Initial Environmental Examination

June 2013

Indonesia: Metropolitan Sanitation Management Investment Project

Pekanbaru City Off-Site Wastewater Collection System and Treatment

Prepared by Directorate General of Human Settlements, under the Ministry of Public Works of the Republic of Indonesia for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 31 May 2013)

Currency unit	–	Indonesian rupiah (IDR)
IDR1.00	=	$0.0001013171
$1.00	=	IDR9,870

ABBREVIATIONS

ADB	–	Asian Development Bank
AMDAL	–	Analisis Mengenai Dampak Lingkungan Hidup
ANDAL	–	Analisis Dampak Lingkungan (environmental impact analysis)
BAPPEDA	–	Badan Perencanaan Pembangunan Daerah
BLH	–	Badan Lingkungan Hidup
BMKG	–	Badan Meteorologi, Klimatologi, dan Geofisika
BOD	–	biochemical oxygen demand
CEMP	–	Contractor's Environmental Management Plan
CPMU	–	Central Project Management Unit
CSECC	–	City Sewerage Environmental Complaints Committee
cumd	–	cubic meters per day
cums	–	cubic meters per second
dB(A)	–	A-weighted sound scale
EIA	–	environmental impact analysis
EMP	–	environmental management plan
FGD	–	focus group discussion
GOI	–	Government of Indonesia
IEE	–	initial environmental examination
IndII	–	Indonesia Infrastructure Initiative
IPAL	–	Instalasi Pengolahan Air Limbah (WWTP)
IR	–	Involuntary resettlement
IRR	–	Implementing rules and regulations
km	–	kilometer
km^2	–	square kilometers
LGU	–	local government unit
lpcd	–	liters per capita per day
lps	–	liters per second
LPMU	–	Local Project Management Unit
mamsl	–	meters above mean sea level
NGO	–	non-government organization
PISC	–	Project Implementation Support Consultant
PPE	–	personal protective equipment
PPIU	–	Provincial Project Implementation Unit
PPTA	–	project preparation technical assistance
RRP	–	report and recommendation of the president (ADB)
TA	–	technical assistance
UPTD	–	Unit Perlaksan Teknis Daerah
UKL	–	Upaya Pengelolaan Lingkungan (environmental management plan)
UPL	–	Upaya Pemantauan Lingkungan (environmental monitoring plan)

ug/Ncm	–	microgram per normal cubic meter
WWTP	–	wastewater treatment plant

NOTE

In this report, "$" refers to US dollars.

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EXECUTIVE SUMMARY

1. An environmental assessment was made for the proposed **Pekanbaru City's Off-site Wastewater Collection System and Treatment**. It is one of the five subprojects to be funded by the Asian Development Bank (ADB) under the Metropolitan Sanitation Management and Investment Project (MSMIP) of the Directorate General of Human Settlements (DGHS) of the Ministry of Public Works, Republic of Indonesia. Pekanbaru City is in Riau Province, Republic of Indonesia. The proposed sewerage system subproject is expected to improve access on sanitation services in Pekanbaru City. Relative to the significance of environmental impacts and risks, this subproject is deemed Environmental Category B based on ADB's environmental categorization and the type of assessment warranted only the preparation of an Initial Environmental Examination (IEE) report. This IEE was carried out under ADB's TA 7993-INO and in accordance with *ADB's Safeguards Policy (2009)* and Government of Indonesia (GOI) environment law, Environmental Protection and Management Law of 2009. For compliance with GOI requirements on environmental assessment, a separate Analisa Mengenai Dampak Lingkungan (AMDAL) report will be prepared by the detailed design consultants during the detailed design phase.

2. *Subproject Description*. Pekanbaru's proposed sewerage system under MSMIP shall cover the central business district (CBD) including the sub-districts of Sukajadi, Pekanbaru Kota, Senapelan, and Limapuluh. This is known in Pekanbaru's Wastewater Investment Master Plan as the "Stage I Sewerage System". The proposed sewerage system will serve 66,860 people through 15,800 domestic service connections by 2018. The proposed Pekanbaru's sewerage network will have a total of 15.0 km of sewer pipelines with diameters ranging from 300 mm to 1,600 mm and 80.0 km of tertiary sewer network (with pipe diameters of 150 mm to 250 mm). ADB will only fund under MSMIP those sewer pipelines with diameters 300 mm and above. Hence, the tertiary sewer network of 80.0 km (with pipe diameter of less than 300 mm) will not be funded by ADB. The network will also include: (i) 15 km of interceptor sewer, (ii) 4.07 km of drainage rehabilitation, (iii) 1,295 sewer manholes, (iv) pipe crossings, and (v) sewer pumping station.

3. Wastewater from the sewer network system will drain to a 14.7-MLD Wastewater Treatment Plant (WWTP) located at Rejosari near the Siak River. WWTP's effluent discharge point is the Siak River. The proposed Rejosari WWTP shall be a Facultative Aerated Pond (FAP) system using covered anaerobic pond, facultative-aerobic ponds, and maturation ponds with a biochemical oxygen demand (BOD) load of 4.5 tons per day (tpd) and will be designed to achieve effluent quality with a maximum BOD of 50 mg/l and total suspended solids (TSS) of 100 mg/l. Other components are: administration office, guard house, small laboratory for wastewater tests, and backup power supply.

4. *Environmental and Socioeconomic Conditions*. The sites of the proposed Pekanbaru City's subproject are essentially urban areas. The sewer lines will be installed along urban roads. While the proposed WWTP site at Rejosari is presently an agricultural piece of land planted with rubber trees, it is generally located in an urban area. Beyond its eastern boundary are houses along an unpaved road. Its north and northeast boundaries is the Siak River, an urban stream. Given the development of the surrounding areas, the proposed site is therefore not within an undisturbed landscape. Hence, the proposed Pekanbaru City's sewerage system subproject is therefore not a new incursion to an ecologically untouched area. For socioeconomic indicators, Pekanbaru City's total population in 2010 was 897,768 people with a population density of 1,270 persons per km^2.

Majority of the labor force (62% of the total) are in the farming sector. Its few large industries are engaged in food/beverage, wood manufacturing, furniture, and rubber/plastic manufacturing.

5. *Impacts and EMP*. Screening for environmental impacts is made through a review of the parameters associated with sewerage projects against the components of the proposed Pekanbaru City's sewage collection network and Rejosari WWTP. An important consideration in analyzing the environmental impacts of the proposed subproject is the fact that its components are infrastructures for environmental improvement and for reducing the risk to public health from untreated sewage.

6. Adverse environmental impacts during construction of the proposed Pekanbaru City's sewerage system are temporary, less than significant, and can easily be mitigated. There will be no massive construction activities that can damage the environment. All open trenches shall be adequately shored and braced to provide a safe working environment. The contractor has a range of options to support the trench during pipe laying operations. Excavated soil is backfilled to the trench after pipelaying and surplus soil hauled to suitable disposal sites. Construction activities for the proposed WWTP at Rejosari shall be confined in a site to be secured by the city government. Typical construction issues are manageable with the implementation of a contractor's environmental management plan (CEMP) for the following: (i) erosion and sediment runoff, (ii) nuisance to the public, (iii) noise and dust, (iv) vehicular traffic, (v) construction wastes, (vi) oil and fuel spillages, (vii) construction camps, (viii) occupational health and safety, (ix) public safety and convenience, (x) proper closure of construction sites, and (xi) potential damage to any archaeological and cultural assets. During detailed design and pre-construction phase, potential nuisances and problems to the public during construction shall be addressed by inclusion in the tender documents of specific provisions addressing these issues.

7. Environmental problems due to operation of the proposed WWTP at Rejosari can be avoided by incorporating the necessary measures in the design and use of appropriate operational procedures. The implementing unit of the proposed WWTP shall ensure that its plant operators are properly trained in operating the facility and in handling situations that may lead to poor quality effluents. Public health risk can be addressed by keeping the public away from the facility. A written health and safety manual shall be prepared for the Rejosari WWTP operation.

8. An Environmental Management Plan for the proposed Pekanbaru City's sewerage system is developed to effectively manage the environmental issues. The plan includes: (i) mitigating measures to be implemented, (ii) required monitoring associated with the mitigating measures, and (iii) implementation arrangement. Institutional setup discusses the requirements and responsibilities during pre-construction, construction, and operation phases. The plan includes tabulated information on: (i) required measures for each environmental impact that requires mitigation, (ii) locations where the measures apply, (iii) associated cost, and (iv) responsibility for implementing the measures and monitoring.

9. *Addressing Climate-Change Impacts*. Climate change adaptation considerations shall be included in the design of the proposed Pekanbaru City's Rejosari WWTP since it is on a low-lying ground and in close proximity to Siak River. Changes in the intensity of extreme weather events as well as gradual changes in climate parameters such as precipitation can be damaging to infrastructures. Inadequate attention to this impact can increase the long-term costs of sewerage investments for Pekanbaru City and increase the likelihood that such investments will fail to deliver the benefits for which they were intended. Flooding

could affect the structural integrity of the proposed WWTP. Flooding can also prevent the WWTP from operating by reducing the head available across the plant. It may also submerge facility components that are supposed to be dry for proper operation. These situations may result to the release of untreated sewage into the environment and increasing the risk to public health. To appropriately address this impact, a hydrology and flooding study shall be conducted for the proposed site of Pekanbaru City's Rejosari WWTP during the design phase to ensure that occurrence of flooding is properly evaluated. Results of the study shall be used for designing the proposed WWTP and the preparation of engineering specifications to ensure that it is less vulnerable to extreme flood events.

10. Climate change mitigation considerations will also be included in the design of the proposed Pekanbaru City's Rejosari WWTP. The membrane covered anaerobic ponds shall be connected to a flare by pipework to avoid releasing the generated methane from the ponds. However, during detailed design, potential use of the generated methane shall be evaluated with due considerations to financial and economic factors.

11. *Institutional Setup and Capacity Building*. The institutional setup from the top starts with the Ministry of Public Works as the executing agency of MSMIP with a Central Project Management Unit (CPMU) to be created under its Directorate of Development, Sanitation, Environment and Housing (PPLP), while the implementing agencies at the subproject level are two units working together, Satuan Kerja (SATKER) for Riau Province as the Provincial Project Implementation Unit (PPIU) and the Pekanbaru City's Local Project Management Unit (LPMU).

12. The CPMU shall appoint a staff, as Environment Officer for MSMIP, to oversee the implementation and monitoring of environmental safeguards requirements. The PPIU is the key implementation unit responsible for construction contracts' supervision of the Pekanbaru City's subproject, while Pekanbaru City's LPMU coordinates the needed local inputs and resources. Environmental Officers will be designated in the PPIU and LPMU to effectively manage the environmental aspects of the Pekanbaru City's subproject and ensure implementation and monitoring of the EMP during construction. Close coordination between the contractors and the Environment Officer of the PPIU is needed to ensure good planning for mitigation measures and ensure the timely implementation.

13. A capacity building for Pekanbaru City's Rejosari WWTP operators is proposed. It is one of the proactive ways to prevent the WWTP from discharging poor quality effluents by ensuring proper operation. The capacity building shall be divided into 2 parts. The first part shall be a hands-on training in a similarly operating WWTP in Indonesia, while the second part shall be the actual operation of the new WWTP with inputs from a WWTP advisor for a 3-month period intermittently, an important input for the WWTP start-up phase.

14. *Consultation and Participation*. Within the context of "meaningful consultation" per ADB's SPS, the city government of Pekanbaru initiated a process of consultation during project preparation and intends to continue it during detailed design and construction phases. The city government conducted an initial public consultation and information disclosure last 22 October 2012 with various stakeholders' representative, and concerned individuals. Details of the proposed subproject components were presented to the stakeholders and their views were requested. The initial public consultation was conducted in the Indonesian language. Issues that stakeholders raised include odor from the WWTP operation, WWTP impact to their wells, impact to Siak river water quality, and construction impacts. Stakeholders expressed support to the proposed subproject. The process of public consultation with various stakeholders shall continue during the detailed design

stage. Public information activities were also conducted earlier during the preparation of Pekanbaru City's Wastewater Investment Master Plan in 2010-2011.

15. *Grievance Redress Mechanism*. Implementation of the proposed sewerage subproject will be fully compliant to ADB's safeguards requirement on grievance redress mechanism. The city government of Pekanbaru disclosed the proposed mechanism during the initial public consultation last 22 October 2012. It will again be presented to stakeholders during detailed design when more subproject details are available and in area meetings during the construction phase. Complaints about the environmental performance of the subproject during the construction phase can best be handled by various levels including the formation of an ad-hoc City Sewerage Environmental Complaints Committee (CSECC) for the expeditious resolution of the complaints, while complaints during the operation phase can be brought to the attention of Pekanbaru's Badan Lingkungan Hidup (BLH), the local environment agency. The CSECC shall be chaired by Pekanbaru City's LPMU head. Members shall include: (i) contractor's highest official at the site such as the Construction Manager or Construction Superintendent, (ii) village (Kelurahan) Chief or his representative, and (iii) a women organization's representative. Creation of the ad-hoc CSECC and its operation shall be included in appropriate sections of the civil works contract.

16. *Conclusion and Recommendation*. Based on the screening for potential environmental impacts and risks of the proposed Pekanbaru City subproject, there are no significant negative environmental impacts and risks that cannot be mitigated. With the EMP, the proposed Pekanbaru City subproject can be implemented in an environmentally acceptable manner. There is no need for further environmental assessment study. A full EIA is not warranted and the subproject's environmental classification as Category B is deemed appropriate. The IEE shall therefore be finalized as the final environmental assessment document of the proposed Pekanbaru City's sewerage system subproject.

17. Implementation of the proposed Pekanbaru City's subproject is hereby recommended with emphasis on the following: (i) EMP of Pekanbaru City's sewerage system subproject shall be included in the design process; (ii) IEE Report/EMP shall be forwarded to the design consultant for consideration in the design process; (iii) Tendering process shall advocate environmentally responsible procurement by ensuring the inclusion of EMP provisions in the bidding and construction contract documents; (iv) Contractor's submittal of a CEMP shall be included in the construction contract; (v) Contract provisions on creation and operation of the CSECC shall be included in construction contracts; (vi) Training of the Rejosari WWTP operators on operation and maintenance of the WWTP shall be completed before actual operation; (vii) a WWTP advisor (consultant) shall be provided intermittently during the initial 3 months of operation to assist the operators in the start-up phase and also to correct any undesirable operating practices; (viii) Monitoring of health and safety requirements shall be given more importance during construction and operation to reduce risks to the public and to personnel; and (ix) Pekanbaru City government, its LPMU, and the PPIU shall continue the process of public consultation and information disclosure during detailed design and construction phases.

I. INTRODUCTION

1. Pekanbaru City is in Riau Province, Indonesia and one of the selected subprojects under the Metropolitan Sanitation Management and Investment Project (MSMIP) for the Republic of Indonesia (ADB TA 7993-INO) funded by the Asian Development Bank (ADB). Objective of the Project Preparatory Technical Assistance (PPTA) study is to assist the government of Indonesia (GOI) in preparing for funding consideration by ADB a project for urban sanitation management. It is intended to improve the livability and competitiveness of millions of city-dwellers in large Indonesian cities through interventions in sanitation management such as the provision of a sewerage system. It will improve access to sanitation services in selected urban areas.

2. Preparation of this Initial Environmental Examination (IEE) is part of the activities of ADB TA 7993-INO. It provides ADB with an assessment of the environmental concerns to be considered regarding the subproject location, planning and design, construction, and operations and maintenance.

3. Preparation of the IEE involved field visits to the proposed subproject area; review of available information, discussions with local government officials, local government agencies, and members of the community within the subproject area.

4. The IEE has been carried out in accordance with *ADB's 2009 Safeguard Policy Statement* (SPS) and the requirements describe in its Appendix 1 (Safeguards Requirement 1: Environment) and the laws of the Republic of Indonesia as embodied in Environmental Protection and Management Law of 2009. For compliance with GOI requirements on environmental assessment, a separate Analisa Mengenai Dampak Lingkungan (AMDAL) report will be prepared by the detailed design consultants during the detailed design phase. This shall be completed prior to any bidding/procurement process.

II. POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

5. The policy, legal, and administrative frameworks relevant to the environmental assessment of infrastructure projects in the Republic of Indonesia have been established by the following laws and regulations: (i) Environmental Management Law of 1997 (Law No. 23/1997), (ii) Environmental Protection and Management Law of 2009, and (iii) Environmental Permit Regulation (Government Regulation No.27/2012).

6. The Environmental Management Law (Law No. 23/1997) required the conduct of environmental assessment of infrastructure projects. This law strengthened the enforcement of the Indonesian environmental assessment system (AMDAL). Government Regulation No.27/1999 was issued, requiring actions to implement the environmental assessment system. Formal guidance on the preparation of environmental assessment was issued by Decree of the Minister of Environment No. 2 of 2000.

7. To further improve the AMDAL system, the Environment Minister of State issued in 2006 Regulation No.11 which clarifies the guidelines of categorizing projects and the type of environmental assessment documents to be submitted by project proponents. Under the AMDAL system, proposed projects must be screened for coverage and compliance. Proposed projects are categorized into: (i) projects requiring Environmental Management Plan (Upaya Pengelolaan Lingkungan, UKL) and Environmental Monitoring Plan (Upaya

Pemantauan Lingkungan, UPL); (ii) projects requiring an EIA report which include an Environmental Impact Analysis (Analisis Dampak Lingkungan, ANDAL), UKL and UPL; and (iii) projects that do not require AMDAL or UKL/UPL. Regulation No.11of 2006 provides an extensive list of screening and sector-specific criteria to this effect.

8. In 2009, the Environmental Protection and Management Law of 2009 replaced the Environmental Management Law of 1997 (Law No. 23/1997). Recently, the Environmental Permit Regulation of 2012 was issued citing the need to implement certain provisions of the Environmental Protection and Management Law of 2009. This new regulation requires all project owners to apply for an environmental permit to the appropriate government authority (minister of environment, governor or mayor) before project implementation. It prescribed the process for environmental permitting and reaffirms GOI's AMDAL processes and requirements. Presently, the local environment agencies, Badan Lingkungan Hidup (BLH), of the subproject cities are still waiting for the issuance of the implementing guidelines for the Environmental Permit Regulation of 2012.

9. Under AMDAL regulation, a proposed WWTP for domestic wastewater that will require an area of more than 3 hectares or will serve a population of more than 100,000 shall be required to prepare an AMDAL report. The Pekanbaru City's subproject will require an area of 8.0 hectares for its WWTP, more than the 3-hectare criterion. It will therefore be required to prepare an AMDAL. Preparation of the AMDAL will be done by the detailed design consultants during the detailed design phase as agreed by ADB and GOI. This will be funded by the GOI. Compliance to GOI requirements shall be completed prior to any bidding/procurement process.

10. Application for Environmental Permit and AMDAL shall be done at the same time as provided for by Environmental Permit Regulation (No.27/2012). The regulation requires that application for environmental permit shall be accompanied by environmental assessment documents (ANDAL and UKL/UPL), business legal documents, and business profile document. Information on the process for environmental permit and AMDAL processing and timelines is presented in Appendix 1.

11. A permit to discharge will also be required for the proposed WWTP under the city's regulation for WWTPs. Information on the process for discharge permit is presented in Appendix 2. This permit shall be applied for during the initial months of WWTP operation since actual data on effluent quality are required to be submitted with the application.

12. *International Conventions*. Some international conventions are part of the environmental framework since the Republic of Indonesia is a party to some international conventions, treaties and agreements on the principles and actions necessary for sustainable development and environmental protection. It has ratified on 1994 both the *Convention on Biological Diversity* and the *United Nations Framework Convention on Climate Change*. These international conventions explicitly reference the application of environmental assessment to address the effects of human activities. The Convention on Biological Diversity, in particular, promotes the use of appropriate procedures requiring environmental impact assessment of proposed projects that are likely to have significant adverse effects on biological diversity.

13. *Sewerage Laws and Regulations*. The framework on wastewater management system development in Indonesia is provided by Public Works Regulation No.16/PRT/M/2008 on National Strategy and Policy in Domestic Wastewater Management. Law No.4/1992 on Housing and Settlements mandates that sewerage systems shall be provided. It requires

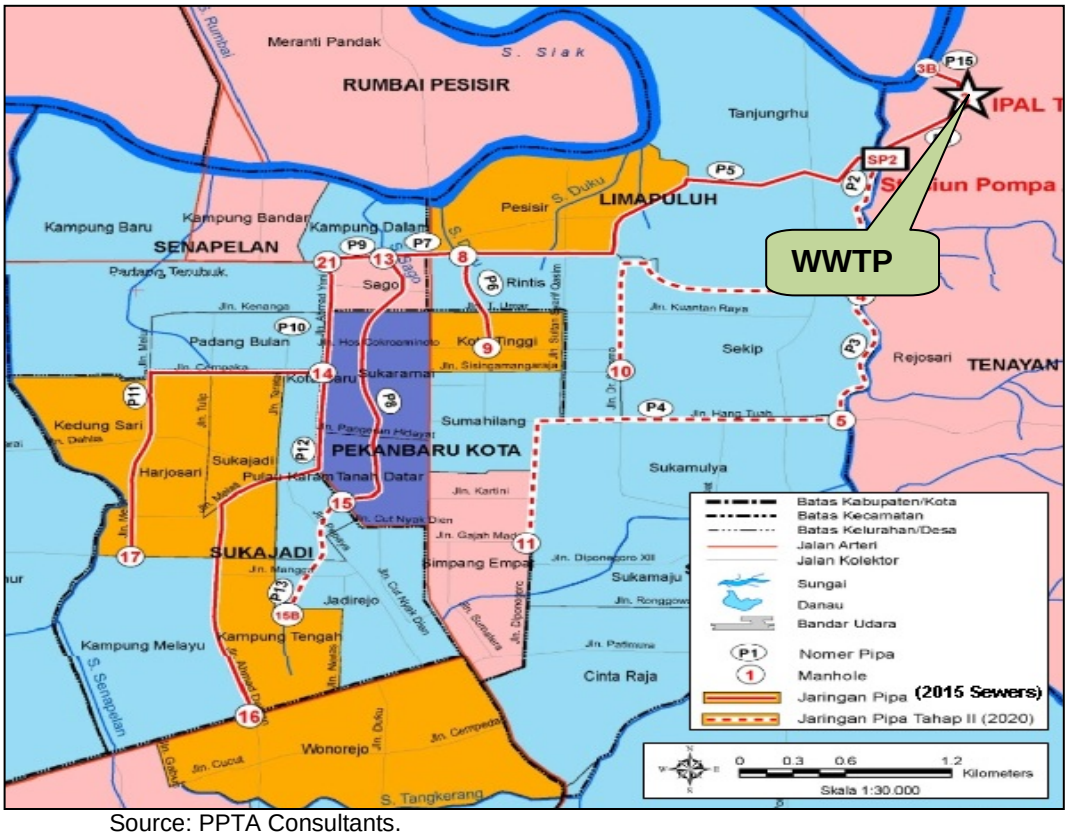
public utilities for wastewater systems to be operated professionally to provide adequate public services. Law No.7/2004 on Water Resources also cites the need for sanitation infrastructures for the protection and preservation of water resources. Effluent standard for wastewater treatment plants are regulated under the Environment Minister Decree No.112 of 2003 on Domestic Wastewater Quality which allows effluent discharge with maximum biochemical oxygen demand (BOD) of 100 mg/l and total suspended solids of 100 mg/l. However, the proposed WWTP will be designed to meet maximum effluent values of 50 mg/l and 100 mg/l. This will be compliant with the provincial standards of 50 mg/l and 100 mg/l.

III. DESCRIPTION OF THE PROJECT

A. Location

14. Pekanbaru's proposed sewerage system under MSMIP shall cover the central business district (CBD) including the sub-districts of Sukajadi, Pekanbaru Kota, Senapelan, and Limapuluh. This is known in Pekanbaru's Wastewater Investment Master Plan as the "Stage I Sewerage System" (Figure 3.1). The proposed sewerage system will serve 66,860 people through 15,800 domestic service connections by 2018.

Figure 3.1: Location Map of Pekanbaru's Proposed Sewerage System



Source: PPTA Consultants.

B. Components and Cost Estimate

15. The proposed Pekanbaru's sewerage network will have a total of 15.0 km of sewer pipelines with diameters ranging from 300 mm to 1,600 mm (Table 3.1) and 80.0 km of tertiary sewer network (with pipe diameters of 150 mm to 250 mm). ADB will only fund under MSMIP those sewer pipelines with diameters 300 mm and above. Hence, the tertiary sewer network of 80.0 km (with pipe diameter of less than 300 mm) will not be funded by ADB. The network will also include: (i) 15 km of interceptor sewer, (ii) 4.07 km of drainage rehabilitation, (iii) 1,295 sewer manholes, (iv) pipe crossings, and (v) sewer pumping station.

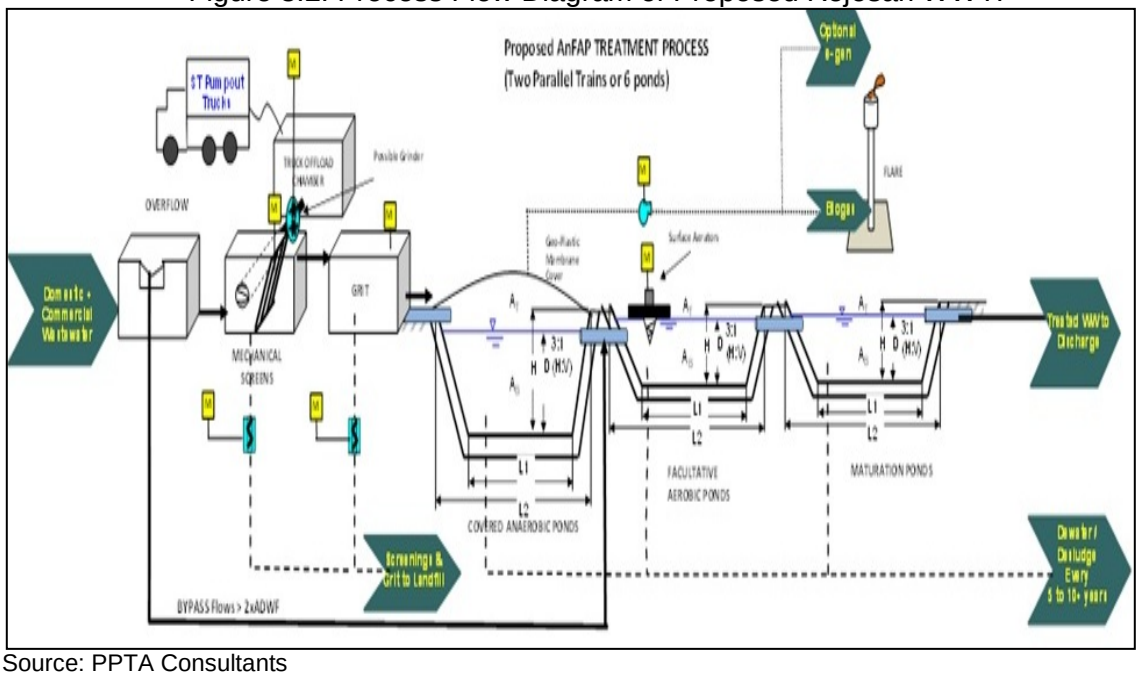
Table 3.1: Proposed Pekanbaru's Sewerage Network (to be funded by ADB)

Sewer Pipe Diameters (in millimeter)	Sewer Pipeline Length (in kilometer)
1600	1.779
1500	1.287
1100	3.041
900	0.774
700	0.881
500	0.858
400	5.235
300	1.134
Total…	15.000

Source: PPTA Consultants

16. Wastewater from the sewer network system will drain to a 14.7-MLD Wastewater Treatment Plant (WWTP) located at Rejosari near the Siak River. WWTP's effluent discharge point is the Siak River. A wastewater treatment plant is locally known in Bahasa as "Instalasi Pengolahan Air Limbah (IPAL)". The WWTP will be a lagoon system as indicated in the process flow diagram (Figure 3.2) with a biochemical oxygen demand (BOD) load of 4.5 tons per day (tpd).

Figure 3.2: Process Flow Diagram of Proposed Rejosari WWTP



Source: PPTA Consultants

17. The proposed Rejosari WWTP shall be a Facultative Aerated Pond (FAP) system in series using covered anaerobic pond, facultative-aerobic ponds, and maturation ponds. There will be 2 parallel trains (total of 6 ponds). The anaerobic pond shall be covered with a polymer (such as "Hypalon") to capture odor and biogas for flaring. Pretreatment system

includes a screen chamber and grit chamber. The WWTP will be provided with a septage receiving structure for future use. Initially, there will be no sludge drying beds since pond desludging will only be needed every 10 years. Other components are: administration office, guard house, small laboratory for wastewater tests, and backup power supply.

18. The FAP system is a biological waste treatment system using stabilization ponds with mechanical aerators to put more oxygen (air) into the wastewater. With higher oxygen transfer the ponds can have smaller hydraulic retention time resulting to smaller requirement for volumes and land area. Top of ponds have aerobic conditions, while the bottom is anaerobic. Both aerobic and anaerobic processes occur within the pond. The top layer of the pond receives oxygen from aerators, while the lower layer is deprived of oxygen and becomes anoxic or anaerobic. Settleable solids accumulate and digested at the bottom of the pond. Aerobic and anaerobic organisms work together to achieve good BOD reductions.

19. The proposed WWTP will be designed to achieve effluent quality with a maximum BOD of 50 mg/l and total suspended solids (TSS) of 100 mg/l. This BOD value is more stringent than the national effluent regulations that (Environment Minister Decree No.112 of 2003 on Domestic Wastewater Quality) allows a discharge quality with a maximum BOD of 100 mg/l. There are no fecal coliform standards for effluents. The provincial effluent standard of maximum 50 mg/l BOD applies (Riau Governor Decree).

20. Total Pekanbaru's subproject cost is estimated at US$47.36 millions based on 2012 prices. The proposed WWTP is estimated to have an operating cost of US$214,000 per year based on 2012 prices.

C. Construction

21. Pekanbaru's Rejosari WWTP construction shall require: (i) site clearing and marking of alignments, (ii) stockpiling of construction materials, (iii) backfilling, (iv) construction of new structures, (v) construction of embankments, (vi) construction of ponds and buildings, (vii) concreting for required tanks, (viii) installation of piping systems, (ix) installation of electro-mechanical equipment (x) cleaning and closure of construction sites.

22. Sewer pipelines of the proposed Pekanbaru's sewerage system shall be laid in trenches along the designated streets of the city. Trenches shall be excavated to the alignment and elevations as indicated on the construction drawings with any deviations to be approved by the supervising engineer representing the city. All open trenches shall be adequately shored and braced to provide a safe working environment. Depending upon the severity of the condition, the contractor may elect to use tight sheeting, skeleton sheeting, stay bracing, trench jacks, a trench shield or box to support the trench during pipe laying operations.

23. All pipe, fittings, and accessories shall be carefully lowered into the trench piece by piece by means of a derrick, ropes, slings, or other suitable tools or equipment in such a manner as to prevent damage to the sewer main materials and any protective coatings. Pipe and fittings shall be embedded in the trench with the invert conforming to the required elevations, slopes, and alignment, and with the pipe bottom uniformly and continuously supported by a firm bedding and foundation. All pipe joints shall be assembled in accordance with the recommendations of the manufacturer. The laid pipelines shall be backfilled with suitable earth materials prescribed in the construction contracts and shall be compacted to the required standards. Compaction will be done to ensure that the pavement sub-grade will not settle and adversely affect the pavement.

24. *Pipeline Leakage Tests*. Before acceptance of the owner of the installed sewer pipeline, leakage tests will be conducted by the supervising engineer representing the city to provide assurance that the pipeline is free from significant leaks. The tests may include low pressure air exfiltration or water exfiltration. Exfiltrations of sewer pipeline between manholes will be measured and shall not exceed the allowable standards for exfiltrations.

25. *Restoration and Clean-up*. After the sewer pipeline trench are backfilled and the pipeline accepted by the owner, the contractor will restore and/or replace paving, curbing, sidewalks, gutters, shrubbery, fences, sod, or other disturbed surfaces or structures to a condition equal to that which existed before the construction work began. The provisions for these restoration activities are usually included in standard construction contracts for sewer pipeline installations. Prior to demobilization, the contractor will remove all surplus pipeline materials, tools and temporary structures resulting from the work. The contractor will also remove and dispose all debris, excess earth from excavations, and construction solid wastes. Standard construction contracts for sewer pipeline installations also contain these provisions.

D. Implementation and Operation

26. Detailed engineering design of the Pekanbaru subproject will start on first quarter of 2013. Construction is scheduled to start on fourth quarter of 2014 and expected to be completed on the second quarter of 2018. Pekanbaru‘s new sewerage system is expected to be operational by third quarter of 2018.

IV. DESCRIPTION OF THE ENVIRONMENT

27. A brief description of the existing environmental and socioeconomic conditions of the Pekanbaru City subproject influence area is presented in the following subsections:

A. Physical Resources

28. Pekanbaru City is the capital city of Riau Province, and geographically located between 101° 14' – 101° 34' west longitude and 0° 25' - 0° 45' north latitude. The city is bounded by Kabupaten Siak to north of the Siak River, Kabupaten Pelalawan to the east and south and Kabupaten Kampar to the south and west. Administratively, the City area covers just over 630 km^2 and comprises 12 sub-districts (kecamatans) and 58 villages (kelurahans).

29. *Topography*. Pekanbaru is located on the swampy Sumatran plains with mildly undulating hills in parts. It is bisected by the Siak River which flows from west to east through the city. Elevations range from 10 meters above mean sea level (amsl) along the Siak River to 75 m above amsl in Tenayan Raya sub-district in the south eastern part of the city. About 40 percent of Pekanbaru area is at an elevation between 25 - 50 m amsl. Most of the land drains either directly to the Siak River or one of its tributaries. The north western and southeastern areas tend to be more marshy with many drainage channels.

30. The significance of this topography to wastewater management is that sewerage systems will likely to need some pump stations. However, sewerage areas will not be necessarily be constrained by drainage catchments. Most of Pekanbaru is relatively flat with slopes in the range of 0 – 2 percent, especially in the areas along the Siak and Sail Rivers. Slopes tend to increase towards the northern parts of Rumbai and Rumbai Pesisir and Tenayan Raya sub-districts. The natural ground gradient would be adequate to enable gravity pipelines for tertiary and secondary sewer pipes over relatively short distances across the flatter areas. However, pump stations will be required for transmission over long distances. In the hilly areas gravity mains could be used to collect wastewater and convey it to a primary carrier closer to the river. As the low lying areas are prone to flood, in many parts of the city disposal of septic tank effluent poses a health hazard to the community and should be connected to a sewerage system.

31. *Geology and Soils*. The underlying rock formations in Pekanbaru City are divided into four types: (i) mudstone unit: formed of mud rock that contain carbonate, lignite, a small amount of silts and sandstones scattered around the northern part forming the relatively flat to gently sloped areas (about 30 percent of the city area); (ii) sand unit : formed of gravel, kerajal, sand, and clay scattered around the north and south part of Pekanbaru that make up for approximately 35 percent of the whole city; (iii) old alluvium unit: formed of gravel, sand, clay, vegetation residue and peat moss (gambut) scattered around the north, south, and west part of Pekanbaru that make up for less than 10 percent of Pekanbaru; and (iv) young alluvium unit: formed of clay, sand, and gravel, along with river or swamp sediment, with a thickness up to four meters and width less than 5 percent of the whole Pekanbaru.

32. Groundwater in Pekanbaru is obtained from the sandy layer or sand rock that can be found at depths between 75 meters and 200 meters. Like in many parts of Sumatra, peat (gambut) is a naturally occurring material which affect the natural (or background) quality of river waters. The above indicates that soils are well draining, which may create contamination concerns if there is a high concentration of septic tanks and cesspits. Such

areas are not well suited for on-site disposal systems and shallow aquifers should not be used as sources of water supply without treatment (disinfection as a minimum). Away from the river the water supply bearing aquifers are deep, so generally should not be affected by seepage from cess spits and septic tanks. In the northern areas the higher clay content would lessen the efficiency of on-site disposal systems but this could be offset by the lower housing density. The absence of significant hard rocky strata in the top 10 m indicates that construction of pipelines should not be too difficult and methods such as trenching and horizontal directional drilling could be employed.

33. Indonesia consist of 6 earthquake zone, earthquake zone 1-2 for minor earthquake, earthquake zone 3-4 for moderate earthquake, and earthquake zone 5-6 for severe earthquake. Pekanbaru include earthquake zone 2 e.i. minor earthquake zone. (Source: Procedure of Earthquake Resistance Planning for Building, Indonesia National Standard/SNI 03-1726-2003). This number Peak Acceleration of Bedrock should be calculated in structural design building to ensure robustness.

34. *Water Resources*. Water resources in Pekanbaru mainly consist of surface water (particularly rivers and lakes) and groundwater. Surface water is commonly found in low quality. However the quantity of the surface water is adequate to sustain economically activities and to be utilized as the main raw water source to fulfill urban water demand of the city. As a matter of fact, the rivers have been actively utilized by the population of Pekanbaru living along the riverbanks, the water supplier, farms and industries. Groundwater, although superior in quality, has limited quantity hence restricted in its utilization for the city needs. (Regional Environmental Status of Pekanbaru City, 2011).

35. The landscape of Pekanbaru is dominated by water. The Siak River has 17 tributaries within the city limits, the main ones being the Air Hitam, Senapelan, Sail, Teleju and Tenayan rivers on the right (south) bank of the Siak, and the Takuana, Umban Sari, Ambang and Likud rivers on the left or north bank. In addition, the Kelulut River in the southern part of the city is a tributary of the Kampar River situated in neighbouring Kabupaten Kampar.

36. The Siak River has a typical monsoonal discharge pattern of high flows during the wet season and a much lower flow in the dry season. The Siak River has a width of 100 m – 150 m and is reputed as one of the deepest rivers in Indonesia with a depth of 12 m to 25 m. The minimum dry and maximum wet season flows in the Siak are reported to be around 45 m3/s and 1,700 m3/s, respectively. The average flows are around 200-300 m3/s. Although it is over 100 km from the coast, the Siak River is subject to tidal fluctuations at Pekanbaru.

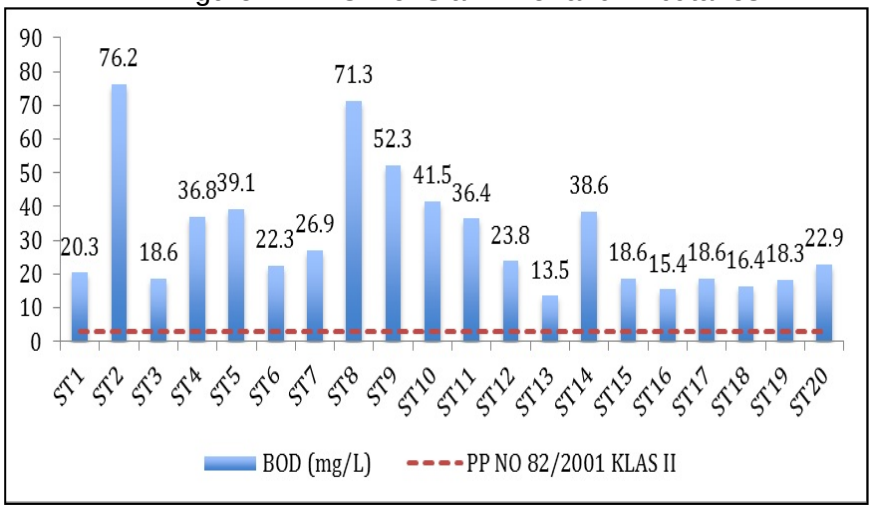
37. The tributary streams are all of short length and small catchments. Consequently, their flow patterns exhibit a rapid rise in flow in response to intense rainfall and a sharp drop during extended dry spells. The largest tributary, the Sail River with a catchment of 120 km2, is also subject to tidal influences and in fact has been observed to flow in the reverse direction during high tides. This would make it unsuitable as a receiving-water for discharge of treated effluent. The streams on the left bank are generally larger than those of on the right bank but flow through lightly populated areas, so are not as affected by wastewater discharges. Most of the tributary streams and drainage channels in Pekanbaru would be unsuitable for discharge of treated effluent as they have limited hydraulic capacities. The Sail and Senapelan rivers are currently the major drains for collecting wastewater discharges from the city. As these streams run through the built-up area and have limited hydraulic capacities, such discharges are not desirable.

38. *Water Quality of Siak River and Tributaries*. The water quality of Siak River is poor. Visually, the water appears turbid, brown and has bad odor. Its water quality in 2010 has exceeded the limits for BOD, COD, DO, suspended solid, NH3-N, Cadmium, Chrome VI, Iron, Copper, Lead, Zinc, Nitrite as N, and Sulfur as H2S (trend in several locations and parameters). Pekanbaru City's BLH reported that Siak River is mildly and moderately contaminated based on the Contamination Index (IP) prescribed in the Decree of the Environment Minister No. 115 Year 2003 on Water Quality Status Determination. Water quality data of the Siak River and its tributaries are presented in Figure 4.1 (BOD) and Figure 4.2 (COD), while information of the sampling locations are presented in Table 4.1. Sampling stations 1 to 4 are the Siak River itself with reported BOD range of 18.6-76.2 mg/l. The datasets were obtained from the survey performed by the Environmental Census Organization in 2010 reported in the Wastewater Investment Master Plan Package III Volume 3 Environmental And Social Appraisal – Pekanbaru, 2011.

Table 4.1: Water Quality Sampling Locations of Siak River and Tributaries

Station	Location	Station	Location
ST1	Bridge Siak I (Bridge. Jln. Satrio-Rejosari)	ST11	River Sinapelan II
ST2	Bridge Siak II (beside PMC Jln. Permasyaratan)	ST12	River Tenayan (Bridge. Jln. Satrio-Rejosari)
ST3	Close to PT. Asia Foresta Raya (PT. AFR)	ST13	River Umban Sari (Bridge. Jln. Umban Sari-Rumbai)
ST4	PelitaPantai	ST14	River Rumbai (drainage of Jln. Sembilang-Rumbai)
ST5	River Kelulut (Jln. Soekarno-Hattaujung)	ST15	River Air Hitam I (Jln. SidoRukun)
ST6	River Labuai (drainage of Jln. Parit Indah)	ST16	River Air Hitam II (Jln. Nangka)
ST7	River TanjungRhu (drainage of Jln. Pasar Lima Puluh)	ST17	River Sibam (Bridge. Jln. Garuda Sakti Km. 6)
ST8	River Limau (close to PelitaPantai)	ST18	River Pengambang (Bridge Danau Buatan to River)
ST9	River Sago	ST19	River Teleju (Bridge. Batu-Parit)
ST10	River Sinapelan I	ST20	River Pembatuan (Bridge. Jln. LintasTimur Km. 14)

Figure 4.1: BOD of Siak River and Tributaries

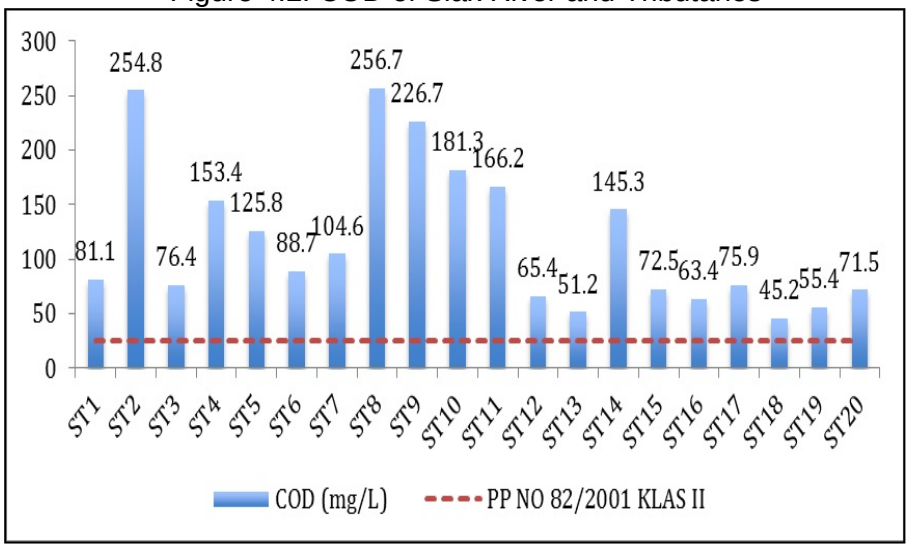


Source: Environmental Census Organization. 2010

39. Siak River water that is mildly contaminated is dominated with high level of BOD, COD, phosphate, sulphide, copper, and iron (Siak Bridge II). Siak River water that is moderately contaminated is dominated with high level of BOD, COD, phosphate, sulphide, lead, copper, zinc, iron and E. Coli (Siak Bridge I, around PT. AFR, Pelita Pantai, and Pelindo).The water quality around Siak Bridge II in Palas area is relatively better than the 4 other locations. This is caused by the low input of domestic waste from household activity.

40. Domestic waste from residential activities in Pekanbaru City flows straight to Siak River through the drainage and river tributaries (Senapelan River I and Sago River). Although those tributaries have been equipped with water pumps and equipment to separate solid objects floating on the tributaries so they do not end up in Siak River, generally, there is no physical, chemical, or biological domestic waste treatment. The water quality status of each the Siak River Tributaries is presented in Table 4.2.

Figure 4.2: COD of Siak River and Tributaries



Source: Environmental Census Organization. 2010

41. Siak River has experienced a lot contamination from various natural causes, industrial and domestic waste. The degradation of the water quality does not only occur to Siak River but also to more or less 17 other of Siak tributaries (Wastewater Investment Master Plan Package III Vol. 1: Final Master Plan – Pekanbaru, 2011). According to residents living on the periphery of the stream, the water used to be potable, but nowadays it is not even suitable for washing and there is considerable loss of aquatic life from poor water quality. The Siak River drainage basin has 26 major industries, 12 of which are located in Pekanbaru City. Additionally, there are 16 major industries in the Siak Districts (Kabupaten) as well as 2.376 middle and small sized industries. The major players are PT. Chevron Pasific Indonesia, PT. Indah Kiat Pulp and Paper, etc. The middle and small industries work in the area of food and beverage, metal, electronics, wood and rattan crafts and natural rubber processing. It has been reported that due these industrial activities, the Siak River drainage basin has been categorized as one of the river basins that is in a critical condition.

Table 4.2: Water Quality Status of Siak River Tributaries

Location	Pollution Index	Status

Location	Pollution Index	Status
1. River Sail I	13.37	Highly polluted
2. River Sail II	18.21	Highly polluted
3. River Sail III	4.44	Slightly polluted
4. River Sail IV	8.84	Moderately polluted
5. River Kelulut	9.29	Moderately polluted
6. River Labuai	5.45	Moderately polluted
7. River Tanjung Rhu	12.63	Highly polluted
8. River Limau	28.98	Highly polluted
9. River Sago	39.63	Highly polluted
10. River Senapelan I	39.18	Highly polluted
11. River Senapelan II	26.35	Highly polluted
12. River Tenayan	5.69	Moderately polluted
13. River Umban Sari	3.23	Slightly polluted
14. River Rumbai	9.32	Moderately polluted
15. River Air Hitam I	5.76	Moderately polluted
16. River Air Hitam II (hulu)	5.24	Moderately polluted
17. River Sibam	4.43	Slightly polluted
18. River Pengambang	3.89	Slightly polluted
19. River Teleju	5.26	Moderately polluted
20. River Pembatuan	5.45	Moderately polluted

Source: Regional Environmental Status of Pekanbaru City. 2011

42. *Climate*. Pekanbaru City is at the equator and as such it has no clearly defined wet or dry seasons, although rainfall tends to be lower than average during May-June and August. The period October to April is the wetter period and generally corresponds to the wet season in more southern latitudes of Indonesia. Based on the rainfall record for the period 2005-2010, the mean monthly rainfall is 220 mm with a standard deviation of 60 mm and on average there are about 149 days of rainfall per year (source: Regional Environmental Status of Pekanbaru City, 2011). Pekanbaru City has a fairly low humidity level that reaches 44 percent with daily maximum temperatures between 32 and 35 °C, and minimum temperature between 23 – 24 °C. The warm humid conditions are favorable for wastewater treatment as they help to accelerate breakdown of the organic waste. The high intensity and almost constant rainfall highlights part of the reason why the septic tanks often do not work as intended, especially in the marshy areas. Ground conditions can be waterlogged for much of the year even away from low lying areas.

43. Relative to climate change, information on climate change projections specific for Pekanbaru City is not yet available. GOI's Climatology Meteorology and Geophysics Agency, the Badan Meteorologi, Klimatologi, dan Geofisika (BMKG) is still preparing its climate change projections.

44. *Air Quality*. The air quality in Pekanbaru City is largely influenced by motor-vehicle-emissions and smokes coming from wildfires in the forest or controlled land burning for agricultural purposes. Overall, the air quality in Pekanbaru worsens as the dry season comes since this is when forest fires most frequently occur. The result of the ambient air quality monitoring in a number of monitoring stations in Pekanbaru City in 2010 showed that about 35% of the time (127 days) it could be categorized as "medium". About 63% of the time (230 days) it was categorized as "good" and it never reached dangerous level. It was estimated to be "unhealthy" for 3 days and "highly unhealthy" for 1 day (Regional Environmental Status of Pekanbaru City, 2011).

45. The air quality condition in the city based on critical parameters such as PM10, SO2, CO, O3, and NO2 in 2010, the most critical parameter is the PM10 at about 54% (197 days).

This parameter indicates air pollutants in the form of dust and smoke from various particles that are the consequences of forest or field fires and the emissions of diesel-fueled vehicles.

B. Ecological Resources

46. The proposed 20-ha Rejosari WWTP site is near the Siak River, the main river draining a wide area of the city. This relatively flat site is aligned towards the northeast and surrounded by areas that are generally planted with rubber trees. The site is presently occupied mostly by planted rubber trees. Beyond its north and northeast boundaries is the Siak River. Beyond the eastern boundary are houses along the unpaved road. The Sail River is beyond the southwestern boundary. This site is annually flooded during heavy rainfall. The Siak River and Sail River are essentially urban rivers draining the city that have been carrying domestic wastewaters and urban solid wastes from the built-up areas. Given the development of the surrounding areas, the proposed site is there not within an undisturbed landscape.

47. Since the Rejosari WWTP site is devoid of forested areas, it is there not a habitat for large wild animals, rare or endangered species. Farm and domesticated animals are therefore the large faunal species such as goats, house cats, and dogs. Photographs of the site are presented Appendix 3.

Figure 4.3: Satellite Photo of Proposed Rejosari WWTP Site

Photo source: Google Earth. 2012

C. Economic Development

48. *City Income and Expenditures*. The total regional income of Pekanbaruin City in 2010 was Rp. 1,183,353,307,772.00 as reported by the BPS-Statistics Pekanbaru. The total expenditure in the same year was Rp. 1,193,935,376,199.00 which means there was a deficit of Rp. 10,582,068,427.00 in the budget (Pekanbaru in Figures, 2011).

49. *Land Use*. Total occupied land in Pekanbaru is 14,892 hectares, or only about 24 percent of the total area. The primary use of the occupied land is 73 percent housing, 12 percent industry, and 5 percent commerce. Land utilization for housing is concentrated in the downtown area and around the Caltex/Chevron residential area. The industrial area is located in Tenayan Raya sub-district and the commercial area is located in the downtown area. Undeveloped lands consists of conservation areas, plantations, bush land and forest, most of which are in the northern area (Rumbai and Rumbai Pesisir sub-districts), and Tenayan Raya sub-districts.

50. *Commerce and Trade*. Data on industries showed that in 2010 there were 18 registered medium scale industries, drawing about 680 workforces. Only 7 large scale industries were reported in the same year, although the numbers of the workforce were much higher at about 2,932 workers. The fields of business for the large industries are food/beverage, wood manufacturing, furniture, and rubber/plastic manufacturing. In addition to the latter activities, medium scale industries also work in the fields of textile manufacturing and paper product/ printing publishing. The trend of foreign trade (export and import) in Pekanbaru, during the last two years increased greatly. Export value of Pekanbaru in 2009 reached US$39,774,044. Meanwhile the import value decreased by 0.19 % from US$81,767,676 to US$66,071,578 (Pekanbaru in Figures, 2011).

51. *Agriculture*. Farming is the biggest sector that contributes to the livelihood of the population in Pekanbaru, amounting to about 62% of the workforce. The role of farming has been increasingly becoming more and more important in Pekanbaru. The types of crops that are grown in Pekanbaru range from paddy, cassava, sweet potato, peanut, soy bean, maizena, small green bean, taro, various vegetables (long beans, chili, tomato, eggplant, cucumber, soft pumpkin, morning glory and spinach), various fruits and herbs (Pekanbaru in Figures, 2011). Animal husbandry is also a promising sector and is open for development, especially for cows and buffaloes. This sector has potentials to be developed given that most of the land areas in Pekanbaru are made up of grasslands, natural feeds for cattle (Regional Environmental Survey, 2011). Fishery in Pekanbaru relies on both natural open water and artificial fishponds.

52. *Tourism*. The government of Pekanbaru relates to tourism as one of the means to reduce the region dependency on oil and gas revenues, as the most reliable source of actual regional income thus far. The tourism sector has the potentials to be developed further to improve people's livelihoods. In Pekanbaru there are a number of excellent touristic objects and events. Tourism attractions include Bandar Kayangan, Nature Park Mayang, lakes, and agro-tourism areas in Palas and Kulim. Accommodations to sustain tourism activities are also growing in Pekanbaru. In 2010, the total numbers of classified and non-classified hotels in Pekanbaru were 24 and 68 (Pekanbaru in Figures, 2011).

53. *Existing Water Supply System*. The provision of clean water in Pekanbaru is the task of PDAM and utilizes the Siak River as raw water source. Siak River that has a flow of about 5000 liters/s is pumped to the Water Treatment Plant (WTP) with an installed capacity of 380 l/s. There are 18,660 units of active house connections and 45 active communal hydrants. In total it was recorded by the Regional Water Supply Enterprise (Tirta Siak) in 2010 that Pekanbaru PDAM distributed about 4.25 cubic millions of clean water. The largest consumer of clean water was householders using about 65 to 70% of the total volume distributed. Small scale businesses come second at about 19 to 24% of usage. From 2001 to 2009, the number of customers of the PDAM was varying between 18.000 up to some 20.000. Production of water was steady at roughly about 4 cubic millions from 2001 to 2005.

It increased to about 5 and 5.5 cubic millions in 2006 and 2007, dropped again to about 4.4 cubic millions in 2008, only to double the next year to 9.3 cubic millions and dramatically decreased to the lowest production of all time in 2010 at only 3.4 cubic millions.

54. *Transportation and Communication*. Roads are very important to smooth traffic flow and to support economic activities in a region. In 2010 the length of roads in Pekanbaru was recorded at 2,578.2 km. According to the survey by the Public Work Service (2010), about 45% of the road in Pekanbaru can be categorized as in good condition. About 23% and 26% were categorized as moderate and damaged, respectively. The remaining 6% was badly damaged (Pekanbaru in Figures, 2011).

55. The main air transportation in Pekanbaru takes place via Sultan Syar Kasim II Airport. In comparison with the previous year number of aircraft arrival, departure and passengers has slightly increased. The unloaded cargo was recorded at 9,392,070 kilograms and loaded cargo was recorded at 2,558,536 kilograms. The marine transportation/river transportation data are data of the monthly report of loaded and unloaded cargo (inter-island) and overseas through ADPEL of Pekanbaru. The inter-island loaded cargo in 2010 was recorded at 1,784,906 tons and unloaded cargo was recorded at 1,555,623 tons. The overseas of unloaded cargo was recorded at 255,548 tons and loaded cargo was recorded at 517,554 tons. In 2010, it was reported by the District Office of Pekanbaru City that about 2,615 units of landline telephones were connected to the population.

56. *Power Supply*. The utilization of electric power increased yearly with the increase of construction in Pekanbaru. The total numbers of customers of the State Electricity Enterprise (PLN) as reported in 2010 were 356,243. The majority (315,552) were household customers. Private offices came second at 33,362. Schools, hospitals, religious and other social facilities were 5,609. The numbers of customers in government office, streets, factories and hotels were 1,200, 357, 111, and 52, respectively. The total energy utilization was 1,315,803,189 kWH (Pekanbaru in Figures, 2011).

D. Socio and Cultural Resources

57. *Population*. Population in 2010 increased by 11.83 % or 94,980 people. The recorded population in Pekanbaru in 2009 was 802,788 persons, in 2010 the number increased to 897,768 inhabitants. Out of the 12 subdistrict in Pekanbaru Municipality, the highest population density area was Sukajadi, about 12,546 per km2, and the lowest population density was Rumbai Pesisir, 411 per km2.The demography profile of Pekanbaru can be seen in Table 4.3.

Table 4.3: Pekanbaru City Demography Profile

Sub District	Male	Female	Total	Population Density (/km2)
1. Tampan	51.817	54.343	106.160	1,775
2. Payung Sekaki	36.756	37.683	74.439	1,722
3. Bukit Raya	44.977	42.609	81.586	3,972
4. Marpoyan Damai	67.695	59.674	127.369	4,283
5. Tenayan Raya	51.311	51.183	102.494	598
6. Lima Puluh	20.993	21.766	42.759	10,584
7. Sail	11.079	11.256	22.335	6,851
8. Pekanbaru Kota	15.199	14.893	30.092	13,315
	25.743	27.246	52.989	14,093

9. Sukajadi	18.667	18.947	37.614	5,656
10. Senapelan	26.582	25.190	51.772	402
11. Rumbai	33.081	34.098	67.179	427
12. Rumbai Pesisir				
Pekanbaru City	403,900	398,888	802,788	1,270

Source: Pekanbaru in Figures, 2011

58. *Public Health and Sanitation*. Pekanbaru has a system of both public and private health care facilities in place. Overall (as of 2009), there are 4 government hospitals and 16 private hospitals, 113 private maternity/ birthing clinics, 291 private polyclinics/ pharmacies, 18 public health clinics (PUSKESMAS) and 33 ancillary public health care clinics (PUSTU). The city has a large number of medical practitioners with a wide range of skills. Staffing of the public health clinics (PUSKESMAS) and hospitals includes a total (as of 2010) of 775 doctors, 2066 nurses / midwives, 140 pharmacists, 47 nutritionists, 192 medical technicians, 26 sanitarians and 51 public health workers (Pekanbaru in Figure 2011).

59. The public health clinics serve as the front line for the treatment of common ailments, particularly contagious diseases, such as respiratory tract infections, the common cold, diarrhoea, dengue fever, etc. Those most frequently using the public health clinics are infants and children under the age of 5 years. In 2010, for instance, these public clinics reportedly treated a total number (of visits) of 889,896 infants and children under the age of five years (Pekanbaru in Figures, 2011). One of the highest disease burdens related to water and sanitation is diarrhea. It is reported in Pekanbaru in Figures 2011, the numbers of diarrhea cases treated by the public health clinics (Puskesmas) were 9,152 in 2010. This is the highest than other diseases recorded in the Puskesmas, 67%.

60. Inadequate sanitation has become a major environmental issue in Pekanbaru, particularly in the higher density areas of the inner city where the public is exposed to higher health risks. WP I Bukit Raya district, Pekanbaru City area, Sukajadi, and Senapelan are areas with high population densities. These areas are crowded with shopping centers, business, offices, industries, etc., and high density settlement areas. They typically have inadequate sanitation systems and are located along or close to the waterways. Most households in these areas and their latrines are also connected directly to the drainage system. Where septic tanks are installed, they are often of inadequate design that results in pollution of the river or groundwater.

61. Previous survey in the area indicated that virtually all households had a toilet/immediate access to a toilet/shared a toilet (99 percent), with the majority owning only one toilet (79 percent had at least one toilet), 18 percent had at least two, and 3 percent had 3. Owning more than one toilet was not restricted to the rich, and even some of the very poor had more than one. Of those who had toilets, 93 percent had a “gooseneck” toilet, another 6 percent had a flush toilet but not a “gooseneck”, and a small few still had common open pit toilets (latrine or plengsengan) About 53 percent of all households reported having a septic tank with infiltration tank, 39 percent having septic tank without infiltration tank, about 7 percent having a latrine and of those that did have them, 12 percent had more than one septic tank (Wastewater Investment Master Plan Package III Vol. 1: Final Master Plan – Pekanbaru, 2011).

62. The septic tank sludge is meant to be transported to the septage treatment facility (IPLT) at the municipal landfill site in Muara Fajar kelaruhan, 20 kilometers from the city center. Although this facility was constructed in 1997, it was only in operation for a short time. It was renovated in 2006, but soon ceased to operate effectively. Therefore, the sludge is usually

disposed to the nearest waterway or to another site leased by the truck operators. Residents can ask a private operator to provide a vacuum truck to desludge their septic tank. There are several sludge suction companies, but only three are registered. During the rainy/wet season, each vehicle makes 2-3 trips/day, but only 1 trip at the most during the dry season.

63. *Education*. Information about educational facilities was obtained from the Statistic Institution of Pekanbaru. The most common type of schools in Pekanbaru is the private Islamic schools that are categorized into four: Diniyah/Awaliah, Ibtidaiyah, Tsanawiyah and Aliyah. For each of the categories the numbers of registered schools in 2010/2011 were 314, 13, 21 and 10, respectively (Pekanbaru in Figures, 2011). There are a few universities in Pekanbaru, Riau University is one of the biggest with about 39,000 students registered in 2010/2011. The university students are still dominated by males. Female students were only about half in number of their counterparts. There are five other listed universities namely, the Islamic University of Riau, Lancang Kuning University, State University of Islamic (UIN) Sultan Syarif Qasim, Abdurrab University and Open University. There are also about a dozens of privately held vocational training schools and 18 others academies and polytechnics (Pekanbaru in Figures, 2011).

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

64. A comprehensive screening for environmental impacts is made through a review of the parameters associated with sewerage projects against the components of the proposed Pekanbaru City's sewerage subproject and the environment where the facilities will be located. A screening checklist was developed to help identify which topics do not require further attention.

65. The assessment is made on the following phases of the Pekanbaru City subproject: (i) pre-construction; (ii) construction; and (iii) operation and maintenance. Results of the environmental impacts screening are summarized in Table 5.1, while the discussions of each issue are presented in the succeeding sections. In Table 5.1, impact types and magnitudes are indicated for both impacts without the mitigating measures and the resulting situations when mitigating measures will be implemented. The screening table uses the symbols "+" for positive impacts and "**–** "for negative impacts. Symbols for impact magnitudes are "∆" for insignificant and "●" for significant. The symbol for an insignificant negative impact is "∆ **–"**, while a significant negative impact is "● **–**". The second column of the table indicates the type and magnitudes of the impacts without any mitigating measures being applied. Some impacts have already insignificant magnitudes even without mitigations and mitigating measures are therefore no longer required. The last column of the table indicates the expected impact magnitude after applying the mitigating measures. Hence, a significant negative impact (● **–**) will become insignificant (∆) after applying the mitigating measures. A summary of the environmental impacts and mitigation measures that should be carried out are detailed in the Environmental Management Plan (EMP) at the end of this section as Table 5.2.

66. Environmental impacts arising from decommissioning of the proposed Pekanbaru City sewerage facilities were also reviewed but are no longer further discussed due to the following: (i) decommissioning of facilities is a remote possibility since these will serve growing urban areas and such facilities are critical for sustaining those areas, (ii) residual waste cleanup is not a major concern since the facilities are not industrial manufacturing plants with potential problems for toxic and hazardous wastes, and (iii) solid wastes from decommissioning is also not a major concern since the WWTP structures are mostly made of reinforced concrete and earth materials. Solid wastes from decommissioning will mostly be recyclable materials such as broken concrete materials, plastic pipes, reinforcing steel bars used in the structures, structural steel, roofing materials, electrical wires, earth materials, etc. A decommissioning plan is appropriately prepared after several years have elapsed after commissioning and by that time, more information regarding operations of the proposed Pekanbaru City sewerage facilities are available.

Table 5.1: Summary of Environmental Impacts Screening for Pekanbaru City Subproject

Environmental Impacts and Risks	Without Mitigation	With Mitigation
PRE-CONSTRUCTION PHASE		
Climate change vulnerability (design aspect)	● –	∆
Climate change mitigation (design aspect)	● –	∆
Conformance to spatial planning	na	na
Encroachment to environmentally sensitive areas	na	na
Impacts and risks to biodiversity conservation	na	na

Environmental Impacts and Risks	Without Mitigation	With Mitigation
Potential nuisance and problems to the public	● −	Δ
Potential damage to archaeological and cultural assets	● −	Δ
Loss of assets (IR concerns)	● −	Δ
CONSTRUCTION PHASE		
Modification of construction site topography	na	na
Removal of Trees	na	na
Displacement of Rare or Endangered Species	na	na
Potential damage to archaeological and cultural assets	● −	Δ
Soil erosion and sediments of construction sites	● −	Δ
Noise from construction equipment	● −	Δ
Local air pollution due to construction activities	● −	Δ
Oil and other hazardous materials releases	Δ −	Δ
Vehicular traffic congestion and public access	● −	Δ
Hazards to public due to construction activities	● −	Δ
Pollution and health risk due to workers camp	● −	Δ
Occupational health and safety at work sites	● −	Δ
Increase employment opportunity in work sites	● +	● +
Improper closure of construction sites	● −	Δ
OPERATION AND MAINTENANCE PHASE		
Pollution due to discharge of poor quality effluents	● −	Δ
Noise and dust pollution from WWTP and pumping station	Δ −	Δ
WWTP sludge disposal	● −	Δ
WWTP's foul odor off-site migration	● −	Δ
Toxic waste generation	na	na
Pollution to groundwater	● −	Δ
Drowning risk in pond and tanks	● −	Δ
Health and safety risk in sewerage system operation	● −	Δ
Increase employment opportunities	● +	● +

Legend: n.a. = not applicable; Δ = insignificant; ● = significant;
+ = positive; - = negative

A. Design/Pre-Construction Phase Considerations

67. *Climate Change Vulnerability*. Climate change adaptation considerations shall be included in the design of Pekanbaru's proposed WWTP at Rejosari since it is in close proximity to Siak River. Changes in the intensity of extreme weather events as well as gradual changes in climate parameters such as precipitation can be damaging to the proposed WWTP. Inadequate attention to this impact can increase the long-term costs of sewerage investments for Pekanbaru City and increase the likelihood that such investments will fail to deliver the benefits for which they were intended. Flooding could affect the structural integrity of the proposed WWTP. Flooding can also prevent the WWTP from operating by reducing the head available across the plant. It may also submerge facility

components that are supposed to be dry for proper operation. These situations may result to the release of untreated sewage into the environment and increase the risk to public health.

68. To appropriately address this impact, a hydrology and flooding study shall be conducted for the proposed site of Pekanbaru City's WWTP at Rejosari during the design phase to ensure that occurrence of flooding is properly evaluated. Results of the study shall be used for designing the proposed WWTP and the preparation of engineering specifications to ensure that it is less vulnerable to extreme flood events. Consultants who will prepare the study shall use the official climate change projections of GOI's Climatology Meteorology and Geophysics Agency, the Badan Meteorologi, Klimatologi, dan Geofisika (BMKG).

69. *Climate Change Mitigation*. Climate change mitigation considerations shall be included in the design of Pekanbaru City's WWTP at Rejosari to control greenhouse gas emissions. The membrane covered anaerobic ponds shall be connected by pipework to a flare and avoid releasing the generated methane from the ponds. However, during detailed design, potential use of the generated methane shall be evaluated with due considerations to the financial and economic factors.

70. *WWTP Site's Conformance to Spatial Plan*. There is no problem with spatial planning for the proposed Pekanbaru City's WWTP at Rejosari. Pekanbaru City's Badan Perenanaan Pembangunan Daurah (BAPPEDA) confirmed that the proposed WWTP site conforms to Pekanbaru City's Spatial Plan. BAPPEDA is the local government agency responsible for planning. It is tasked with the preparation and implementation of the city's development plans and policies.

71. *Encroachments to Environmentally Sensitive Areas*. There will be no encroachments to environmentally sensitive areas. The sewer network and the proposed Pekanbaru City's WWTP at Rejosari will be located in the urban areas of Pekanbaru City. The proposed WWTP will be constructed in a site that has been transformed into its present agricultural landscape over the years. These sites are not within undisturbed landscapes. The proposed primary secondary sewer lines will pass through main city streets, while the tertiary sewer lines will be installed in the streets of built-up areas.

72. *Impacts and risks to biodiversity conservation*. The issue on impacts and risks to biodiversity conservation is not applicable to the Pekanbaru City subproject since its components will not be located in an areas that have concerns on biodiversity conservation. The sewer network will be located in built-up areas. The areas surrounding the proposed Rejosari WWTP site are not undisturbed and over the years the ecological changes due to human activities in the area have resulted to its present agricultural landscape.

73. *Nuisance and Problems to the Public*. Potential nuisances and problems to the public during construction of the proposed Pekanbaru City sewerage system can best be avoided if proactively addressed during detailed design and pre-construction phase. During detailed design, when the final sewer line alignments are available, consultation and information dissemination to potentially affected people shall be done. Tender documents for the proposed Pekanbaru City sewerage system shall include provisions addressing potential nuisances and problems to the public during construction. These include environmental management provisions on the following issues: (i) erosion and sediment runoff, (ii) noise and dust, (iii) vehicular traffic, (iv) construction wastes, (v) oil and fuel spillages, (vi) construction camps, and (v) public safety and convenience. These shall also be reflected in the bidding and construction contracts of the proposed sewerage system.

74. During detailed design, construction methods that avoid excavations of the entire proposed sewer alignment, such as pipe jacking and micro-tunneling, shall be evaluated for their applicability (with consideration also to cost implications) to streets with heavy commercial activities.

75. Pipe jacking is a trenchless technique for installing underground pipelines by tunneling. Powerful hydraulic jacks are used to push the pipes through the ground behind a shield at the same time as excavation is taking place within the shield. Microtunneling is also a trenchless pipeline installation technology that uses a remotely controlled small tunnel boring machine combined with pipe jacking technique to directly install pipelines underground, such as sewer lines, in a single pass. This has been a proven sewer line installation method for various soil conditions.

76. *Potential Damage to Archaeological and Cultural Assets*. At present, there are no information of any archaeological and cultural assets that may be affected by excavations works of the proposed sewer lines and the proposed Rejosari WWTP. Nevertheless, precautions will be taken to avoid potential damage to any archaeological and cultural assets by inclusion of provisions in tender and construction documents requiring the contractors to immediately stop excavation activities and promptly inform the local authorities and the Balai Arkeologi Medan (Medan Archaeological Research Office) if archaeological and cultural assets are discovered. This office also covers the area of Pekanbaru City.

77. *Loss of Assets*. Inventory of losses for the proposed Pekanbaru City subproject was made during the planning phase and shall be updated during detailed design phase as soon as the final pipeline alignments and final locations of facilities are available. A plan for compensation and other assistance (separate from this IEE) corresponding to the losses of the affected people was prepared under the PPTA. All payments to affected parties shall be made before the start of construction activities. There will be no people to be physically displaced or resettled.

B. Construction Phase Environmental Impacts

78. *Site Preparation*. Construction of the proposed Pekanbaru City sewerage system will not involve significant modification of the construction site topography. The proposed Pekanbaru City's WWTP site at Rejosari will only be backfilled by a meter high. Sewer lines installation will not involve changing the topography of the surrounding area. This issue is therefore considered not significant. Removal of trees will not be an issue due to the following: (i) site for proposed Rejosari WWTP is an agricultural area and (i) sewer lines will be installed along the right-of-way of existing roads. The issue on displacement of rare or endangered species is not applicable since there are no known rare or endangered species within the proposed site of the site of the proposed WWTP at Rejosari.

79. *Potential Damage to Archaeological and Cultural Assets*. During construction, excavation activities of the proposed sewer lines and the proposed WWTP at Rejosari have the potential to damage archaeological and cultural assets that lay undiscovered below the ground. Although at present there is no information of any archaeological and cultural assets that may be affected by excavations works, this potential impact requires precautionary measures.

80. Mitigation. An effective approach to avoid potential damage to any archaeological and cultural assets during the construction phase is the inclusion of provisions in construction documents requiring the contractors to immediately stop excavation activities and promptly inform the local authorities and the Balai Arkeologi Medan (Medan Archaeological Research Office) if archaeological and cultural assets are discovered.

81. *Soil Erosion and Sediment of Construction Sites*. During rainy periods, exposed soil at the construction sites for sewer lines can easily be washed away by runoff and carried to the natural drainage system. Construction of embankments for the Rejosari WWTP is a potential source of sediments and can easily release soil materials to Siak River and surrounding area if not provided with sediment control. During rainy periods, soil materials from embankment sections that are not yet stabilized can easily be carried by runoff to the Siak River.

82. Mitigation. Control of the surface runoff is necessary in preventing erosion. The contractor shall be required to use structural erosion prevention and sediment control practices which will divert the storm water flows away from the exposed areas, prevent sediments from moving offsite, and reduce the erosive forces of runoff waters. These may include the following: (i) small interceptor dikes, (ii) pipe slope drains, (iii) grass bale barriers, (iv) sediment traps, and (v) temporary sediment basins. Whenever possible, total exposed area shall be minimized.

During construction of embankments for the ponds of the Rejosari WWTP, the following shall be required in order to control erosion: (i) construction of all permanent erosion control features as soon as practical, such as riprap, and (ii) provision of erosion control blankets for sections not yet stabilized.

83. *Construction Noise*. Trucks and construction equipment, which can generate noise of 80 dB(A) from a distance of 30 meters are the potential sources of noise during construction of the Rejosari WWTP and sewer lines. The issue is mostly applicable in the trench excavation activities for the sewer line installation since the lines will pass through built-up areas with establishments and houses.

Mitigation. Nuisance from equipment noise can be mitigated with the use of sound suppression devices for the equipment. In areas near houses or noise-sensitive sites, noisy equipment shall not be operated during nighttime to early morning (19:00H – 06:00H). Noise levels due to construction activities should not exceed 55 dB(A) near schools and residential areas as mandated by GOI's Decree of Environment Ministry No.48/1996. Temporary noise barriers shall be used in areas determine by PPIU's supervising engineer. Workers using noisy equipment shall be provided with ear plugs.

84. *Local Air Pollution Due to Construction Activities*. During dry periods, dust generation can be expected from activities associated with the construction of the Rejosari WWTP and the sewer lines such as trenching, earthworks, and soil preparation. Intermittent episodes of localized air pollution from smoke belching equipment may also occur. Other potential sources of air pollution are large stockpiles of construction materials such as soil and aggregates. Without any mitigating measures, dust generation could be problematic during dry periods. This issue is important for the proposed sewer lines installation by trenching along the roads since the sites will be excavated.

85. Mitigation. The contractor should be required to perform regular water spraying of the sites during dusty periods in order to reduce the generation of dusts. He will also be

required to use equipment that are properly maintained and are not smoke belchers. Covers for stockpiles of soil and aggregates that will be left idle for a long time shall be required. Covers will prevent dust generation due to wind action. Trucks transporting loose construction materials such as sand, gravel, spoils, and the like shall be provided with tarpaulin cover. This requirement is particularly important in the hauling of backfill materials for the proposed Rejosari WWTP due to the significant number of hauling trips.

86. *Oil and other hazardous materials releases*. Presence of oil products and other hazardous materials are expected in sewerage construction. These include fuel, oil, grease, paints, and solvents. These materials are associated with operation of the construction heavy equipment and vehicles and various construction activities. Some of these materials may accidentally be released to the environment. However, the issue is considered less significant since expected quantities will be relatively small for sewerage construction.

87. However, as part of good construction practice, the contractors will be required to implement an awareness program for all workers regarding the prevention and management of spills and proper disposal of used containers. Fuel and oil shall be stored in a designated secured area provided with an impermeable liner to prevent the accidental spills from seeping into the ground.

88. *Vehicular Traffic Congestion and Public Access*. Installation of sewer lines may cause traffic congestion in heavily traveled roads and narrow streets. It may hinder public access. Sewer lines installation in narrow streets may cause the temporary total closure of the road and will lead to traffic congestion in the area.

89. While sewer line construction in wide streets, such as Jalan Setia Budi, could easily be managed with regards to traffic congestion and pedestrians' access to the area, the same could not be said of narrow roads with heavy commercial activities, such as the Jalan Melur. Transport of backfill materials for the proposed WWTP site may also cause traffic congestion along Jalan Sumber Sari if not properly managed.

90. Mitigation. Contractors shall be required to: (i) prepare a traffic plan and (ii) closely coordinate with local authorities for the closure of roads or rerouting of vehicular traffic, and (iii) ensure access in areas with excavations by provision of secured walkways, provision of access between mounds, steel plates for vehicle passage, expedite works in front of shops, and provide signs to direct the pedestrians to access areas. Timing of construction activities in any sites should consider the schedules of local activities with heavy presence of people such as festivities, processions, parades, etc.

91. As discussed in the pre-construction section, construction methods that avoid excavations of the entire proposed sewer alignment, such as pipe jacking and micro-tunneling, shall be evaluated during detailed design for their applicability (with consideration also to cost implications) to streets with heavy commercial activities such as in Jalan Jenderal Ahmad Yani.

92. *Hazards to public due to construction activities*. Hazards to the public associated with construction activities for the proposed Pekanbaru City's sewerage system are expected since sewer lines shall be constructed in roads. Hazardous driving conditions maybe created in sewer line installation by trenching since vehicles would still be using the road while construction activities are ongoing. The movement of construction vehicles and excavations would pose some hazards to the driving public. There is also risk of people falling down in open trenches since trenches are normally left uncovered until pipeline

testing is completed. There is always a potential for hazardous situations since sewer line installation by trenching will require wide trenches in order to accommodate the large sewer pipes.

93. Mitigation. The contractor shall be required to implement a road safety plan incorporated in his proposed construction methodology. Safety measures shall be implemented including: (i) warning signs to alert people of hazards around the construction sites, (ii) barricades, and (iii) night lamps for open trenches. Provision of these measures shall be included in the construction contract specifications.

94. *Pollution and Health Risk due to Workers Camp*. The contractor is expected to erect temporary workers' camps during construction of the Pekanbaru City's sewerage system. Improperly managed silt runoff and sanitary wastes from these camps may reach nearby areas. Poor sanitation and lack of proper solid waste management at the worker's camp will provide the conditions for vermin and other disease vectors to easily multiply and infect the workers. This may lead to the transmission of diseases from the workers camp to other areas. These conditions will increase public health risk. Areas near the site of the proposed WWTP are potential areas for workers camp.

95. Mitigation. The construction contractor shall be required to: (i) install proper sanitary facilities to prevent the indiscriminate discharge of sanitary wastes at the camps surroundings, (ii) implement proper solid waste management, and (iii) prevent surface runoffs from flowing into the workers camps to avoid carrying away any contaminants. The contractor shall be required to use temporary diversion drains, catch drains, and silt-traps at these camps.

96. *Occupational Health and Safety at Work Sites*. Construction hazards are expected in the implementation of the proposed WWTP, pumping station, and sewer lines. Hazards may exist in all construction sites in many different forms such as sharp edges, falling objects, flying sparks, chemicals, noise and various potentially dangerous situations. Good practices in construction occupational health and safety requires that employers protect their employees from workplace hazards that can cause injury.

97. Mitigation. Contractors shall be required to address the issue on occupational health and safety at the construction sites by: (i) implementing a construction site health and safety management plan, (ii) ensuring that an equipped first aid station is available at all times, (iii) providing the workers with potable water and adequate sanitation facilities, (iv) providing the workers with clean eating areas, and (v) providing the workers with personal protective equipment (PPE) to minimize exposure to a variety of hazards.

98. The construction site health and safety management plan (CSHSMP) will provide guidance to the contractors' staff on how good work practices can be carried out on every activity in the construction site to prevent accidents to the workers and the general public. This shall include, among others, emergency procedures and the required resources, clear description of responsibilities and management, specific requirements of occupational health and safety policies and regulations, training requirements, and site safety rules.

99. However, establishing and maintaining a safe and healthful work environment requires responsibilities from both the contractors and their workers. In general, contractors are responsible for: (i) performing a "hazard assessment" of the workplace to identify and control physical and health hazards, (ii) identifying and providing appropriate PPE for employees, (iii) training employees in the use and care of the PPE, (iv) maintaining PPE, including

replacing worn or damaged PPE, (v) periodically reviewing, updating and evaluating the effectiveness of the PPE program. Workers should: (i) properly wear PPE (ii) attend training sessions on PPE, (iii) care for, clean and maintain PPE, and (iv) inform a supervisor of the need to repair or replace a PPE.

100. *Increase Employment Opportunities at Work Sites*. Considerable number of workers will be required for the various construction activities of the proposed Pekanbaru City's sewerage system. The impact would be beneficial and significant since employment opportunities in the area will increase for a few years during the construction period.

101. Enhancement. Whenever possible, the contractor shall be required to use the available local labor for these construction activities. The recruitment of workers shall be coordinated with the local officials and Pekanbaru City's LPMU.

102. *Improper Closure of Construction Sites*. Construction activities of the proposed Pekanbaru City's sewerage system are expected to generate construction solid wastes during construction and after completion of work. This may include used wood materials, steel works cuttings, paint and solvents containers, used oil from equipment, unused aggregates, etc. If not remove from the sites after completion of the construction activities, these solid wastes will cause aesthetic problems and some will be potential sources of contaminants for surface runoffs. Due to the large pipe diameters, considerable amount of surplus excavated soil will be generated by the sewer line construction.

103. Mitigation. After completion of work activities, the contractor shall be required to remove the construction wastes from the sites before finally leaving them. The entire sites must be free of any construction solid wastes. Implement the required surface restoration. All surplus excavated soil shall be disposed away from the built-up areas to sites approved by the PPIU. Design of disposal sites shall also be approved by the supervising engineer. It will be the contractor's responsibility to identify suitable sites for disposal of the surplus excavated soil. To ensure the timely removal of the surplus materials associated with the installation of the sewer lines, disposal of surplus excavated soil materials shall be keep abreast with the progress of the construction activities.

C. Operation Phase Environmental Impacts

104. *Discharge of Poor Quality Effluents*. The proposed Pekanbaru City's Rejosari WWTP may produce low quality effluents due to operational problems. This situation may happen if the proposed WWTP is: (i) not operated according to its design parameters and (ii) in emergency situations such as lack of power supply for an extended period of time. These situations will lead to poor operational performance and will produce low quality effluents not complying with effluent regulations.

105. Mitigation. The WWTP shall be operated according to its design parameters in order to produce effluent quality satisfying the national and provincial effluent quality standards. The relevant maximum standards for main parameters are: 50mg/l of BOD, 100mg/l of suspended solids, and 10mg/l of fats and oil. The implementing unit of the proposed Rejosari WWTP shall ensure that its plant operators are properly trained in operating the facility and in handling situations that may lead to poor quality effluents.

106. The requirement for properly trained operators cannot be overemphasized since the proposed Rejosari WWTP is not a sophisticated system that relies on continuous online performance monitoring instruments. The newly hired Rejosari WWTP operators shall undergo a one month hands-on training in an existing WWTP facility. In addition, a WWTP advisor shall be provided intermittently during the initial 3 months of operation. The WWTP advisor shall provide advisory services for a full-week and every other week within the 3-month period. This type of advisory services is very important since the WWTP will be in the start-up phase and also to correct any undesirable operating practices of the newly hired operators.

107. Operating manuals shall be provided to help ensure that the plant is operated as design. Operating manuals shall also guide the operators in handling emergency situations. WWTP design shall consider the reliability of power supply to the mechanical equipment. This is an important aspect of the proposed Rejosari WWTP since its aerobic process will be dependent on the continuous supply of power to the mechanical equipment.

108. Another prevention measure is to prevent the discharge of industrial wastes into the sewer lines. Industrial waste will affect adversely affect the biological processes in the Rejosari WWTP and could lead to poor effluent quality. This can be done by implementing a local regulation preventing the discharge of industrial wastes into the sewer lines.

109. *Noise and Dust Pollution of WWTP and Pumping Station*. Noise of the proposed WWTP will not be an issue during operation since there will be no sources of significant mechanical noise within the site. In addition, potential sources of noise, such as pumps, blowers and mounted aerators are inherently provided with enclosures that provide noise attenuation. There will be no operational activities that will cause dust generation. Additional mitigating measures are therefore not necessary for noise and dust pollution.

110. *Disposal of Sludge from WWTP*. Operation of the WWTP will generate sludge from the treatment processes. The sludge has to be removed regularly to maintain good operational performance. The sludge cannot simply be disposed without proper treatment since it may cause land pollution. However, the frequency of desludging for the Rejosari WWTP could be once every 10 years since an allowance is provided in the design concept to allow sludge accumulation for better digestion and avoid frequent desludging.

111. Mitigation. Initially, a sludge dewatering system is not necessary for the first 10 years of operation with the built-in allowance for sludge accumulation. When desludging will finally be done, sludge from the proposed WWTP shall be directed to a sludge dewatering system such as a drying bed or a mechanical dewatering machine. Dewatered sludge shall be hauled and applied to farm lands. However, during detailed design, a biosolids program for the WWTP shall be developed by adopting appropriate standards from other countries since Indonesia does not have biosolids management standards for WWTPs.

112. *WWTP's Foul Odor Off-site Migration*. Operation of the Rejosari WWTP has the potential for generating foul odor that may be carried off-site. Hence, there is a need to prevent the foul odor from escaping the process units and migrating off-site. Potential sources of odor under normal operating conditions are the anaerobic ponds and the lack of air input to the aerobic units under extended power failures.

113. Mitigation. Mitigations shall include the following: (i) anaerobic pond shall be covered with a polymer (such as "Hypalon") to capture odor and biogas for flaring (to minimize the escape of methane gas), (ii) close monitoring of the aerobic units to ensure the

conditions are not anaerobic (without enough oxygen), (iii) landscaping with trees and shrubs around the facility shall be done to position them as wind breaks, and (iv) conduct of WWTP's annual odor audit to identify operational measures that can prevent odor problems.

114. The role of reliable power supply to the mechanical equipment is very important in ensuring adequate odor control and management. The lack of power supply will cause the lack of air input to the aerobic units. If the situation persists for an extended period of time, the resulting anaerobic (without enough oxygen) condition will generate foul odor. During detailed design, it is therefore necessary to carefully evaluate the need for providing emergency electrical power supply to the proposed Rejosari WWTP.

115. *Toxic waste generation*. Operation of the proposed Rejosari WWTP will not generate any toxic wastes under normal operating conditions. The operation is simply the use of physical and biological processes for treating domestic wastewater.

116. *Pollution to Groundwater*. Wastewater of the proposed Rejosari WWTP may seep into the ground from process units, such tanks and ponds if these facilities are not impermeable.

117. Mitigation. Concrete tanks process units shall be design and constructed as impermeable containers. Wastewater treatment ponds of the proposed Rejosari WWTP shall be design and constructed with impermeable plastic liners.

118. *Drowning Risk in WWTP Tanks and Ponds*. The potential for drowning always exists when large tanks and ponds are filled with liquid. Persons and animals falling in the tanks and ponds of the proposed Rejosari WWTP can drown easily since these are deep facilities.

119. Mitigation. To reduce the risk of drowning in the tanks and ponds, Rejosari WWTP shall be: (i) provided with a safety station with a pole, rope, and flotation device in a visible, well-marked location along the berms, (ii) posted with warning signs indicating that the tanks and ponds are deep and that dangers exist, (iii) provided with at least a five-foot-high fence to keep people and animals away, and (iv) provide security personnel to guard the facility.

120. *Health and Safety Risks in Sewerage System Operation*. Operation of the proposed Pekanbaru City sewerage system has an associated health risk to the workers and the public since sewage is an infectious material. It can cause disease if ingested or if it comes in contact with broken skin. Accidents involving sewage spills at the proposed WWTP can seriously threaten the health and safety of the personnel.

121. Workers' safety at proposed Rejosari WWTP relative to the generation of biogas should not be taken lightly. The anaerobic process unit in the WWTP, the anaerobic pond, will generate biogas. Methane in biogas forms explosive mixtures with air. Flammable gases, such as methane, have a lower explosive limit (LEL) and an upper explosive limit (UEL). The LEL is the lowest concentration (in percentage of total volume) of a gas in a mixture with air capable of producing a flash of fire in the presence of an ignition source such as arc or flame, while the UEL is the highest concentration. Methane has an explosive range of 5% to 15%. Explosive mixture of methane gas may accumulate in confined spaces. Another potential risky situation will be the use of chlorine gas as disinfectant of the final effluents. Accidents may occur with chlorine gas handling.

122. Mitigation. Facility hazards identification shall be conducted during the initial operation phase of the Pekanbaru City sewerage system and updated as necessary. Due to the possibility of methane gas accumulation in confined spaces, hazards identification associated with methane shall be given more attention. A written facility health and safety manual shall be prepared to address the prevention, reduction and control of occupational injury and illness of Pekanbaru City sewerage system operation. The manual shall among others: (i) clearly identify conditions that may cause acute workers health and safety problems, (ii) specific requirements that all workers should comply, (iii) include management of spills, and (iv) specify training requirements for health and safety. All workers should have the authority to stop any work if they observe any unsafe conditions that present imminent danger, particularly injury. Utmost care should be taken to avoid sewage spills. Workers shall be trained on health and safety aspects of handling sewage spills. The public should be kept away from the proposed Rejosari WWTP. A five-foot-high fence shall be provided to keep people away from the Rejosari WWTP.

123. For methane management, the Rejosari WWTP shall be provided with a portable digital gas analyzer capable of detecting methane and carbon dioxide. This instrument shall provide sampling and analysis of gas composition in percent by volume of methane, carbon dioxide, oxygen, percent LEL of methane, and temperature. Standard gas safety devices, such as flame arresters and pressure relief valves shall be installed at appropriate locations to be determined during detailed design.

124. To reduce the risk of accidental exposure to chlorine gas, a separate chlorine gas building shall be provided. Use of sodium hypochlorite (NaOCl), the liquid form of chlorine, shall be evaluated during detailed design for its applicability instead of chlorine gas with consideration on its availability in Indonesia. NaOCl is inherently a safer disinfectant.

125. *Increase Employment Opportunities*. Operation and maintenance of the proposed Pekanbaru City's sewerage system will definitely require a number of workers. The impact would be beneficial since there will be additional employment opportunities in the area.

126. Enhancement. Operating unit of the sewerage system is expected to implement a manpower development program of its workforce. This will help ensure in providing good service to the public and the proper maintenance of its assets.

127. *Cumulative Effects*. Cumulative effects generally refer to impacts that are additive or interactive in nature and result from multiple activities over time. In the case of the Pekanbaru City subproject, the cumulative effect would be its organic and nutrient load to Siak River, the WWTP's discharge point. The cumulative positive effect of the proposed Pekanbaru City sewerage system is the reduction of the total organic and nutrient loads to the river since it will capture a significant portion of the domestic wastewater that presently find its way to the river. This effect highlights the role of the proposed sewerage system as an environmental improvement infrastructure.

128. After impacts screening, Table 5.2 lists the environmental impacts and risks that requires mitigation and shall be carried to the EMP Section.

Table 5.2: Environmental Impacts and Risks for Inclusion in EMP of Pekanbaru City Subproject

Environmental Impacts and Risks	Without Mitigation	With Mitigation

Environmental Impacts and Risks	Without Mitigation	With Mitigation
PRE-CONSTRUCTION PHASE		
Climate change vulnerability (design aspect)	● −	Δ
Climate change mitigation (design aspect)	● −	Δ
Potential nuisance and problems to the public	● −	Δ
Potential damage to archaeological and cultural assets	● −	Δ
Loss of assets (IR concerns)	● −	Δ
CONSTRUCTION PHASE		
Potential damage to archaeological and cultural assets	● −	Δ
Soil erosion and sediments of construction sites	● −	Δ
Noise from construction equipment	● −	Δ
Local air pollution due to construction activities	● −	Δ
Oil and other hazardous materials releases	Δ −	Δ
Vehicular traffic congestion and public access	● −	Δ
Hazards to public due to construction activities	● −	Δ
Pollution and health risk due to workers camp	● −	Δ
Occupational health and safety at work sites	● −	Δ
Increase employment opportunity in work sites	● +	● +
Improper closure of construction sites	● −	Δ
OPERATION AND MAINTENANCE PHASE		
Pollution due to discharge of poor quality effluents	● −	Δ
Noise and dust pollution from WWTP and pumping station	Δ −	Δ
WWTP sludge disposal	● −	Δ
WWTP's foul odor off-site migration	● −	Δ
Pollution to groundwater	● −	Δ
Drowning risk in pond and tanks	● −	Δ
Health and safety risk in sewerage system operation	● −	Δ
Increase employment opportunities	● +	● +

Legend: Δ = insignificant; ● = significant; + = positive; - = negative

VI. INFORMATION DISCLOSURE, CONSULTATION, AND PARTICIPATION

129. Ensuring subproject success requires meaningful stakeholders' consultation and participation. Activities for information disclosure, public consultation, and public participation are part of the overall planning, design process, and construction of the proposed Pekanbaru City's sewerage system subproject.

130. During preparation of the Pekanbaru City's Wastewater Investment Master Plan in 2011, information regarding the proposed sewerage subproject was disclosed to the public during the conduct of a willingness to pay survey for sanitation services. Subproject information was also disclosed in focus group discussions (FGDs) conducted as part of the activities for the master plan.

131. *Public Consultation*. Last 22 October 2012, Pekanbaru City's BAPPEDA conducted an initial public consultation and formally discussed the proposed sewerage subproject with the stakeholders and requested their views. A total of 26 stakeholders and representatives participated.

132. These are the stakeholders from those areas living near the WWTP, community leaders, non-government organizations, and officials of various government offices. Stakeholders expressed support to the proposed sewerage system. Summary of the consultation outcomes is presented in Table 6.1, while the documentations are presented at the appendices.

133. Representative of Badan Perenanaan Pembangunan Daurah (BAPPEDA) explained that the purpose of the public consultation is to seek advice and opinions from the participants about the city's sanitation development project plan under MSMIP. BAPPEDA gave a "powerpoint" presentation of the proposed sewerage subproject. It was explained that the location at Rejosari was selected against other alternative sites. It was mentioned that the proposed unit to operate the sewerage system will initially be a Unit Perlaksan Teknis Daerah (UPTD) which will be upgraded later to a Badan Layanan Umum Daerah (BLUD).

134. After the presentation, the participants were encouraged to ask question and raise their concerns. Participants from Tanjung Rhu Village and Suma Hilang Village are expecting this subproject to be implemented because their area is very densely populated and it is difficult to build a septic tank. They expressed their support to the proposed sewerage system since it will improve environmental health .They also mentioned that their wells may be polluted by seepages from septic tanks. The proposed sewerage system will therefore help address these problems. A participant asked if hospital wastes will also be accommodated by the proposed WWTP. It was explained that hospital wastes will not be accommodated by the proposed WWTP and hospitals are required by law to have their own WWTP.

135. Some environmental issues that were raised include odor from the WWTP operation, WWTP impact to their wells, impact to Siak river water quality, and excavation materials along the road. Participant from an NGO asked where to bring their complaints about the odor from proposed WWTP. It was explained that a properly operated WWTP will not generate any odor and impact to environment can be minimized. The WWTP effluent to be discharged to the river will comply with the government standards. Copies of the proposed grievance redress mechanism were distributed during the meeting and participants were

requested for their reactions. These proposed grievance redress mechanisms are for environmental complaints during construction and another mechanism for involuntary resettlement. It was also explained that the city government has mechanism for receiving complaints.

136. A government sector representative asked whether proposed WWTP site is consistent with the city's spatial planning. BAPPEDA explained that the planning was coordinated with the Spatial Planning Agency and the WWTP location has been included in the RTRW/Spatial Planning of Pekanbaru City.

137. The need to conduct public information campaign to every district, village, local community, and women organization were discussed and some participants wanted to help in this activity. BAPPEDA promised to conduct more public information campaign and public consultation will be held directly to the communities.

Table 6.1: Summary of Consultation Outcomes

Group Represented	Issues/ Concerns Raised	Project's Response
Tanjung Rhu Village	• Local residents are expecting this program to implement because their area is densely populated, it is difficult to build septic tanks	• The location had been selected in view of various considerations. Originally there were 3 alternative locations. Alternative 2 was crowded by inhabitants requiring enormous land acquisition. The alternative 3 was close to pond and local inhabitants had no houses. The existing land use would be more prioritized for Rusunawa (Rental Low Cost Apartment). The remaining choice was only alternative 1 in Kelurahan Rejosari, 20 ha, RT 02/RW 02, consisting of 20 ha land. This option was also suitable for further expansion of the plant in future. • One purpose of this meeting is to know if there are objections from local residents to this program • IPLT has different function from IPAL. The former is to treat sludge taken from septic tank. If the houses have septic tanks there must be IPLT facility to
NGO, Forum Kota Sehat	• Wastewater Treatment Plant (IPAL) or Septage Treatment Plan (IPLT?)? What is the difference of these two facilities? • Of three alternative WWTP sites, which one would be selected? Why alternative 1 was selected? • The customers would be charged for some fees.	

Group Represented	Issues/ Concerns Raised	Project's Response
	What will they receive for in return?	treat its wastewater. Meanwhile, IPAL is to treat water from toilet or known as black water and from bathing or washing or cooking known as grey water. This grey water is thus far directly disposed to drainage. It is not a hygienic practice. If IPAL is built, all domestic wastewater must be drained to this treatment facility.
Suma Hilang Village	Will hazardous waste of hospitals be accommodated in the proposed WWTP?	Hospital wastes will not be accommodated by the proposed WWTP due to the nature of their wastes. Hospitals are required by law to have their own WWTP
Tanjung Rhu Village (near the Rejosari WWTP site	At present we use drilled well (20-30 m) for our clean water with some having depth of 60 m. What is the impact of the WWTP to our wells?	The WWTP will be impermeable and will not disturb the surrounding environment. There is also monitoring well to check the quality of well water closed to the plant.
Tanjung Rhu Village (near the Rejosari WWTP site	Many children play in the surroundings of WWTP site. Will this plant generate unpleasant odor to the nearest houses?	Do not worry about the unpleasant odor. If properly operated a WWTP will not generate any odor. The odor will be similar to smell of paddy field. You can see by yourself in communal WWTP (Sanimas, etc). With good management these facilities produce no odor. Today, many WWTPs are built in city centers and residential zones as found in Bangkok, Malaysia, and Australia.
Community Leader closed to WWTP site, Tanjung Rhu Village	How is the distance of WWTP site to river Siak? Too close proximity will cause environmental destruction	The quality of river will not be disrupted. The water discharged to river will be first treated until complying with government standards.

Group Represented	Issues/ Concerns Raised	Project's Response
Working Group AMPL	• Is there any provincial representative invited in this consultation? • Consultants can assist socialization, not only for FGD in 10 kelurahan/ villages only. The local persons must be prepared. Only few land owners attend this consultation.	There is Coordination with the provincial government and this is continuously being done. There will be socialization. AMDAL will be prepared by IndII and also the DED.
NGO, Forum Kota Sehat	• The local government needs to conduct public socialization about this planned WWTP. What kind of structures to be built? Will it consist of pipes only? • Will the affected persons receive compensation if their fences or land affected by the program? • Pipe or cable construction leaves excavation material along the road. What's about the development of this wastewater pipes?	• Not only pipes, there will be other fixtures for these wastewater pipeline networks such as manhole, drop manhole placed at certain distance. They must be maintained after operation. Please don't open manhole or discard any water into it. There is also flushing structure to prevent clogged pipes. • There will be compensation for lands and plants affected by project • During pipe construction, the method will be clean construction to prevent disruption to environment and the local residents and their daily activities. Cost for the construction of pipes with diameter > 300 mm will be charged to ADB. Clean construction is one requirement for ADB financing.

Group Represented	Issues/ Concerns Raised	Project's Response
	• In case of odor from WWTP operation, where will the resident make their complaints?	• As to complaint resolution, a proposed complaint resolution mechanism has been distributed. Your feedback is awaited. This mechanism concerns procedure of addressing complaints. Moreover, the local government has operated mechanism for the reporting of environmental complaints.
Agricultural office	• What can be used from this WWTP process? As fertilizer, for example. • Can it be turned into biogas and how is the quality?	• Its treated water. It is just presented that the treated water may around 40000 m3/day. It is huge volume of water that can be used for watering the plants. In Jakarta, the groundwater is expensive, i.e. Rp. 18000 per m3. Some malls and industries treat their wastewater using membrane technology at cost Rp. 8000 – 10000 per m3 for flushing purpose, watering the plants and cooling water. • Another product of WWTP treatment is sludge that can be used as compost. However further research is necessary to ensure its safety. • Wastewater treatment with anaerobic process will produce biogas. This product is normally used for internal operation of the plant or burned it. As for its sludge treatment, WWTP in Indonesia normally uses sludge drying bed system.
Official Leader of Sub-district Sukajadi	• Personally support the project. • Socialization to each Kecamatan is necessary	• In 2012 socialization has been made to SKPD, especially in WWTP development and pipeline networks • Public consultation will be made

Group Represented	Issues/ Concerns Raised	Project's Response
		directly to the communities.
National Land Office	Is WWTP site consistent with Spatial Planning?	There is discussion and coordination with Spatial Planning Agency. The WWTP location has been included in RTRW Kota Pekanbaru.

138. *Future Disclosure and Consultations*. Public consultation and participation activities will again be conducted in the future. The Riau's Provincial Project Implementation Unit (PPIU) and Pekanbaru City's Local Project Management Unit (LPMU) will conduct public consultations and information disclosure during detailed design. Discussions during these consultations are expected to be more focused and detailed since design information will be available such as exact locations and alignments of sewer lines. Views of the stakeholders will be considered in the overall design process. Stakeholders' consultations shall be continued throughout the construction phase on an area by area basis to sort out any potential problems. These shall be done by the PPIU, LPMU, and contractors prior to actual construction activities. In these construction consultations, specific concerns of the people such as the disturbance associated with the excavations in their area shall be discussed in detail. Records of environmental and social complaints, received during consultations, field visits, informal discussions, and/or formal letters, together with the subsequent follow-up and resolutions of issues shall be kept.

VII. GRIEVANCE REDRESS MECHANISM

139. Local grievance redress mechanism (GRM) is important in the planning and implementation of the proposed Pekanbaru City sewerage subproject since any complaints and concerns of the affected people must be address promptly at no costs to the complainant and without retribution. There will be 2 GRMs. The first one shall address the grievances associated directly with the construction activities, while the second one shall address the grievances on land acquisition, compensation and resettlement. Both GRMs were presented to stakeholders' representatives during the initial public consultation meeting last 22 October 2012.The GRM for the construction activities shall be explained fully to the various areas where construction activities are expected. This is appropriately done during public consultations in the detailed design phase when actual alignments will made for the proposed works. During the operational life of Pekanbaru City's Rejosari WWTP, complaints about its environmental performance can also be brought to the attention of the local environment agency, the Pekanbaru City's Badan Lingkungan Hidup (BLH).

A. Construction Activities Grievances

140. The GRM for the construction activities shall again be disclosed to the public in consultation meetings during the design phase of the subproject and before the start of construction activities. The proposed Pekanbaru City's Local Project Management Unit (LPMU) and the contractors shall inform the local officials and representatives, such as district and village, about the GRM. There will be three levels of GRM. The first level GRM shall handle the first instance of a complaint. If not resolve, then the complainant shall go to the next levels.

141. *First Level GRM*. A fast resolution to most grievances during construction can easily be handled by the contractors' representatives at the construction site and whenever necessary together with the construction supervision consultants. At this first level, the grievance should be resolved within 2 days maximum. If the complaint is not resolved at this level, the complainant may elevate his grievances to the second level GRM which is the temporary City Sewerage Environmental Complaints Committee (CSECC).

142. *Second Level GRM*. In every Kelurahan, where a construction activity shall be implemented, an ad-hoc CSECC shall be created and shall be chaired by City's Chief of the LPMU which could be Unit Perlaksan Teknis Daerah (UPTD) or other equivalent. Members shall include the following: (i) contractor's highest official at the site such as the Construction Manager or Construction Superintendent, (ii) village (Kelurahan) Chief or his representative, and (iii) a women organization's representative. Creation of the CSECC and its operation, including the procedures for filing of complaints, shall be included in appropriate sections of the civil works contracts with the contractors. This mechanism shall be disclosed in public consultations during detailed design and in public meetings during the construction phase.

143. Fast resolution of complaints during construction is important since activities are sometimes continuous and several changes may occur within a week. For the quick filing of complaints, the CSECC shall prepare a form to be used for the filing of complaints. The use of form will also facilitate the filing of complaints by persons who cannot write through the assistance of another person.

144. The steps to be followed in filing complaints and the procedures for handling are the following: (i) complainant shall provide the background information and file the complaint verbally or in writing to the CSECC. The CSECC secretary shall assist the complainant in filling-up the complaint form; (ii) within 2 working days, the Pekanbaru City's LPMU Chief, contractor's representative, and complainant shall discuss if the complaint can be resolved without calling for a CSECC meeting; (iii) if the complaint cannot be resolved by the Pekanbaru City's LPMU Chief and contractor's representative, a CSECC meeting shall be called with the complainant to resolve the complaint within 5 working days.

145. *Third Level GRM*. If the complaint cannot be resolved at the CSECC, the complainant shall go to the courts and file the necessary charges.

Table 7.1: GRM Processing of Complaints

GRM Level	Maximum number of days to decide on complaint	Persons to handle the complaint
First level	2 days	contractors' representatives at the construction site
Second level	2 days	Pekanbaru City's LPMU Chief, contractor's representative
	5 days	temporary City Sewerage Environmental Complaints Committee (CSECC)
Third level	---	courts

B. Resettlement Activities Grievances

146. A separate report on Land Acquisition and Resettlement Plan (LARP) was prepared for the Pekanbaru City's subproject. The said report contains a GRM addressing land acquisition and other concerns on involuntary resettlement.

C. Complaints to Pekabaru City's Badan Lingkungan Hidup

147. Complaints about environmental performance of projects issued an Environmental Permit can also be brought to the attention of the Pekanbaru City's Badan Lingkungan Hidup, the local agency responsible for enforcing the AMDAL system. It is also involved in monitoring the water quality of rivers.

VIII. ENVIRONMENTAL MANAGEMENT PLAN

148. This section addresses the need for mitigation and management measures for the Pekanbaru City subproject. Information includes: (i) mitigating measures to be implemented, (ii) required monitoring associated with the mitigating measures, and (iii) implementation arrangement. Institutional setup is presented in the implementation arrangement and discusses the roles during implementation and the required monitoring. It also outlines the requirements and responsibilities during pre-construction, construction, and operation phases.

A. Environmental Mitigation

149. Table 8.1 presents the information on: (i) required measures for each environmental impact that requires mitigation, (ii) locations where the measures apply, (iii) associated cost, and (iv) responsibility for implementing the measures. Details of mitigating measures are already discussed in Section V where the need for mitigation of each impact was determined in the screening process.

150. During the pre-construction phase, the cost of preparing tender documents with provisions for the required environmental measures are part of the design consultant's contract, while the cost to Pekanbaru City's Local Project Management Unit (LPMU) is the cost of meetings for stakeholders' consultations which are minimal costs to the LPMU. During construction, all cost of environmental mitigation measures shall be borne by the contractor and are considered part of their contracts as specified in the technical specifications. During the operation phase, all cost of mitigation measures are part of the operation and maintenance costs of Pekanbaru City sewerage system, while some were already included in the construction of particular items.

151. For budgetary purposes of the overall MSMIP cost, the EMP costs shall not be taken as separate environmental costs since they are already part of specific items such as the design consultant's contract, contractors' contracts, and Pekanbaru City's operation and maintenance costs. Capacity building cost is part of overall MSMIP capacity building program which shall address the capacity building needs of all subprojects under MSMIP.

152. **Budget for Environmental Mitigation Measures of Construction**. The construction contract documents shall contain a provision allocating part of the construction cost for the implementation of the environmental mitigating measures during construction. For budgetary purposes, this is estimated at 1% of the total direct cost of the WWTP and the sewer lines. For the Pekanbaru City subproject, the estimated amount is US$ 0.27million.

153. To ensure that funds will be allocated during the Pekanbaru City subproject implementation, the tender documents during the bidding process shall include a lump sum bid item in the bill of quantities to be titled "Environmental Mitigation Measures". It shall be clarified in the specification documents that the environmental mitigating measures identified in the construction EMP are to be charged to this item. This will allow the construction supervision engineer to require the contractor to quickly address the environmental issues during construction.

Table 8.1: Environmental Mitigation Plan of Pekanbaru City Subproject

Project Activity	Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Location	Mitigation Cost	Responsibility Implementation/ Supervision
PRE-CONSTRUCTION PHASE					
Ensure climate-proofing of WWTP	Climate change vulnerability of WWTP	Conduct of hydrology and flooding study for the proposed WWTP site to ensure that occurrence of flooding is properly evaluated; study to be used for WWTP design and engineering specifications to ensure that it is less vulnerable to extreme flood events considering climate changes	WWTP site	Part of detailed design cost	Design Consultants/ Riau Province's PPIU and CPMU
Addressing greenhouse gas emission in design	Escape of WWTP's greenhouse gas	membrane covered anaerobic ponds shall be connected by pipework to a flare for burning to avoid releasing the generated methane from the ponds	WWTP	Part of detailed design cost	Design Consultants/ Riau Province's PPIU and CPMU
Social and community concerns	Potential nuisance and problems to the public from Pekanbaru City sewerage system implementation	Consultation with the affected communities regarding the expected impacts and proposed mitigation measures of the project; Tender documents shall include provisions addressing the potential nuisances and problems to the public during construction phase During detailed design, construction methods that avoid excavations of the entire proposed sewer alignment, such as pipe jacking and micro-tunneling, shall be evaluated for their applicability (with consideration also to cost implications) to streets with heavy commercial activities	Sewer line routes, WWTP site	Part of detailed design cost	Design Consultants, Riau Province's PPIU, and LPMU / CPMU
Excavation requirements	Potential damage to archaeological and cultural assets	Tender documents shall include a provision that will require construction activities to be stopped immediately upon discovery of any archaeological and cultural relics; Pekanbaru City government and the Balai Arkeologi Medan (Medan Archaeological Research Office) will be informed promptly	Sewer line trenches, civil works excavations	Part of detailed design cost	Design Consultants/ Riau Province's PPIU and CPMU
IR concerns	Loss of assets	Compensation and other assistance for loss of assets and land acquisition; Consultation and information dissemination to affected people.	Pipelines routes, WWTP site	Part of detailed design cost; separate land acquisition costs	Design Consultants/ Pekanbaru City government / PPIU and CPMU
CONSTRUCTION PHASE					
Sewer lines installation, WWTP construction, and other civil works	Potential damage to archaeological and cultural assets	Contractors shall stopped immediately the activities upon discovery of any archaeological and cultural relics; Pekanbaru City government and the Balai Arkeologi Medan (Medan Archaeological Research Office) will be informed promptly	Sewer line routes, WWTP site	Incorporated in construction contract; part of US$ 0.27 million as environmental mitigations allocation of construction contract	Contractor / CPMU, PPIU, Supervision Consultants

Project Activity	Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Location	Mitigation Cost	Responsibility Implementation/ Supervision
Sewer lines installation, WWTP construction, and other civil works	Soil erosion and sediments of construction sites	Total exposed area shall be minimized; divert storm water flows away from the exposed areas and sediment controls using small interceptor dikes, pipe slope drains, grass bale barriers, sediment traps, and temporary sediment basins; isolation barrier for raw water intake construction of embankments for the ponds, requires: (i) construction of all permanent erosion control features as soon as practical, such as riprap, and (ii) provision of erosion control blankets for sections not yet stabilized	Sewer line routes, WWTP site	Incorporated in construction contract; part of US$ 0.27 million as environmental mitigations allocation of construction contract	Contractor / CPMU, PPIU, Supervision Consultants
Sewer lines installation, WWTP construction, and other civil works	Nuisance from noise of construction equipment	not to operate noisy equipment during nighttime (19:00 – 06:00); sound suppression for equipment; ear plugs for workers; noise levels not to exceed 55 dB(A) near schools and residential areas as mandated by GOI's regulation; use of temporary noise barriers	Sewer line routes, WWTP site	Incorporated in construction contract; part of US$ 0.27 million as environmental mitigations allocation of construction contract	Contractor / CPMU, PPIU, Supervision Consultants
Sewer lines installation, WWTP construction, and other civil works	Air pollution due to construction activities	Water spraying for dust control; construction materials with potential for significant dust generation shall be covered; not smoke belchers equipment; Trucks transporting loose construction materials such as sand, gravel, spoils, and the like shall be provided with tarpaulin cover	Sewer line routes, WWTP site	Incorporated in construction contract; part of US$ 0.27 million as environmental mitigations allocation of construction contract	Contractor / CPMU, PPIU, Supervision Consultants
Sewer lines installation, WWTP construction, and other civil works	Vehicular traffic congestion and hindrance to public access	Close coordination with local authorities in road closure and traffic rerouting; contractor's traffic plan; provision of planks, provision of access between mounds, steel plates for vehicle passage, expedite works in front of shops, and provide signs to direct the pedestrians to access areas; timing of construction activities in any sites should consider the schedules of local activities with heavy presence of people such as festivities, processions, parades, etc. Use of construction methods that avoid excavations of the entire proposed sewer alignment, such as pipe jacking and micro-tunneling	Sewer line routes, WWTP site	Incorporated in construction contract; part of US$ 0.27 million as environmental mitigations allocation of construction contract	Contractor / CPMU, PPIU, Supervision Consultants
Sewer lines installation, WWTP construction, and other civil works	Hazard to public due to construction activities	Implement road safety plan and safety measures including warning signs to alert people of hazards around the construction sites, barricades, and night lamps for open trenches in sewer lines installation	Sewer line routes, WWTP site	Incorporated in construction contract; part of US$ 0.27 million as environmental mitigations allocation of construction	Contractor / CPMU, PPIU, Supervision Consultants

Project Activity	Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Location	Mitigation Cost	Responsibility Implementation/ Supervision
				contract	
Sewer lines installation, WWTP construction, and other civil works	Pollution and health risks due to workers camp	Proper camp sanitation; installation of sanitary facilities; solid waste management; surface runoffs control	Workers camp	Incorporated in construction contract; part of US$ 0.27 million as environmental mitigations allocation of construction contract	Contractor / CPMU, PPIU, Supervision Consultants
Sewer lines installation, WWTP construction, and other civil works	Occupational health and safety at work sites	Implement construction site health and safety management plan, provision of equipped first aid station at all times, workers provided with potable water, adequate sanitation facilities, clean eating areas, and personal protective equipment (PPE) to minimize exposure to a variety of hazards	Sewer line routes, WWTP site	Incorporated in construction contract; part of US$ 0.27 million as environmental mitigations allocation of construction contract	Contractor / CPMU, PPIU, Supervision Consultants
Sewer lines installation, WWTP construction, and other civil works	Increase employment opportunities	Contractor required to give preference to local labor; workers recruitment to be coordinated with local officials and LPMU	Sewer line routes, WWTP site	No cost	Contractor / CPMU, PPIU, Supervision Consultants
Rehabilitation and closure of construction sites	Improper closure of construction sites	Removal of all construction wastes and implement surface restoration; proper disposal of surplus soil to suitable sites away from built-up areas	Sewer line routes, WWTP site	Incorporated in construction contract; part of US$ 0.27 million as environmental mitigations allocation of construction contract	Contractor / CPMU, PPIU, Supervision Consultants
OPERATION PHASE					
Sewerage system operation	Discharge of WWTP poor quality effluents	WWTP operated according to its design parameters; ensure plant operators are properly trained in operating the facility and in handling situations that may lead to poor quality effluents; provision of WWTP operating manuals; WWTP shall have reliable power supply to the mechanical equipment; local regulation to prevent discharge of industrial wastes into the sewer lines	Sewer line, WWTP	Part of operation & maintenance costs	Pekanbaru City's Unit Perlaksan Teknis Daerah / Pekanbaru City's BLH
WWTP operation	Noise of WWTP	Ensure that potential sources of noise, such as pumps, blowers and mounted aerators are inherently provided with enclosures that provide noise attenuation	WWTP	Part of operation & maintenance costs	Pekanbaru City's Unit Perlaksan Teknis Daerah / Pekanbaru City's BLH
WWTP operation	Disposal of sludge from WWTP	No sludge dewatering for initial 10 years; WWTP sludge be sent to sludge drying bed or mechanical dewatering system; dewatered sludge to be hauled and applied to farm lands; during detailed design, a biosolids program for the WWTP shall be developed by adopting appropriate standards from other	WWTP	Part of capital, operation & maintenance costs	Pekanbaru City's Unit Perlaksan Teknis Daerah / Pekanbaru City's BLH

Project Activity	Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Location	Mitigation Cost	Responsibility Implementation/ Supervision
		countries since Indonesia does not have biosolids management standards for WWTPs			
WWTP operation	WWTP foul odor offsite migration	Odor control and management include: (i) membrane covered anaerobic ponds connected by pipework to a flare for burning , (ii) close monitoring of the aerobic units to ensure conditions are not anaerobic, (iii) landscaping with trees and shrubs around the facility be positioned as wind breaks, and (iv) conduct of WWTP's annual odor audit to identify operational measures that can prevent odor problem	WWTP	Part of capital & maintenance costs	Pekanbaru City's Unit Perlaksan Teknis Daerah / Pekanbaru City's BLH
WWTP operation	Pollution to groundwater	Concrete tanks process units shall be design and constructed as impermeable containers; WWTP treatment ponds shall be design and constructed with impermeable plastic liners	WWTP	Part of capital & maintenance costs	Pekanbaru City's Unit Perlaksan Teknis Daerah / Pekanbaru City's BLH
WWTP operation	Drowning risk in WWP tanks and ponds	WWTP shall be: (i) provided with a safety station with a pole, rope, and flotation device in a visible, well-marked location along the berms, (ii) posted with warning signs indicating that tanks and ponds are deep and that dangers exist, (iii) provided with at least a five-foot-high fence to keep people and animals away, and (iv) provided with security personnel to guard the facility	WWTP	Part of capital, operation & maintenance costs	Pekanbaru City's Unit Perlaksan Teknis Daerah / Pekanbaru City's BLH
Sewerage system operation	Health and safety risks in sewerage system operation	Conduct facility hazards identification during initial operation phase; written facility health and safety manual to address the prevention, reduction and control of occupational injury and illness; all workers authorized to stop any work if they observe any unsafe conditions that present imminent danger, particularly injury; workers to be trained on health and safety aspects of handling sewage spills; five-foot-high fence to be provided to keep people away from the WWTP; standard gas safety devices, such as flame arresters and pressure relief valves be installed at appropriate locations to be determined during detailed design; operators to be provided with portable digital gas analyzer capable of detecting methane and carbon dioxide; separate chlorine gas building; during detailed design evaluate the use of sodium hypochlorite instead of chlorine gas as disinfectant	Sewer line routes, WWTP site	Part of capital, operation & maintenance costs	Pekanbaru City's Unit Perlaksan Teknis Daerah / Pekanbaru City's BLH

154. Although details of the required mitigating measures are already discussed in the screening for impacts, the following items are discussed further to highlight their importance: (i) tender documents and construction contracts, (ii) contractor's environmental management plan, (iii) sewerage system operations manual, and (iv) unanticipated environmental impacts.

155. *Tender Documents and Construction Contracts*. Pekanbaru City subproject's EMP shall form part of the bidding and contract documents. Environmentally responsible procurement advocates the inclusion in construction contract documents the provisions addressing the management of environmental impacts and risk during construction. This includes the contractor's submittal of a Contractor's EMP (CEMP). Tender documents and construction contracts shall therefore include environmental management provisions on the following issues: (i) erosion and sediment runoff, (ii) noise and dust, (iii) vehicular traffic, (iv) construction wastes, (v) oil and fuel spillages, (vi) construction camps, and (vii) public safety and convenience, (viii) occupational health and safety, (ix) proper closure of construction sites, and (x) potential damage to any archaeological and cultural assets.

156. *Contractor's EMP*. During construction, each contractor will be guided by its detailed Contractor's EMP (CEMP). This shall be based on the Pekanbaru City subproject's EMP with details on staff, resources, implementation schedules, and monitoring procedures. The agreed CEMP will be the basis for monitoring by CPMU, Riau Province's PPIU, and Pekanbaru City's LPMU and other monitoring parties. Inclusion in construction contract documents the provisions requiring the contractor to submit a CEMP is important since the contractor will be legally required to allocate a budget for mitigation measures implementation. The CEMP will allow Riau Province's PPIU construction supervision engineer to focus on what are specific items expected from the contractor regarding environmental safeguards on a day-to-day basis. With the CEMP, PPIU can easily verify the associated environmental requirements each time the contractor will request approval for work schedules.

157. The CEMP shall be prepared by all contractors before the start of the construction works and shall be approved by the CPMU and Riau Province's PPIU. This requirement shall be included in the construction contracts. It shall provide details on specific items related to the environmental aspects during construction. It shall include specifications on requirements for dust control, erosion and sediment control, avoidance of casual standing water, management of solid wastes, workers' camp sanitation, pollution from oil, grease, fuel spills, and other materials due to the operation of construction machineries, safety and traffic management, avoidance of inconveniences to the public, air and noise pollution control. It shall also include guidance on the proper design of the construction zone, careful management of stockpiles, vegetation, topsoil, and vehicles and machinery.

158. *Sewerage System Operations Manuals*. Pekanbaru City's UPTD shall ensure that operations manuals are available prior to operating the sewer network and the WWTP. These manuals shall provide the standard operating procedures of the proposed sewerage system. It shall also include, among others, on how to address the issues on environmental and health and safety of workers and the public.

159. *Unanticipated Environmental Impacts*. Where unanticipated environmental impacts become apparent during project implementation, CPMU and Riau Province's PPIU shall prepare a supplementary environmental assessment and EMP to assess the potential impacts and outline mitigation measures and resources to address those impacts.

B. Environmental Monitoring

160. Table 8.2 presents the information on: (i) aspects or parameter to be monitored, (ii) location where monitoring is applicable, (iii) means of monitoring, (iv) frequency of monitoring, (v) responsibility of compliance monitoring, and (vi) cost of monitoring.

161. The Riau Province's PPIU Environment Officer shall provide the CPMU with its monthly environmental monitoring reports. The CPMU shall consolidate all monthly environmental monitoring reports of all subprojects and prepare a monthly and quarterly environmental monitoring report. Using the quarterly reports, the CPMU shall prepare the semi-annual environmental safeguards progress report of MSMIP which shall be submitted to ADB and detailing the status of mitigating measures implementation. The suggested outline of the monitoring reports is presented in Appendix 8. Roles of the CPMU and the PPIU are outlined in the succeeding section for institutional arrangement.

162. *Environmental Monitoring Cost*. Monitoring cost for pre-construction is minimal cost to CPMU since this is simply verification by the CPMU on whether the EMP is included in tender and contract documents. Construction monitoring cost is minimal cost to Riau Province's PPIU since it will be their personnel who will do checking/ inspections of the construction activities and its part of their operational costs. Monitoring cost of construction supervision consultants are also minimal costs since this is checking/ inspections cost and part of their contracts. The cost to Pekanbaru City's LPMU for the GRM is also minimal cost since these are only meetings for resolving the complaints and it is included in the contractor's contract. During the operation phase, effluent monitoring costs is part of Pekanbaru City's UPTD operational cost using its own small laboratory. Cost for monitoring of other activities such as sludge disposal, generation of odor, safety and health issues are minimal costs to Pekanbaru City's UPTD since these are checking/ inspections activities only.

Table 8.2: Environmental Monitoring Plan of Pekanbaru City Subproject

Aspects/ Parameters to be monitored	Location	Means of Monitoring	Monitoring Frequency	Mitigation Respon-sibility	Compliance Monitoring Respon-sibility	Monitoring Cost
PRE-CONSTRUCTION						
WWTP design and engineering specifications based on hydrology and flooding study	WWTP site	Verify study and engineering specifications	once	Design consultants	CPMU/ PPIU	Part of project management in detailed design (minimal cost)
methane capture system and flare are included in WWTP design and specifications	WWTP	Verify engineering specifications	Twice – draft and final tender documents	Design consultants	CPMU/ PPIU	Part of project management in detailed design (minimal cost)
Consultation meetings; Specific provisions in tender documents on nuisance & problems to public	Sewer line routes, WWTP site surroundings	Verify draft and final tender documents	After completion of meetings; Twice – draft and final tender documents	LPMU/ Design consultants	CPMU/ PPIU	Part of project management in detailed design (minimal cost)
Specific provision in tender documents on archeological/ cultural relics	Sewer line trenches, civil works excavations	Verify draft and final tender documents	Twice – draft and final tender documents	Design consultants	CPMU/ PPIU	Part of project management in detailed design (minimal cost)
Consultation	Pipelines	Verify meetings	After	LPMU/	CPMU/ PPIU	Part of project

Aspects/ Parameters to be monitored	Location	Means of Monitoring	Monitoring Frequency	Mitigation Respon-sibility	Compliance Monitoring Respon-sibility	Monitoring Cost
meetings; payments to affected people	routes, WWTP site	documentation; Verify plans and IR payments	completion of meetings; upon completion of payments	Design consultants		management in detailed design (minimal cost)
CONSTRUCTION PHASE						
Presence of archeological/ cultural relics in excavations	Sewer line routes, WWTP site	Visual inspection of sites	Daily	contractor	Construction supervision consultants, CPMU/ PPIU	Part of consultant's construction supervision contract; minimal cost to CPMU/ PPIU
Total area to be exposed; runoff flowing into disturbed sites	Sewer line routes, WWTP site	Visual inspection of sites; plans verification	Daily during rainy periods	contractor	Construction supervision consultants, CPMU/ PPIU	Part of consultant's construction supervision contract; minimal cost to CPMU/ PPIU
noise levels not to exceed 55 dB(A) near schools and residential areas; noisy equipment not operated between 19:00 – 06:00hrs;ear plugs for workers	Sewer line routes, WWTP site	Use of sound levels meter; visual inspection of sites	Daily	contractor	Construction supervision consultants, CPMU/ PPIU	Part of consultant's construction supervision contract; minimal cost to CPMU/ PPIU
Dust, cover of stockpiles, smoke belching	Sewer line routes, WWTP site	Visual inspection of sites	Daily	contractor	Construction supervision consultants, CPMU/ PPIU	Part of consultant's construction supervision contract; minimal cost to CPMU/ PPIU
Road closure and traffic rerouting; traffic plan; temporary access facilities	Sewer line routes, WWTP site	traffic plans verification; visual inspection of sites	weekly	contractor	Construction supervision consultants, CPMU/ PPIU	Part of consultant's construction supervision contract; minimal cost to CPMU/ PPIU
Road safety plan; warning signs, barricades, and night lamps	Sewer line routes, WWTP site	Visual inspection of sites	Daily	contractor	Construction supervision consultants, CPMU/ PPIU	Part of consultant's construction supervision contract; minimal cost to CPMU/ PPIU
Sanitary toilets, garbage bins, runoff controls in camps	Workers camp	Visual inspection of sites	Once before start of construction and once monthly	contractor	Construction supervision consultants, CPMU/ PPIU	Part of consultant's construction supervision contract; minimal cost to CPMU/ PPIU
Health and safety plan; first aid station; PPE, sanitation facilities	Sewer line routes, WWTP site	Visual inspection of sites	Daily	contractor	Construction supervision consultants, CPMU/ PPIU	Part of consultant's construction supervision contract; minimal cost to CPMU/ PPIU
Number of local labor employed	Sewer line routes, WWTP site	Verification of contractor's records	Once a month	contractor	Construction supervision consultants, CPMU/ PPIU	Part of consultant's construction supervision

Aspects/ Parameters to be monitored	Location	Means of Monitoring	Monitoring Frequency	Mitigation Respon-sibility	Compliance Monitoring Respon-sibility	Monitoring Cost
						contract; minimal cost to CPMU/ PPIU
Construction wastes; surplus soil not removed	Sewer line routes, WWTP site	Visual inspection of sites	Once before final stage of demobilization; weekly for surplus soil	contractor	Construction supervision consultants, CPMU/ PPIU	Part of consultant's construction supervision contract; minimal cost to CPMU/ PPIU
OPERATION PHASE						
Effluent quality not to exceed 50mg/l of BOD, 100mg/l of suspended solids, and 10mg/l of fats and oil (consistent with Provincial Effluent Standards and GOI's National Standards for Effluent Quality, Ministry of Environment Decree 112, 2003)	Sewer line, WWTP	effluent sampling and laboratory tests	twice monthly	Pekanbaru City's Unit Perlaksan Teknis Daerah	Pekanbaru City's BLH	Part of WWTP Operating Unit's operation cost/ (USD2,000 /year)
Presence of noise attenuation enclosures for pumps, blowers and mounted aerators	WWTP	Visual inspection of sites	Once a year	Pekanbaru City's Unit Perlaksan Teknis Daerah	Pekanbaru City's BLH	Minimal cost to Pekanbaru City's BLH since this is an annual visual inspection
Sludge volume; biosolids strategy for the WWTP initiated	WWTP	Visual inspection of sites; verify strategy for biosolids	Once a year	Pekanbaru City's Unit Perlaksan Teknis Daerah	Pekanbaru City's BLH	Minimal cost to Pekanbaru City's BLH since this is an annual visual inspection
flare and odor control units operational; no odor of aerobic units; annual odor audit conducted	WWTP	Visual inspection of sites; verify records of annual odor audit	Once a year	Pekanbaru City's Unit Perlaksan Teknis Daerah	Pekanbaru City's BLH	Minimal cost to Pekanbaru City's BLH since this is an annual visual inspection
Integrity of concrete and impermeable plastic liners	WWTP	Visual inspection of WWTP	Once a year	Pekanbaru City's Unit Perlaksan Teknis Daerah	Pekanbaru City's BLH	Minimal cost to Pekanbaru City's BLH since this is an annual visual inspection
safety station, warning signs, and fence	WWTP	Visual inspection of WWTP	Once a year	Pekanbaru City's Unit Perlaksan Teknis Daerah	Pekanbaru City's BLH	Minimal cost to Pekanbaru City's BLH since this is an annual visual inspection
Health safety plan; workers training	Sewer line routes, WWTP site	Visual inspection of WWTP; verify workers training records	Once a year	Pekanbaru City's Unit Perlaksan Teknis Daerah	Pekanbaru City's BLH	Minimal cost to Pekanbaru City's BLH since this is an annual visual inspection

163. *Project Performance Monitoring*. Project performance monitoring presents the desired outcomes as measurable events by providing parameters or aspects that can be monitored and verified (Table 8.3). Tendering process advocating environmentally

responsible procurement is a desired outcome during the pre-construction phase. This can easily be verified by checking if EMP requirements are incorporated in construction contracts. Construction phase desired outcomes include effective management of environmental impacts and reduce risk to public. For the operation phase, the WWTP discharges shall meet GOI's standards for BOD, suspended solids, oil and fats.

Table 8.3: Project Performance Monitoring of Pekanbaru City Subproject

Desired Outcomes	Aspects / Parameters to be monitored	Means of Monitoring	Monitorng Frequency	Implemen-tation	Compliance Monitoring	Monitoring Cost
PRE-CONSTRUCTION PHASE						
Detailed design is environmentally responsive	EMP requirements incorporated in detailed design of Pekanbaru City sewerage system	Verify detailed design documents	Two reviews: (i) draft detailed design documents and (ii) prior to approval of final documents	Design consultants/ PPIU	CPMU	Part of project manageme nt in detailed design (minimal cost)
Tendering process advocates environmentally responsible procurement	EMP requirements incorporated in construction contracts of Pekanbaru City sewerage system	Verify construction contract documents	Prior to finalization of construction contract documents of Pekanbaru City sewerage system	Design consultants/ PPIU	CPMU	Part of project manageme nt in tendering (minimal cost)
CONSTRUCTION PHASE						
Effective management of environmental impacts during construction	Number of public complaints on construction activities	Verification of contractor's records; PPIU/ LPMU's coordination with local officials	Once a month	Contractor	Construction supervision consultants, CPMU/ PPIU	Part of consultant's construction supervision contract; minimal cost to CPMU/ PPIU
Reduce risk to workers and the public during construction	Number of accidents involving construction activities	Verification of contractor's records; PPIU/ LPMU's coordination with local officials	Once a month	Contractor	Construction supervision consultants, CPMU/ PPIU	Part of consultant's construction supervision contract; minimal cost to CPMU/ PPIU
OPERATION PHASE						
WWTP effluents meets Provincial Effluent Standards and GOI's National Standards for Effluent Quality, Ministry of Environment Decree 112, 2003	Effluent quality not to exceed 50mg/l of BOD, 100mg/l of suspended solids, and 10mg/l of fats and oil	effluent sampling and laboratory tests	twice monthly	Pekanbaru City's Unit Perlaksan Teknis Daerah	Pekanbaru City's BLH	Part of WWTP Operating Unit's operation cost (USD2,000 /year)
Pekanbaru City's sewerage system operation acceptable to the public	Public Complaints on sewerage system operation	Verification of operation records	Once a year	Pekanbaru City's Unit Perlaksan Teknis Daerah	Pekanbaru City's BLH	Minimal cost

C. Implementation Arrangement

164. This subsection presents the: (i) institutional setup, (ii) implementation schedule, (iii) GOI permits, and (iv) capacity building.

165. *Institutional Setup*. The institutional setup from the top starts with the Ministry of Public Works as the executing agency of MSMIP with a Central Project Management Unit (CPMU) to be created under its Directorate of Development, Sanitation, Environment and Housing (PPLP), while the implementing agencies at the subproject level are two units working together, the Satuan Kerja (SATKER) for RiauProvince as the Provincial Project Implementation Unit (PPIU) and the Pekanbaru City's Local Project Management Unit (LPMU).

166. The CPMU shall appoint a staff, as Environment Officer for MSMIP, to oversee the implementation and monitoring of environmental safeguards requirements. With assistance from the Environmental Advisor of the Project Implementation Support Consultants (PISC) team, the CPMU shall be responsible for the following activities related to environmental safeguards: (i) confirm that the IEEs are updated in accordance with ADB's SPS based on detailed designs and submit to ADB for review and approval prior to contract award; (ii) confirm that the required AMDAL, a GOI requirement, has been prepared during detailed design and approved by the respective environment agency, the Badan Lingkungan Hidup (BLH); (iii) confirm that the EMP is included in the bidding documents and civil works contracts; (iv) ensure Contractor's EMPs (CEMPs) are prepared by contractors prior to actual construction; (v) establish a system to monitor environmental safeguards of the subprojects including monitoring the indicators set out in the monitoring plan of the EMP; (vi) supervise the implementation of environmental mitigating measures required for the construction activities; (vii) review, monitor and evaluate the effectiveness of the implemented CEMPs, and recommend necessary corrective actions; (viii) prepare monthly and quarterly environmental monitoring reports and submit semi-annual environmental monitoring report to ADB; (ix) ensure timely disclosure of final IEE and EMP in locations and form accessible to the public, and (x) address, record, and report on any grievances brought about through the Grievance Redress Mechanism in a timely manner.

167. The SATKER for Riau Province, as the PPIU, is the key implementation unit responsible for construction contracts' supervision of the Pekanbaru City subproject, while Pekanbaru City's LPMU coordinates the needed local inputs and resources. Environmental Officers will be designated in the PPIU and LPMU to effectively manage the environmental aspects of the Pekanbaru City subproject. The Environment Officer of the PPIU has an important role in ensuring that the required environmental mitigation measures are implemented in a timely manner by actively participating in construction supervision. The LPMU has an important role in addressing grievances during the construction period. Its chief sits as the chairperson of the ad-hoc City Sewerage Environmental Complaints Committee (CSECC) for Pekanbaru. Pekanbaru City's LPMU's Environment Officer shall assist the CSECC.

168. PISC and the Capacity Building Consultants (CBC) shall be engaged to assist the CPMU, PPIU, and LPMU. The National Environmental Advisor (part of PISC) will: (i) review the revised IEEs prepared during detailed design stage, (ii) assist CPMU in ensuring that EMPs are included in the bidding documents and civil works contracts; (iii) assist the CPMU, PPIU, and LPMU in monitoring of EMP implementation, (iv) training of CPMU, PPIU, and

LPMU staff in environmental safeguards and monitoring; and (v) assist CPMU in preparation of semi-annual environmental monitoring reports.

169. An important capacity building component is the hands-on training and advisory services for Pekanbaru City's WWTP operators. During the initial years of operation, the sewerage system will be operated by a temporary unit which will be the Unit Perlaksan Teknis Daerah (UPTD) or another unit to be determined later. The UPTD is considered a practical approach for the interim period since it can easily be formed through a Mayor's decision, while other units such as the Badan Layanan Umum Daerah (BLUD) will take some time to form due to legal and other requirements.

170. At the bottom of this institutional setup are the construction contractors for the Pekanbaru City sewerage system which are responsible for implementing the required environmental mitigation measures as defined by their respective approved CEMP. Close coordination between the contractors and the Environment Officer of Riau Province's PPIU is needed to ensure good planning for mitigation measures and ensure the timely implementation. The contractors are also directly involved in addressing grievances during the construction period since their activities will cause disturbances to the public. Oftentimes, complaints can easily be resolved between the contractors and the complainants. The contractor's highest official at the site such as the Construction Manager or Construction Superintendent, shall be a member of Pekanbaru City's CSECC.

171. During the operation phase, environmental impacts will be associated with the operation and maintenance of the sewer networks and WWTPs. There is a need for the UPTD to appoint a staff as Pollution Control Officer/ Environment Officer to attend to the environmental concerns of the sewerage system failures and coordination with the environment agency, the BLH. One of the main concerns is the possibility of poor WWTP performance leading to odor problems and poor effluent quality.

172. External environmental monitoring will be done by BLH as required by its mandate. BLH is tasked to prepare and implement regional policies and rules to promote environment protection and conservation. It reports to the Mayor through the Regional Secretary. Its function is to: (a) formulate and recommend policies on environmental management and (b) prepare and carry out work plans and programs on environmental management and monitoring and AMDAL (EIA system). It is responsible for enforcing the AMDAL system. It is also involved in monitoring the water quality of rivers in Pekanbaru City.

173. Table 8.4 presents information on where the environmental aspects are addressed in the institutional setup and the associated requirements for environmental consultants and training consultants.

Table 8.4: Environmental Aspects Institutional Setup

Unit	Unit Functions	Responsible for Environmental Aspects/ Functions	Consultants/ Functions
Construction Phase			
Ministry of Public Works' Directorate General for Human	Executing Agency for the MSMIP; provides technical		

Unit	Unit Functions	Responsible for Environmental Aspects/ Functions	Consultants/ Functions
Settlements (Cipta Kayra)	supervision and responsibility over the investment		
Central Project Management Unit (CPMU) will be created under the Directorate of Development, Sanitation, Environment and Housing (PPLP)	responsible for MSMIP implementation in project cities; coordinates with ADB and other external agencies	CPMU Environment Officer (to be designated); responsible for overall environmental supervision of subprojects; coordinates with PPIU and LPMU Environment Officers to ensure environmental requirements are address effectively; responsible for semi-annual environmental monitoring reports preparation	Project Implementation Support Consultants (PISC) and the Capacity Building Consultants (CBC); National Environmental Advisor (part of PISC) will: (i) review the revised IEEs prepared during detailed design stage, (ii) assist CPMU in ensuring that EMPs are included in the bidding documents and civil works contracts; (iii) assist the CPMU, PPIU, and LPMU in monitoring of EMP implementation, (iv) training of CPMU, PPIU, and LPMU staff in environmental safeguards and monitoring; and (v) assist CPMU in preparation of semi-annual environmental monitoring reports. WWTP Training Consultant (part of CBC) shall facilitate hands-on training of all WWTP operators
SATKER for Riau Province as the	key implementation	PPIU Environment Officer; responsible for	Advisory services to be provided by the

Unit	Unit Functions	Responsible for Environmental Aspects/ Functions	Consultants/ Functions
Provincial Project Implementation Unit (PPIU)	unit in the field; Provides construction contracts' supervision; closely monitors construction progress	overall environmental supervision of construction activities; ensures that the Contractor's EMP is properly implemented and monitored; prepares monthly environmental monitoring reports; provides input to the CPMU Environment Officer in the preparation of the semi-annual environmental monitoring reports preparation	National Environmental Advisor (part of PISC)
Pekanbaru City's Local Project Management Unit (LPMU).	Monitors implementation of the project in the city and coordinates the needed local inputs and resources;	LPMU Environment Officer; coordinates with the city's environment agency, Badan Lingkungan Hidup (BLH); assists the PPIU in monitoring the implementation of the Contractor's EMP ; assists the CSECC in addressing environmental complaints; LPMU chief sits as the Chairperson of the ad-hoc City Sewerage Environmental Complaints Committee (CSECC)	Advisory services to be provided by the National Environmental Advisor (part of PISC)
Construction contractors of the proposed Pekanbaru City's sewerage system	Implement construction activities; implement the Contractors' EMP	Contractor's Environment Officer (to be designated); responsible for implementation of the Contractor's EMP; coordinates with the PPIU and LPMU Environment Officers and Pekanbaru City's BLH; assist the Pekanbaru City's CSECC in addressing environmental	

Unit	Unit Functions	Responsible for Environmental Aspects/ Functions	Consultants/ Functions
		complaints; contractor's highest official at the site such as the Construction Manager or Construction Superintendent sits as a member of the CSECC	
Operation Phase			
Pekanbaru City's Unit Perlaksan Teknis Daerah (UPTD) or another service delivery unit	Operates Pekanbaru City's sewerage system	Pekanbaru City's Pollution Control Officer (to function also as the Environment Officer); responsible for all environmental matters of the sewerage system including EMP implementation and self-monitoring; coordinates with the city's environment agency (Badan Lingkungan Hidup); The Pollution Control Officer shall ideally be the WWTP Supervisor; ensures WWTP compliance to effluent regulations; attend to permits requirements for continued WWTP operation; supervise the proper operation and maintenance of pollution control devices; prepares reports required by BLH including notification if the WWTP is not functioning well due to technical problems; recommend to management any improvements or required additional equipment for better WWTP compliance to GOI standards	WWTP Advisor (consultant) guides Pekanbaru City's WWTP operators during the initial 3-month period

174. *Implementation Schedule*. As presented in the project description, construction of the Pekanbaru City sewerage system subproject is scheduled to start on the fourth quarter of 2014 and expected to be completed on the second quarter of 2018. CPMU and Pekanbaru City government shall ensure that construction contract provisions related to the contractor's EMP shall be included in the tendering stage in 2013.

175. *GOI Permits*. Under GOI's Environmental Permit Regulation (No.27/2012), Pekanbaru City government shall apply for an Environmental Permit and AMDAL approval from the Pekanbaru City's BLH, the local environment agency. Information on the process for environmental permit and AMDAL processing and timelines is presented in Appendix 1. According to BLH, there will be no problems with the AMDAL processing of this sewerage subproject since it is a priority infrastructure of the city. The BLH is part of the city government's units.

176. *MSMIP Capacity Building*. MSMIP implementation will be supported by consulting services for: (i) project management advisory services, including detailed engineering designs, preparation of contract documents, support to PPIUs on construction supervision and quality control; and (ii) institutional development and capacity building. During pre-construction and construction period, it shall be necessary to provide an Environmental Advisor to the CPMU. This shall be the National Environment Specialist of the PISC supporting the CPMU.

177. *Capacity Building for WWTP Operators*. One of the proactive ways to prevent the Pekanbaru City's Rejosari WWTP from discharging poor quality effluents is to ensure that the WWTP operators are properly trained. While acknowledging the fact that capacity building is a long-term process and is much more than training only, MSMIP shall start with the initial hands-on training of the WWTP operators during pre-operation phase and continue during the initial few months of the operation phase. This part of capacity building shall be divided into 2 parts. Estimated cost of the initial capacity building is presented below. This capacity building for WWTP operators is also reflected in the overall capacity building plan for MSMIP.

178. The first part shall be a hands-on training in a similarly operating WWTP in Indonesia. There are presently operating WWTPs in Indonesia that use aerated and facultative lagoons. Operators hired for the new Pekanbaru City's Rejosari WWTP shall undergo a one month hands-on training on operating and maintaining a WWTP, together with the new operators of the other MSMIP subprojects. This training shall be facilitated by a local WWTP training consultant. It is necessary to engage the services of a local consultant since this type of training is intensive and requires good communication between the newly hired operators and the training consultant.

179. The second part shall be the actual operation of the new Pekanbaru City's Rejosari WWTP with inputs from a WWTP advisor for a 3-month period intermittently. The WWTP advisor shall provide advisory services for a full-week and every other week within the 3-month period. This type of advisory services is very important since the Rejosari WWTP will be in the start-up phase and also to correct any undesirable operating practices of the newly hired operators. Again, similar to the first part hands-on training, it is necessary to engage the services of a local consultant for effective communication.

Table 8.5: Cost of Capacity Building for Rejosari WWTP Operators

Capacity Building Activity	Duration	Total Cost (US$)
1st Part:[a]		
Training of 2 newly-hired WWTP operators	1 month	7,600
2nd Part:[b]		
WWTP Advisor services	6 weeks (in 3-month spread)	14,000
	Total Cost…	**21,600**[c]

Notes:
[a] 1st Part will be a hands-on training of all newly-hired WWTP operators in an existing WWTP. This will be a combined training with the operators of the other MSMIP subprojects.
[b] For the 2nd Part, a WWTP Advisor will be present every other week in the WWTP to guide the operators.
[c] Total Cost for this subproject only.

IX. CONCLUSION AND RECOMMENDATIONS

180. Pekanbaru City has been known as a clean city due to its low population density, wide streets, and attention to cleanliness. It received recognition 6 times consecutively from 2005 to 2010 for the competition on cleanest big city category in Indonesia. However, similar to many cities in Indonesia, Pekanbaru City does not have a sewerage system that collects domestic wastewater from its central business district and other built-up areas. This situation has resulted to the continuing pollution of the urban streams including the Siak River. Consequently, the city government wants to improve the overall sanitation situation and the water quality of the Siak River. The proposed sewerage system subproject will therefore help the city government achieve its objectives and provide better access to sanitation facilities.

181. The environmental screening process has highlighted the environmental issues and concerns of the proposed Pekanbaru City's sewerage system subproject. The screening has considered the fact that the proposed subproject sites are essentially urban areas. The sewer lines will be installed along urban roads. While the proposed WWTP site at Rejosari is presently an agricultural piece of land planted with rubber trees, it is generally located in an urban area. Beyond its eastern boundary are houses along the unpaved road. Its north and northeast boundaries is the Siak River. Given the development of the surrounding areas, the proposed site is therefore not within an undisturbed landscape. Hence, the proposed Pekanbaru City's sewerage system subproject is therefore not a new incursion to an ecologically untouched area. An important consideration in analyzing the environmental impacts of the proposed Pekanbaru City's sewerage system is the fact that its components are infrastructures for environmental improvement and for reducing the risk to public health from untreated sewage.

182. Based on the screening for potential environmental impacts and risks of the proposed Pekanbaru City subproject, there are no significant negative environmental impacts and risks that cannot be mitigated. With the EMP, the proposed Pekanbaru City subproject can be implemented in an environmentally acceptable manner. There is no need for further environmental assessment study. A full EIA is not warranted and the subproject's environmental classification as Category B is deemed appropriate. The IEE shall therefore be finalized as the final environmental assessment document of the proposed Pekanbaru City's sewerage system subproject.

183. Implementation of the proposed Pekanbaru City's subproject is hereby recommended with emphasis on the following: (i) EMP of Pekanbaru City's sewerage system subproject shall be included in the design process; (ii) IEE Report/EMP shall be forwarded to the design consultant for consideration in the design process; (iii) Tendering process shall advocate environmentally responsible procurement by ensuring the inclusion of EMP provisions in the bidding and construction contract documents; (iv) Contractor's submittal of a CEMP shall be included in the construction contract; (v) Contract provisions on creation and operation of the CSECC shall be included in construction contracts; (vi) Training of the WWTP operators on operation and maintenance of the WWTP shall be completed before actual operation; (vii) a WWTP advisor (consultant) shall be provided intermittently during the initial 3 months of operation to assist the operators in the start-up phase and also to correct any undesirable operating practices; (viii) Monitoring of health and safety requirements shall be given more importance during construction and operation to reduce risks to the public and to personnel; and (ix) Pekanbaru City government, its LPMU, and the PPIU shall continue the process of public consultation and information disclosure during detailed design and construction phases.

APPENDICES

APPENDIX 1

Environmental Permit and AMDAL Processing

Environmental Permit Regulation (Government Regulation No.27/2012) requires all project owners to apply for an environmental permit to the appropriate government authority (minister of environment, governor or mayor) before project implementation. It prescribes the process for environmental permitting and reaffirms GOI's AMDAL processes and requirements. Presently, the local environment agencies, Badan Lingkungan Hidup (BLH), of the subproject cities are waiting for the issuance of the implementing guidelines for Environmental Permit Regulation of 2012.

Chapter IV of the regulation refers to environmental permit application and issuance. The GOI will use 130 working days (4.3 months) for processing from receipt of Environmental Permit application up to permit issuance, considering there are no revisions to the submitted documents. The steps and required processing time are presented below.

Steps	Required Time
Application for environmental permit shall be accompanied by the environmental assessment documents, business legal documents, and business profile document.	
After receiving the Environmental Permit application, the appropriate government authority (minister of environment, governor or mayor) should announce the Environmental Permit application through multimedia and announcement board where the businesses and activities shall be located	within 5 working days
The public is given time to give their advice, opinions, and responses to the announcement	maximum of 10 working days after the announcement
Project proponent shall submit a Terms of Reference (TOR) for the preparation of the environmental assessment documents. The EIA Appraisal Committee shall review the administrative completeness of the TOR	within 30 working days upon receipt
The project proponent prepares the environmental assessment documents based on the Terms of Reference which has been approved.	Variable; based on how fast the EIA can be prepared
Upon receipt of the environmental assessment documents, the EIA Appraisal Committee shall review the documents	within 75 working days
The approving government authority (minister of environment, governor or mayor) shall decide on the Environmental Eligibility of the project.	within 10 working day after receiving the recommendations from the EIA Appraisal Committee
Environmental Permit is issued at the same time with the issuance of Environmental Eligibility Decision. Environmental Permit list the environmental protection and management actions expected from the permit holder	
Environmental Permit holder shall submit the performance report on the terms and obligation set out in the Environmental Permit to the appropriate government authority (minister of environment, governor or mayor)	on a regular basis, every 6 months

AMDAL Processing

The basis for determining the type of environmental study required for the environmental permitting of a proposed WWTP is prescribed by Regulation No.11 of 2006 issued by the Environment Minister of State. Under this regulation, a proposed WWTP for domestic wastewater that will require an area of more than 3 hectares or will serve a population of more than 100,000 shall be required to prepare an AMDAL report.

The Pekanbaru subproject will be required to prepare an AMDAL report since it will use a WWTP area of 8 hectares, much more than the 3-hectare criterion. The AMDAL report will be prepared by the consultants to be engaged by the GOI during the detailed design phase of this subproject. Compliance to GOI requirements shall be completed prior to any bidding/procurement process.

APPENDIX 2

WWTP DISCHARGE PERMIT REQUIREMENTS OF PEKANBARU CITY

Operation of a wastewater treatment plant (WWTP) in Pekanbaru City requires a discharge permit. Under Pekanbaru City's Control and Disposal of Liquid Waste Permit Regulation No.07/2011, operation of a WWTP needs permission from the Mayor.

A WWTP owner shall make a written application to the Mayor for an environmental permit with the following requirements:

- Documents of Permits and Environmental Management
- Production Information
- Manpower and Business Data
- Raw Water Data
- Wastewater Data
- Point Disposal Data
- Location of Receiving Water Source
- Study Wastewater Disposal
- Emergency Handling

Processing of environment permit is through Pekanbaru City's Badan Lingkungan Hidup (BLH). According to regulation, they can quickly process the application for permit. This permit shall be applied for during the initial months of WWTP operation since actual data on effluent quality are required to be submitted with the application.

APPENDIX 3

PHOTOGRAPHS OF SITES FOR PROPOSED PEKANBARU SEWERAGE SYSTEM

Photo No.1 – Proposed site of Pekanbaru's Rejosari WWTP is mostly planted with rubber trees.

Photo No.2 – Houses along the unpaved road near the eastern access of the proposed site of Pekanbaru's WWTP (beyond the houses – rightside of photo)

Photo No.3 – Narrow road at Pekanbaru's Kecamatan Tanjung Rhu area near the access to the proposed WWTP; a challenge for sewer line construction

Photo No.4 – Some Pekanbaru's streets (J. Melur) are narrow for sewer line construction

APPENDIX 4

Minutes of the Initial Public Consultation and Information Disclosure held at Pekanbaru City's BAPPEDA, 22 October 2012

Opening/ Presentations:

The public consultation started at 10.05 A.M with Mrs Devita expressed her thanks for the attendance of Heads of Agency, Camat, Lurah and communities. She also explained the purpose of public consultation today which was to seek advice and opinions from the participants about the city Sanitation Development project plan, Metropolitan Sanitation Management Investment Program (MSMIP).

Bpk Yunannaris, Head of Settlement & Regional Infrastructure Development Division BAPPEDA Kota Pekanbaru, gave a "powerpoint" presentation of the proposed subproject and other information of the master plan. He pointed out:

a. Kota Pekanbaru government planned to develop an integrated WWTP. Originally this plan had three alternative locations. At last, Kelurahan Rejosari in Kecamatan Tenayan Baru, Kota Pekanbaru was selected. The plant would be developed over a 20 ha area.
b. Alternative wastewater treatment and the number of WWTP beneficiaries and wastewater pipeline network plan.
c. The institution charged to managed this WWTP plan was UPTD (Regional Technical Service Unit) that would be promoted its status into BLU (Public Service Body).
d. Regional Regulation (Perda) on Wastewater Management highlighting IMB charge, and requirements on the construction of septic tanks according to SNI standards and the requirements as customers for households whose houses were passed over by wastewater pipelines was still under way. In addition, it is also prepared now Perda concerning piped and non-piped wastewater management system including the tariff structure for wastewater services and new connections.
e. Financing sources planned for the program

Supriadi of MSMIP Consultants:

a. Costs for physical development of WWTP and its primary pipeline network came from ADB, with the municipal government allocating budget for land acquisition.
b. This public consultation was only one requirement of ADB for its assistance. ADB wished comments and input from the people to be affected by land acquisition process or construction activities.
c. ADB expected no affected persons suffered living degradation from its program.

Ariani Dwi Astuti of MSMIP Consultant:

a. WWTP was important for Kota Pekanbaru being a developed city. There was only 11 off-site sanitation systems throughout Indonesia. This facility would enhance the health rate of local residents.
b. For this ADB funded MSMIP, WWTP with pipe diameter higher than 300 mm would require environmental assessment. Given that, input, comments of local residents with regard to environment and social issues were anxiously expected, especially during pipeline network construction and WWTP construction and

operation, notable from residents living in the areas to be served by this piped wastewater networks and those who were adjacent to the WWTP location.

c. Booklets of Project Information and draft Complain Resolution and Compensation Mechanism had been distributed. They should be attentively perused. They were encouraged to express their questions for any matter they did not understand or any suggestion as input for project execution later. This approach was to prevent and minimize social and environmental impacts.

Comments, Views, Issues and Concerns

1. Pak H. Wajib Hartono, community leader/LKM Kelurahan Tanjung Rhu
    a. The local residents were eagerly expecting this program. This program was much more obvious in densely populated areas, where to make septic tank was not an easy task.
    b. The planned WWTP had been informed 2 years ago. [hearsay] 4 ha of land had been allocated in Tanjunghulu. However to date no certain site had been designed.
2. Pak Mardiyanto Manan, resident, Forum Kota Sehat = healthy city forum
    a. What was about to develop WWTP or Sludge Treatment Plan? What was the difference of these two facilities?
    b. Of three alternative WWTP sites, which one would be selected?
    c. Way alternative 1 was selected?
    d. The customers would be charged for some fees. What they received for the return? If there was service, the customers/communities would have no objection to pay.

    Pak Edwin's answer (Public Work Office/Coordinator Pokja):
    a. The location had been selected in view of various considerations. Originally there were 3 alternative locations. Alternative 2 was crowded by inhabitants requiring enormous land acquisition. The alternative 3 was close to Setu (?) and local local inhabitants had no houses. The existing land use would be more prioritized for Rusunawa (Rental Low Cost Aparment). The remaining choice was only alternative 3 consisting of 20 ha land. This option was also suitable for further expansion of the plant in future.
    b. Kota Pekanbaru has one Sludge Treatment Plant (IPLT) to collect human waste. This facility was dedicated for residents or areas deprived from piped wastewater services.
    c. With regard to service charge. A survey to identify the willingness to pay of potential customers was started in 2007.
    d. What we need from you is your no objection to the program.
3. Pak Ariebudi Sunarto's progress report, Bagian Pemerintahan Kota Pekanbaru
    a. WWTP location in Kelurahan Rejosari, 20 ha, RT 02/RW 02, the permit has been processed. The latest progress is that of earthfilling.
    b. In the coming days, payment will be made to 6 land owners of 9.5 ha. Other 10,5 ha will be purchased later.
    c. Tommorow is planned to meet the land owner.

    Bu Devita Sari (BAPPEDA):
    a. With this land, Kota Pekanbaru gets plus score. The land must be provided by the municipal government.
    b. Land is important to comply with ADB requirements. Despite complicated issue, we see the positive side. The program is beneficial to residents.

4. Pak Taswir, Community Leader/LPM Village Suma Hilang
    a. The local residents support the program since it will enhance their health rate and eradicate disease.
    b. In Pekanbaru, there is province hospital. Will their hazardous waste be accommodated in WWTP to be built.
    c. While the hospital has its own WWTP, their waste frequently contaminates wells and drainage notably during raining.

    Ariani Dwi Astuti's answer (MSMIP Konsultan):
    a. He is very relieved since the local people understands the benefits of WWTP for health and living standard improvement. Their city will become cleaner like Denpasar and other cities operating off-site sanitation system.
    b. IPLT has different function from IPAL. The former is to treat sludge taken from septic tank. If the houses have septic tanks there must be IPLT facility to treate its wastewater. Meanwhile, WWTP is to treat water from toilet or known as black water or from bathing or washing or known as grey water. This grey water is thus far directly disposed to drainage. It is not a hygienic practice. If WWTP is built, all domestic wastewater must be drained to this treatment facility.
    c. According to the law, hospital must operate their own WWTP due to their specific wastewater and may not disposed to domestic wastewater treatement system.

    Pak Syafrudin Sayuti, Kepala Badan Lingkungan Hidup Kota Pekanbaru
    a. He confirms that hospital wastewater may not processed in WWTP, but in separate plant.
    b. Of 4 treatment alternative, which one is to be selected?

    Pak Edwin's answer (Public Work Office/Coordinator Pokja):
    a. Alternative 3 will be adopted. Its land of 8 ha is sufficient.
    b. At present, land acquisition for 20 ha of land is still on going, while only 8 ha will be necessary. The past experience indicates that more people will dwell close to the plant site and they blame the municipality. To avoid this phenomenon, there must be additional land in the surroundings of WWTP site.
5. Pak Zulkifli, villager dari daerah sekitar IPAL
    a. He personally supports the program. He thinks that the drawing of WWTP looks like a dam. At present we use drilled well (20-30m) to meet our clean water. Some reach 60 m. What is the impact of WWTP to our wells?
    b. Many children play in the surroundings of WWTP site. Will this plant generate unpleasant odor to the nearest houses? We are afraid that this impact will spark public anxieties.
6. Pak Masrul, Ketua RT di Tanjung Rhu, dekat IPAL
    a. He is informed that land acquisition of 20 ha lands for WWTP there is gas pipelines of PT Kalila. Will their representatives be invited?
    b. How is the distance of WWTP site to river Siak? Too close proximity will cause environmental destruction.
7. Pak Ismail Nasution, (Pokja AMPL)
    a. Is there any provincial representative invited in this consultation?
    b. Consultants can assist socialization, not only for FGD in 10 kelurahan only. The local persons must be prepared. Only few land owners attend this consultation.

c. Female representatives should be included. Wastewater has close relation with female activities.

Ariani Dwi Astuti's answer (MSMIP Konsultan) :

a. WWTP to be built will be watertight and will not disturb the surrounding environment. There is also monitoring well to check the quality of well water closed to the plant.
b. Don't worry about the unpleasant odor. If properly operated a WWTP will not generate any odor. The odor will be similar to smell of paddy field. You can see by yourself in communcal WWTP, sanimas, etc. With sound management these facilities produce no odor. Today, many WWTPs are built in city centers and residential zones as found in Bangkok and Malaysia.
c. The quality of river will not be disrupted. The water discharged to river will be first treated until reaching quality as established in laws. River will become cleaner since there is no untreated water entering the river.

Bu Devita Sari's answer (BAPPEDA):

a. There will be socialization. AMDAL will be prepared by Indii and so will the DED.
b. Coordination with province continues.

Pak Edwin's answer (Public Work Office/Coordinator Pokja):

a. In Australia WWTP locates in city center without generating unpleasant odor. Likewise in Jakarta, this plant can be found in Jalan Rasuna Said Kuningan. Nobody complains about odor. The surroundings of WWTP Kuningan are full of residents and offices and hotels. No serious problem arises to date.
b. Socialization will continue. There will be 3 stages of socialization. Socialization in service areas will be prepared.
c. Ideally WWTP to be built in Pekanbaru and its pipe installation will be supported with DED.
d. For this project (MSMIP), the provincial government will be involved on top of central Government. The coordination continues.

8. Pak Mardianto Manan, (Forum Kota Sehat = healthy cities forum)
    a. Since for years ago we have promoted healthy city campaign to local residents. They support our program since Pekanbaru now turns into a metro city.
    b. According to Health Agency the distance of septic tank with well should be minimum 10 m. In residential area with houses type 36, their wells may be polluted from septic tanks. Thus WWTP is crucial.
    c. The local government needs to conduct public socialization about this planned WWTP. What kind of structures to be built? Will it consist pipes only?
    d. Will the affected persons receive compensation if their fences or land affected by the program?
    e. Pipe or cable construction leaves earth waste along the road. What's about the development of this wastewater pipes?
    f. In case of odor from WWTP operation, where will the resident complaint?
9. Bu Sri Alam (Dinas Pertanian)
    a. What can be used from this WWTP process? As fertilizer, for example.
    b. Can it be turned into biogas and how is the quality?

Bu Devita Sari's answer (BAPPEDA)

a. Is there any biogas used at present?
b. There will be zoning for IPLT and pipes and communal WWTP.

Ariani Dwi Astuti's answer (MSMIP Konsultan):

a. Not only pipes, there will be other fixtures for these wastewater pipeline networks such as manhole, drop manhole placed at certain distance. They must be maintained after operation. Please don't open or discard any water into it. There is also flushing structure to prevent clogged pipes.
b. During pipe construction, the method will be clean construction to prevent disruption to environment and the local residents and their daily activities. Cost for the construction of pipes with diameter > 300 mm will be charged to ADB. Clean construction is one requirement for ADB financing.
c. As to complain resolution, a complain resolution mechanism has been distributed. Your feedback is awaited. This mechanism concerns procedure of addressing complaints. Moreover, the local government has operated mechanism for the reporting of environmental complaints.
d. What can be used from WWTP treatment? Its treated water. It is just presented that the treated water may reach 40000 m3/day. It is huge volume of water that can be used for watering the plants. In Jakarta, the groundwater is expensive, i.e. Rp. 18000 per m3. Some malls and industries treat their wastewater suing membrane technology at cost Rp. 8000 – 10000 per m3 for flushing purpose, watering the plants and cooling water.
e. Another product of WWTP treatment is sludge that can be used as compost. However further research is necessary to ensure its safety. Wastewater treatment with anaerob process will produce biogas. This product is normally used for internal operation of the plant or burned. As for its sludge treatement, WWTP in Indonesia normally uses sludge dyring bed system.

Pak Supriadi's answer (MSMIP Konsultan):

a. There will be compensation for lands and plants affected by project.
b. This socialization or public consultation is not the last one. During AMDAL preparation there will be another socialization: (i) in mass media; (ii) billboards in project sites; (iii) face to face meeting with local communities. In construction phase, another public consultation will be convened.

10. Pak Mardianto Manan, (Forum Kota Sehat = healthy cities forum)
    a. Will the community be invovled in the treatment?

Pak Edwin's answer (Public Work Office/Coordinator Pokja):

Only those meeting criteria for WWTP may work in the plant, except for cleaning operators.

11. Hj. Seniwati Hais, Camat Sukajadi
    a. Personally support the project.
    b. Socialization to each Kecamatan is necessary

Devita Sari's answer (BAPPEDA):

a. In 2012 socialization has been made to SKPD, especially in WWTP development and pipeline networks
b. For example in Yogyakarta, there is Perda for houses passed over by pipelines network must have WWTP connection.
c. Public consultation will be made directly to the communities.

12. H. Wajib Hartono, Kelurahan Tanjung Rhu
    a. Bigger map is necessary to identify the pipelines and facilitate socialization to the communities.
13. Widodo, Head of National Land Office/Kepala BPN Kota Pekanbaru

a. Forestry Agency should be involved to discuss river that will be used for disposal site. Is WWTP site consistent with RUTR?
b. Land survey and negosiation have been made for 9.5 ha. As to the other 10.5 ha, their survey and negotiation will be carried out immediately.

Devita Sari' answer (BAPPEDA) :

a. There is discussion and coordination with Spatial Planning Agency. The Location has been included in RTRW Kota Pekanbaru.

Meeting closed at 12:00 noon.

APPENDIX 5

List of Participants of Initial Public Consultation and Information Disclosure (Pekanbaru Subproject, October 22th 2012)

Stakeholders/Participants:

1. Suganda, Community Leader/Ketua RT 17 of Rejosari
2. Siswanto, Community Leader of Pekanbaru Kota District
3. Taswir, Community Leader/LPM Suma Hilang
4. Masrul, Community Leader/Ketua RT of Tanjung Rhu
5. Syahril, Community Leader
6. H.Wajib Hartono, Community Leader/LKM of Tanjung Rhu
7. Zaiful, Village Leader/Lurah of Tanjung Rhu
8. Hj. Seniwati Hais, District Leader/Camat of Sukajadi
9. Sugio, Village Officials of Rejosari
10. H. Zulkifli, villager
11. M. Daud, villager
12. I. Syahruddin, Villager Rejosari
13. Mardianto Manan, Forum Kota Sehat = *healthy cities forum*
14. Arwin, Community Leader/LPM of District Sukajadi
15. Rustam, District Officials of Bukit Raya
16. H. Abdurrohman, District Leader/Camat of Tenayan Raya
17. Syafruddin Sayuti., Head of Environmental Office
18. Ismail Nasution, POKJA AMPL
19. M Syukri, Marine and Fisheries Office
20. Widodo, Head of Nasional Land Office/BPN
21. Sri Alam, Agriculture Office
22. Suardiman, Office of Women Empowerment, Community and Family Planning/BPPMKB
23. M. Taufik Azhari, Spatial Planning and Building Office
24. Mujalis, Education Office
25. Tatik Supriyadi, Health Office of Pekanbaru
26. Rofiyanti, Health Office of Pekanbaru

Public Development Department Team:

1. Edwin
2. Yuliansyah
3. Marolop

BAPPEDA Team:

1. H. Syofian, Head of BAPPEDA
2. Mulyasman, Secretary of BAPPEDA
3. Yunannaris
4. Triyatno
5. Syaiful Agustianto
6. Aribudi Sunarko
7. Andri B.
8. Rinaldi
9. Devita sari
10. Dody Rinaldi
11. Sofian
12. Hj. Nurheni
13. Naimah

MSMIP Consultants:

1. Ruel Janolino, Environment Specialist
2. Ariani Dwi Astuti, Environment Specialist
3. Angelito Corpuz, Social Safeguard/ Involuntary Resettlement Specialist
4. Supriadi, Social Safeguard/ Involuntary Resettlement Specialist

APPENDIX 6

Attendance Sheet of Initial Public Consultation and Information Disclosure (Pekanbaru Subproject, 22 October 2012)

ABSENSI RAPAT

Hari / Tanggal : Senin, 22 Oktober 2012
Pukul : 09.00 wib s/d selesai
Agenda : Public Consultation (PC), Program MSMIP (IPAL Rejosari)
Tempat : Aula Bappeda Kota Pekanbaru (Lantai 3)

NO.	NAMA	JABATAN	NO. TELP	TANDA TANGAN
1	H. SYOFIAN	KA. BAPPEDA / ROPSA AMPL		
2	MULYASMAN	Sek Bappeda		
3	Syafruddin Fauzi	Ka. Bid PRW		
4	Tri Yatno	Bappeda		
5	EDWIN	[illegible] PU		
6	SUPRIADI DT TUMPATIH	MSMIP KONSULTAN	08[illegible]	
7	RUEL JANGLING	MSMIP Consultant		
8	ANGELITA N. CORPUZ	MSMIP CONSULTANT		
9	Arioni Dwi Astuti	MSMIP Konsultan	0816 135 1747	
10	SRI ALAM	Dinas Pertanian	081268014288	
11	WIDODO	[illegible] KOTA PKU	0811761[illegible]	
12	SUGANDA - ST	[illegible]	0852 [illegible]	
13	Hj Nurhdui	Kasubid [illegible] KS	0812[illegible]	
14	Nasamah	[illegible]	081365[illegible]	
15	Sunjanto	[illegible] Kec. P. [illegible]	0761[illegible]	
16	TARDIS	[illegible]	0812[illegible]	
17	MASRUL	[illegible]	0821[illegible]	
18	Syamsil J	Tokoh	0812[illegible]	
19	H Wazir Hare [illegible]	Lkm Tj Rhu	0812 [illegible]	
20	ZAIRUL	LKM Tj. Rhu	0852 [illegible]	
21	[illegible]	[illegible]	081276[illegible]	
22	SUARDIMAN	[illegible]	[illegible]	
23	H. Venunaf [illegible]	Camat [illegible]	081275[illegible]	
24	SUGENG	[illegible]		
25	M. TAUFIK AZHARI	DINAS TATA RUANG & BGN	0813[illegible]	

NO.	NAMA	INSTANSI	NO. TELP	TANDA TANGAN
26	H. Zulkifli	Masyarakat	0813 653 52798	
27	M. DAVID	Masyarakat	0821-74334815	
28	M. SYUKRI	DKP		
29	[illegible]	EPPM	08117872066	
30	[illegible]	Dinsos PKU	0811 [illegible]	
31	ARMAN	LPM Kec [illegible]	0823 71181434	
32	[illegible]	Dinkes Kota	0812 [illegible]	
33	ROFIYANTI	DINKES KOTA	0813 [illegible]	
34	[illegible]	[illegible]	[illegible]	
35	[illegible]	BAG. [illegible]	[illegible]	
36	H. [illegible]	[illegible]	0813 66 [illegible]	
37	YUNANIASTRI	KABID [illegible]	0811 [illegible]	
38	[illegible]	[illegible]	[illegible]	
39	ANDRI [illegible]	[illegible]	[illegible]	
40	YULI [illegible]	CK, PU		
41	HAMMED. T	PU [illegible]		
42	[illegible] RINALDI	BAPPEDA		
43	[illegible]	[illegible]	081275476764	
44	DEVITA SARI	BAPPEDA		
45	DODY RINALDI	Bappeda	081174668760	
46	SOFIAN	- " -		

APPENDIX 7

PHOTOGRAPHS OF INITIAL PUBLIC CONSULTATION AND INFORMATION DISCLOSURE (PEKANBARU SUBPROJECT)

Photo No.5: A stakeholders' representative raising some points [22 Oct 2012]

Photo No.6: A stakeholders' representative raising some points [22 Oct 2012]

Photo No.7: Environment Office Chief, BLH, stressing some points [22 Oct 2012]

Photo No.8: A stakeholders' representative from an area near the WWTP site raising some points [22 Oct 2012]

APPENDIX 8

SAMPLE CONTENTS OF ENVIRONMENTAL MONITORING REPORT

(Note: this format also satisfies the GOI requirements for environmental monitoring based on Decree of State Minister of Environment Reg.45/2005)

Executive Summary

- Summary of EMP Implementation
- Key issues, corrective actions, and any grievances
- recommendations

1.0 Background

- Profile of Proponent
- Location Information

2.0 Status of Activities

- Activities of Proponent
- Progress of Work (% physical completion)
- Changes of Surrounding Environment
- Status of Permits / Consents

3.0 Details of EMP Implementation Status /Evaluation

- Design/Location/Preconstruction Phase Monitoring
- Construction Phase Monitoring
- Operation Phase Monitoring
- Occupational Health Risks and Safety Plan for Workers
- Redress of Grievances (type of grievance, date, persons, etc.)
- Corrective Actions Taken
- Field Visits and Consultations (sites visited, dates, persons met)
- Training (Nature of training, number of participants, date, location, etc.)

4.0 Conclusion

- Important results from the implementation of environmental management and monitoring
- Recommendations to improve environmental management and monitoring

Appendices

Consents / permits
Monitoring data (water quality, air quality, etc.)
Photographs
Maps