Initial Environmental Examination

June 2013

Indonesia: Metropolitan Sanitation Management Investment Project

Losari 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
KLH	–	Kantor Lingkungan Hidup
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 **Makassar City's Losari 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. Makassar City is in South Sulawesi Province, Republic of Indonesia. The proposed sewerage system subproject is expected to improve access on sanitation services in Makassar 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 is usually prepared. AMDAL reports were prepared and Makassar's environmental agency already issued approval decrees for the proposed WWTP and sewer network. GOI shall issue a certification that the previous approval decrees are still valid. The need for updating/finalization of the AMDAL EMP shall be determined after the design is completed. This shall be completed prior to any bidding/procurement process.

2. *Subproject Description*. Makassar's proposed sewerage system under MSMIP shall cover the areas in the sub-districts of Mariso and Ujung Pandang including the banks of the Jongaya Canal in Tamalate sub-district, the commercial and institutional areas of Wajo sub-district, and the commercial area of Pannakukang. This is known in Makassar's Wastewater Investment Master Plan as the "Stage I: Losari 1 and Losari 2". The proposed sewerage system will serve 62,500 people through 15,000 domestic service connections by 2018.

3. The proposed sewerage network will have 13.0 km of sewer pipelines with diameters ranging from 350 mm to 1,650 mm, 0.78 km of 250 mm concrete pipe, and 396.2 km of 150 mm collector/ service sewers. MSMIP will only fund those sewer pipelines with diameters 300 mm and above. Hence, the 396.2 km of tertiary sewer network (with pipe diameter of less than 300 mm) will not be funded under MSMIP. The system also includes 7,957 sewer manholes and a sewage pumping station.

4. Wastewater from the Makassar sewer network system will drain to a 19.1-MLD Wastewater Treatment Plant (WWTP) located at Tamalate Sub-district just beside the Jongaya Canal and near the Metro Tanjung Bunga bridge. WWTP's effluent discharge point is the Jongaya Canal. The proposed WWTP shall be a Facultative Aerated Pond (FAP) system using covered anaerobic pond, facultative-aerobic ponds, and maturation ponds. It will have a biochemical oxygen demand (BOD) load of 4.98 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.

5. *Environmental and Socioeconomic Conditions*. The proposed subproject sites are essentially urban areas. The sewer lines will be installed along urban roads. The proposed

WWTP site at Tamalate sub-district is an unused fishpond area but located in a generally urban area. Beyond its northern border is an urban road (Jalan Metro Tanjung Bunga). Built-up areas are present beyond the Jongaya Canal and commercial areas beyond the road towards the northwest. The Jongaya Canal, the WWTP discharge point, is a large urban canal draining a wide area of the city. The proposed Makassar City's sewerage system subproject is therefore not a new incursion to an ecologically untouched area. Socioeconomically, Makassar is a growing city with a 2010 total population of 1,339,374 people. Its industrial sector has a wide range of manufacturing with 39 companies and has established an industrial estate. It has the biggest airport in East Indonesia to support its various tourism, commercial, and industrial activities.

6. *Impacts and EMP*. Screening for environmental impacts of the proposed Makassar sewerage subproject is made through a review of the parameters associated with sewerage projects against the components of the proposed sewage collection network and 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.

7. Adverse environmental impacts, during construction of the proposed Makassar 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 Tamalate sub-district shall be confined in a site already acquired 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.

8. Environmental problems due to operation of the proposed Makassar WWTP at Tamalate sub-district 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 Makassar WWTP's operation.

9. An Environmental Management Plan of the Makassar sewerage subproject 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 set-up 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.

10. *Addressing Climate-Change Impacts*. Climate change adaptation considerations shall be included in the design of the proposed Makassar WWTP since it is on a low-lying ground and just beside a large urban canal. 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 Makassar City and will 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 Makassar 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.

11. Climate change mitigation considerations will also be included in the design of Makassar's proposed WWTP at Tamalate. 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.

12. *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 South Sulawesi Province as the Provincial Project Implementation Unit (PPIU) and the Makassar City Local Project Management Unit (LPMU).

13. 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 Makassar City subproject, while Makassar 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 Makassar City 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.

14. A capacity building for Makassar City's 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 Makassar City's WWTP with inputs from a WWTP advisor for a 3-month period intermittently, an important input for the WWTP start-up phase.

15. *Consultation and Participation*. Within the context of "meaningful consultation" per ADB's SPS, the city government of Makassar 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 16 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. During the consultation, 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. Issues that stakeholders raised include efforts to help address the public's awareness on the importance of sanitation and the need for regulations on domestic wastewater management. 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 Makassar's Wastewater Investment Master Plan in 2010-2011.

16. *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 Makassar disclosed the proposed mechanism during the initial public consultation last 16 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 Makassar's Badan Lingkungan Hidup (BLH), the local environment agency. The CSECC shall be chaired by Makassar 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.

17. *Conclusion and Recommendations*. Based on the screening for potential environmental impacts and risks of the proposed Makassar City subproject, there are no significant negative environmental impacts and risks that cannot be mitigated. With the EMP, the proposed Makassar 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 Makassar City's sewerage system subproject.

18. Implementation of the proposed Makassar City's subproject is hereby recommended with emphasis on the following: (i) EMP of Makassar 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) Makassar 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. Makassar City is in South Sulawesi 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 is usually prepared. AMDAL reports were prepared and Makassar's environmental agency already issued approval decrees for the proposed WWTP and sewer network. GOI shall issue a certification that the previous approval decrees are still valid. The need for updating/finalization of the AMDAL EMP shall be determined after the design is completed. 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. 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.

10. 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 Makassar subproject will require an AMDAL since its WWTP area is 6 hectares, more than the 3-hectare criterion. The Makassar subproject has already complied with the AMDAL requirements.

11. Approval decrees from Makassar's environmental agency, Badan Lingkungan Hidup, have been issued for the proposed WWTP and sewer lines network. According to the environmental agency, an Environmental Permit under Environmental Permit Regulation No.27/2012 is no longer required since the AMDAL approval decrees were issued long before the issuance of the regulation. Copies of the approval decrees are presented in Appendix 1.

12. 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.

13. *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.

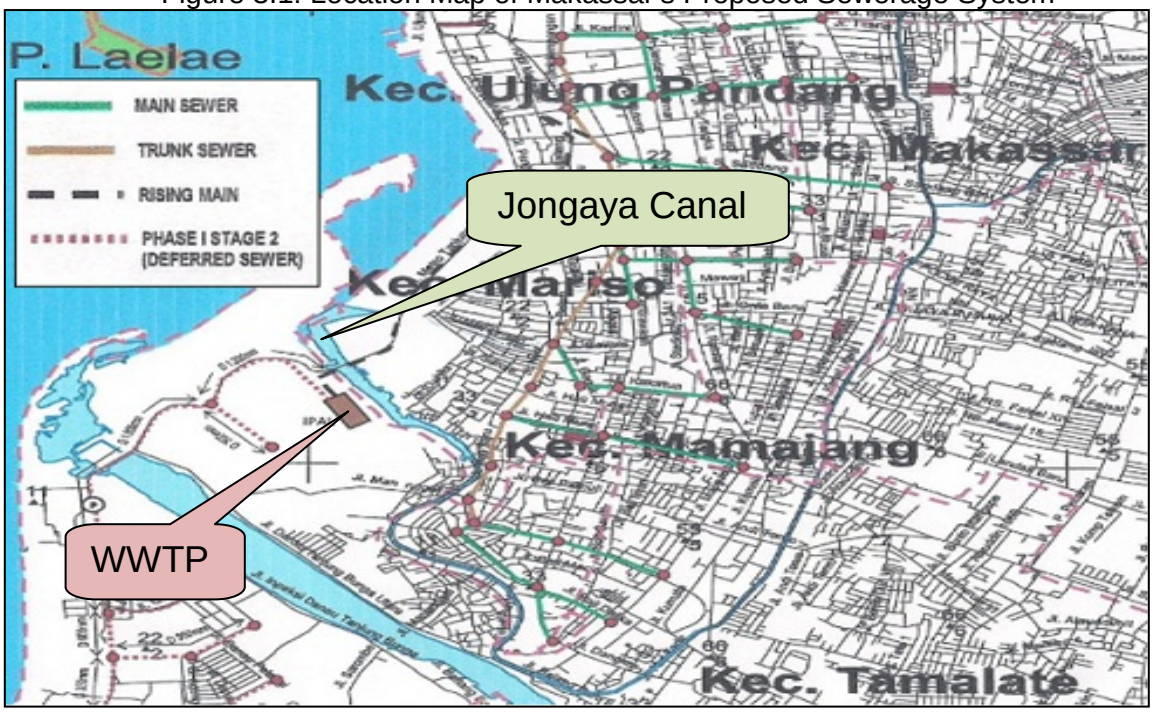
14. *Sewerage Laws and Regulations*. The framework on wastewater management system development in Indonesia is provided by Public Works Regulation No.16/PRT/M/2008 on National Strategy and Policy in Domestic Wastewater Management. Law No.4/1992 on Housing and Settlements mandates that sewerage systems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

III. DESCRIPTION OF THE PROJECT

A. Location

15. Makassar's proposed sewerage system under MSMIP shall cover the areas in the sub-districts of Mariso and Ujung Pandang including the banks of the Jongaya Canal in Tamalate sub-district, the commercial and institutional areas of Wajo sub-district, and the commercial area of Pannakukang. This is known in Makassar's Wastewater Investment Master Plan as the "Stage I: Losari 1 and Losari 2" (Figure 3.1). The proposed sewerage system will serve 62,500 people through 15,000 domestic service connections by 2018.

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



Source: PPTA Consultants

B. Components and Cost Estimate

16. The proposed sewerage network will have 13.052 km of sewer pipelines with diameters ranging from 350 mm to 1,650 mm (Table 3.1), 0.78 km of 250 mm concrete pipe, and 396.2 km of 150 mm collector/ service sewers. MSMIP will only fund those sewer pipelines with diameters 300 mm and above. Hence, the 396.2 km of tertiary sewer network (with pipe diameter of less than 300 mm) will not be funded under MSMIP. The system also includes 7,957 sewer manholes and a sewage pumping station.

Table 3.1: Proposed Makassar's Sewerage Network (to be funded under MSMIP)

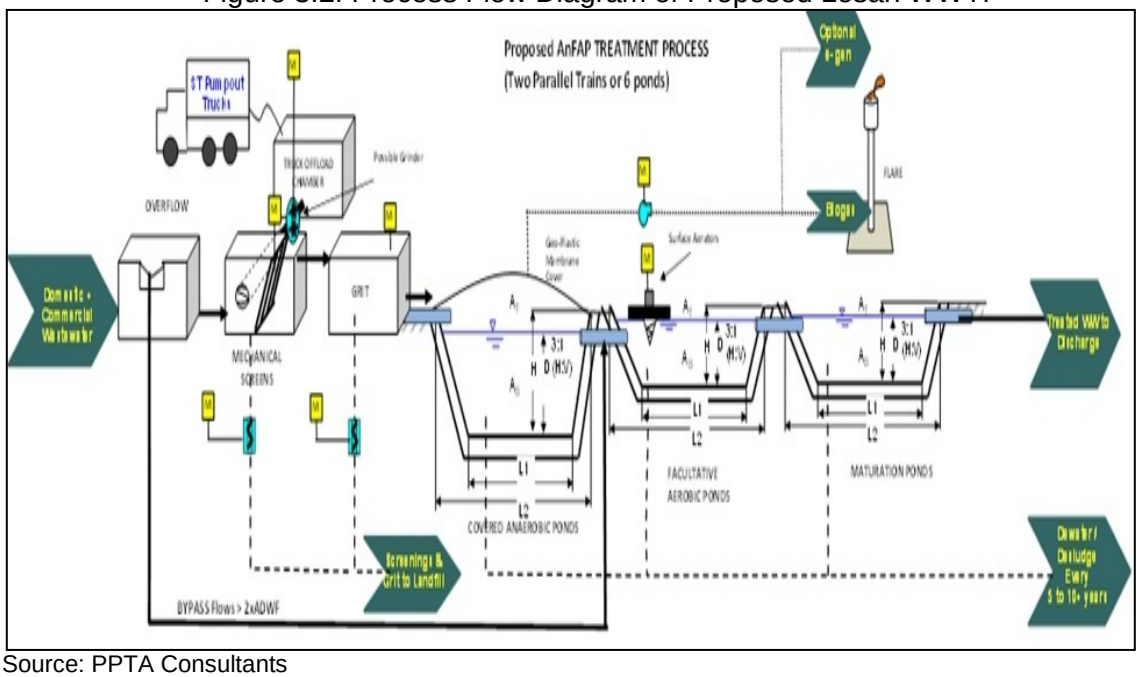
Sewer Pipe Diameters (in millimeter)	Sewer Pipeline Length (in kilometer)

1650	0.100
1500	0.580
1350	0.562
1200	0.616
1050	1.154
900	0.860
750	1.207
600	1.149
525	0.993
450	3.834
350	1.997
Total…	13.052

Source: PPTA Consultants

17. Wastewater from the Makassar sewer network system will drain to a 19.1-MLD Wastewater Treatment Plant (WWTP) located at Tamalate Sub-district just beside the Jongaya Canal and near the Metro Tanjung Bunga bridge. WWTP's effluent discharge point is the Jongaya Canal. 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 4.98 tons per day (tpd).

Figure 3.2: Process Flow Diagram of Proposed Losari WWTP



Source: PPTA Consultants

18. The proposed 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.

19. 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.

20. 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 (South Sulawesi Governor Decree No.14 of 2003).

21. Total Makassar subproject’s cost is estimated at US$64.47 millions based on 2012 prices. The proposed WWTP is estimated to have an operating cost of US$174,000 per year based on 2012 prices.

C. Construction

22. The proposed Makassar’s Losari WWTP construction shall require: (i) site clearing and marking of alignments, (ii) stockpiling of construction materials, (iii) construction of new structures, (iv) construction of embankments, (v) construction of ponds and buildings, (vi) concreting for required tanks, (vii) installation of piping systems, (viii) installation of electro-mechanical equipment (ix) cleaning and closure of construction sites. The WWTP site will be backfilled with clean fill materials and there will be no site excavations for the ponds.

23. Sewer pipelines of the proposed Makassar’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.

24. 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.

25. *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.

26. *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

27. Detailed engineering design of the Makassar 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. Makassar‘s new sewerage system is expected to be operational by third quarter of 2018.

IV. DESCRIPTION OF THE ENVIRONMENT

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

A. Physical Resources

29. Makassar is located between 119^{O}18'28 "-119^{O}32'31" longitude east and 5^{O}30'30 "-5^{O}14'49" South latitude on the west coast of South Sulawesi. It is the fourth largest city in Indonesia, and the largest city in the eastern part of Indonesia. Makassar city is divided into 14 Sub districts and 163 villages. The northern part of Makassar is bordered by Pangkajene Islands, eastern by Maros regency, on the south by Gowa and on the western border by Makassar Strait.

30. *Topography*. Makassar is located at the foot of the mountain Bawakaraeng towards the East and the Makassar Strait to the west. Western area is at an elevation between 0 to 5 m. Parts of the east and north of city located on the right side of the River Tallo. This area has an average elevation of 5 to 25 m.Thus the areas covered in this study had a fairly low altitude and has an average slope of range from 0 to 5% in the east-west direction.

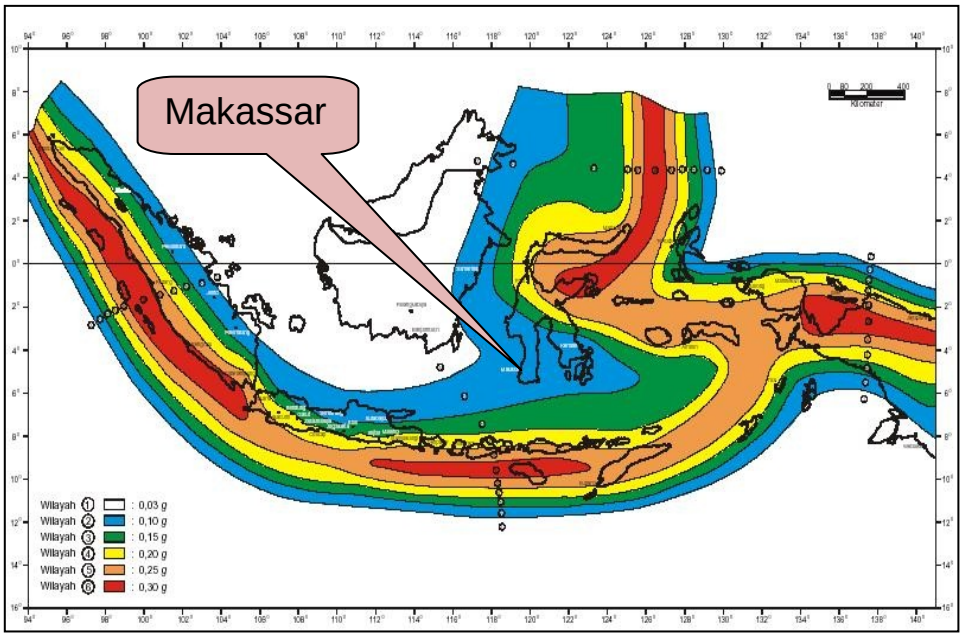
31. *Geology and Soils*. Bedrock layers of Makassar are volcanic rock, sandy tuff and sandstone, low levels of weathering, soil good enough in the original soil and soil stock piles. Younger sedimentary (soft ground) dominate to depths of 20 m. Based on the results of the study conducted Soil Investigation Land Development Building in Makassar Celebes Convention Centre, indicating that the composition of the soil layer consists of: (i) Topsoil layer: Topsoil is sandy silt soil, brown-gray to black-gray, thick from the face of the local soil to a depth of 3 m (elevation -3.76 m), is a land of sandy soil sediment, qc approximately 5-10 kg/cm^2 (new sediment not yet solid), is a farm land; (ii) Sand silt soil unit little clay: Thick unit is approximately 7.5 m between depths of 3 m (elevation -3.76 m) to 10.5 m (elevation -11.26 m), the average relative density slightly increases with depth, black, where the value of cone resistance (qc) of 10-20 kg/cm^2; (iii) Unit layer of sandy soil with a mixture of clay and silt: Thick unit is approximately 10.40 m between depths of 10.5 m up hard soil, medium consistency, qc values around 20-30 kg/cm^2, occurs secondary consolidation process, increasing the consistency of the corresponding increase in depth about the surface of the bed-rock layer; and (iv) Hard soil unit: Hard soil to a depth MMSL between elevation 18.6 m. Qc values> 220 kg/cm^2.

32. Indonesia has 6 earthquake zones: earthquake zone 1-2 for minor earthquake, earthquake zone 3-4 for moderate earthquake, and earthquake zone 5-6 for severe earthquake. Makassar is in earthquake zone 2, minor earthquake zone. (Source: Procedure of Earthquake Resistance Planning for Building, Indonesia National Standard/SNI 03-1726-2003). The map of earthquake zone and peak acceleration of bedrock can be seen in Figure 4.1. The value of peak acceleration of bedrock should be calculated in the structural design of buildings to ensure safety. Structure and geological bedrock in the WWTP site proposed is in balance and relatively safe from the dynamic geologic processes.

33. *Water Resources*. Based on the analysis of hydro geological map sheet 2010 Ujungpandang and field observation, information was obtained that the aquifer system at the location of WWTP site proposed and surrounding regional, aquifer is formed by two aquifers with flow through the spaces between the grains and fissured aquifers or nest. Constituent

rock aquifer with flow through the chamber was precipitated swamps, rivers and coastal sediments are composed of fine to coarse sand, silt and clay. While fissured rock aquifers such constituent sandstone, clay, silt stone, tufa and tufaan sandstone. Free ground water varies from one place to another with a depth ranging from 0,5 to 1,5 m below sea level. (Source: Environmental Impact Analysis of Development Waste Water Treatment Plant in Makassar City, 2011).

Figure 4.1: Indonesia Earthquake Zones



Note: Peak Acceleration of Bedrock with Return Period 500 years.
Source: Procedure of Earthquake Resistance Planning for Building, Indonesia National Standard/SNI 03-1726-2003

34. Makassar has a high ground water level. Table 4.1 shows the study of ground water-free and shallow ground water in the city of Makassar. Groundwater is used for domestic water needs (Source: Waste Water Treatment Plant Package I: Makassar – Final Mater Plan, 2011).

Table 4.1: Ground water Depth in Makassar City

Sub Districts	Area (Ha)	Km from the Sea	Water Depth (m)	Type of Aquifer Layer	Porosity (%)	Spf (%)
Mariso	236	0 – 2.7	0.45 – 1.2	Fine sand; sand clay	30 – 45	15
Mamajang	199	0.5 – 2.86	0.3 – 3.2	Fine sand	30 – 45	15
Tamalate	583	0 – 2.69	0.15 – 2.61	sand clay	35 – 55	10
Makassar	250	2.1 – 2.3	0.43 – 2.4	Fine sand	30 – 35	15
Ujung Pandang	263	1.75 – 3.9	0.25 – 1.6	sand clay	30 – 35	20
Wajo	252	1.7 – 3.8	0.2 – 2.1	Fine sand	35 – 50	15
Bontoala	125	1.6 – 3	0.15 – 1.1	sand clay	35 – 55	10
Ujung tanah	125	0 – 2.9	0.25 – 0.75	Fine sand	35 – 55	10
Tallo	2,944	0.8 – 20.9	0.17 2.5	sand clay	30 – 45	8

Panakkukang	4,119	0-4,01	0.11 – 0.4	Fine sand	30 – 35	15
Biringkanaya	8,006	0-22	0.5 - 15	sand clay	35 – 45	8

Source: Waste Water Treatment Plant Package I: Makassar – Final Mater Plan, 2011

35. Analysis of total coliform and E. coli in several wells in the Sub-district Mariso Makassar, showing the range of 240 -1100 MPN/100 ml and 4-7 MPN/100ml. This shows that the well community has water contamination. Interviews and field observations indicate that the distance between the wells and latrines discharge is less than 5 meters.

36. Surface Water. Makassar crossed by two rivers: Tallo River which flows from the southeast to the north along the eastern outskirts of the city and the river flowing Jeneberang from the East to the West along the South City. The city is also divided by Panampu-Jongaya Canal towards the East.

37. The primary drainage channel of Makassar is Panampu-Jongaya canal. In addition there are small canals and waterways that criss-cross in the center of city, some discharging directly into the sea. Most of the canals in the city center are polluted. During the dry season, BOD level in most of the canals were measured to be about 120-180 mg / l. Based on the analysis, DO in Jongaya canal very has been low (1.1 mg/L) as a result of the high BOD and COD. Concentration of BOD in Jongaya canal is 192 mg/L, while COD is 480 mg/L. The high COD and BOD Jongaya indicate that the canal is polluted. Total coliform showed highly significant increases in the last 2 years, from 13,600 MPN/100 ml to 2.4 million MPN /ml. Jongaya Canal discharge in the range between 2.28 to 4.49 m^3 s with canal flow velocity ranged from 0.02 to 0.18 m/s the conditions of high tide and from 0.03 to 0.22 m/s in conditions of low tide. Daily discharge for the transition between the wet season to the dry season is ranged from 5.1 m^3/s. Table 4.2 presents the Jongaya Canal water quality. (Source: Environmental Impact Analysis of Development Waste Water Treatment Plant in Makassar City, 2011).

Table 4.2 Jongaya Canal Water Quality

No	Parameter	Unit	Standard Quality Class III[a]	Water Quality of Jongaya Canal	
				16 July 2009	21 Jan 2011
A	Physical				
1	Temperature	C	Normal Air + 3°C	28.5	29.4
2	Total Dissolved solids (TDS)	mg/l	1000	31299	712
3	Total suspended solid (TSS)	Skala NTU	400	155	8
B	Chemical				
1	pH	-	6 – 8.5	8.5	6
2	Mercury (Hg)	mg/l	0.002	-	<0.001
3	Chromium VI (Cr^{6+})	mg/l	1	0.0045	<0.02
4	Grease and Oil	mg/l	1	-	<0.1
5	Nitrite (NO_2-N)	mg/l	0.06	-	0.1
6	Copper (Cu)	mg/l	0.2	-	<0.015
7	Lead (Pb)	mg/l	1	0.0012	<0.01
8	Dissolved Oxygen (DO) (insitu)	mg/l	3	4.15	1.1

No	Parameter	Unit	Standard Quality Class III[a]	Water Quality of Jongaya Canal	
				16 July 2009	21 Jan 2011
9	BOD_5	mg/l	6	21.22	192
10	COD	mg/l	50	64.61	480
C	Microbiology				
1	Fecal Coliform	MPN/100ml	2000	-	400
2	Total Coliform	MPN/100ml	10000	13500	2400000

[a]National Government Regulation No 82 of 2001 for Water Quality Management and Control of Water Pollution, Class III

Source : Environmental Impact Analysis of Development Waste Water Treatment Plant in Makassar City, 2011.

38. Sea water entering the Losari bay is experiencing mass mixing with fresh water from Jongaya canal and Mariso canal. Water transparency ranges from 0.4 m to 2 m. Brightness in the waters of the Losari bay is 0.4 m. Phosphate concentrations were 80 mg/L from domestic activity and cafeteria/restaurant. Nitrate concentrations analysis is in the range of 0.05 to 0.13 mg/L. Coliform bacteria in Losari sea waters has increased, from 2400 - 9200 MPN/100 ml (2009) to 170000-2400000 MPN/100 ml (2011). Analysis results at 7 outlets drainage was performed in 2007 also showed high concentrations of BOD ranging from 31.979 to 309.127 mg/L (Source: Environmental Impact Analysis of Development Waste Water Treatment Plant in Makassar City, 2011)

39. *Climate*. Makasar City is located in the tropical climate zone, with two seasons. The wet season is from November to April and the dry season is from May to October. Average annual rainfall is between 2000-2500 mm, about 75% of it down in the rainy season. (Source: Waste Water Treatment Plant Package I: Makassar – Final Mater Plan, 2011). Makassar air temperature conditions (± 30 years) based on data obtained from meteorological and geophysical stations areas IV Makassar shows the range from 25,3 to 28,8 ^{O}C and an average temperature of 27^{o}C. Temperature increase per year in Makassar city is about 0,029 °C.

40. Humidity of the air around the study area is high, around 75-85%. The high value of humidity occurred by location of the site near the Losari beach. The increase in high humidity occurred in 2010 (86.45%). This is due to a rainy day with a fairly high rainfall varies. Based on data from meteorological and geophysical stations areas IV Makassar shows that the average humidity over the last 10 years (2001-2010) is 79.97%. Lowest humidity occurs in 2002 (75.42%) and highest in 2010 (86.45%).

41. The sunshine intensity within last 10 years is ranging from 60-73% with an average of 67, 3%. Irradiation peaked in 2002 characterized by a long dry season. Lowest sunshine intensity occurred in 2010 marked by rain almost all year round. Wind speeds in the study area (WWTP site proposed) ranges between 8-22 knots or 4.11 to 11.32 m/s. Wind speed data is much influenced by differences in air pressure and temperature. In 10 years (1999-2008) the percentage of the dominant wind direction is coming from the west (36.87%) and then followed from the Southwestern (17.13 %.) Wind Speed range of 0 – 10.7 m/s) and from 10.7 to 17.9 m / s. (Source: Environmental Impact Analysis of Development Waste Water Treatment Plant in Makassar City, 2011).

42. Relative to climate change, information on climate change projections specific for Makassar 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.

43. *Air Quality and Noise*. Previous measurements of ambient air quality of the proposed WWTP site showed parameters complying with GOI standards except for NH3 at four locations and TSP at one location. City-wide monitoring of noise showed a range of 72 to 80 dB in all 15 sampling points (Source: Regional Environmental Status of Makassar City, 2011).

Table 4.3: Air Quality at Proposed WWTP Site

Parameter	Unit	Measurement Results				GOI Standard
		U1	U2	U3	U4	
Temperature	^{o}C	31.7	28.9	29	28.9	
Wind Speed	m/s	1.44-3.22	0.8-2.5	0.03-2.38	0.15-1.89	
Humidity	%	55-70	70-71	75	70-71	
TSP	$\mu g/Nm^3$	258.34	83.34	175	66.67	230
SO2	$\mu g/Nm^3$	564.64	517.1	515.64	196.31	900
NO2	$\mu g/Nm^3$	29.9	30.18	27.79	25.3	400
CO	$\mu g/Nm^3$	2349.27	1286.8	1311.13	1311.13	30000
O3	$\mu g/Nm^3$	83.99	114.99	65.95	59.07	235
NH3	$\mu g/Nm^3$	13.75	12.58	18.94	15.13	2
Pb	$\mu g/Nm^3$	< 0.01	< 0.01	< 0.01	< 0.01	2

Sampling locations in 2011:
U1: Crossroad Jl. Metro Tj. Bunga-WWTP Location
U2: Jl. Poros-Jl. Metro Tj. Bunga
U3: Location of proposed WWTP
U4: South of proposed WWTP

Source: Environmental Impact Analysis of Development Waste Water Treatment Plant in Makassar City, 2011

B. Ecological Resources

44. The proposed 6-ha WWTP site in Tamalate sub-district is near the bridge of the Jongaya Canal, a large urban canal draining a wide area of the city. It is presently an unused fishpond area acquired by the city government. This site is aligned towards the northwest and generally a flat area with low elevations (approximately between 1 to 3 meters above mean sea level). A road (Jalan Metro Tanjung Bunga) bordered the site in the north. Its tip is some 800 meters towards the sea but shielded from it by Jalan Metro Tanjung Bunga and further up north by a low-lying strip of land. The west is bounded by fishponds, while the east is bounded by Jongaya Canal, lined with mangrove trees. The southern part is bounded by a vacant piece of land. This site is not within an undisturbed landscape. On a broader scale, it is generally in an urban landscape with built-up areas beyond the Jongaya Canal and commercial areas beyond the road towards the northwest. Jongaya Canal has been carrying domestic wastewater and urban solid wastes from the built-up areas. It has poor water quality. Effluent of the proposed WWTP will be discharged to the Jongaya Canal. A satellite photograph of the site and its surrounding areas is presented in Figure 4.2.

Figure 4.2: Satellite Photo of Proposed WWTP Site

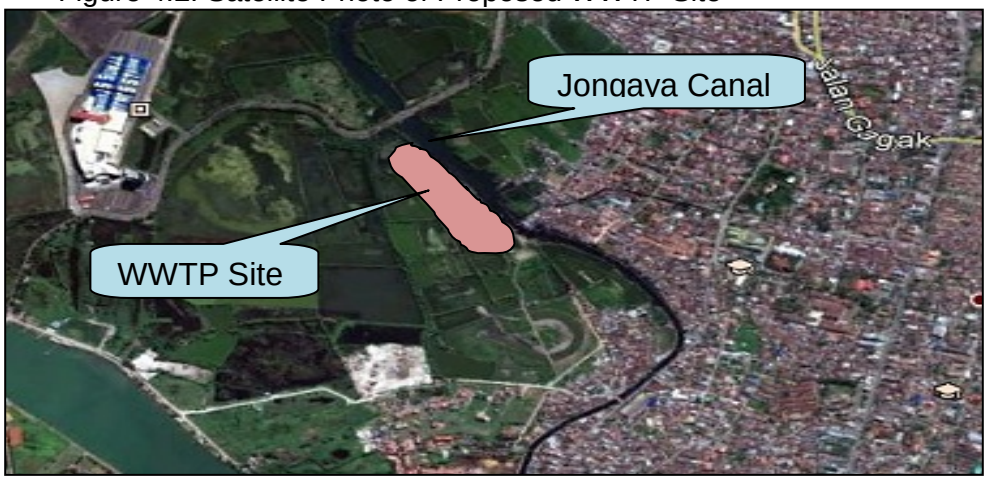


Photo source: Google Earth. 2012.

45. Based on the satellite photo and the presence of mangrove trees patches, it can be inferred that the general area where the WWTP will be located was previously a mangrove area that has been converted over the years into fishponds and built-up zones. Since the Tamalate WWTP site is devoid of forested areas, it is not a habitat for large wild animals, rare or endangered species. Photographs of the site are presented Appendix 3.

46. Results of previous biological survey in 2011 of the proposed WWTP site and nearby areas are presented in Table 4.4 and succeeding paragraphs.

Table 4.4: Flora of WWTP Site and Nearby Areas

No.	Sample code	Species	Local name
1	Flora 01 (Jongaya Canal)	Avicennia marina	Api-api
		Cyperus sp.	Teki
		Musa paradisca	Pisang
		Sonneratia alba	Pedada
2	Flora 02 (Losari Bay)	Avicennia marina	Api-api
		Cyperus sp.	Teki
		Lagerstromia speciosa	Bungur
		Sonneratia alba	Pedada
3	Flora 03 (Metro Tanjung Bunga Street)	Acrostichum sp.	Paku laut
		Acanthus ilicifolius	Akantus
		Acacia mangium	Akasia
		Aegiceras corniculatum	Duduk agung
		Cocos nucifera	Kelapa
		Pluchea indica	Beluntas
		Cyperus sp.	Teki
		Manihot esculenta	Ubi Kayu

Source: Environmental Impact Analysis of Development Waste Water Treatment Plant in Makassar City

47. Animal species that dominates is the group aves such as Dara laut (*Chlidonias leucopterus*), kingfisher (*Halcyon chloris*), kite (*Hirundo tahitica*), finches (*Pycnotus aurigaster*), and church birds (*Passer montanus*). Some types of fish (necton) were identified in Losari WWTP site proposed include Belanak fish (*Mugil sp*.); Balusu Fish (*Elops machnata*); Kakapas fish (*Carangoides sp*.); Pepetek Fish (*Leiognathus sp*.); Bandeng Fish (*Chanos chanos*), crab (*Scyla sp*) and crayfish (*Panaeus monodon*).

48. Types of Phytoplankton in Makassar are *Cyanophyceae, Chlorophyceae*, and *Bacillariophyceae*. Types of Zooplankton in Makassar are *Protozoa, Rotifera, Crustacea, Pelecypoda*, and *Nematoda*. The condition of the waters around the Jongaya canal with relatively high concentrations of BOD (192 mg/L) and low DO concentration trigger the growth of phytoplankton such as *cyanophyceae* (*Oscillatoria sp.* and *Trichodesmium sp*.) and type of *Euglenophyceae. Oscillatoria sp.* is the type that has a high tolerance to water with a high organic content.

C. Economic Development

49. *City Income and Expenditures*. Regional budget revenue was 1,451,537,120,407.85 rupiahs in year 2010 and 1,215,460,818,849.79 rupiahs in year 2009, an increase of about 19.42 %. Region expenditure was 1,217,795,378,191.67 rupiahs in 2009 and 1,239,084,281,517.01 rupiahs in 2009, a decrease of about 1.72 %. (*Source: Makassar city in Figure, 2011)*

50. *Land Use*. Current land use based on Planning Makassar, consisting of housing, playing fields, business areas, roads, cemeteries, paddy fields, plantations, fish ponds, land disposal, salting products, industries, forest, Meadowland, warehouses, rivers and wetlands. Generally, industrial areas located in the north of the city, the harbor area to the west and northwest of the city of Sultan Hasanuddin Airport to the west. The downtown area is home to the majority of commercial and domestic buildings, with most of the area are vacant land, marshes and ponds in the region were laid. A large amount of land occupied or owned by the University, the Military and government buildings. Under Law No. 41 of 1999 about the provisions of the principal forestry, green open space in Makassar is 30% of the city. Spacious areas of green open space in Makassar reached 35.27% or 6199.63 Ha. Green Open Space region is generally located in the campus, city parks, government offices, and the river border (Source: Environmental Impact Analysis of Development Waste Water Treatment Plant in Makassar City, 2011).

51. *Commerce and Trade*. Makassar City has established an industrial estate in the Sub district of Biringkanaya and Tamalanrea as an industrial area Makassar (KIMA) managed by PT. Kawasan Industri Makassar (KIMA) with total area of 703 hectares located in the Km 15 Independence Pioneer Power Makassar, 90241 Indonesia. Location KIMA found in Zone F of integrated industrial estate industry ranging from household, industrial medium to large industry. Industrial company in Makassar in 2010 there were 39 companies with total employment as compared to 687 people and in 2009, the number of new industries reached 27 companies with a employee of 636 people. Active industries in KIMA such as carbon industry, leather preservation industry, plastic industry, wood processing industry, packaging industry carbon, rice processing industry, instant noodle industry, industrial processing cocoa beans, coffee beans processing industries, grass marine processing industries, cold storage industry, tractors industry, rattan industry, retreading industry, machineryindustry, iron / steel industry. *(Source: Regional Environmental Status of Makassar city, 2011).*

52. *Agriculture*. In year 2010, production of paddy was 17,803.12 tons harvested from the 3,125 hectares; which mean average of productivity was 5.70 tons per hectare. Production of maize in year 2010 was 855 tons with the harvested area 277 hectares or average of productivity was 3.09 tons per hectare. In year 2010, production of cassava was 4,025 tons, peanuts was 2.67 tons; sweet potato was 299 tons; and small green pea beans was 22.04 tons. Big livestock in Makassar are cows, buffaloes, and horses. In 2010, number of cows

increase to 2,065, buffaloes increase was 326 and horses increase was 67. While in the year 2009 the number were 2,007 cows, 273 buffaloes and 61 horses.

53. *Tourism*. Makassar has tourism points of interest such as Losari Beach, Fort Rotterdam Benteng, and Trans Studio. Makassar is a transit City for tourists before trip to Tana Toraja, bira or other tour object in South Sulawesi. To support of tourism development which be able is encouraged the economic activity, include of other sector activity of interrelated, and then make serious effort of development of tourism infrastructure various. In Makassar, number of objects and tour enchanted of attraction tour is 95 objects, consist: culture tour and history tour object is 19, further natural tour object (Island, river and beach) is 19, and shopping tour is 8 objects, education tour is 4, sport facilities object is 4 objects, culinary tour is 33 objects and religion tour is 8 objects. An airport facility in Makassar is the biggest airport in East Indonesia. (Source: Regional Environmental Status of Makassar city, 2011).

54. *Existing Water Supply System*. Water sources used by PDAM Makassar from Jemberang River, Maros River, and Bili-bili DAM. Based on data, PDAM Makassar only served 64.89%. Statistical Agency (2010) states that 81% of water service PDAM are intended for household activities. PDAM has 5 water treatment plant: WTP I Ratulangi, WTP II Panaikang, WTP Antang III, WTP IV Maccini Sombala, WTP V Somba Opu. Distribution pumping system is a closed system by using pipes from diameter 50 mm to 1100 mm with an overall length of pipe 2,789,860 meters. Based on the survey of the city of Makassar in 2011 EHRA source of drinking water in the city of Makassar varied including bottled water, tap water, boreholes, dug wells and protected springs. Most people (73.7%) stated that their water quality is always good, while the rest (14.7%) said the quality of water from the main source is often poor; 10.4% of respondents said water quality is often good; 0.6% respondents said the quality of the water is always bad and 0.6% said other *(Source: Regional Environmental Status of Makassar city, 2011).*

55. *Sanitation Facilities*. According to a survey conducted in 2010 by the Public Works Department, approximately 75% of the households in Makassar has the same type of sanitary facilities (bathroom and WC); 88% of households using latrine (or a septic tank and leach pit) for treating black water, while 12% were discharged directly into the drainage channel. Generally grey water discharged into the rainwater drain in front or in back of the house without treatment.. Sometimes, that has limited land, builds a leach pit under the kitchen or living room, and covered with tiles. People who have a narrow land and low income, use public toilets, cleaning facilities and/or the neighbor's toilet to wash and defecation. Private residents of the apartment generally have medium and high incomes. Wastewater treatment systems are usually available for each building and the responsibility of the building owner.

56. Three pilot small-scale sewage scheme (SBS - Small Bore Sewerage) by Upflow Anaerobic Sludge Blanket (UASB) / Anaerobic Up flow Filter (AUF) has been implemented since 2007. The purpose of this program is to provide services for the poor, and high density residential areas and new development that are not in coverage area of off-site wastewater system (Source: Waste Water Treatment Plant Package I: Makassar – Final Mater Plan, 2011).

57. Based on data from Makassar Health Agency in 2010, the number of households with a private septic tank that is 220,829. The number of communal septic tanks in 14 Sub districts in Makassar city is 18 units and the number of communal latrines at 27 units *(Source: Regional Environmental Status of Makassar city, 2011).* Sludge treatment plant (IPLT) in the city of Makassar is 1 unit with a processing capacity is 100 m^3/day. IPLT located in the Nipa-

nipavillage, Manggala Sub district. This installation was built in 1990. IPLT located about 20 Km from the center city. Conditions IPLT is technically not feasible, require rehabilitation: dredging sludge settled and wall repair leaking pools and channels; replacement of valves that are not function. Desludging service in the city of Makassar until 2009 administered by PD Cleanliness Makassar City, then next years run by the Cleanliness and Landscaping Agency. The number of customers in 2000 amounted to 4899 subscribers and subscribers increased to 5905 in 2001. The number of fecal transported in 2000 was recorded at 12,457 m^3, while in 2001 amounted to 14,750 m^3. Operation IPLT system is supported by 25 field workers. *(Source: Regional Environmental Status of Makassar city, 2011).*

58. Landfill in Makassar called TPA Tamangapa was built in 1993 and located on a hill. This landfill has allocated approximately 14.3 hectares of land with a width of about 4-20 m. Since the opening of the landfill, approximately 1.24 million tons of organic waste has been dumped into this place with a volume of approximately 1.8 million m^3 of waste. This landfill has been in operation since 1994 and a land area of 11.9 hectares is already in use.

59. *Transportation and Communication*. Length of road in 2010 is 1593.46 Km, long way to go compared to the year 2009 has not changed. In 2010, for good road conditions decreased 14.07% compared to 2009. Increasing number of vehicles in Makassar is not accompanied by road increase. Increasing of road in Makassar had experiencing stagnant, only increased 1-30 meters per year. It is causing a variety of jams in Makassar. Makassar residents lost productivity time by 30% on public transportation, the distance of 14 kilometers must be completed in 1.5 hours. The number of city registered city transportation is 4,113 units, while around 4,000 illegal without public transportation routes. According to data Makassar port in the year 2011 registered that number of passenger debarkation was 366443 persons. Number of passenger was 469,690 persons. in 2011 on embarked passengers is decrease : they increased to 20.4 %. Meanwhile, there is also increase on debarked passengers; they decreased to 17.89 %. (Makassar city in Figure 2011).

60. According to the data of post office, in year 2010, the overall number of mails sent was 1.446.808, for domestic mails were 1.434.271 and 12.537 abroad mails. Number of mail Acceptance was 3.270.451 domestic mails and abroad mails. Number of mails acceptance was 3.247.619 domestic mails and 22.832 abroad mails. Number of main telephone connection year 2010, by is number of customers 157,500, line in service 160,250, and connected line 210,000. (Source: Makassar City in Figure 2011).

61. *Power Supply*. Source of electricity in Makassar city is supplied from the Power Company (PLN). In year 2010, Number of Electricity Costumers of PLN branch Makassar was 260.098 costumers. Out of sold energy 1.299.387.198 Kwh with of value 910.843.470.985 rupiahs. Total costumers continued to increase from 2008. The number of customers in 2010 increased as much as 7.75%.

D. Socio and Cultural Resources

62. *Population*. Total population of Makassar in the 2010 year is 1,339,374 people; 661,379 males and 677,995 females. Distribution of population of Makassar by sub districts showed that population is concentrated in Tamalate sub districts area, is 170,878 population or 12.76 percent of total population, is followed in Biringkanaya sub districts 167,741 (12.52 percent). Rappocini sub districts 151,091 (11.28 percent) and Lowest is Ujung Pandang sub districts 26,904 (2.01 percent) of population. From population density per each square kilometer, Makassar sub districts has a highest density of population is 32,421 population

per each square kilometer is followed Mariso sub districts (30,701), Mamajang sub districts (26,221), and Tamalanrea sub districts has lowest density of population is about (3,241), than Biringkanaya sub districts (3,479), Manggala sub districts (4,850), Ujung Tanah sub districts (7,860), Panakkukang sub distrcts (8,292) population per each kilometer (Source: Makassar City in Figure 2011).

63. Public Health and Sanitation. In 2010, the numbers of hospitals were about 16 units which, 7 units owned by the government, 8 units owned by private institutions, and the 1 unit were other special hospital. Numbers of public health centers were about 119 units which consisted of 38 units of public health centers, and 44 units of public health sub centre. Beside of health infrastructure, also there are human resources in the health sector such as. Practice doctor number it is 1.108 people and practice midwife it is 117 people.

64. Number of infectious diseases such as diarrhea, typhoid, measles, DHP, varicella, and tetanus were 44,697 cases and no one died. Based on the number of patients observed, there is a decrease in the number of deaths in the city of Makassar. The environment is very influential on human health. In addition to infectious diseases are also non-infectious diseases are generally influenced by the lifestyle of the people. Non-infectious diseases are such as high blood pressure, cancer, diabetes mellitus, heart disease, liver disease, kidney disease and others. number of health facilities and infrastructure that has been built is as follows: 15 units of general hospitals, 11 maternity units, 2 units of psychiatric hospitals, one special hospital units, 38 units of community health centers, 44 sub-health centers unit, 37 unit mobile clinics, 8 units of medical centers, 186 dispensaries units, 46 units of the drug store, and 1108 units of physician practice. (Source: Regional Environmental Status of Makassar city, 2011).

65. *Education*. The goal of education development is to improve intellectual life of the nation. The development of human resource determines the character of economic and social development, because the human is a subject of development. In 2010/2011, in Makassar, number of primary school was 452 schools with 6,033 teachers and 144.499 students. Number of Junior High school was 179 schools with 4,268 teachers and 61,107 students. Number of Senior High School was 116 schools with 5,595 teachers and 35,567 students (Source: Makassar City in Figure 2011).

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

66. A comprehensive screening for environmental impacts is made through a review of the parameters associated with sewerage projects against the components of the proposed Makassar 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.

67. The assessment is made on the following phases of the 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.

68. Environmental impacts arising from decommissioning of the proposed Makassar City's 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 Makassar City's sewerage facilities are available.

Table 5.1: Summary of Environmental Impacts Screening for Makassar City's 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

69. *Climate Change Vulnerability*. Climate change adaptation considerations shall be included in the design of Makassar City's proposed WWTP at Tamalate since it is on a low-lying ground and just beside the Jongaya Canal, a large urban canal. 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 Makassar 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.

70. To appropriately address this impact, a hydrology and flooding study shall be conducted for the proposed site of Makassar City's WWTP at Tamalate 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).

71. *Climate Change Mitigation*. Climate change mitigation considerations shall be included in the design of Makassar's proposed WWTP at Tamalate 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.

72. *WWTP Site's Conformance to Spatial Plan*. There is no problem with spatial planning for the proposed WWTP. Makassar City's Badan Perenanaan Pembangunan Daurah (BAPPEDA) confirmed that the proposed WWTP site conforms to Makassar 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.

73. *Encroachments to Environmentally Sensitive Areas*. There will be no encroachments to environmentally sensitive areas. The sewer network and the proposed Makassar City's WWTP at Tamalate will be located in the urban areas. The proposed WWTP will be constructed in a site that has been transformed into its present fishpond 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.

74. *Impacts and risks to biodiversity conservation*. The issue on impacts and risks to biodiversity conservation is not applicable to the Makassar City's 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 WWTP site at Tamalate are not undisturbed and over the years the ecological changes due to human activities in the area have resulted to its present fishpond landscape.

75. *Nuisance and Problems to the Public*. Potential nuisances and problems to the public during construction of the proposed Makassar City's 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 Makassar City's 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.

76. 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.

77. 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.

78. *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 WWTP at Tamalate. 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 Makassar (Makassar Archaeological Research Office) if archaeological and cultural assets are discovered.

79. *Loss of Assets*. Inventory of losses for the proposed Makassar City's 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. The land of the proposed WWTP site was already acquired by the city government. A "Due Diligence and Corrective Action Plan" was prepared under the PPTA. There will be no people to be physically displaced or resettled.

B. Construction Phase Environmental Impacts

80. *Site Preparation*. Construction of the proposed Makassar City's sewerage system will not involve significant modification of the construction site topography. The proposed WWTP site at Tamalate will only be backfilled by a 0.5 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 WWTP is a fishpond 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 Tamalate.

81. *Potential Damage to Archaeological and Cultural Assets*. During construction, excavation activities of the proposed sewer lines and the proposed WWTP at Tamalate 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.

82. 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 Makassar (Makassar Archaeological Research Office) if archaeological and cultural assets are discovered.

83. *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 WWTP is a potential source of sediments and can easily release soil materials to Jongaya Canal 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 Jongaya Canal.

84. 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, 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.

85. *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 WWTP at Tamalate 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.

86. *Local Air Pollution Due to Construction Activities*. During dry periods, dust generation can be expected from activities associated with the construction of the WWTP at Tamalate 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.

87. 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 Tamalate WWTP due to the significant number of hauling trips.

88. *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.

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.

89. *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.

90. While sewer line construction in wide streets, such as Jalan Kakatua, could easily be managed with regards to traffic congestion and pedestrians access to the area, the same could not be said of busy roads with heavy commercial activities, such as Jalan Cendrawasih. Transport of backfill materials for the proposed WWTP site may also cause traffic congestion along Jalan Metro Tanjung Bunga if not properly managed.

91. 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.

92. 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 Jalan Arif Rate and Jalan Cendrawasih.

93. *Hazards to public due to construction activities*. Hazards to the public associated with construction activities for the proposed Makassar 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.

94. 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.

95. *Pollution and Health Risk due to Workers Camp*. The contractor is expected to erect temporary workers' camps during construction of the proposed Makassar 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.

96. 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.

97. *Occupational Health and Safety at Work Sites*. Construction hazards are expected in the implementation of the proposed Makassar City's WWTP 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.

98. 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.

99. The construction site 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.

100. 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.

101. *Increase Employment Opportunities at Work Sites*. Considerable number of workers will be required for the various construction activities of the proposed Makassar 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.

102. 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 Makassar City's LPMU.

103. *Improper Closure of Construction Sites*. Construction activities of the proposed Makassar 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.

104. 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

105. *Discharge of Poor Quality Effluents*. The proposed Makassar City's WWTP at Tamalate 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.

106. Mitigation. The WWTP shall be operated according to its design parameters in order to produce effluent quality satisfying the South Sulawesi Governor Decree No. 14 of 2003. The relevant maximum standard 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 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.

107. The requirement for properly trained operators cannot be overemphasized since the proposed Makassar City's WWTP is not a sophisticated system that relies on continuous online performance monitoring instruments. The newly hired 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.

108. 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 WWTP since its aerobic process will be dependent on the continuous supply of power to the mechanical equipment.

109. 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 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.

110. *Noise and Dust Pollution of WWTP and Pumping Station*. Noise of the proposed Makassar City's 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.

111. *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 Makassar City's WWTP could be once every 10 years since a allowance is provided in the design concept to allow sludge accumulation for better digestion and avoid frequent desludging.

112. 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

113. *WWTP's Foul Odor Off-site Migration*. Operation of 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.

114. Mitigation. Mitigations shall include the following: (i) anaerobic ponds shall be connected to a flare by pipework to avoid releasing the generated methane from the ponds, (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.

115. 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 WWTP.

116. *Toxic waste generation*. Operation of the proposed Makassar City's 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.

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

118. Mitigation. Concrete tanks process units shall be design and constructed as impermeable containers. Wastewater treatment ponds of the proposed Makassar City's WWTP shall be design and constructed with impermeable plastic liners.

119. *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 of the proposed Makassar City's WWTP can drown easily since these are deep facilities.

120. Mitigation. To reduce the risk of drowning in the tanks and ponds, the proposed Makassar City's 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.

121. *Health and Safety Risks in Sewerage System Operation*. Operation of the proposed Makassar City's 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.

122. Workers' safety at proposed Makassar City's WWTP relative to the generation of biogas should not be taken lightly. The anaerobic process unit in the WWTP, the anaerobic ponds, 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.

123. Another potential risky situation will be the use of chlorine gas as disinfectant of the final effluents. Accidents may occur with chlorine gas handling. Provisions are included for the future use of chlorine gas as disinfectant of the final effluents.

124. Mitigation. Facility hazards identification shall be conducted during the initial operation phase of the 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 Makassar City's 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 WWTP. A five-foot-high fence shall be provided to keep people away from the WWTP.

125. For methane management, the 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.

126. 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.

127. *Increase Employment Opportunities*. Operation and maintenance of the proposed Makassar 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.

128. 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.

129. *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 Makassar City subproject, the cumulative effect would be on the organic and nutrient loads to urban streams including the Jongaya Canal, the WWTP's discharge point. The cumulative positive effect of the proposed Makassar sewerage system is the reduction of the total organic and nutrient loads to the streams since it will capture a significant portion of the domestic wastewater that presently find its way to the streams. This effect highlights the role of the proposed sewerage system as an environmental improvement infrastructure.

130. In addition, the WWTP effluents to be discharged to Jongaya Canal will have a dilution effect on the canal's water quality considering the flow of 19.1 MLD added to this stream. This positive effect is more pronounced during periods of less rainfall and lack of rainfall since Jongaya Canal is quite polluted with an average BOD of 192mg/l.

131. 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 Makassar City's Subproject

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

132. 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 Makassar City's sewerage system subproject.

133. During preparation of the Makassar 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.

134. *Public Consultation*. Last 16 October 2012, Makassar 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 30 stakeholders and representatives participated.

135. 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.

136. The Dinas Pekerjaan Umum (Public Work Office) of Makassar City gave a "powerpoint" presentation of the proposed sewerage subproject. It was pointed out that the proposed sewerage subproject will help the city government in restoring Losari beach as a public space with high economic value and tourism destination. 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. However, it was also pointed out that for the last four years the Makassar City government has conducted information campaign including various meetings, consultations, and use of billboards and leaflets. Various issues were also discussed in those meetings.

137. After the presentation, the participants were encouraged to ask question and raise their concerns. The discussions include the state of pollution of the Losari Beach area, the area presently receiving domestic wastewater from the service area of the proposed Makassar Cty's sewerage system. Some participants stated that the benefits of having a sewerage system and WWTP should be brought to the attention of the people since poor management of the city's domestic wastewater could pollute the beach area and also spread those bacteria causing diarrhea.

138. The need to exert efforts in increasing public's awareness on the importance of sanitation was discussed and some participants recognized the challenge in changing the public's behavior on sanitation. Participants pointed to the need for regulations on domestic wastewater management that have firmer sanctions against violators. Public Works explained that efforts are ongoing to address the need for regulations.

Table 6.1: Summary of Consultation Outcomes

Group Represented	Issues/ Concerns Raised	Project's Response
NGO, The Green Foundation	The positive environmental impacts to Losari beach from WWTP should be disseminated	Poorly managed wastewater would spread diarrhea from E coli bacteria. WWTP was important to prevent the spread of worm disease
NGO, The Green Foundation	How much time would be necessary to make Losari beach clean again?	It is dependent on some factors since the sources of pollution to Losari beach must be identified and whether such pollution sources had been managed appropriately. At present there are 7 big outlets of wastewater to the Losari beach
Community closed to WWTP site	Other cities, such as Bandung, have managed their domestic wastewater using WWTPs. Communities are advised to visit the WWTP site of Bandung	The idea of visiting the WWTP site of Bandung is a good suggestion
NGO, The Green Foundation	Regulations on domestic wastewater discharges should be made with firmer sanctions to violators and the media can play a role in informing the public	Preparation of a regional regulation on wastewater management, including drainage, is ongoing. Charge setting mechanism is also being prepared and supports from all parties are needed. To enact a regulation is not an easy task.
NGO, CARE International Indonesia	majority of communities have no objection with the proposed wastewater management project. Losari 1 and 2 areas should be designed as priorities. However, the challenge is to change people's behavior on the importance of sanitation.	The most challenging issue during pre-construction concerned how to change the perception of communities. More public information campaign activities will be conducted including community forums.
Health workers (community health centers)	Should construction start on 2013, public information campaign should be intensified and the Puskemas (community health centers) within the service areas can be engaged for this purpose	Use of the Puskemas for public information campaign is a good suggestion

139. *Future Disclosure and Consultations*. Public consultation and participation activities will again be conducted in the future. The Provincial Project Implementation Unit (PPIU) and Makassar 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

140. Local grievance redress mechanism (GRM) is important in the planning and implementation of the proposed Makassar City's 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 16 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 Makassar City's sewerage system, complaints about its environmental performance can also be brought to the attention of the local environment agency, the Badan Lingkungan Hidup (BLH).

A. Construction Activities Grievances

141. 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 Makassar 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.

142. *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).

143. *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.

144. 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.

145. 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 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 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.

146. *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	City's LPMU Chief, contractor's representative
	5 days	temporary City Sewerage Environmental Complaints Committee (CSECC)
Third level	---	courts

B. Resettlement Activities Grievances

147. A separate report on Due Diligence and Corrective Action Plan was prepared for the Makassar City's subproject. The said report contains a GRM addressing land acquisition and other concerns on involuntary resettlement.

C. Complaints to Makassar City's Badan Lingkungan Hidup

148. Complaints about environmental performance of projects issued an approval decree by Makassar's Badan Lingkungan Hidup, the local agency, can also be brought to the attention of the same agency since it is responsible for enforcing the AMDAL system. Approval decrees were already issued to the proposed Makassar City's sewerage system. The Badan Lingkungan Hidup is also involved in monitoring the water quality of Makassar's rivers.

VIII. ENVIRONMENTAL MANAGEMENT PLAN

149. This section addresses the need for mitigation and management measures for the proposed Makassar City's sewerage system subproject. Information includes: (i) mitigating measures to be implemented, (ii) required monitoring associated with the mitigating measures, and (iii) implementation arrangement. Institutional set-up 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

150. 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.

151. 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 Makassar 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 Makassar City's sewerage system, while some were already included in the construction of particular items.

152. 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 Makassar 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.

153. **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 proposed Makassar City's sewerage system subproject, the estimated amount is US$0.39million.

154. To ensure that funds will be allocated during implementation of the proposed Makassar City's sewerage system, 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 Makassar City's 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/ 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/ PPIU and CPMU
Social and community concerns	Potential nuisance and problems to the public from Makassar City's 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, pumping station	Part of detailed design cost	Design Consultants, 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; Makassar City government and the Balai ArkeologiMakassar (Makassar Archaeological Research Office) will be informed promptly	Sewer line trenches, civil works excavations	Part of detailed design cost	Design Consultants/ 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/ Makassar 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; Makassar City government and the Balai Arkeologi Makassar (Makassar Archaeological Research Office) will be informed promptly	Sewer line routes, WWTP site	Incorporated in construction contract; part of US$ 0.39 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	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$ 0.39 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$ 0.39 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$ 0.39 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$ 0.39 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$ 0.39 million as environmental mitigations allocation of	Contractor / CPMU, PPIU, Supervision Consultants

Project Activity	Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Location	Mitigation Cost	Responsibility Implementation/ Supervision
				construction 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$ 0.39 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 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$ 0.39 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$ 0.39 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	Makassar City's Unit Perlaksan Teknis Daerah (UPTD) / Makassar 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	Makassar City's Unit Perlaksan Teknis Daerah (UPTD) / Makassar 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	WWTP	Part of capital, operation & maintenance costs	Makassar City's Unit Perlaksan Teknis Daerah (UPTD) / Makassar City's BLH

Project Activity	Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Location	Mitigation Cost	Responsibility Implementation/ Supervision
		appropriate standards from other 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 problems	WWTP	Part of capital & maintenance costs	Makassar City's Unit Perlaksan Teknis Daerah (UPTD) / Makassar 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	Makassar City's Unit Perlaksan Teknis Daerah (UPTD) / Makassar 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	Makassar City's Unit Perlaksan Teknis Daerah (UPTD) / Makassar 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	Makassar City's Unit Perlaksan Teknis Daerah (UPTD) / Makassar City's BLH

155. **Mitigations Required by Approved AMDAL Decrees**

156. The approval decrees issued by Makassar City's local environment agency, the BLH (see Appendix 1) have specified several mitigation measures that shall be implemented by the Makassar City subproject. Mitigation requirements for the WWTP are: (i) additional aeration capacity in aeration pond to reduce odor; (ii) provision of covers for trucks transporting soil materials; (iii) use of noise barriers; (iv) use of low-noise electric generators; (v) provision of ear plugs to workers (vi) control of working time schedule to avoid noise nuisance to the public (vii) regular water spraying of roads to control dust generation; (viii) providing speed limits for construction vehicles; (ix) use of sheet piles to control water pollution from construction sediment; (x) planting of trees for buffer zone; (xi) addition of heterotrophic bacteria in the sedimentation pond to reduce H2S emission; (xii) use of fish to control mosquito breeding, and (xiii) and mangrove rehabilitation. The need for updating/finalization of the AMDAL EMP shall be determined after the design is completed. This shall be completed prior to any bidding/procurement process.

157. Mitigation requirements for sewer network: (i) give priority for employment from the people surrounding the project according to skills and expertise and provide provincial minimum wage; (ii) transport of materials not in peak hours, avoiding spills by covering material, look for alternative roads that have no traffic jam, use a decent truck, adjusting the tonnage vehicles with carrying capacity of the road, making improvement to roads damaged; (iii) high-risk workers should use protective equipment and provided with insurance; (iv) excavated material to be disposed to properly, if not transported yet to be stored temporary with barricade; (v) reduce the intensity of construction activities during community resting time of those near the pipeline area; (vi) place signs or notice board to the public about the activity; (vii) water spraying before excavation to control dust generation; (viii) operation of pumping station must be in accordance with standard operational procedures; (ix) pipeline laying should immediately be done after excavating a 500m-lenth to avoid impacts; and (x) place 1.5 m barricade around excavations, excavated material stored alongside of pipeline and dispose properly, pipe work in the crossroad have to be done in the night, hole must be covered by 10 steel plate so that car can pass through and water cannot enter the hole.

158. Almost all of these required mitigation measures are already covered by Table 8.1 and the pre-construction requirements except for the following: (i) providing speed limits for construction vehicles; (ii) pipeline laying should immediately be done after excavating a 500m-lenth to avoid impacts; (iii) use of sheet piles to control water pollution from construction sediments; (iv) addition of heterotrophic bacteria in the sedimentation pond to reduce H_2S emission; (v) use of fish to control mosquito breeding, (vi) and mangrove rehabilitation. However, during detailed design phase when it is finally decided that there will be no sedimentation pond, Makassar's UPTD shall request the Makassar City's BLH to omit the requirements for the addition of heterotrophic bacteria in the sedimentation pond.

159. These additional required mitigation measures are presented in Table 8.2 with the usual EMP format that presents 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.

Table 8.2: Environmental Mitigation Measures Required Under AMDAL Approvals (measures not covered by Table 8.1)

Project Activity	Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Location	Mitigation Cost	Responsibility Implementation/ Supervision
CONSTRUCTION PHASE					
WWTP construction	dust due to construction activities	providing speed limits for construction vehicles	WWTP site	Incorporated in construction contract; part of US$ 0.39 million as environmental mitigations allocation of construction contract	Contractor / CPMU, PPIU, Supervision Consultants
WWTP construction	Soil erosion and sediments of construction site	use of sheet piles to control water pollution from construction sediments	WWTP site	Incorporated in construction contract as part of WTP design	Contractor / CPMU, PPIU, Supervision Consultants
Sewer lines installation	Vehicular traffic congestion and hindrance to public access	pipeline laying should immediately be done after excavating a 500m-lenth to avoid impacts	Sewer line routes	Incorporated in construction contract; part of US$ 0.39 million as environmental mitigations allocation of construction contract	Contractor / CPMU, PPIU, Supervision Consultants
OPERATION	PHASE				
WWTP operation	WWTP odor generation	addition of heterotrophic bacteria in the sedimentation pond to reduce H_2S emission	WWTP site	Part of operation & maintenance costs ($1,350/yr)	Makassar City's Unit Perlaksan Teknis Daerah (UPTD) / Makassar City's BLH
WWTP operation	Increase in mosquito breeding	use of fish to control mosquito breeding	WWTP site	Part of operation & maintenance costs ($500/yr)	Makassar City's Unit Perlaksan Teknis Daerah (UPTD) / Makassar City's BLH
WWTP operation	Decrease in vegetation cover	mangrove rehabilitation	WWTP site	Part of capital, operation & maintenance costs ($1,500 initial)	Makassar City's Unit Perlaksan Teknis Daerah (UPTD) / Makassar City's BLH

160. 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.

161. *Tender Documents and Construction Contracts*. Makassar 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.

162. *Contractor's EMP*. During construction, each contractor will be guided by its detailed Contractor's EMP (CEMP). This shall be based on the Makassar 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, South Sulawesi Province's PPIU, and 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 South Sulawesi 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.

163. The CEMP shall be prepared by all contractors before the start of the construction works and shall be approved by the CPMU and South Sulawesi 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.

164. *Sewerage System Operations Manuals*. Makassar City UPTD and LPMU 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.

165. *Unanticipated Environmental Impacts*. Where unanticipated environmental impacts become apparent during project implementation, CPMU and South Sulawesi 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

166. Table 8.3 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.

167. The South Sulawesi 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.

168. *Environmental Monitoring Cost*. Monitoring cost for pre-construction of the Makassar City's subproject is minimal cost to Ministry of Public Works' 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 South Sulawesi Province's PPIU since it will be their personnel who will do checking/ inspections of the construction activities and it is 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 Makassar 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 Makassar 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 Makassar City's UPTD since these are checking/ inspections activities only.

Table 8.3: Environmental Monitoring Plan of Makassar City's 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 meetings; payments to affected people	Pipelines routes, WWTP site	Verify meetings documentation; Verify plans and IR payments	After completion of meetings; upon completion of payments	LPMU/ Design consultants	CPMU/ PPIU	Part of project 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/ LPMU	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/ LPMU	Part of consultant's construction supervision contract; minimal cost to CPMU/ PPIU
noise levels not to	Sewer line	Use of sound	Daily	contractor	Construction	Part of

Aspects/ Parameters to be monitored	Location	Means of Monitoring	Monitoring Frequency	Mitigation Respon-sibility	Compliance Monitoring Respon-sibility	Monitoring Cost
exceed 55 dB(A) near schools and residential areas; noisy equipment not operated between 19:00 – 06:00hrs;ear plugs for workers	routes, WWTP site	levels meter; visual inspection of sites			supervision consultants, CPMU/ PPIU/ LPMU	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/ LPMU	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/ LPMU	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/ LPMU	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/ LPMU	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/ LPMU	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 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/ LPMU	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,	Sewer line, WWTP	effluent sampling and laboratory tests	twice monthly	Makassar City's Unit Perlaksan Teknis Daerah (UPTD)	Makassar City's BLH	Part of WWTP Operating Unit's operation cost / (USD2,000 /year)

Aspects/ Parameters to be monitored	Location	Means of Monitoring	Monitoring Frequency	Mitigation Respon-sibility	Compliance Monitoring Respon-sibility	Monitoring Cost
Ministry of Environment Decree 112, 2003)						
Presence of noise attenuation enclosures for pumps, blowers and mounted aerators	WWTP	Visual inspection of sites	Once a year	Makassar City's Unit Perlaksan Teknis Daerah (UPTD)	Makassar City's BLH	Minimal cost to 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	Makassar City's Unit Perlaksan Teknis Daerah (UPTD)	Makassar City's BLH	Minimal cost to 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	Makassar City's Unit Perlaksan Teknis Daerah (UPTD)	Makassar City's BLH	Minimal cost to BLH since this is an annual visual inspection
Integrity of concrete and impermeable plastic liners	WWTP	Visual inspection of WWTP	Once a year	Makassar City's Unit Perlaksan Teknis Daerah (UPTD)	Makassar City's BLH	Minimal cost to BLH since this is an annual visual inspection
safety station, warning signs, and fence	WWTP	Visual inspection of WWTP	Once a year	Makassar City's Unit Perlaksan Teknis Daerah (UPTD)	Makassar City's BLH	Minimal cost to 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	Makassar City's Unit Perlaksan Teknis Daerah (UPTD)	Makassar City's BLH	Minimal cost to BLH since this is an annual visual inspection

169. **Environmental Monitoring Plan of Additional Mitigation Measures Under AMDAL Approvals**. The Environmental Monitoring Plan of the additional mitigation measures required under the AMDAL approval decrees of Makassar City's sewerage system is presented in Table 8.4.

Table 8.4: Environmental Monitoring Plan of Additional Mitigation Measures Required Under AMDAL Approvals (measures not covered by Table 8.1)

Aspects/ Parameters to be monitored	Location	Means of Monitoring	Monitoring Frequency	Mitigation Respon-sibility	Compliance Monitoring Respon-sibility	Monitoring Cost
CONSTRUCTION						
Dust generation; speed limits	WWTP site	Visual inspection of sites	Daily	contractor	Construction supervision consultants, CPMU/ PPIU/ LPMU	Part of consultant's construction supervision contract; minimal cost to CPMU/ PPIU
sheet piles being used; runoff flowing into disturbed sites;	WWTP site	Visual inspection of sites; plans verification	Daily during rainy periods	contractor	Construction supervision consultants, CPMU/ PPIU/ LPMU	Part of consultant's construction supervision contract; minimal cost to CPMU/ PPIU
excavated 500m-lenth	Sewer line	traffic plans	weekly	contractor	Construction	Part of

Aspects/ Parameters to be monitored	Location	Means of Monitoring	Monitoring Frequency	Mitigation Respon-sibility	Compliance Monitoring Respon-sibility	Monitoring Cost
ready for pipe installation	routes	verification; visual inspection of sites			supervision consultants, CPMU/ PPIU/ LPMU	consultant's construction supervision contract; minimal cost to CPMU/ PPIU
OPERATION PHASE						
WWTP odor; use of heterotrophic bacteria	WWTP	Visual inspection of sites; verify records of WWTP operation regarding addition of heterotrophic bacteria	Once a year	Makassar City's Unit Perlaksan Teknis Daerah (UPTD)	Makassar City's BLH	Minimal cost to BLH since this is an annual visual inspection
Fish introduced to the ponds	WWTP	Visual inspection of sites; verify records of WWTP operation	Once a year	Makassar City's Unit Perlaksan Teknis Daerah (UPTD)	Makassar City's BLH	Minimal cost to BLH since this is an annual visual inspection
Presence of planted mangrove trees	WWTP	Visual inspection of sites; verify records of WWTP operation	Once a year	Makassar City's Unit Perlaksan Teknis Daerah (UPTD)	Makassar City's BLH	Minimal cost to BLH since this is an annual visual inspection

170. *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 8.5). 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 of the proposed Makassar City's subproject 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 8.5: Project Performance Monitoring of Makassar City's 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 Makassar City's 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	EMP requirements incorporated	Verify construction contract	Prior to finalization of construction	Design consultants/ PPIU	CPMU	Part of project manageme

Desired Outcomes	Aspects / Parameters to be monitored	Means of Monitoring	Monitorng Frequency	Implemen-tation	Compliance Monitoring	Monitoring Cost
responsible procurement	in construction contracts of Makassar City's sewerage system	documents	contract documents of Makassar City's sewerage system			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/ LPMU	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/ LPMU	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	Makassar City's Unit Perlaksan Teknis Daerah (UPTD)	Makassar City's BLH	Part of WWTP Operating Unit's operation cost (USD2,000 /year)
Makassar City's sewerage system operation acceptable to the public	Public Complaints on sewerage system operation	Verification of operation records	Once a year	Makassar City's Unit Perlaksan Teknis Daerah (UPTD)	Makassar City's BLH	Minimal cost

C. Implementation Arrangement

171. This subsection presents the: (i) institutional set-up, (ii) implementation schedule, (iii) GOI permits, and (iv) capacity building.

172. *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 South Sulawesi Province as the Provincial Project Implementation Unit (PPIU) and the Makassar City's Local Project Management Unit (LPMU).

173. 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 National 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 EMP is included in the bidding documents and civil works contracts; (iii) ensure Contractor's EMPs (CEMPs) are prepared by contractors prior to actual construction; (iv) establish a system to monitor environmental safeguards of the subprojects including monitoring the indicators set out in the monitoring plan of the EMP; (v) supervise the implementation of environmental mitigating measures required for the construction activities; (vi) review, monitor and evaluate the effectiveness of the implemented CEMPs, and recommend necessary corrective actions; (vii) prepare monthly and quarterly environmental monitoring reports and submit semi-annual environmental monitoring report to ADB; (viii) ensure timely disclosure of final IEE and EMP in locations and form accessible to the public, and (ix) address, record, and report on any grievances brought about through the Grievance Redress Mechanism in a timely manner.

174. The SATKER for South Sulawesi Province, as the PPIU, is the key implementation unit responsible for construction contracts' supervision of the Makassar City subproject, while Makassar 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 Makassar 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 Makassar City. LPMU's Environment Officer shall assist the CSECC.

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.

175. An important capacity building component is the hands-on training and advisory services for Makassar City's WWTP operators. During the initial years of operation, the sewerage systems 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 the legal and other requirements.

176. At the bottom of this institutional set-up are the construction contractors for the Makassar 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 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 Makassar City's CSECC.

177. During the operation phase of the Makassar City sewerage system, 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 local environment agency, the BLH. One of the main concerns is the possibility of poor WWTP performance leading to odor problems and poor effluent quality.

178. 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 streams in Makassar City.

179. Table 8.6 presents information on where the environmental aspects are addressed in the institutional setup and the associated requirements for environmental consultants and training consultants.

Table 8.6: Environmental Aspects Institutional Set-up

Unit	Unit Functions	Responsible for Environmental Aspects/ Functions	Consultants/ Functions
Construction Phase			
Ministry of Public Works' Directorate General for Human Settlements (Cipta Kayra)	Executing Agency for the MSMIP; provides technical 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 South Sulawesi Province as the Provincial Project Implementation Unit (PPIU)	key implementation unit in the field; Provides construction contracts' supervision; closely monitors construction progress	PPIU Environment Officer; responsible for 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	Advisory services to be provided by the National Environmental Advisor (part of PISC)
Makassar 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 Makassar 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 BLH; assist Makassar City's CSECC in addressing environmental 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			

Makassar City's Unit Perlaksan Teknis Daerah (UPTD) or another service delivery unit	Operates Makassar City's sewerage system	Makassar City UPTD'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 Makassar City's WWTP operators during the initial 3-month period

180. *Implementation Schedule*. As presented in the project description, construction of the Makassar City's 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 Makassar City's government shall ensure that construction contract provisions related to the contractor's EMP shall be included in the tendering stage in 2013.

181. *GOI Permits*. Under GOI's Environmental Permit Regulation (No.27/2012), Makassar subproject shall apply for an Environmental Permit and AMDAL approval from the Badan Lingkungan Hidup, the local environment agency. The AMDAL requirements were already complied. Approval decrees from Makassar's BLH, have been issued for the proposed WWTP and sewer lines network. According to the environmental agency, an Environmental Permit under Environmental Permit Regulation No.27/2012 is no longer required since the AMDAL approval decrees were issued long before the issuance of the regulation. Copies of the approval decrees are presented in Appendix 1.

182. In addition, 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.

183. *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.

184. *Capacity Building for WWTP Operators*. One of the proactive ways to prevent the Makassar City's 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.

185. 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 Makassar City's 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.

186. The second part shall be the actual operation of the new 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 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 8.7: Cost of Capacity Building for Makassar City's 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

187. Makassar City's government has long recognized that increasing population will aggravate the environmental problems related to inadequate wastewater collection, treatment, and disposal. Since 1997, it supported several studies on the development of wastewater systems and developed its long-term wastewater management strategy.

Presently, however, it does not have a sewerage system that collects domestic wastewater from its central business district and other built-up areas. The proposed sewerage system subproject will therefore help the city start implementing the much needed infrastructures for its wastewater management strategy and provide better access to sanitation facilities.

188. The environmental screening process has highlighted the environmental issues and concerns of the proposed Makassar 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 Tamalate sub-district near the bridge of the Jongaya Canal is presently an unused fishpond area, it is however, generally located in an urban area. Beyond the WWTP's northern border is an urban road (Jalan Metro Tanjung Bunga). The Jongaya Canal, the WWTP discharge point, is a large urban canal draining a wide area of the city. On a broader scale, the WWTP site is generally in an urban landscape with built-up areas beyond the Jongaya Canal and commercial areas beyond the road towards the northwest. Jongaya Canal has been carrying domestic wastewater and urban solid wastes from the built-up areas. Hence, the proposed Makassar 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 Makassar 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.

189. Based on the screening for potential environmental impacts and risks of the proposed Makassar City subproject, there are no significant negative environmental impacts and risks that cannot be mitigated. With the EMP, the proposed Makassar 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 Makassar City's sewerage system subproject.

190. Implementation of the proposed Makassar City's subproject is hereby recommended with emphasis on the following: (i) EMP of Makassar 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) Makassar 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

MAKASSAR SUBPROJECT'S COMPLIANCE TO AMDAL REQUIREMENTS

A. Copy of Makassar BLHD's Approval Decree of the proposed WWTP

PEMERINTAH KOTA MAKASSAR
BADAN LINGKUNGAN HIDUP DAERAH
Jalan Jenderal Urip Sumoharjo No. 8 Tlp. (0411) 438381 Makassar

KEPUTUSAN KEPALA BADAN LINGKUNGAN HIDUP DAERAH KOTA MAKASSAR

NOMOR : 660.22/ 01 /Kep/BLHD/VII/2011

TENTANG

KELAYAKAN LINGKUNGAN HIDUP RENCANA PEMBANGUNAN INSTALASI PENGOLAHAN AIR LIMBAH (IPAL) DOMESTIK KAWASAN LOSARI KOTA MAKASSAR

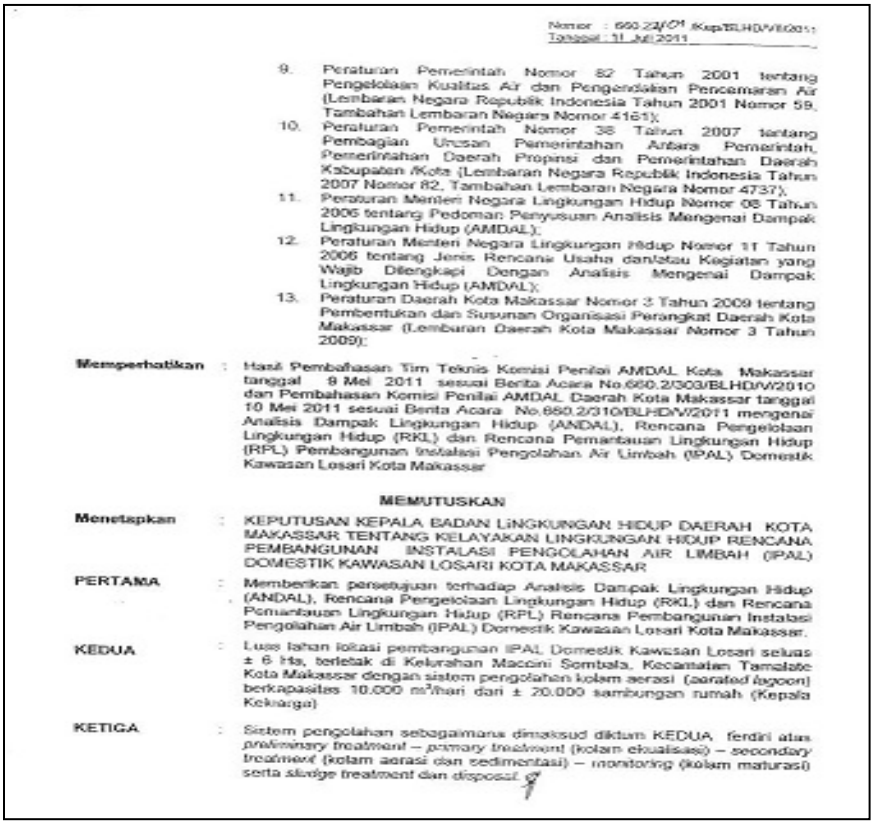
KEPALA BADAN LINGKUNGAN HIDUP DAERAH KOTA MAKASSAR

Menimbang :

a. bahwa kegiatan Pembangunan Instalasi Pengolahan Air Limbah (IPAL) Domestik Kawasan Losari Kota Makassar termasuk jenis kegiatan yang potensial menimbulkan dampak penting terhadap lingkungan hidup;
b. bahwa Pembangunan Instalasi Pengolahan Air Limbah (IPAL) Domestik Kawasan Losari Kota Makassar wajib dilengkapi Analisis Mengenai Dampak Lingkungan Hidup (AMDAL);
c. bahwa berdasarkan pertimbangan sebagaimana dimaksud huruf a dan huruf b, perlu menetapkan Keputusan Kepala Badan Lingkungan Hidup Daerah Kota Makassar tentang Kelayakan Lingkungan Hidup Pembangunan Instalasi Pengolahan Air Limbah (IPAL) Domestik Kawasan Losari Kota Makassar

Mengingat :

1. Undang-undang Nomor 29 Tahun 1959 tentang Pembentukan Daerah-Daerah Tingkat II di Sulawesi (Lembaran Negara Republik Indonesia Tahun 1959 Nomor 74, Tambahan Lembaran Negara Nomor 1822);
2. Undang-undang Nomor 5 Tahun 1990 tentang Konservasi Sumber Daya Alam Hayati dan Ekosistemnya (Lembaran Negara Republik Indonesia Tahun 1990 Nomor 49, Tambahan Lembaran Negara Nomor 3419);
3. Undang-undang Nomor 32 Tahun 2004 tentang Pemerintahan Daerah (Lembaran Negara Republik Indonesia Tahun 2004 Nomor 125, Tambahan Lembaran Negara Nomor 4437);
4. Undang-undang Nomor 26 Tahun 2007 tentang Penataan Ruang (Lembaran Negara Republik Indonesia Tahun 2007 Nomor 68, Tambahan Lembaran Negara Nomor 4725);
5. Undang-undang Nomor 22 Tahun 2009 tentang Lalu Lintas dan Angkutan Jalan (Lembaran Negara Republik Indonesia Tahun 2009 Nomor 130, Tambahan Lembaran Negara Nomor 5049);
6. Undang-undang Nomor 32 Tahun 2009 tentang Perlindungan dan Pengelolaan Lingkungan Hidup (Lembaran Negara Republik Indonesia Tahun 2009 Nomor 140, Tambahan Lembaran Negara Nomor 5059);
7. Undang-undang Nomor 36 Tahun 2009 tentang Kesehatan (Lembaran Negara Republik Indonesia Tahun 2009 Nomor 147, Tambahan Lembaran Negara Nomor 5066);
8. Peraturan Pemerintah Nomor 51 Tahun 1971 tentang Perubahan Batas-batas Daerah Kotamadya Makassar dan Kabupaten Gowa, Maros, dan Pangkajene Kepulauan dalam Lingkungan Daerah Sulawesi Selatan (Lembaran Negara Republik Indonesia Tahun 1971 Nomor 65, Tambahan Lembaran Negara Nomor 3373);



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9. Peraturan Pemerintah Nomor 82 Tahun 2001 tentang Pengelolaan Kualitas Air dan Pengendalian Pencemaran Air (Lembaran Negara Republik Indonesia Tahun 2001 Nomor 59, Tambahan Lembaran Negara Nomor 4161);
10. Peraturan Pemerintah Nomor 38 Tahun 2007 tentang Pembagian Urusan Pemerintahan Antara Pemerintah, Pemerintahan Daerah Propinsi dan Pemerintahan Daerah Kabupaten /Kota (Lembaran Negara Republik Indonesia Tahun 2007 Nomor 82, Tambahan Lembaran Negara Nomor 4737);
11. Peraturan Menteri Negara Lingkungan Hidup Nomor 08 Tahun 2006 tentang Pedoman Penyusuan Analisis Mengenai Dampak Lingkungan Hidup (AMDAL);
12. Peraturan Menteri Negara Lingkungan Hidup Nomor 11 Tahun 2006 tentang Jenis Rencana Usaha dan/atau Kegiatan yang Wajib Dilengkapi Dengan Analisis Mengenai Dampak Lingkungan Hidup (AMDAL);
13. Peraturan Daerah Kota Makassar Nomor 3 Tahun 2009 tentang Pembentukan dan Susunan Organisasi Perangkat Daerah Kota Makassar (Lembaran Daerah Kota Makassar Nomor 3 Tahun 2009);

Memperhatikan : Hasil Pembahasan Tim Teknis Komisi Penilai AMDAL Kota Makassar tanggal 9 Mei 2011 sesuai Berita Acara No.660.2/303/BLHD/V/2010 dan Pembahasan Komisi Penilai AMDAL Daerah Kota Makassar tanggal 10 Mei 2011 sesuai Berita Acara No.660.2/310/BLHD/V/2011 mengenai Analisis Dampak Lingkungan Hidup (ANDAL), Rencana Pengelolaan Lingkungan Hidup (RKL) dan Rencana Pemantauan Lingkungan Hidup (RPL) Pembangunan Instalasi Pengolahan Air Limbah (IPAL) Domestik Kawasan Losari Kota Makassar

MEMUTUSKAN

Menetapkan : KEPUTUSAN KEPALA BADAN LINGKUNGAN HIDUP DAERAH KOTA MAKASSAR TENTANG KELAYAKAN LINGKUNGAN HIDUP RENCANA PEMBANGUNAN INSTALASI PENGOLAHAN AIR LIMBAH (IPAL) DOMESTIK KAWASAN LOSARI KOTA MAKASSAR

PERTAMA : Memberikan persetujuan terhadap Analisis Dampak Lingkungan Hidup (ANDAL), Rencana Pengelolaan Lingkungan Hidup (RKL) dan Rencana Pemantauan Lingkungan Hidup (RPL) Rencana Pembangunan Instalasi Pengolahan Air Limbah (IPAL) Domestik Kawasan Losari Kota Makassar.

KEDUA : Luas lahan lokasi pembangunan IPAL Domestik Kawasan Losari seluas ± 6 Ha, terletak di Kelurahan Maccini Sombala, Kecamatan Tamalate Kota Makassar dengan sistem pengolahan kolam aerasi (*aerated lagoon*) berkapasitas 10.000 m³/hari dari ± 20.000 sambungan rumah (Kepala Keluarga)

KETIGA : Sistem pengolahan sebagaimana dimaksud diktum KEDUA, terdiri atas *preliminary treatment – primary treatment* (kolam ekualisasi) – *secondary treatment* (kolam aerasi dan sedimentasi) – monitoring (kolam maturasi) serta *sludge treatment* dan *disposal*.

Nomor : 660.2[illegible]/ 01 /Kep/BLHD/VII/2011
Tanggal : 11 Juli 2011

KEEMPAT : Pemrakarsa dalam melakukan usaha dan/atau kegiatan Pembangunan Instalasi Pengolahan Air Limbah (IPAL) Domestik Kawasan Losari Kota Makassar wajib memenuhi ketentuan sbb :

1. memberikan informasi yang benar dan jelas kepada penduduk setempat tentang kegiatan yang dilaksanakan dan akan memprioritaskan penduduk setempat untuk diterima bekerja sesuai dengan bidang ilmu dan keahlian yang dipersyaratkan;
2. memberikan upah kepada karyawan sesuai dengan Upah Minimum Provinsi (UMP) yang berlaku di Provinsi Sulawesi Selatan;
3. meminimalisasi dampak penurunan kualitas udara berupa debu/gas buangan akibat kegiatan konstruksi dan operasional yang akan dilakukan dengan cara menutup bak kendaraan pengangkut dengan terpal, membatasi kecepatan laju kendaraan, dan membersihkan ceceran/ tumpahan material di atas jalan yang dilalui kendaraan proyek serta melakukan penyiraman jalan secara berkala;
4. meminimalisasi dampak peningkatan kebisingan akibat kegiatan konstruksi fisik berupa pemasangan penghalang kebisingan (*noise barrier*) dan pengaturan jadwal pekerjaan yaitu kegiatan yang menimbulkan kebisingan tinggi tidak dilakukan pada saat masyarakat sedang istirahat;
5. mewajibkan pekerja menggunakan alat pelindung diri seperti penutup telinga (*ear plug / ear muff*), khususnya tenaga kerja yang terpapar langsung kebisingan seperti operator alat berat;
6. menempatkan genset dalam ruang tertutup / *shielding* atau menggunakan *silent genset*;
7. meminimalisasi dampak penurunan kualitas air terutama akibat kegiatan pembersihan dan pengurugan lahan dengan melengkapi sediment trap, turap atau kisdam di sekeliling areal kegiatan, terutama di Kanal Jongaya;
8. pembangunan dinding tanggul atau kisdam untuk membatasi areal yang akan ditimbun dengan Kanal Jongaya dan areal sekitarnya, ketinggian tanggul harus mempertimbangkan ketinggian muka air kanal dan air laut rata-rata akibat pengaruh perubahan iklim;
9. penanaman tanaman yang berfungsi pagar hidup, filter udara, penahan angin, peredam kebisingan serta sebagai zona penyangga (*buffer zone* ± 30 % luasan IPAL), seperti *Sansevieria sp.* *Mimosops elengi* (Tanjung), *Murraya paniculata*, *Azadirachta indica* dan *Melia azadirachta*;
10. penambahan bakteri heterotrophik di unit kolam sedimentasi, antara lain *Achromobacter, Alcaligenes, Nitromonas* dan *Pseudomonas* untuk mengurangi konsentrasi H_2S yang berfungsi mempercepat proses dekomposisi limbah;
11. menambah kapasitas aerator di kolam aerasi dan dijalankan secara kontinu sehingga dapat mengurangi bau yang ditimbulkan;
12. menyusun SOP berisi tentang cara dan prosedur pengoperasian IPAL sesuai dengan sistem pengolahan yang dipakai;
13. penyediaan kolam yang berfungsi sebagai bio-kontrol yang berisi ikan Cyprinus carpio sebelum effluent dibuang ke badan air;
14. Melakukan kegiatan rehabilitasi mangrove yang ada disekitarnya sesuai dengan pola zonasi alami hutan mangrove;
15. melaporkan hasil pemantauan pelaksanaan RKL dan RPL kepada Badan Lingkungan Hidup Daerah Kota Makassar, Dinas Pemadam Kebakaran dan Penanggulangan Bencana Kota Makassar, Dinas Kesehatan Kota Makassar, Dinas Tata Ruang dan Bangunan Kota Makassar, Dinas Pekerjaan Umum Kota Makassar, Dinas Perhubungan Kota Makassar, Dinas Tenaga Kerja Kota Makassar dan Dinas Kelautan, Perikanan, Pertanian, dan Peternakan Kota Makassar, serta pemerintah setempat minimal setiap 6 bulan sekali

Nomor : 660.2[illegible]/ 01 /Kep/BLHD/VII/2011
Tanggal : 11 Juli 2011

KELIMA : Pernyataan Pelaksanaan Rencana Pengelolaan Lingkungan Hidup (RKL) dan Rencana Pemantauan Lingkungan Hidup (RPL) yang menjadi Lampiran Keputusan ini merupakan persyaratan yang wajib ditaati oleh pemrakarsa usaha dan/atau kegiatan untuk melakukan pengelolaan dan pemantauan lingkungan hidup.

KEENAM : Hal-hal yang belum diatur dalam Keputusan ini tetap mengikuti Prosedur Operasional Baku (*Standard Operating Procedure*) yang berlaku.

KETUJUH : Instansi pemberi izin wajib mencantumkan segala persyaratan dan kewajiban, baik yang tercantum dalam Keputusan ini maupun yang tercantum dalam ANDAL, RKL dan RPL sebagai ketentuan dalam izin melakukan kegiatan Pembangunan Instalasi Pengolahan Air Limbah (IPAL) Domestik Kawasan Losari Kota Makassar.

KEDELAPAN : Apabila di kemudian hari timbul dampak lingkungan di luar perencanaan dan perkiraan yang tercantum dalam dokumen RKL dan RPL yang telah disetujui, wajib segera dilaporkan kepada instansi yang tercantum dalam diktum KEEMPAT angka 15 untuk diambil langkah-langkah yang diperlukan.

KESEMBILAN : Keputusan ini mulai berlaku sejak tanggal ditetapkan.

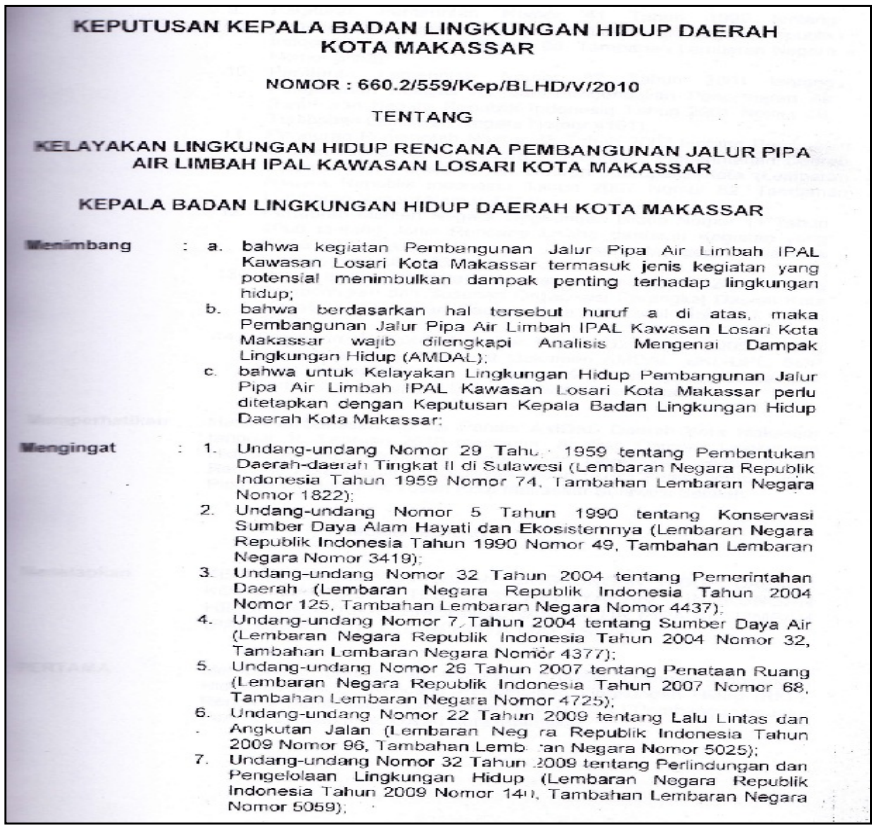
Ditetapkan di Makassar
Pada tanggal 11 Juli 2011

KEPALA BADAN LINGKUNGAN HIDUP DAERAH
KOTA MAKASSAR

Ir. H. [illegible] SAIYYENG, M.Si.
Pangkat : Pembina Utama Muda
NIP : 19571231 198503 1 301

Tembusan : disampaikan Kepada YTH.
1. Walikota Makassar di Makassar (sebagai laporan).
2. Wakil Walikota Makassar di Makassar (sebagai laporan).
3. Kepala Dinas Pekerjaan Umum Kota Makassar di Makassar.
4. Kepala Dinas Tata Ruang dan Bangunan Kota Makassar di Makassar.
5. Kepala Dinas Kesehatan Kota Makassar di Makassar
6. Kepala Dinas Perhubungan Kota Makassar di Makassar.
7. Kepala Dinas Tenaga Kerja Kota Makassar di Makassar.
8. Kepala Dinas Kelautan, Perikanan, Pertanian dan Peternakan Kota Makassar.
9. Camat Tamalate Kota Makassar di Makassar.
10. Pemrakarsa usaha/kegiatan.
11. Arsip.

B. Copy of Makassar BLHD's Approval Decree of the proposed Sewer Network



KEPUTUSAN KEPALA BADAN LINGKUNGAN HIDUP DAERAH
KOTA MAKASSAR

NOMOR : 660.2/559/Kep/BLHD/V/2010

TENTANG

KELAYAKAN LINGKUNGAN HIDUP RENCANA PEMBANGUNAN JALUR PIPA AIR LIMBAH IPAL KAWASAN LOSARI KOTA MAKASSAR

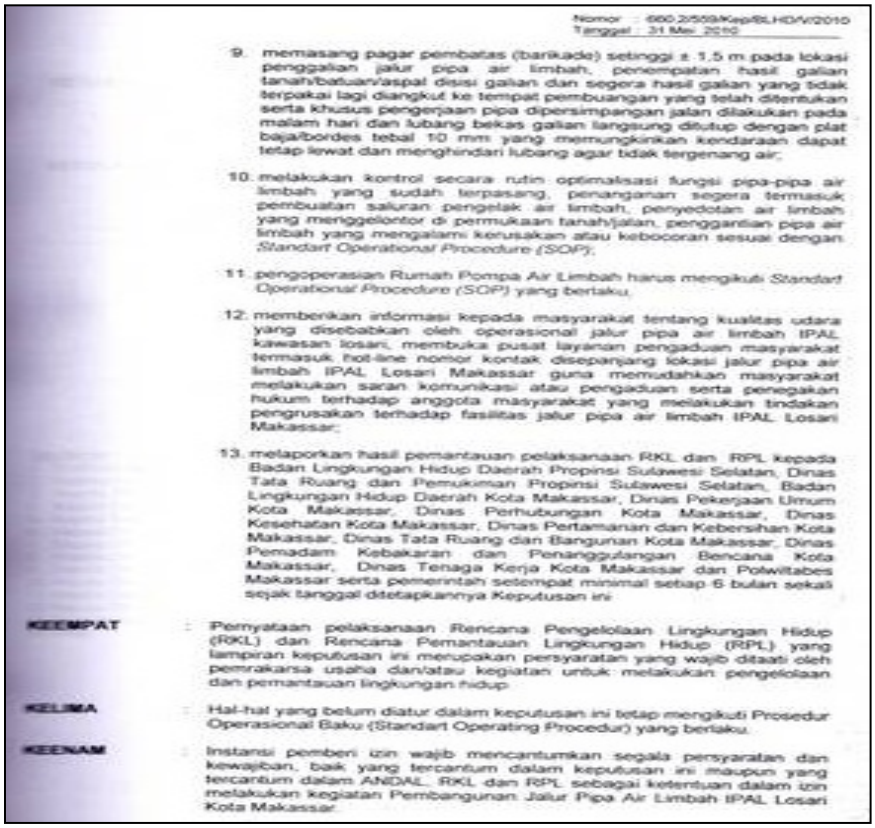
KEPALA BADAN LINGKUNGAN HIDUP DAERAH KOTA MAKASSAR

Menimbang :

a. bahwa kegiatan Pembangunan Jalur Pipa Air Limbah IPAL Kawasan Losari Kota Makassar termasuk jenis kegiatan yang potensial menimbulkan dampak penting terhadap lingkungan hidup;
b. bahwa berdasarkan hal tersebut huruf a di atas, maka Pembangunan Jalur Pipa Air Limbah IPAL Kawasan Losari Kota Makassar wajib dilengkapi Analisis Mengenai Dampak Lingkungan Hidup (AMDAL);
c. bahwa untuk Kelayakan Lingkungan Hidup Pembangunan Jalur Pipa Air Limbah IPAL Kawasan Losari Kota Makassar perlu ditetapkan dengan Keputusan Kepala Badan Lingkungan Hidup Daerah Kota Makassar;

Mengingat :

1. Undang-undang Nomor 29 Tahu 1959 tentang Pembentukan Daerah-daerah Tingkat II di Sulawesi (Lembaran Negara Republik Indonesia Tahun 1959 Nomor 74, Tambahan Lembaran Negara Nomor 1822);
2. Undang-undang Nomor 5 Tahun 1990 tentang Konservasi Sumber Daya Alam Hayati dan Ekosistemnya (Lembaran Negara Republik Indonesia Tahun 1990 Nomor 49, Tambahan Lembaran Negara Nomor 3419);
3. Undang-undang Nomor 32 Tahun 2004 tentang Pemerintahan Daerah (Lembaran Negara Republik Indonesia Tahun 2004 Nomor 125, Tambahan Lembaran Negara Nomor 4437);
4. Undang-undang Nomor 7 Tahun 2004 tentang Sumber Daya Air (Lembaran Negara Republik Indonesia Tahun 2004 Nomor 32, Tambahan Lembaran Negara Nomor 4377);
5. Undang-undang Nomor 26 Tahun 2007 tentang Penataan Ruang (Lembaran Negara Republik Indonesia Tahun 2007 Nomor 68, Tambahan Lembaran Negara Nomor 4725);
6. Undang-undang Nomor 22 Tahun 2009 tentang Lalu Lintas dan Angkutan Jalan (Lembaran Neg ra Republik Indonesia Tahun 2009 Nomor 96, Tambahan Lemb an Negara Nomor 5025);
7. Undang-undang Nomor 32 Tahun 2009 tentang Perlindungan dan Pengelolaan Lingkungan Hidup (Lembaran Negara Republik Indonesia Tahun 2009 Nomor 140, Tambahan Lembaran Negara Nomor 5059);



Nomor : 660.2/559/Kep/BLHD/V/2010
Tanggal : 31 Mei 2010

9. memasang pagar pembatas (barikade) setinggi ± 1,5 m pada lokasi penggalian jalur pipa air limbah, penempatan hasil galian tanah/batuan/aspal diusi galian dan segera hasil galian yang tidak terpakai lagi diangkut ke tempat pembuangan yang telah ditentukan serta khusus pengerjaan pipa dipersimpangan jalan dilakukan pada malam hari dan lubang bekas galian langsung ditutup dengan plat baja/bordes tebal 10 mm yang memungkinkan kendaraan dapat tetap lewat dan menghindari lubang agar tidak tergenang air;

10. melakukan kontrol secara rutin optimalisasi fungsi pipa-pipa air limbah yang sudah terpasang, penanganan segera termasuk pembuatan saluran pengelak air limbah, penyedotan air limbah yang menggelontor di permukaan tanah/jalan, penggantian pipa air limbah yang mengalami kerusakan atau kebocoran sesuai dengan *Standart Operational Procedure (SOP)*;

11. pengoperasian Rumah Pompa Air Limbah harus mengikuti *Standart Operational Procedure (SOP)* yang berlaku;

12. memberikan informasi kepada masyarakat tentang kualitas udara yang disebabkan oleh operasional jalur pipa air limbah IPAL kawasan losari, membuka pusat layanan pengaduan masyarakat termasuk hot-line nomor kontak disepanjang lokasi jalur pipa air limbah IPAL Losari Makassar guna memudahkan masyarakat melakukan saran komunikasi atau pengaduan serta penegakan hukum terhadap anggota masyarakat yang melakukan tindakan pengrusakan terhadap fasilitas jalur pipa air limbah IPAL Losari Makassar;

13. melaporkan hasil pemantauan pelaksanaan RKL dan RPL kepada Badan Lingkungan Hidup Daerah Propinsi Sulawesi Selatan, Dinas Tata Ruang dan Pemukiman Propinsi Sulawesi Selatan, Badan Lingkungan Hidup Daerah Kota Makassar, Dinas Pekerjaan Umum Kota Makassar, Dinas Perhubungan Kota Makassar, Dinas Kesehatan Kota Makassar, Dinas Pertamanan dan Kebersihan Kota Makassar, Dinas Tata Ruang dan Bangunan Kota Makassar, Dinas Pemadam Kebakaran dan Penanggulangan Bencana Kota Makassar, Dinas Tenaga Kerja Kota Makassar dan Polwiltabes Makassar serta pemerintah setempat minimal setiap 6 bulan sekali sejak tanggal ditetapkannya Keputusan ini.

KEEMPAT : Pernyataan pelaksanaan Rencana Pengelolaan Lingkungan Hidup (RKL) dan Rencana Pemantauan Lingkungan Hidup (RPL) yang lampiran keputusan ini merupakan persyaratan yang wajib ditaati oleh pemrakarsa usaha dan/atau kegiatan untuk melakukan pengelolaan dan pemantauan lingkungan hidup.

KELIMA : Hal-hal yang belum diatur dalam keputusan ini tetap mengikuti Prosedur Operasional Baku (Standart Operating Procedur) yang berlaku.

KEENAM : Instansi pemberi izin wajib mencantumkan segala persyaratan dan kewajiban, baik yang tercantum dalam keputusan ini maupun yang tercantum dalam ANDAL, RKL dan RPL sebagai ketentuan dalam izin melakukan kegiatan Pembangunan Jalur Pipa Air Limbah IPAL Losari Kota Makassar.

Nomor : 660.2/559/Kep/BLHD/VI/2010
Tanggal : 31 Mei 2010

KETUJUH : Apabila di kemudian hari timbul dampak lingkungan di luar perencanaan dan perkiraan yang tercantum dalam dokumen RKL dan RPL yang telah disetujui, wajib segera dilaporkan kepada instansi yang tercantum dalam diktum KEDUA angka13 untuk diambil langka-langka yang diperlukan.

KEDELAPAN : Keputusan ini mulai berlaku sejak ditetapkan.

Ditetapkan di Makassar
Pada tanggal 31 Mei 2010

A.n. WALIKOTA MAKASSAR
KEPALA BADAN LINGKUNGAN HIDUP DAERAH
KOTA MAKASSAR

IR. H. KUSAIYYENG, M.Si.
Pangkat : Pembina Utama Muda
NIP : 19571231 198603 1 301

Tembusan : disampaikan **Kepada YTH**.
1. Walikota Makassar di Makassar (sebagai laporan);
2. **Kepala** Poliltabes Kota Makassar di Makassar
3. **Kepala** Dinas Badan Lingkungan Hidup Daerah Propinsi SulSel di Makassar
4. **Kepala** Dinas Tata Ruang dan Pemukiman Propinsi SulSel di Makassar
5. **Kepala** Bappeda Kota Makassar di Makassar
6. **Kepala** Dinas Tata Ruang dan Bangunan Kota Makassar di Makassar
7. **Kepala** Dinas Pekerjaan Umum Kota Makassar di Makassar
8. **Kepala** Dinas Kesehatan Kota Makassar di Makassar
9. **Kepala** Dinas Perhubungan Kota Makassar di Makassar
10. **Kepala** Dinas Tenaga Kerja Kota Makassar di Makassar
11. **Kepala** Dinas Pertamanan dan Kebersihan Kota Makassar di Makassar
12. **Kepala** Dinas Pemadam Kebakaran dan Penanggulangan Benciana Kota Makassar di Makassar
13. Pemrakarsa usaha/kegiatan
14. Arsip.

APPENDIX 2

WWTP DISCHARGE PERMIT REQUIREMENTS OF MAKASSAR CITY

Operation of a wastewater treatment plant (WWTP) in Makasar City requires a Wastewater Treatment Plant permit. Under Government Regulation No. 27/2012, operation of a WWTP needs permission from the Mayor through the Head of Makasar's Badan Lingkungan Hidup Daerah (BLHD).

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

- Copy of photo (3x4) of person in-charge of business
- Permit Surat Izin Tempat Usaha (SITU) / Surat izin usaha perdagangan (SIUP) (premises license/permit trading)
- Environmental Documents; AMDAL
- Layout of WWTP
- Design of WWTP
- Record of water quality analysis for one month period done by accredited Laboratories

Processing of WWTP permit is through Makasar's BLHD. According to BLHD, they can quickly process the application for permit (maximum of 30 days after field verification). 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 MAKASSAR SEWERAGE SYSTEM

Photo No.1 – Proposed site of Makassar's WWTP and its western boundary presently occupied by fishponds

Photo No.2 – Eastern part of proposed site of Makassar's WWTP bordered by Jongaya Canal (polluted) and a strip of mangrove trees

Photo No.3 – North of proposed site for Makassar's WWTP bordered by a main highway (Jalan Metro Tanjung Bunga)

Photo No.4 – One of the streets in Makassar's Losari area where a sewer line will be installed, indicating sufficient space for sewer line construction

APPENDIX 4

Minutes of the Initial Public Consultation and Information Disclosure held at Conference Room of Makassar Mayor's Office Secretariat, 16 October 2012

Opening/ Presentations:

The Public Consultation started at 10.05 A.M with Mr. Masri Tiro, Kepala Bidang Fisik dan Prasarana BAPPEDA/ Chief of Physical and Infrastructure of The Regional Development Planning Agency (BAPPEDA) Kota Makasar welcoming and thanking the participants for being able to attend the public consultation meeting. He also explained the purpose of public consultation today that to seek advice and opinions from the participants about the city sanitation development project plan, Metropolitan Sanitation Management Investment Program (MSMIP).

Presentation on Metropolitan Sanitation Management Investment Program (MSMIP) Kota Makasar by Mr. Imbang M, Dinas Pekerjaan Umum/Public Work Office Kota Makasar. He pointed out that WWTP development was not something new. The socialization has been carried out for the last four years with various meetings, consultations, billboards and leaflets. He also elucidated the current issues on wastewater management including river and coast pollution. The city government planned to restore Losari beach as a public space with high economic value and tourism destination. Of 6 ha of lands required for WWTP construction, 5.1 ha had been purchased spending a budget of 19 billion rupiah. The other 0.9 ha was owned by GMTD (developer), for which its transfer was awaited. The land consisted of vacant plots and former fish ponds with some mangrove trees found in several spots. No resettlement would be required. There were 2 pump stations that in DED their locations might be relocated. According to the plan, the total connection by 2018 would reach 15,000 SR (house connections) and 20,000 SR in 2028 serving 6 Kecamatan and 40 Kelurahan. The presentation was continued with video on wastewater treatment process in WWTP Yogyakarta.

Comments, Views, Issues and Concerns:

1. Mr. Partono Sumaryo, local leader, living close to WWTP site, LPM Association in Makassar
    a. He admitted that socialization had been performed several times. With regard to the conversion of land function, WWTP in other cities had been initiated. He as a citizen was very supportive to the program. His support was more obvious since Makassar was attempting to be a world class tourism city. Out of 14 Kecamatan, 6 Kecamatan were engaged in the program. The most significant tourism object might be Losari beach, from which Makassar could be promoted to the neighboring countries.
    b. Bandung city managed to reuse the disposed wastewater. It was also true in Yogya. He advised to invite the communities to visit WWTP site. He promised to socialize this WWTP development program.

    Mr. Masri's answer:
    a. Pak Partono was very active in assisting the socialization of WWTP development program to the communities since 4 years ago.

   b. A lot of people affected by the project had been socialized by pak Partono. His advice to invite the affected residents to visit WWTP site was a constructive recommendation that should cause serious concern.

2. Mrs.Huniyati of NGO, The Green Foundation
   a. Changing mindset was necessary. Regulations with firmer sanctions were therefore required.
   b. Media played leading role in socializing such regulations and sanctions.

   Mr. Masri's answer :
   a. Indeed, changing mindset should be further augmented.
   b. Legal sanction was under process including for the management institutions. Binding regulations and the legal sanctions were necessary. The residents reserved rights to be served, however they also reserved obligation of paying the delivered services.
   c. For the said regulations whether their drafting would be finance under ADB. Regulatory drafting needed protracted process.

   Mr. Imbang's answer :
   a. The preparation of Regional Regulation (PERDA) on wastewater management including the drainage was still under way.
   b. Disposal system and charge setting mechanism were also being prepared and supports from all parties were needed. It was not an easy task to enact a regulation. [He agreed with] firmer [regulatory] enforcement.
   c. As to the institution, a UPTD unit would be established as currently within PU Agency apart from WWTP Losari and Sludge Treatment Plant (IPLT), which was previously managed by PD Kebersihan and Dinas Kebersihan. UPTD for wastewater management would be further discussed including collective WWTPs managed by local communities. It was expected that these UPTDs could be developed into BLU.
   d. Regulations would be further developed to include institutional aspects under UIWASS of AUSAID.

3. Mrs. Zuhaelsi (Elsi), Manager UPTD Kota Makasar
   a. UPTD highly appreciated this ADB investment since within the organizational structure of UPTD that had been set up on 25 July 212 there were 4 parts: (i) centralized WWTP, (ii) communal WWTP, (iii) IPLT; and (iv) Communal WWTP not served by the community.
   b. Some advocacy services had been given to communal WWTP according to Tupoksi (Main Tasks and Functions). Socialization would be intensified. Cooperation would be established with Pak Bambang of LPSM. The positive impacts of environmental preservation must be disseminated. Socialization was necessary to change the behavior of the communities. Communal WWTP ran appropriately as envisaged. It was expected that WWTP Locari would also operate properly so as to advance the health rate of people.

   Mr. Masri's answer :
   a. Bu Elsi is the manager of UPTD that would manage WWTP. Public participation would be soundly encouraged if all parties fully understood, for which socialization played leading role here.

4. Mrs. Sulha, Health Agency
   a. Construction should have been commenced in 2013. Socialization must be intensified. Puskemas (community health centers) within the service

areas should be engaged in socialization. Puskesmas' sanitation officers could assist in cooperation and coordination.

Mr. Masri's answer :

a. The engagement of Puskesmas in socialization was a good input and would be recorded.
b. Some Puskesmas had their WWTP.

5. Mr. T. Cahyo Putra, CARE International Indonesia
    a. Land was no longer main issue. The greatest challenge concerned behavioral changes. Two days ago, 30 kelurahan expressed their commitments to set up a forum at city level with regard to AMPL. They were optimistic that within 4 days time their commitment would have been prepared in a document. These groups had established cooperation with UNICEP and AUSAID since 5 years ago. Their commitments remained unchanged today.
    b. There were many movements to change behavior. The priorities must be established based on extraordinary demands. Communal WWTP was an extraordinary demand. Thus, it was important to assign kecamatan and kelurahan as the priorities. In majority the communities had no objection with waste water management project. Losari 1 and 2 should be designaed as priorities.
    c. With regard to the intermediate, they could serve as buffers to support behavioral changes. Behavioral changes in Losari 1 and 2 should be the priorities.

    Mr. Imbang's answer :

    a. The most challenging issue during pre-construction concerned how to change the perception of communities. Nevertheless, thus far no serious problem was found with the local communities. The settlement of conflict with GMTD was considerably dependent on successful socialization.
    b. As Pak Cahyo's input on intermediate program, coordination had been made with two regions prone to sanitation, i.e. coastal areas and sub-urban areas. The program however must be consistent with City policies. For the involvement of regional stakeholders, this proposal was very constructive. Once the program started to commence, some regional teams would be set up consisting of LPMs and LKMs to jointly conduct socialization. However, no certainty had been obtained to date. In the event of "green light" of ADB, socialization would be immediately started to grass root. Community forums would be forthwith established including LPM, BKM, and AMPL. Thirty one (31) kelurahan were ready to mobilize at any time.

    Mr. Masri's answer :

    a. Construction would be financed under ADB loan borrowed by the Government.
    b. 2015 the latest the program would be commenced.

6. Mrs Uni, LSM
    a. The positive environmental impacts to Losari beach from WWTP should be disseminated.
    b. How much time would be necessary to make Losari beach clean again.

    Mrs. Suha's answer :

    a. Poorly managed wastewater would spread diarrhea from E coli bacteria. WWTP was important to prevent the spread of worm disease.

b. There was indication that the sea was polluted.

Mr. Imbang's answer :

a. Not as fast as we imaged. It was dependent on some factors. The sources of pollution to Losari beach must be identified and whether such pollution sources had been managed appropriately.
b. At present there were 7 big outlets. If their wastewater was treated properly, the positive impacts would be evident. Firmer regulation was necessary for commercial areas.
c. The domestic waste had been managed. However, for industrial waste especially in Somba Opu heavy metal pollution was identified and not yet managed.
d. The mindset must be changed. We currently dealt with water safety meanwhile the others thought about water sensitive. After the water used, it must be detected where it drained and might be reused as raw water since the latter got more expensive in terms of price.
e. In some countries, there were three types of pipes, i.e. for potable water, clean water and wastewater.

Ariani's answer :

a. The successful of the project depends on the participation of all parties and the implementation of plan prepared. Everything must be integrated. The sources of pollution must be identified and their management plan must be formulated. Experience of other countries showed that they managed to restore their rivers in 20 years. Nevertheless, participation of all parties, stakeholders including the communities was paramount.
b. We distribute material such as booklets Project Information and Grievance Redress Mechanism Draft for Environment and Land Acquisition and Resettlement. Please read carefully whether there are any suggestions and feedback as this draft will be used as guidelines.

7. Mr. Hasanudin, BAPPEDA
    a. For program in Losari, was it possible to clean the rivers and big canals that had polluted the beach?

    Mr. Masri's answer:

    a. The main priority was Losari
    b. Was it possible to treat the surrounding canals as priorities? Could they be designated as service areas?
    c. Would black and grey water become part of waster for treatment? There were some hospitals in the vicinity of Losari. Their wastewater treatment should be tightly monitored.

8. Ms. Supriadi, Consultant MSMIP
    a. Had the piping networks been socialized?
    b. To where wastewater from the port and Rusunawa (low-cost rental block) would be treated?
    c. What about the fishermen.

    Mr. Masri's answer :

    a. Direct socialization had been made. However, pipeline networks were not yet informed in detail to the communities.
    b. Disposal to coast, was it included in program 2?

Mr. Imbang's answer :

a. Socialization was made not only in WWTP site, but also in 6 kecamatan and 40 kelurahan. During Musrebang (Deliberation Forum) this program was also pointed out. No socialization on the locations of house connection was made waiting the design. If the design was ready, coordination would be made with regional stakeholders for socialization. Technical plan was necessary for review by IndII.
b. AMDAL study for WWTP by IndII and AMDAL study for Pipeline Networks had been prepared and public consultation had been organized before such AMDAL studies. The program had been informed despite once. Rusunawa has its own WWTP. Wastewater from business areas must be disposed to WWTP Losari. For hospitals and industries, separate WWTP would be necessary. Another regulation was also needed.
c. Estuary management should not be carried out in the estuary but before the wastewater entered the estuary.
d. The conditions of fishermen not only related to the waste but social-economic aspects. Rusunawa was dedicated for fishermen. Berthing points for their boats had been provided close to Rusunawa. However, such berthing points were dumped.

Meeting closed at 12 noon.

APPENDIX 5

List of Participants of Initial Public Consultation and Information Disclosure (Makassar City's Subproject, October 16th 2012)

Stakeholders/Participants:

1. H. A Hadi, M, participant from District Tamanhalak
2. Sabang Chandra, LPM of Mariso Village
3. Partono S., Asosiasi LPM
4. T. Cahyo Putra, Care International Indonesia
5. Huniyati, The Green Foundation
6. Raliah, The Green Foundation
7. Awaluddin, Global Trade Center (GTC)
8. Ahyar Kurani, Global Trade Center (GTC)
9. Maslina, SKM, MARS, Government Hospital
10. Suha, SKM, MKes, Health Office
11. Alfira Gasang, Health Office
12. Teoppi AP, Public Relation of Makasar city
13. Zuhaelsi Zubir , Staff of UPTD Waste Water Treatment Plant
14. Kerlinus, Staff of UPTD Waste Water Treatment Plant
15. Daniel, Staff of UPTD Waste Water Treatment Plant

Public Work Office :

1. Imbang M, Staff
2. Hasmawaty, Staff

BAPPEDA Team of Makasar:

1. Masri Tiro,
2. Hasanudin
3. Rini Indriyani
4. B Maryani Imran
5. Nurul Sri H
6. Katarina Dewi
7. Nurbaedah
8. Yanizar
9. Siti Khadijah

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 (Makassar City's Subproject, 16 Oct 2012)

HARI/TGL : Selasa, 16 Oktober 2012
WAKTU : 10.00 - 12.00 WITA
TEMPAT : Ruang Sekda, Lantai 9 Balaikota Tower, Makasar.
ACARA : Konsultasi Publik.

NO	NAMA	INSTANSI	PARAF
1	MASRI TIRO	BAPPEDA	1. [signature]
2	Hosamddin	Bappeda	2. [signature]
3	KATARINA DEWI	Bappeda	3. [signature]
4	Nurul Sri H.	Bappeda	4. [signature]
5	NURBAEDAH	Bappeda	5. [signature]
6	Imbang M	Dinas PU	6. [signature]
7	H. A. Hali, M	Kel. Tamalate	7. [signature]
8	SABANG Chandra	LPM KEL. MARISO	8. [signature]
9	Hasmawaty	DINAS PU	9. [signature]
10	RUEL JARIOLWO	LAHMEYER - IDP	10. [signature]
11	Ariani Dwi Astuti	Konsultan MS MIP	11. [signature]
12	SUPRIADI DT TUMPATIH	— " —	12. [signature]
13	ANGELITO N. CORPUZ	LAHMAYER-IDP for ADB	13. [signature]
14	Marlina. eker. MARS	RSU Daya	14. [signature]
15	PARTONO SUHARYO	Asosiasi LPM MKS	15. [signature]
16	T. Cahyo Putra	CARE Int. Indonesia	16. [signature]
17	Zuhaelsi Zubir	UPTD Pengel. Air Limbah	17. [signature]
18	KERLINUS.B	UPTD Penge Air limbah	18. [signature]
19	[illegible]	— " —	19. [signature]
20	Yanizar	Bappeda	20. [signature]
21	B. MRAYANI IMRAN	Bappeda	21. [signature]
22	Terry AP	Humas.	22. [signature]
23	Sulha kuba, SKM., M.Kes	Din Kes Kota Mks	23. [signature]
24	Alfika Basong	Din Kes Kota Mks	24. [signature]
25	Rini Indriani	Bappeda	25. [signature]
26	Awaluddin	GTC	26. [signature]
27	Ahyar. Kur'ani	GTC.	27. [signature]
28	ST. KHADIJAH	BAPPEDA	28. [signature]
29	Husniyati	the green practices	29. [signature]
30	Rahian	the green practices	30. [signature]

APPENDIX 7

PHOTOGRAPHS OF INITIAL PUBLIC CONSULTATION AND INFORMATION DISCLOSURE (MAKASSAR CITY'S SUBPROJECT)

Photo No.5: Stakeholders' representatives listening to subproject presentation by Public Works [16 October 2012].

Photo No.6: An NGO representative raising some points [16 October 2012].
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Photo No.7: Stakeholders carefully reading the draft GRM [16 October 2012].

Photo No.8: A stakeholder raising some points [16 October 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