	Commune Council	092 565 116
9	Tout Lin	M	Sla Ket Commune	Commune Leader	012 912 844
10	Aem Sary	F	Svay Poar Commune	Commune Council	012 614 200
11	Yim Chamnan	M	PMC (ADB-MPWT)	NES	012 945 546
12	Chhim Seyha	M	PPIC Consultant firm	Environmental Team	012 312 202
13	Heng Sotheary	F	PPIC	Environmental Team	012 944 784
14	Chea Vongnarith	M	PDOE	Deputy department	085 808 333