

**Metropolitan Waterworks and Sewerage System
Manila Water Company, Inc.**

Initial Environmental Examination

of the

**Community Sanitation Project
Manila Second Sewerage Project
IBRD 4019**

**Project No. 8
Maharlika Medium Rise Housing (MRH)
Taguig, Metro Manila**

Prepared by:

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EXECUTIVE SUMMARY

The proposed project for Maharlika Medium Rise Housing (MRH) is one of the twenty-three (23) sub-projects of the Community Sanitation Project Phase 1, which is a component of the World Bank-assisted Manila Second Sewerage Project (MSSP).

The project is intended to reduce the current wastewater pollution discharged to the Laguna Lake by the four hundred and twenty (420) residential units in Maharlika MRH. The project involves the improvement and rehabilitation of the sewerage system in the compound. Specifically, the project includes the installation of sewer lines to intercept sewage flows from existing communal septic tanks as well as raw wastewater flows from buildings without septic tanks. An underground centralized sewage treatment plant (STP) will be constructed to treat the wastewater flows.

A Memorandum of Agreement (MOA) between Manila Water Company and the National Housing Authority (NHA) was executed to allow project implementation.

In conformity with the requirements of the Department of Environment and Natural Resources (DENR), an Environmental Compliance Certificate (ECC) NCR-2000-10-04-0216-120 issued pursuant to P.D. 1586 was secured for the project.

I. BASELINE ENVIRONMENTAL CONDITIONS

Maharlika MRH was designed to address the housing requirements of the growing population of Muslims in Metro Manila. It occupies a parcel of land within Maharlika Village in the Muslim community of Barangay Maharlika, Taguig, Metro Manila.

Designed in the latter part of 1990s and constructed under the supervision of the National Housing Authority, Maharlika MRH occupies an 11, 418 square meter of gently rolling property on the northeast side of Maharlika Village. The MRH is bounded by Maharlika Road the West and barangay roads in the north and in the east.

Completed in 1999, Maharlika MRH consists of seven (7) five-story residential buildings. The 420 residential units in Maharlika MRH shelter an estimated population of 2,940. Income classes in the community range from low to middle.

Floral population within Maharlika MRH constitutes ornamental plants and a few trees. Faunal population is limited to household pets and stray animals. The area is characterized by a relatively even distribution of precipitation during the year. Like in most parts of Metro Manila, the community has two distinct seasons:

the dry season during the months of November to May and the wet season during the months of June to October.

Existing Sewerage System

The sewerage system of the 2,940 population of Maharlika MRH is made up of polyvinyl chloride (PVC) sewer pipes with diameters ranging from 150-200 millimeters. The sewer lines collect wastewater flows from the 420 residential units to the septic tanks of each building. From the septic tanks, settled wastewater flows to the municipal drainage system which discharges to the Hagonoy Creek. The Hagonoy Creek ultimately discharges to the Laguna Lake.

The current BOD₅ of the Laguna Lake ranges from 2-5 mg/L which falls within the BOD₅ for Class C waters. DENR Administrative Order 34 (DAO 34) describes Class C water as that suitable for the following:

1. **Fishery Water** for the propagation and growth of fish and other aquatic resources;
2. **Recreational Water Class II** (Boating, etc.);
3. **Industrial Water Supply Class I** (For manufacturing processes after treatment).

II. ENVIRONMENTAL IMPACTS AND MITIGATING MEASURES

Potential Environmental Impact	Mitigating Measures
CONSTRUCTION PHASE	
1. Poor quality of construction	<ul style="list-style-type: none"> • Manila Water Company will monitor the supply and installation contract to assure quality of equipment and construction. Site Managers and Engineers with experience in construction management shall approve all materials and equipment to be used and installed at the site. • The contractor will be required to post a performance bond for the Design and Construction Contract of the sewerage system.

<p>2. Air pollution (suspended particulates, odor and fumes, vehicle emissions eg. CO₂, CO NO_x)</p>	<ul style="list-style-type: none"> • Efficient construction planning and work scheduling • Formulation of appropriate work plans, work scheduling, work specifications and work methodologies • Provision of properly maintained storage area for keeping stocks of construction materials and equipment • Prompt and fast removal of excavated materials or dredges spoils from construction site • Sprinkling of water on dust-generating mounds of resulting from earthmoving activities and civil works. • Control of motor vehicle emissions • Dust accumulation will also be prevented through proper washing of the vehicles prior to its departure from the site • Development and enforcement of strict health and safety pollution control regulations specific for the project site <ul style="list-style-type: none"> - Good housekeeping of workplace and construction affected areas - Use of Protective Gear by all workers
<p>3. Water pollution due to wastewater , oil leakage/spills</p>	<ul style="list-style-type: none"> • Provide temporary drain systems and storage facilities for excavation soils, fuel and oils needed for equipment • Cautious and sensible planning for construction and post-construction phases of the project • Provision of a routine chemical and oil spill clean-up plan • Formulation of a monitoring program
<p>4. Noise pollution from operation of construction equipment</p>	<ul style="list-style-type: none"> • Establish temporary sound barriers around the work site • Proper scheduling and phasing of high-noise activities • Use of appropriate mufflers and sound proofing for construction machinery, equipment and engines • Use of Personnel Protective Equipment by all workers
<p>5. Temporary disruption of traffic flow within the compound</p>	<ul style="list-style-type: none"> • Public information campaign posting schedule of construction • Provision of a liaison officer from the residents of the compound to assist the information dissemination regarding inevitable changes in schedule of operations • Provision of temporary alternative routes, including visible traffic warning signals • To the extent possible, sewer lines, manholes and lift station will be constructed in common areas not used for pedestrian or vehicular traffic • Scheduling of delivery materials and removal of excavated material during non-rush hour periods.
<p>OPERATIONAL PHASE</p>	
<p>1.Environmental hazards due to accidents, man-made and natural disasters eg. accidental spills, fire, seismic activity, earthquakes, heavy rain/flooding and design failure</p>	<ul style="list-style-type: none"> • Carefully designed post-construction maintenance, contingency and monitoring programs • Well designed plan for detection of accident or natural events including precautionary and remedial measures to be observed • Provision of preventive and remedial procedural manuals at workplace • Adequate plans for environmental rehabilitation and restoration of site and removal of temporary structures and facilities installed during construction phase

<p>2. Water Pollution (effluent discharge)</p>	<ul style="list-style-type: none"> • Wastewater discharged by the STP shall conform with the Effluent Standards set forth in DENR Administrative Order 34 and 35 for Class C waters • Regular monitoring of wastewater effluent by the Manila Water Company Central Laboratory • Regular check on sewer lines to prevent discharge/seepage of untreated wastewater to the environment • Quality of civil work on the STP facility shall be enforced during construction to avoid seepage
<p>3. Noise Pollution (STP equipment, lift station)</p>	<ul style="list-style-type: none"> • Use of appropriate mounting for machinery to minimize vibration • All mechanical/electrical equipment shall be installed inside enclosures • If appropriate, motors shall be provided with soundproofing devices • Maintenance of greenbelt zones and vegetation with appropriate tree species
<p>4. Solid Waste (generated within the facility and by the facility)</p>	<ul style="list-style-type: none"> • Solid waste generated within the STP facility will be minimal but provision will be made for garbage collection • Disposal of sludge generated will be in accordance with established procedures of relevant authorities (disposal of sludge for use as soil conditioner)
<p>5. Odors (organic and sulfur compounds coming from raw wastewater and during desludging of septic tanks)</p>	<ul style="list-style-type: none"> • Maintenance of greenbelt zones and vegetation with appropriate tree species • Provision of landscape which will improve the aesthetic of the area by planting green strips using appropriate plant or tree species • Provision of odor control mechanisms (deodorizer/adsorbent/masking agent) to prevent malodorous emissions)
<p>6. Maintenance and Operation of the System</p> <ul style="list-style-type: none"> • Poor maintenance of mechanical equipment (pumps and motors) • Connections 	<ul style="list-style-type: none"> • Regular asset condition monitoring by Manila Water Company personnel • Regular maintenance works for STP equipment (pumps and motors), sewer network and septic tanks • Adequate training of STP operators • A liaison officer from the Community will assist the STP operator in assuring the facility's efficiency in operation • Provision of adequate maintenance equipment and spares for the sewerage system facility

III. ENVIRONMENTAL MONITORING PLAN

Environmental monitoring will be the responsibility of Manila Water Company.

Parameter	Location	Frequency
<u>Construction Phase</u>		
Compliance with Manila Water Company health and safety policies (dust emissions, good housekeeping, noise, odors)	<ul style="list-style-type: none"> • At STP site and its perimeter • Pipe laying area • Equipment and materials storage area 	<ul style="list-style-type: none"> • On-the-spot daily inspection and monitoring will be implemented by the Health and Safety Dept. of Manila Water Company using the STARRT Card (Annex 1)
Traffic	<ul style="list-style-type: none"> • Ingress and egress to the construction site 	<ul style="list-style-type: none"> • Daily
<u>Operational Phase</u>		
Effluent Water Quality for parameters like pH, 5-day BOD, COD, Total coliform, suspended solids, and oil and grease.	<ul style="list-style-type: none"> • Influent • Samples from Treatment stages • Effluent 	<ul style="list-style-type: none"> • Annex 2 describes in detail the schedule of wastewater quality monitoring.
Odor	<ul style="list-style-type: none"> • STP site and perimeter 	<ul style="list-style-type: none"> • Daily
Sludge accumulation/Clogging	<ul style="list-style-type: none"> • At STP site • Sewer network • Communal septic tanks 	<ul style="list-style-type: none"> • Weekly

1.0 PROJECT DESCRIPTION

1.1 Basic Project Information

Name of Project : **MAHARLIKA MRH
COMMUNITY SANITATION PROJECT
MANILA SECOND SEWERAGE PROJECT**

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1.2 PROJECT LOCATION

The proposed project for Maharlika MRH is a sub-project of the Community Sanitation Project, which is a component of the World Bank-assisted MSSP.

The service area is the entire Maharlika MRH compound. The project site is accessible by way of DBP Road in the FTI Compound and through Maharlika Road. Figure 1 presents the vicinity map of the project.

Figure 1. Location Map



Project Area

Water Bodies

1.3 PROJECT RATIONALE

In Metro Manila, untreated/partially treated domestic wastewater is the major source of pollution of inland waters. Most residential houses in Metro Manila treat their wastewater by means of septic tanks, which do not provide adequate treatment to satisfy the DENR requirements for wastewater effluent standards. Moreover, majority of septic tanks in Metro Manila is not properly maintained. This situation has led to the deterioration of the Pasig River and other inland waters. The DENR has estimated that around 60% of the pollution load to Pasig River, which empties to Manila Bay and Laguna Lake, come from domestic discharges. In the case of Laguna Lake, 65% of the pollution loading is attributed to domestic waste.

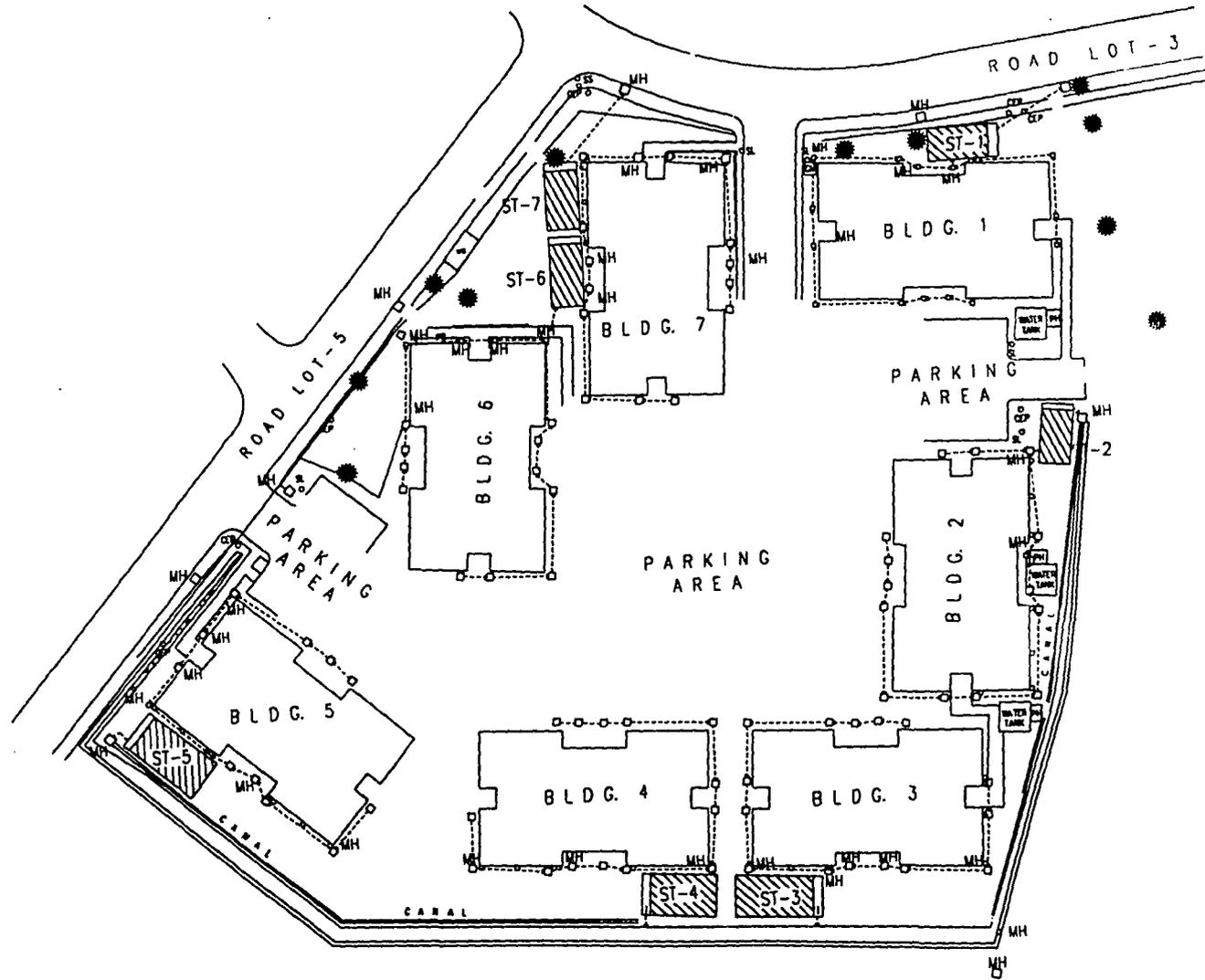
There is therefore an urgent need to establish collection and treatment methods that will help reduce the pollution load to inland waters. The provision of an efficient and cost-effective sewage collection, treatment and disposal is the primary objective of the Community Sanitation Project under the MSSP.

This project specifically aims to address the problems of inadequate wastewater treatment and disposal in Maharlika MRH. Figure 2 shows the existing sewer layout in Maharlika MRH. Inadequate treatment of wastewater in septic tanks is indicated by the typical analysis of the effluent quality of septic tanks in other project sites (see Table 1 below). The project will help reduce public health risks and environmental pollution from untreated/partially treated domestic wastewater by providing a sustainable sanitation and sewerage facility. It will also serve as a good illustration of proper sanitation especially to the neighboring communities near Laguna Lake.

**Table 1
Typical Analysis of Septic Tank Effluent Quality**

Parameter	Limit(s) DENR-EMB	Septic Tank Effluent
PH	6.5-9	<u>7.3@27.9°C</u>
Suspended solids, mg/L	70	90-120
Dissolved Oxygen, mg/L	-	0.00
Biochemical Oxygen Demand (BOD ₅), mg/L	50	150-250
Chemical Oxygen Demand, mg/L	100	200-300
Total Coliform Count, MPN/100 ml	10,000	10 ⁶ -10 ⁷
Fecal Coliform Count, MPN/100 ml	-	10 ⁶ -10 ⁷

Figure 2
Existing Sewer Network Layout for Maharlika MRH



1.4 DESCRIPTION OF PROJECT PHASES

1.4.1 Pre-Operational / Construction Phases

1.4.1.1 Construction Plan

The project is scheduled for bidding in December 2001. Construction is expected to commence in March 2002 and project completion is targeted in August 2002 (180 calendar days).

Figure 3 shows the implementation schedule for the project. Manila Water Company will undertake the project implementation.

1.4.1.2 Total Surface Development Block

The service area is approximately 1.1 hectares and is estimated to have a current population of 2,940. The project will serve all the residential units in Maharlika MRH. Any increase in population is not considered because there are no further planned development within the compound that would significantly affect the quality and/or quantity of wastewater discharges.

1.4.1.3 Estimate of Total Land Area to be Opened for Civil Works

Civil Works will include the STP construction and the laying of sewer lines to connect the septic tanks to the STP. The STP will be located underground in a 200 square-meter lot. Sewer lines totaling 232 meters will be opened for civil works. Figure 4 shows the sewer network layout plan for the project.

1.4.1.4 Major Openings and Construction Activities

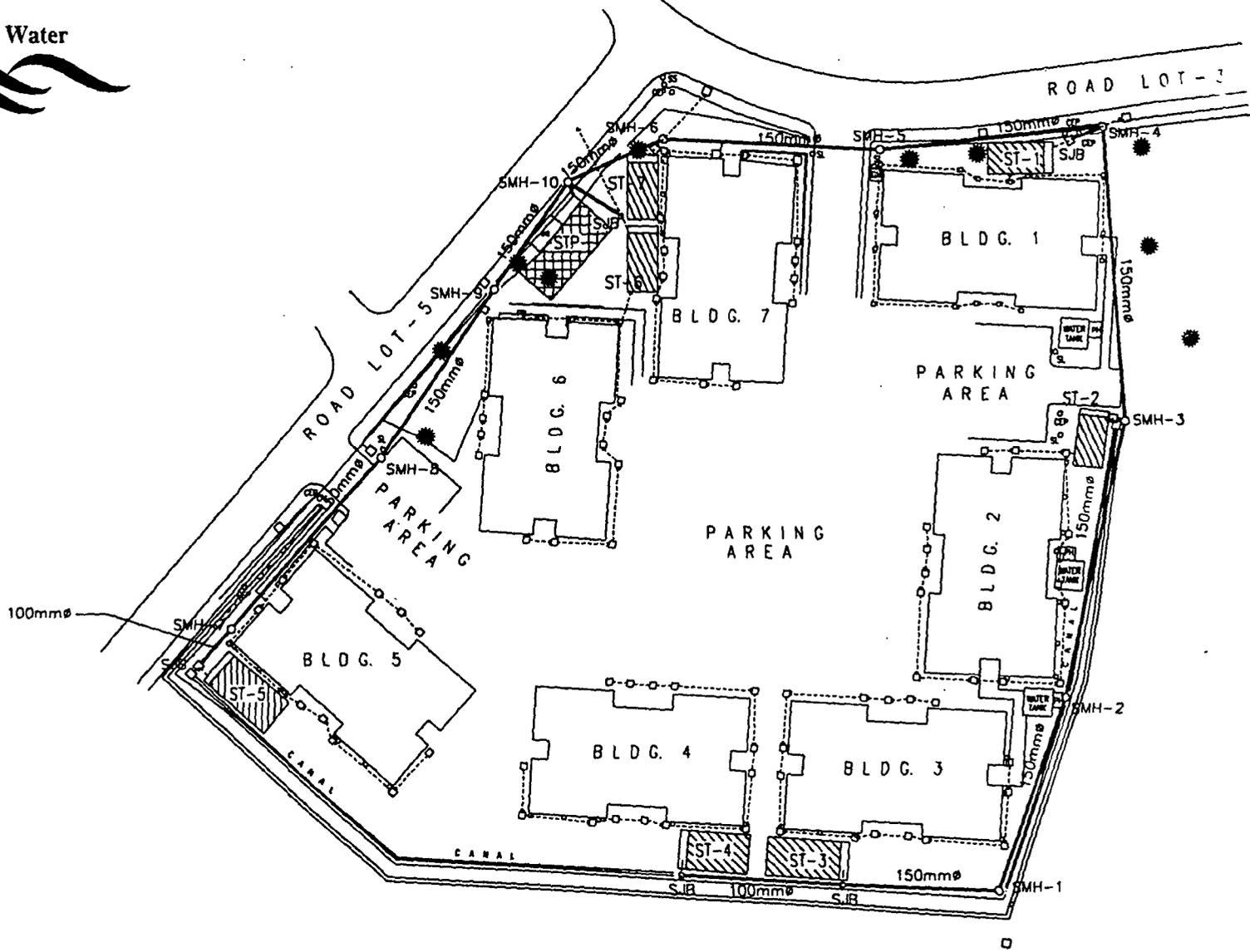
The complete sewerage system will include the following components:

- ◆ Collection sewers (diameter=150 mm) with a total estimated length of 232 meters to connect the 7 communal septic tanks and buildings without septic tanks to the STP
- ◆ Ten (10) sewer manholes and junction boxes with depth less than 1.5 meters
- ◆ Underground STP with a design capacity of 470 m³/day and land requirement of 200 m²
- ◆ Sewer line (diameter=150 mm) with a total estimated length of 10 meters from STP discharge point to existing storm drainage

Figure 3
Proposed Implementation Schedule
for the MAHARLIKA MRH Community Sanitation Project

Week No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Permits and Clearances	█	█	█	█																				
Layout and Staking			█	█																				
Order Equipment	█	█	█	█	█	█	█	█																
Temporary Field Office					█																			
Excavation for Main Reactor						█	█	█	█															
Formwork, Steelwork, Pouring									█	█	█	█												
Form Removal and Curing												█	█	█	█									
Excavate and Install Sewer Line									█	█	█	█	█	█										
Testing of Sewer Lines												█	█	█	█									
Backfilling and Restoration												█	█	█	█	█								
Purchase Imported/ Special Equipment for Treatment					█	█	█	█	█	█	█	█	█	█										
Install Treatment Equipment																		█	█	█	█	█		
Install Electrical and Plumbing																█	█	█	█	█				
Testing, Acceptance & Turnover																						█	█	█

Figure 4
Proposed Sewer Collection Layout for Maharlika MRH



Civil works to be implemented are as follows:

For STP/Lift Stations

- ◆ Site clearing
- ◆ Earthworks
 - excavation and handling
 - dewatering
 - backfill and compaction
 - lean concrete/ gravel bedding
- ◆ Concrete Works
 - shoring and soil protection
 - formworks
 - concreting
- ◆ Electro-mechanical
 - internal and external pipeworks
- ◆ mechanical installation

– electrical installation

- ◆ Site restoration
- Clearing/ miscellaneous activities

For Pipelaying

- ◆ Pavement cutting
- ◆ Shoring and removal
- ◆ Excavation and handling
- ◆ Dewatering
- ◆ Pipelaying
- ◆ Backfill and compaction
- ◆ Testing pavement restoration
- ◆ Clearing / miscellaneous activities

1.4.1.5 Types of Equipment to be Used

The civil works contractor will provide equipment which include, but is not limited to, the following:

- ◆ backhoe/loader
- ◆ dewatering equipment
- ◆ concrete mixer/concrete pump
- ◆ welding machine
- ◆ compactor
- ◆ jackhammer and air compressor
- ◆ generator
- ◆ dump trucks

1.4.1.6 Source of Construction Materials and Facilities

The following alternative type of pipe materials will be permitted for sewer mains:

- ◆ UPVC Pipe
- ◆ Polyethylene
- ◆ Fiberglass Pipe
- ◆ Ductile Iron Pipe
- ◆ Cast Iron Soil Pipe

The contractor can choose from the above pipe materials.

1.4.1.7 Support Services and Facilities Requirements and Availability

Support services and facilities will be tapped from the available utilities on site. Arrangements with locators in Maharlika MRH and/or any other party will be made by the contractor.

1.4.1.8 Estimate Total Cut Soil Volume(for pipelaying)

Table 2 presents the total system length, average excavation depth of the sewer pipes and area of the project.

Table 2
Estimates of Soil Excavation Volumes

	Estimated Dimensions (sq.m)	Average Excavation Depth (m)	Average Excavation Volume (cu. m.)
STP site	200.00	6.0	1,200.00
Sewer line 150mmØ	0.450 x 232	1.5	156.60
TOTAL			1,356.60

*Estimated dimension of pipe (sq.m.)= [(pipe diameter +0.3) x total length of pipe required]

1.4.1.9 Total Manpower Requirement

The project will be bid out based on World Bank procedures. The winning bidder will provide contractual work for a period of around 180 calendar days. The contractor will provide skilled and unskilled workers to carry out the scope of works as detailed in the bid documents. The scope of works includes:

- ◆ site clearing
- ◆ installation works for the sewer network
- ◆ detailed engineering design and construction/installation works for the STP and its appurtenances
- ◆ landscaping of the STP site and the vicinity
- ◆ abandonment activities (road restoration, etc.)
- ◆ STP start-up operations

1.4.2 Operational Phase

1.4.2.1 Project Operation Schedule and Duration

Completion of construction is expected by August 2002. Start-up operations will begin immediately after project completion.

1.4.2.2 Process Technology and Activities

The project will be bid on the basis of performance specifications for the STP Treatment Process:

- ◆ Wastewater flows were computed on the basis of a per capita water demand of 200 liters per day and a 70% wastewater discharge. Storm infiltration was estimated at 10% of the total flows. A peak factor of 1.5 was added in the computation of design flows to determine pipes sizes and capacity of STP.
- ◆ The influent flow characteristics were based on random laboratory analyses of septic tank effluent in representative sites. The influent quality assumptions are shown in Table 3 below:

Table 3
Influent Flow Characteristics

TSS (mg/l)	BOD₅ (mg/l)	COD (mg/l)	Oil and Grease (mg/l)	pH
100	200	350	50	6-9

TSS = Total Suspended Solids
BOD₅ = 5-day biochemical oxygen demand at 20°C
COD = chemical oxygen demand

- ◆ Wastewater discharged by the STP shall conform with the Effluent Standards set forth in DENR Administrative Order 34 and 35 for Class C waters as shown in Table 4 below:
- ◆ Wastewater treatment will reduce the BOD₅ from 200 mg/L to 50 mg/L, at the minimum. This illustrates an STP treatment efficiency of at least 75%.

Table 4
DENR Effluent Parameters for Class C Waters

Parameters	Units	Concentration
Color	PCU	150
pH		6-9
COD	mg/L	100
Settleable solids	mg/L	0.5
5-day 20°C BOD	mg/L	50
Total Suspended Solids	mg/L	70
Total Dissolved Solids	mg/L	7
Oil and Grease	mg/L	5
Phenolic Substances	mg/L	0.10
Total Coliforms	MPN/100 ml	10,000

Process Scheme of STP

The STP to be constructed in Maharlika MRH will be below ground. The only aboveground structures will be the control room/panel.

The STP treatment process will provide secondary treatment to septic tank effluent. It is expected that bidders will propose different process technologies based on the performance specifications in the bid documents. Some factors which will be considered in selecting the STP treatment process are:

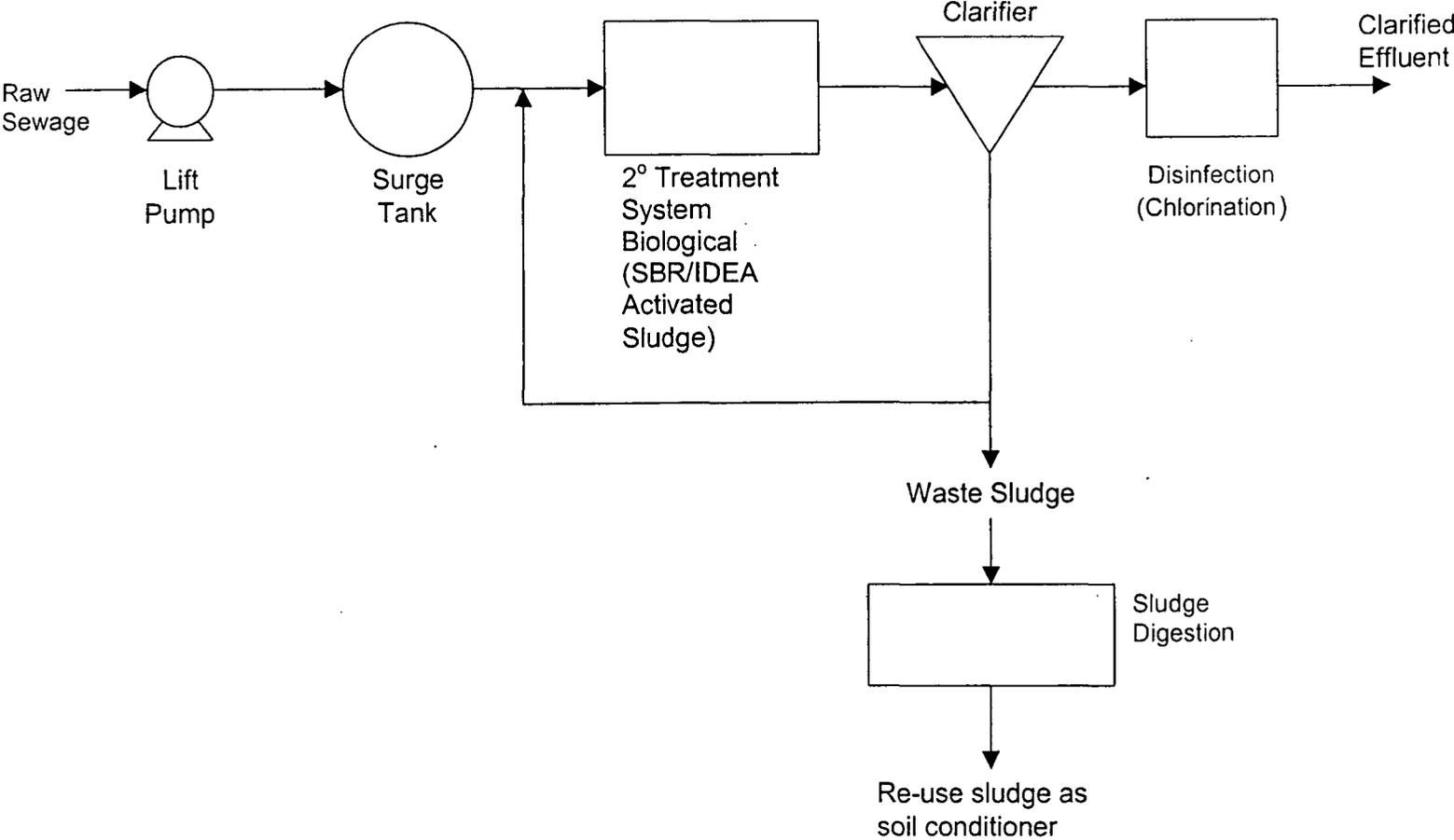
- ◆ Suitability in project site
- ◆ Performance/Treatment efficiency
- ◆ Capital and Replacement costs
- ◆ Operations and Maintenance Costs
- ◆ Complexity of operations
- ◆ Flexibility of treatment process

A general scheme for the treatment process is illustrated in Figure 5.

1.4.2.3 Waste Production Scheme

Up to 2005, sludge produced in the treatment process will be transported to a centralized Septage Sea Disposal Station located in J.P. Rizal St, Brgy. West Rembo, Makati City. Mobile vacuum tankers will collect the sludge produced in the STP.

Figure 5
General Treatment Process Scheme



A long-term disposal scheme for biosolids from the STP will be as soil conditioner for sugarcane and corn in Pampanga. *Experiments done in coordination with the Sugar Regulatory Administration on the use of sludge in enhancing the soil quality of lahar-covered areas and the growth of crops such as sugarcane, corn and bittergourd resulted in the issuance of a temporary license issued by the Fertilizer and Pesticide Authority. The license allows the use of sludge in growing similar crops.*

Sludge generated from the STP can also be treated in the 600 cum/day septage treatment facility which is expected to be operational by 2004. This facility is part of the Sanitation Component of the Pasig River Rehabilitation Project. The facility will be operated by Manila Water Company.

1.4.2.4 Manpower Requirement

Manila Water Company will assign an LLDA and DENR-accredited Pollution Control Officer (PCO) who will be responsible for the compliance of the STP with government regulations. The PCO will have trained operators/crews who will monitor and manage the operation of the sewer network.

Since the STP operations will be operated largely by automation, regular maintenance works will include declogging of sewer lines and removal of sludge from the STP site and the communal septic tanks. The STP operator will visit the project site daily. Monitoring of the effluent quality will be the joint responsibility of the PCO and the Central Laboratory of Manila Water Company.

The community has also agreed to provide a liaison officer who will coordinate with Manila Water Company personnel on the proper operations of the STP and the sewer network. A 24-hour Customer Service Hotline (1627) is available to accept complaints and other emergency reports. Manila Water Company has sewer network repair crews who work in regular round-the-clock 8-hour shifts and who are readily available for any emergency work.

1.4.3 Abandonment Phase

Upon completion of the project scope, the contractor will remove all temporary structures and facilities installed during the construction phase. All pavements will be restored. The cost of abandonment will be incorporated in the overall cost of the project. Manila Water Company will issue a certificate of final acceptance only upon completion of all abandonment works by the contractor and upon turnover of the STP operations.

2.0 BASELINE ENVIRONMENTAL CONDITIONS

2.1 STUDY METHODOLOGY

This Initial Environmental Examination (IEE) was prepared in compliance with the World Bank's Operational Directive 4.01 on Environmental Assessment. An IEE was previously carried out according to the DENR Administrative Order No. 96-37, for which an Environmental Compliance Certificate (ECC) dated Oct. 4, 2000 has been issued by the DENR-Regional Office (Annex 3).

2.2 LAND

2.2.1 Land Resource Utilization

Maharlika MRH has an estimated land area of 1.1 hectares. Approximately 40% of the total area is devoted to residential use, while 60% accounts for parking spaces, driveways, other common facilities and open spaces.

2.2.2 Physiography and Geology

Maharlika MRH lies on a relatively flat plain. Soil type in the area fall under the QA1-Quaternary Alluvium classification. QA1 is characterized by detrital deposits; mostly silt, sand and gravel.

2.2.3 Vegetation and Wildlife

The proposed site for the STP is in a vacant area behind buildings 6 and 7. Figure 6 shows a photograph of the proposed site.

The vegetative cover of the site is predominantly wild grass interspersed with a small number of wild, adolescent vegetation. The plant species that can be found in the site and which will be uprooted during construction are:

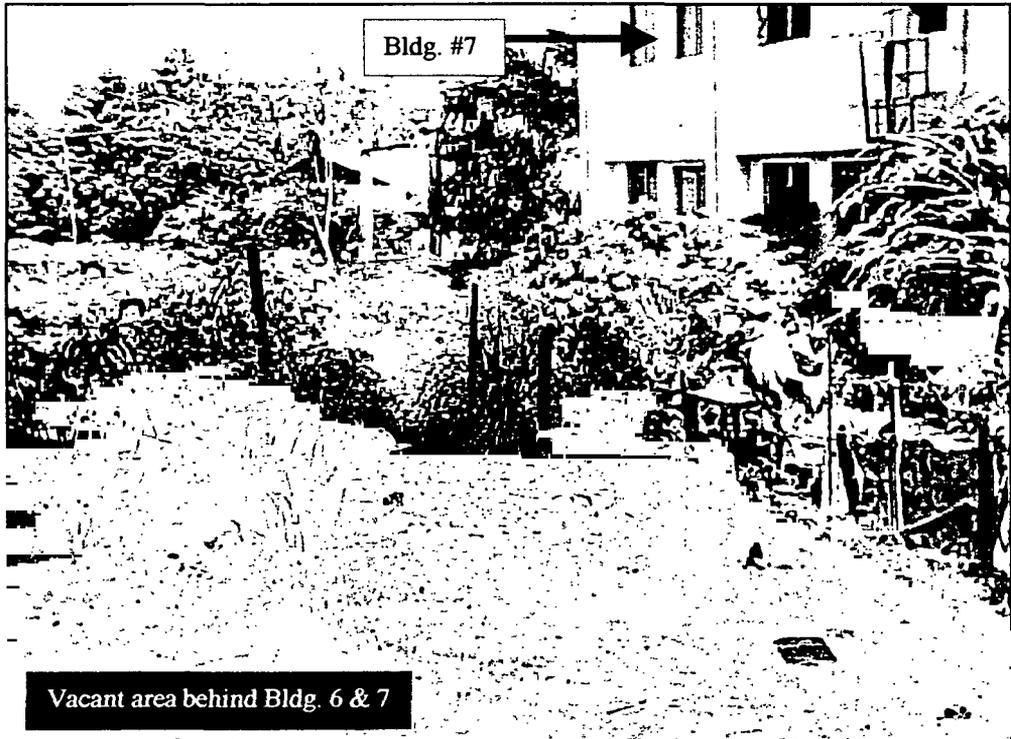
Acapulco (<i>Cassia alata</i>)	Guava (<i>Psidium guajava</i>)
Lemon grass	Narra (<i>Pterocarpus indicus</i>)
Papaya (<i>Carica papaya</i>)	Sili (<i>Capsicum</i>)
Sugarcane	Alugbati
Bittergourd	Cassava (<i>Manihot esculenta</i>)
Common grass (<i>Phragmites</i> spp)	Eggplant
Gabi (<i>Colocasia esculenta</i>)	Uray

Faunal population is limited to household pets and stray animals.

Figure 6. Proposed STP Site



Vacant area behind Bldg. 6 & 7



Vacant area behind Bldg. 6 & 7

2.2 4 Land Acquisition Assessment

Manila Water was allowed to use a parcel of land for the STP by way of a grant of perpetual easement from the National Housing Authority, the owner/developer of the community. The STP site is free from informal settlers.

2.3 WATER

2.3.1 Inventory of Water Bodies

Wastewater from the MRH enters the communal septic tanks which discharge to the local drainage system. The drainage system discharges to Hagonoy Creek which flows to the Laguna Lake.

The current BOD₅ of the Laguna Lake is 2-5 mg/L which falls within the BOD₅ for Class C waters. DENR Administrative Order 34 (DAO 34) describes Class C water as that suitable for the following:

1. **Fishery Water** for the propagation and growth of fish and other aquatic resources;
2. **Recreational Water Class II** (Boating, etc.); and
3. **Industrial Water Supply Class I** (For manufacturing processes after treatment)

2.3.2 Water Quality (Surface/Ground)

Surface Water Quality. Pollution loading to the Laguna Lake will be reduced since septic tanks and raw wastewater from the project area will no longer be discharged directly to the Lake. Effluent from the plant will comply with DENR Effluent Quality standards sufficient for Class C waters.

At present, the Laguna Lake is used for the propagation and growth of fishes as well as recreational and industrial uses. Sixty five percent (65%) of the pollution loading to the Lake comes from domestic waste. Without any sewerage or sanitation interventions, the pollution load entering the Lake is expected to increase dramatically unless necessary steps to reduce pollution loading from domestic wastewater is taken.

Ground Water Quality. Since septic tank effluent will undergo further treatment in the plant, the possibility of contaminating the aquifers due to leachate from septic tank discharge or from raw wastewater will be eliminated. Seepage from plant operations will be non-existent.

2.4 AIR

Taguig experiences only two types of weather conditions, rainy season and the dry season. Rainy season occurs between the months of July and October, while the dry season occurs between November and June. Mean annual temperature is 27.4°C and average annual humidity is 77% for Metro Manila.

Air quality within Maharlika MRH is moderately unpolluted. However, outside the premise is a national road where public and private vehicles exhaust vehicle fumes contributing to the air pollution in the vicinity.

2.5 PEOPLE

2.5.1 Population

All 420 units in Maharlika MRH are currently occupied. Assuming 7 persons per unit, the estimated population is 2,940. Social status of the families range from Class B to Class D based on the classification of the National Statistics Office (NSO).

2.5.2 Project Affected Persons

During construction, the project will cause noise and traffic nuisance to the residents of C5-MRB, its neighboring communities and pedestrians. Once operational, the project will directly affect the residents of the entire C5-MRB. The sanitation of the community will be improved when the new sewer system is operational.

Manila Water will assign skilled personnel to operate and maintain the system up to approved standards.

3.0 ALTERNATIVES

Maharlika MRH is considered a priority area for the improvement of sanitation conditions based on the following factors:

- ◆ It has a relatively high population density.
- ◆ The existing sanitation facilities are inadequate to comply with the DENR effluent standards.
- ◆ The communal sanitation and drainage systems in the compound are not maintained.

The potential site identified for the STP is the vacant area behind buildings 6 and 7. The site will not require relocation of inhabitants during construction.

4.0 IMPACT ASSESSMENT

4.1 IMPACT IDENTIFICATION

Table 5
Sources and List of Potential Environmental Impacts

Source of Impacts	Potential Environmental Impact
CONSTRUCTION PHASE	
<u>Air Pollution</u> 1. Dust emission will occur due to civil works such as excavation, disposal of excess soil, etc. 2. Emission of dust and other air pollutants by vehicles.	The impact on the air quality will only occur during the construction phase, but could be controlled through proper measures. Among the potential air impacts are: <ul style="list-style-type: none"> • Ground level concentration of suspended solids will increase • Air pollutants such as CO₂, CO, and NO_x will occur from vehicle emissions.
<u>Water Pollution</u> 1. Domestic waste made by the construction workers and staff. 2. Wastewater will be produced due to the washing of vehicles. 3. Spillage of oil might occur through improper handling.	<ul style="list-style-type: none"> • Improper disposal of the wastewater produced could lead to contamination of ground water. • Uncontrolled wastewater discharge, construction debris and oil leakage / spill will increase the sedimentation/contribute to the pollution of the nearest body of water
<u>Noise Pollution</u> 1. Noise pollution from the operation of construction equipment and vehicles.	<ul style="list-style-type: none"> • Noise level will increase due to the usage of noise generating equipment.
OPERATIONAL PHASE	
<u>Water Pollution</u> 1. Improper operation and maintenance of the STP will result to water pollution.	<ul style="list-style-type: none"> • The project will reduce the wastewater load into the Laguna Lake and will constitute a positive impact. However, improper operations/maintenance of the STP will result to the discharge of untreated or partially treated effluent.
<u>Odor Pollution</u> 1. Unpleasant odor will result from the anaerobic conditions and improper operation and maintenance of the STP.	<ul style="list-style-type: none"> • The whole Maharlika MRH, especially the buildings near the STP, will experience unpleasant odor during periods of odor emission.
<u>Noise Pollution</u> 1. Noise generating engines and equipment that are necessary for the operation of STP will be used. Added noise will be created during its operation.	<ul style="list-style-type: none"> • Impact will be insignificant and can easily be controlled through proper preventive measures.

<p><u>Socio-Economic</u></p> <ol style="list-style-type: none"> 1. The project will result to proper treatment of wastewater. 2. Value of land will increase. 	<ul style="list-style-type: none"> • The STP will result to a positive impact since the domestic wastewater will be treated and will help decrease the pollution load into Pasig River. Also, the treated water could be re-used.
<p><u>Residual and Unavoidable Impacts</u></p> <ol style="list-style-type: none"> 1. Accidents and man-made disasters might occur due to design failure and improper construction practices. 2. Environmental hazards might occur due to natural disasters like earthquakes, typhoon, etc. 	<ul style="list-style-type: none"> • Proper precautionary and preventive measures to avoid these kinds of impacts.

4.1.1 Impacts During Construction Phase

A. Air Quality

During the implementation of the project, an increase in emission of dust and suspended particulates will occur in the vicinity of the STP site and excavations for the sewer pipes. This can be attributed to civil works such as excavation, disposal of excess soil and other related construction activities. Another cause will be emission of fumes and other air pollutants of the vehicles to be used.

B. Water Quality

Excavation activities in the project site could loosen soils and transport of these materials to the Laguna Lake will result in siltation or increase in turbidity. Inappropriate disposal of human waste by construction workers, excessive use of water for washing of equipment and spillage of oil might also occur.

C. Noise

Noise will be generated during the construction of the project due to the operation of equipment and construction activities. Considering that the proposed site for the project is near the residential buildings, proper mitigating measures will be done to ensure that the equipment and activities will cause little or no disturbance to the residents.

Heavy equipment will be monitored to operate only in short periods of time to avoid sustained high level of noise. The operator of heavy equipment will be required to pause work for 10-15 minutes after every two (2) hours of operation. The use of heavy equipment will be strictly prohibited from 6:00 P.M. until 8:00 A.M. on weekdays. Residents will be given prior notice at least one (1) day before use of any heavy equipment on Saturdays. Use of heavy equipment will be prohibited during Sundays except for special or emergency activities that need immediate action.

Table 6 shows the typical noise emissions of common construction equipment used at various distances from source.

Table 6
Typical Noise Emissions of Construction Equipment at Various Distances from Source in dB(A)

Equipment	15 meters	30 meters	60 meters
Air Compressor	75-87	69-81	63-75
Backhoe	71-92	65-87	59-81
Compactor	72	66	60
Concrete Mixer	75-88	69-82	63-76
Pumps	70-90	64-84	56-78
Tractors, Bulldozers	78-95	72-89	66-83
Trucks	83-93	77-87	71-81
Jack Hammer	81-97	75-91	69-85

D. Ecological Effects

Since there are no rare, endemic species of flora and fauna in the project area, project implementation has minimal impact on the overall terrestrial ecology of Maharlika MRH. Some plants will be unavoidably cleared during civil works.

4.1.2 Impacts During Operation Phase

A. Air Quality

There will be minimal effect on the air quality during the operational phase of the STP. Aside from the occasional odor nuisance, there will be no adverse effect on the air quality. The performance specifications for the STP treatment process specifically state that the facility should have odor control mechanisms (eg., deodorizer, masking agent, adsorbent, etc.). Manila Water Company will not accept the turnover of the STP by the contractor if the facility emits unpleasant odors. Permanent solution(s) to address any odor nuisance will be the responsibility of the contractor.

B. Water Quality

Without wastewater treatment, Maharlika MRH accounts for an estimated 94 kg BOD₅/day loading to the Laguna Lake. The implementation of the project will contribute to the improvement of the quality of water in Laguna Lake by reducing discharge of untreated/partially treated wastewater. From a pollution loading of 94 kg BOD₅/day, loading will be reduced to 14-23.5 kg BOD₅/day, or a 75-85% BOD₅ reduction, when the STP becomes operational.

C. Socio-Economic

A flat sewer charge equivalent to 50% of the water charge will be included in the water bill once the STP is commissioned. This fee will help cover the costs of the operations and maintenance of the STP and the sewer network. This arrangement was explained to barangay officials and the community developers during the consultation process. The consultation done with the community is explained in Chapter 6.0.

The general sanitation conditions in the project area will significantly improve. The project will reduce, if not eliminate the threat of water borne diseases such as diarrhea and typhoid fever, which are more costly to manage.

D. Sludge Disposal and Management

The existing septic tanks in the area produce an estimated 19.84 kg of sludge per year. The table below illustrates the sludge production averages for various wastewater treatment processes. Also indicated is the estimated sludge production of the STP considering each type of treatment.

Table 7
Sludge Production of Various Wastewater Treatment Processes

Treatment Process	Typical Dry Solids Production (kg/m ³)	Estimated STP Sludge Production (kg/day)
Activated sludge	85	39,950
Trickling filtration	70	32,900
Extended aeration	100*	47,000
Aerated lagoon	100*	47,000

*assumes no primary treatment

The bidders for the project may propose any of the above wastewater treatment process or their modifications. Cost and operational efficiency are among the considerations for awarding the bid.

In the interim (i.e. up to 2005), sludge produced in the treatment process and collected from the communal septic tanks will be transported to a Septage Sea Disposal Station located in J.P. Rizal St., Brgy, West Rembo, Makati City. Vacuum tankers will collect the sludge produced in the STP and the septage from septic tanks.

A long-term alternative is the disposal of sludge and septage to the lahar areas in Pampanga. The sludge can be used as soil conditioner for sugarcane and corn. *Experiments done in coordination with the Sugar Regulatory Administration on the use of sludge in enhancing the soil quality of lahar-covered areas and the growth of crops such as sugarcane, corn and bittergourd resulted in the issuance*

The implementation of the project is projected to produce minimal adverse effect environmental impacts. Moreover, the long-term benefits from the project such as improved sanitation conditions within the compound, lesser risk of waterborne diseases, and reduction in pollution will more than compensate for the negative effects that this project will cause during construction and operation.

Mitigating measures will be implemented to minimize, if not eliminate any adverse impact that the project may cause. Measures to enhance the existing environmental conditions in the project site shall be implemented, as needed.

4.3 UNAVOIDABLE AND RESIDUAL IMPACTS

Unavoidable and residual impacts are those which occur as a result of natural calamities such as floods caused by typhoons or heavy rains, earthquakes and the like. Appropriate measures will be done to anticipate these impacts and to implement contingency action plans.

5.0 ENVIRONMENTAL MANAGEMENT PLAN

5.1 IMPACTS MITIGATION / ENHANCEMENT PLAN

Table 9 below is a matrix on the environmental management plan of the proposed project.

**Table 9
ENVIRONMENTAL MANAGEMENT PLAN**

CONSTRUCTION PHASE			
Potential Environmental Impact	Mitigating Measures	Manner of Implementation	Schedule
1. Poor quality of construction	<ul style="list-style-type: none"> • Manila Water Company will monitor the supply and installation contract to assure quality of equipment and construction. Site Managers and Engineers with experience in construction management shall approve all materials and equipment to be used and installed at the site. • The contractor will be required to post a performance bond for the Design and Construction Contract of the sewerage system. 	To be included in the contractor's scope of work, under the supervision of Manila Water Company.*	Daily

<p>2. Air pollution (suspended particulates, odor and fumes, vehicle emissions eg. CO₂, CO NO_x)</p>	<ul style="list-style-type: none"> • Efficient construction planning and work scheduling • Formulation of appropriate work plans, work scheduling, work specifications and work methodologies • Provision of properly maintained storage area for keeping stocks of construction materials and equipment • Prompt and fast removal of excavated materials or dredges spoils from construction site • Sprinkling of water on dust-generating mounds of resulting from earthmoving activities and civil works. • Control of motor vehicle emissions • Dust accumulation will also be prevented through proper washing of the vehicles prior to its departure from the site • Development and enforcement of strict health and safety pollution control regulations specific for the project site <ul style="list-style-type: none"> - Good housekeeping of workplace and construction affected areas - Use of Protective Gear by all workers 	<p>To be included in the contractor's scope of work, under the supervision of Manila Water Company.*</p>	<p>Start of construction and daily</p>
<p>3. Water pollution due to wastewater, oil leakage/spills, toxic and hazardous substances</p>	<ul style="list-style-type: none"> • Provide temporary drain systems and storage facilities for excavation soils, fuel and oils needed for equipment • Cautious and sensible planning for construction and post-construction phases of the project • Provision of a routine chemical and oil spill clean-up plan • Formulation of a monitoring program 	<p>To be included in the contractor's scope of work, under the supervision of Manila Water Company.*</p>	<p>During construction</p>
<p>4. Noise pollution from operation of</p>	<ul style="list-style-type: none"> • Establish temporary sound barriers around the work site 	<p>To be included in the contractor's scope of</p>	<p>Daily</p>

construction equipment	<ul style="list-style-type: none"> • Proper scheduling and phasing of high-noise activities • Use of appropriate mufflers and sound proofing for construction machinery, equipment and engines • Use of Personnel Protective Equipment by all workers 	work, under the supervision of Manila Water Company.*	
5. Temporary disruption of traffic flow within the compound	<ul style="list-style-type: none"> • Public information campaign posting schedule of construction • Provision of a liaison officer from the residents of the compound to assist the information dissemination regarding inevitable changes in schedule of operations • Provision of temporary alternative routes, including visible traffic warning signals • To the extent possible, sewer lines, manholes and lift station will be constructed in common areas not used for pedestrian or vehicular traffic • Scheduling of delivery materials and removal of excavated material during non-rush hour periods. 	To be included in the contractor's scope of work, under the supervision of Manila Water Company.*	Daily
6. Accumulation of solid waste in construction site	<ul style="list-style-type: none"> • Hauling and proper disposal of waste construction materials by contractor, supervised by Manila Water Company • Provision of temporary toilet facilities for workers 	To be included in the contractor's scope of work, under the supervision of Manila Water Company.*	Daily

*Manila Water Company's contractor shall comply with all the conditions stipulated in the scope of work. Any violation by the contractor will be penalized by a performance security incorporated in the bid. The performance security will be in the form of an unconditional bank guarantee in the amount of 10% of the contract price.

OPERATIONAL PHASE

Potential Environmental Impact	Mitigating Measures	Manner of Implementation	Schedule
<p>1. Environmental hazards due to accidents, man-made natural disasters eg. Accidental spills, fire, seismic activity, earthquakes, heavy rain/flooding and design failure</p>	<ul style="list-style-type: none"> • Carefully designed post-construction maintenance, contingency and monitoring programs • Well designed plan for detection of accident or natural events including precautionary and remedial measures to be observed • Provision of preventive and remedial procedural manuals at workplace • Adequate plans for environmental rehabilitation and restoration of site and removal of temporary structures and facilities installed during construction phase 	<p>Manila Water Company</p>	<p>Observance of guidelines will be done daily.</p>
<p>2. Water Pollution</p>	<ul style="list-style-type: none"> • Wastewater discharged by the STP shall conform with the Effluent Standards set forth in DENR Administrative Order 34 and 35 for Class C waters. Annex 2 describes in detail the schedule of wastewater quality monitoring. • Regular monitoring of wastewater effluent by the Manila Water Company Central Laboratory • Regular check on sewer lines to prevent discharge/seepage of untreated wastewater to the environment • Quality of civil work on the STP facility shall be enforced during construction to avoid seepage 	<p>Manila Water Company</p>	<p>Refer to Annex 2</p>

3. Noise Pollution	<ul style="list-style-type: none"> • Use of appropriate mounting for machinery to minimize vibration • All mechanical/electrical equipment shall be installed inside enclosures • If appropriate, motors shall be provided with soundproofing devices • Maintenance of greenbelt zones and vegetation with appropriate tree species 	Manila Water Company	Observance shall be done daily.
4. Solid Waste (generated within the facility and by the facility)	<ul style="list-style-type: none"> • Solid waste generated within the STP facility will be minimal but provision will be made for garbage collection • Disposal of sludge generated will be in accordance with established procedures of relevant authorities (disposal of sludge for use as soil conditioner) 	Manila Water Company	Weekly
5. Odors (organic and sulfur compounds coming from raw wastewater and during desludging of septage)	<ul style="list-style-type: none"> • Maintenance of greenbelt zones and vegetation with appropriate tree species • Provision of landscape which will improve the aesthetic of the area by planting green strips using appropriate plant or tree species • Provision of odor control mechanisms (deodorizer/adsorbent/masking agent) to prevent malodorous emissions) 	Manila Water Company	This shall be inspected daily.
6. Maintenance and Operation of the System <ul style="list-style-type: none"> • Poor maintenance of mechanical equipment (pumps and motors) 	<ul style="list-style-type: none"> • Regular asset condition monitoring by Manila Water Company personnel • Regular maintenance works for STP equipment (pumps and motors), sewer network and septic tanks • Adequate training of STP operators • A liaison officer from the Community will assist the STP operator in assuring the facility's efficiency in operation • Provision of adequate maintenance equipment and spares for the sewerage system facility 	Manila Water Company	This shall be done daily.

5.2 ENVIRONMENTAL MONITORING ACTION PLAN

Tables 10 and 11 below presents the action plan for environmental monitoring for the proposed project. Manila Water Company will be responsible for the monitoring of the STP, the sewer network, and communal septic tanks.

**Table 10
Environmental Monitoring Action Plan**

Parameter	Location	Frequency
<u>Construction Phase</u>		
Compliance with Manila Water Company health and safety policies (dust emissions, good housekeeping, noise, odors)	<ul style="list-style-type: none"> • At STP site and its perimeter • Pipe laying area • Equipment and materials storage area 	<ul style="list-style-type: none"> • On-the-spot daily inspection and monitoring will be implemented by the Health and Safety Dept. of Manila Water Company using the STARRT Card (Annex 1)
Traffic	<ul style="list-style-type: none"> • Ingress and egress to the construction site 	<ul style="list-style-type: none"> • Daily
<u>Operational Phase</u>		
Effluent Water Quality for parameters like pH, 5-day BOD, COD, Total coliform, suspended solids, and oil and grease.	<ul style="list-style-type: none"> • Influent • Samples from Treatment stages • Effluent 	<ul style="list-style-type: none"> • Annex 2 describes in detail the schedule of wastewater quality monitoring.
Odor	<ul style="list-style-type: none"> • STP site and perimeter 	<ul style="list-style-type: none"> • Daily
Sludge accumulation/Clogging	<ul style="list-style-type: none"> • At STP site • Sewer network • Communal septic tanks 	<ul style="list-style-type: none"> • Weekly

Table 11
Institutional Monitoring

Item	Reporter	Reporting Scheme Recipient	Frequency
Pre-Construction Phase			
Confined Space Permit	Contractor	Manila Water	every entry into a confined space
Welding Accreditation	Contractor	Manila Water	once
Construction Phase			
STARRT Card	Contractor	Manila Water	daily
Progress Report	Manila Water	MWSS	quarterly
	MWSS	World Bank	
Operation Phase			
PCO Report (See Annex 4 for the PCO Report Format)	Manila Water PCO	DENR/LLDA MWSS	quarterly

The procedures to be used during the sampling and analysis will be based on the standard methods prescribed in DENR Administrative Order No. 34 and 35. Annex 5 presents a sample monitoring sheet of effluent quality used by Manila Water Company.

6.0 CONSULTATION PROCESS

The development of the project included consultations with barangay officials and community developers and managers. Annex 6 presents the endorsement of the Barangay Captain of the project. Finally, a Memorandum of Agreement (MOA) was executed between Manila Water Company and the National Housing Authority. The MOA specifies the responsibilities of the parties concerned in the project (see Annex 7).

ANNEXES

which are not the result of or due to the acts, fault or negligence of the NHA and/or any locator in the Maharlika MRH.

- 1.8 At its expense, MWCI has the option to make any addition and/or modification on the **Sewerage System** and the Treatment Plant.
- 1.9 MWCI shall bill, collect and receive payments from the NHA/any duly registered homeowners association/legal aggregation of the Maharlika MRH, as the case may be, of water and sewer charges in the Maharlika MRH, the rates of which are in accordance with the Concession Agreement based on the readings registered on the master meters. The sewer charges shall be incorporated in the MWCI water bill commencing from the date of commissioning of the Treatment Plant.

Article 2: RIGHTS AND RESPONSIBILITIES OF THE NHA

- 2.1 Prior to the operation of the **Deepwell**, any rectification necessary for ensuring that said **Deepwell** is operable and conforms to MWCI standards and specifications shall be for the sole account of the NHA. The cost of additional water service connection to be installed or any transfer of water service connection shall also be shouldered by NHA.
- 2.2 Subject to Article 1.5 above, the NHA shall provide a gratuitous perpetual easement on :
 - 2.2.1 An appropriate piece of land whereon MWCI shall construct the Treatment Plant as indicated in Annex 1, and
 - 2.2.2 Lot 4-~~6~~ where the **Deepwell** is located.NHA shall retain ownership of the land whereon the **Treatment Plant** is to be constructed.
- 2.3 The NHA shall grant a right-of-way or ingress and egress to any authorized representative(s) of MWCI, its contractors, and assigns for the construction/installation, operation and maintenance of the Treatment Plant, **Sewerage System** and the **Deepwell** and for the execution/performance of all necessary and related works/activities in connection therewith.
- 2.4 In the event that the ownership or title to any common area subject of this Agreement is transferred or encumbered to another party, the NHA shall see to it that the rights and obligations of the parties in this Agreement be respected by appropriate stipulation.
- 2.5 Within 15 days from the execution of this Agreement, the NHA shall provide MWCI with all historical data and information related to the performance of the **Deepwell** and the treatment performance of the **Sewerage System**.
- 2.6 The NHA shall ensure that the homeowners/locators of the Maharlika Medium Rise Housing are duly notified of the turnover of the

ANNEX 1

ANNEX 1. MANILA WATER COMPANY STARTT CARD FOR MONITORING CONSTRUCTION WORKS

SAFETY TASK ANALYSIS RISK REDUCTION TALK (STARTT) CARD			
NAME OF CONTRACTOR :		DATE: _____	
SUPERVISOR/FOREMAN :		_____	
JOB DESCRIPTION :		NIGHT <input type="checkbox"/>	
LOCATION :		DAY <input type="checkbox"/>	
TODAY ACTIVITIES: _____			
PRIMARY HAZARDS INVOLVED: _____			
SAFETY PRECAUTIONS TAKEN: _____			
PUBLIC SAFETY		HAZARDS (ENVIRONMENTAL)	
BARRICADES	N/A YES NO	NOISE	N/A YES NO
TRENCH PLATE	N/A YES NO	HEAT STRESS	N/A YES NO
SIGNS	N/A YES NO	GROUND CONTAMINATION	N/A YES NO
BARRIERS	N/A YES NO	WORKING AT HEIGHT	
FLASHERS	N/A YES NO	FULL BODY HARNESS	YES NO
GUARDS	N/A YES NO	SHOCK ABSORBING LANYARD	YES NO
NOTICES	N/A YES NO	ACCESS LADDERS	YES NO
OTHER	N/A YES NO	TIE OFF POINTS	N/A YES NO
HAZARDS (BODY)		HORIZONTAL SAFETY LINE	N/A YES NO
FALL POTENTIAL	N/A YES NO	ENERTIA REAL	N/A YES NO
PINCH POINTS	N/A YES NO	SLIP GRIPS	N/A YES NO
ELECTRICAL SHOCK	N/A YES NO	SAFETY NETS	N/A YES NO
SLIP-TRIP	N/A YES NO	MAN BASKETS	N/A YES NO
FLYING PARTICLES	N/A YES NO	SUSPENDED PLATFORM	N/A YES NO
THERMAL BURNS	N/A YES NO	DROP AREA PROTECTION	N/A YES NO
MANUAL LIFTING	N/A YES NO	BARRICADES	N/A YES NO
SHARP OBJECT	N/A YES NO	SCAFFOLD	
HOUSEKEEPING		GREEN TAG UP TO DATE	N/A YES NO
AREA TIDY	YES NO	HANDRAILS, LADDERS, BOARDS	N/A YES NO
FREE OF WASTE	YES NO	FULL WIDTH PLANKING	N/A YES NO
PPE		ALL PLANKS IN GOOD CONDITION	N/A YES NO
HARD HAT	YES NO	CONFINED SPACE	
SAFETY GLASSES	YES NO	CONFINED SPACE PERMIT ISSUED	YES NO
WORK GLOVES	YES NO	CONFINED SPACE STANDBY PERSON	YES NO
SAFETY BOOTS	YES NO	ATMOSPHERE TESTED	YES NO
CHEMICAL GLOVES	N/A YES NO	WORKERS TOLD OF HAZARDS	YES NO
RUBBER BOOTS	N/A YES NO	ENTRY PERMIT COMPLETED	YES NO
MONO GOGGLES	N/A YES NO	WELDING	
FOOT GUARDS	N/A YES NO	HOT WORK PERMIT	YES NO
EXCAVATION		FIRE WATCH MAN	YES NO
EXCAVATION PERMIT	YES NO	FIRE EXTINGUISHERS	YES NO
DAILY INSPECTION	YES NO	FIRE BLANKET	YES NO
BENCHED/SLOPED/STEPED	YES NO	SHIELDS	N/A YES NO
LADDER PROVIDED	YES NO	CYLINDERS SECURED...	
SIGNS & BARRICADES IN PLACE	YES NO	... & MOVED FROM SPARK AREA	N/A YES NO
ELECTRICAL		SPARKS CONTAINED	N/A YES NO
CORDS IN GOOD CONDITION	N/A YES NO	COMBUSTIBLES CLEARED	N/A YES NO
PLUGS & RECEPTORS NOT - BROKEN	N/A YES NO	FACE SHIELD	N/A YES NO
CORRECT VOLTAGE RATING	N/A YES NO	BURNING GOGGLES	N/A YES NO
STRUNG ABOVE GROUND	N/A YES NO	FRESH AIR	N/A YES NO
NOT THROUGH WATER	N/A YES NO	RESPIRATOR	N/A YES NO
		EAR PROTECTION	N/A YES NO
		SAFETY HARNESS	N/A YES NO
		OTHERS: _____	

ANNEX 2

ANNEX 2. WASTEWATER QUALITY MONITORING SCHEDULE

Parameters	Sample Identity	Frequency	Agency	Total Costs for Manila Water (PhP/month)
				TOT=46,961.00
pH Suspended solids Dissolved Oxygen BOD ₅ COD Oil & grease Residual Chlorine Total Coliform Fecal Coliform	Influent, effluent	quarterly	DENR	14,696.00
		monthly	MWSS Regulatory Office	
		weekly	Manila Water	
30-Minute settling test	Sample from Aeration tank	daily	Manila Water	25,080.00
COD	effluent			
Residual Chlorine	effluent			
Dissolved oxygen Sludge Volume Index Settleable Matter Suspended Solids Total Solids	Return activated sludge, Mixed liquor tanks	weekly	Manila Water	2,640.00
pH Suspended solids Cyanide Cadmium Chromium Copper Iron Manganese Lead Zinc	Raw sludge, Digested sludge	monthly	Manila Water	4,545.00

ANNEX 3

ANNEX 3. ENVIRONMENTAL COMPLIANCE CERTIFICATE (ECC)



Republic of the Philippines
Department of Environment and Natural Resources
NATIONAL CAPITAL REGION
Congressional Plaza Building # 51 Congressional Avenue, Project 8 Quezon City
Tel No : 926-09-29 • 526-09-07



NCR-2000 - 10 - 04 -0216-120
2008 - 240 - TG - 120

ENVIRONMENTAL COMPLIANCE CERTIFICATE

DENR-NCR hereby grants **Environmental Compliance Certificate (ECC)** for the construction and operation of the **Sewage Treatment Plant** project of **Manila Water Company Inc. (MWC)** located in Maharlika Condominium, Lot 4, Blk. 10, Maharlika Village, Taguig, Metro Manila after complying with the Environmental Impact Statement (EIS) system requirements as prescribed in the guidelines of the implementing Rules and Regulations of Presidential Decree 1586.

This Certificate is issued subject to the following conditions:

I. PRE-CONSTRUCTION AND CONSTRUCTION STAGE:

1. That all amenities/utilities (e.g. recreational areas, parking areas, drainage lines, paved areas, etc.) affected by the project shall be immediately restored and rehabilitated;
2. That the proponent shall conduct orientation for resident engineers and contractor who will undertake and implement the project to apprise them of the conditions/stipulations of this ECC and the necessary measures that will mitigate adverse environmental impacts and submit report within fifteen (15) days from date of orientation;
3. That a billboard measuring 0.5 meter by 1.0 meter, bearing "**NCR-2000-10 - 04 -0216-120 issued pursuant to P.D. 1586**" shall be displayed in a conspicuous location at the project site for identification and guidance;

II. OPERATION STAGE:

4. That this Certificate covers the operation of a 420 cu.m. per day capacity, below ground mounted Sewage Treatment Plant to exclusively serve the existing buildings of Maharlika Condominium;
5. That adequate maintenance procedures shall be undertaken to avoid emission of objectionable odor from said facility;

III. OTHERS

6. That all the proposed environmental management measures contained in the Environmental Management Plan shall be effected;
7. That should adverse impacts occur as a result of project operations, all the activities causing the same shall be immediately stopped and remedial measures shall be effected and all damages to life and property shall be properly compensated to all aggrieved parties;

8. That in case of abandonment or indefinite work stoppage, the project proponent shall submit a written notification thirty (30) days before the scheduled abandonment/work stoppage and to restore the site to its original condition or provide safety and protective measures to prevent adverse environmental impacts that may be caused by the project;
9. That restoration works/grading of the exposed grounds shall be immediately undertaken for safety, enhancement and ecological purposes;
10. That this Certificate shall be posted in a conspicuous place in the Administration's Office for easy reference and guidance;
11. That the proposed Environmental Monitoring Program must be implemented, the report and/or result under oath of said monitoring and on the compliance with each of the conditions of the ECC shall be submitted to this Office annually;
12. That a written notification shall be made to the DENR-NCR for approval, in case the project proponent cannot comply with any of the conditions for technical reasons; and
13. That the project proponent shall allow DENR-NCR personnel with proper identification card and travel/mission order to conduct inspection/monitoring of the project without prior notice to oversee compliance to ECC conditions.

Non-compliance with any of the above stipulations and/or misrepresentations in the IEE submitted by the proponent will be sufficient cause for the suspension or cancellation of this Certificate and/or imposition of a fine in an amount not to exceed Fifty Thousand Pesos (P50,000.00) for every violation thereof pursuant to Article IX, Section 6.0, DENR Administrative Order No. 37, Series of 1996. This ECC is not a permit rather it is a certification that the proponent has committed to undertake or implement mitigation measures to reduce the negative impacts to acceptable level.

Given this _____ day of ⁰⁴ OCT. 2000, 2000.


CORAZON C. DAVIS
OIC, Regional Executive Director

Recommending Approval:


SIXTO E. TOLENTINO, JR.
Regional Director for Environment

ANNEX 4

- 1 – Name of Air Pollution Installations the Quarter
- 2 – Number of Hours of Operation of the Installation During the Quarter
- 3 – Name of Materials Processed by the Source Installations
- 4 – Name of the Pollution Control Device of the Installations
- 5 – Number of Hours of Operation of the Devices During the Quarter
- 6 – Name of Air Contaminants by the Installations
- 7 – Concentration of Air Contaminants Emitted by the Installations
- 8 – Name the Collected Solid Wastes and Means of Disposal

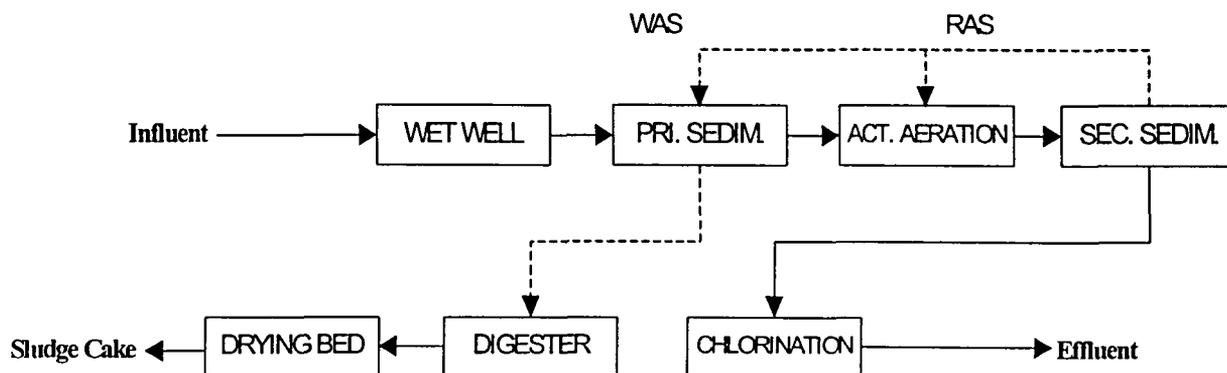
B.1. Sources of Wastewater

Sources	Quantity
1. Domestic	19,820 m ³ / d
2. Process	200.0 m ³ / d
3. Cooling	m ³ / d
4. Washings: Equipment	2.6 m ³ / d
Floor	2.0 m ³ / d

B.2. Wastewater Treatment Process

• **Treatment Scheme**

Indicate wastewater flow directions and rates and the different units involved in the process.



- **Design Capacity of the Wastewater Treatment Facilities** _____ m³ / day

• **Operation of the Treatment Facilities:**

Average Hours/Day 24
 Number of Days During the Quarter 92

• **Sludge Management :**

Quantity Produce: _____ m³ / day

Method Used for Sludge Thickening _____

Method Used for Sludge Treatment _____

Method Used for Sludge Disposal _____

Frequency of Disposal _____

B.3. Wastewater Characteristics

Attach results of the monthly physical and chemical laboratory analysis on the WTP effluent.

Physical & Chemical Analysis include the following:

Parameters	Results
Color	Color Un
Temperature	
pH	
Suspended Solids	mg
BOD ₅	mg
Oil/Grease	mg

C. Maintenance & Repairs Works *(Indicate any breakdown on the air & water pollution installations problems encountered in the operation; repair & maintenance works undertaken & improvements made on the control devices.)*

Submitted by:

Attested by:

Pollution Control Officer

ANTONINO T. AQUINO
President

Quality and Regulation
Laboratory Services
Analytical Services

RESULT OF ANALYSIS

AC-01-03-012
AT-01-03-013

Source of Sample :
Submitted by :
Collected by :
Date/Time Collected :
Date/ Time Submitted :
Analyzed by : Analytical Services Personnel

PARAMETER(S)		LIMIT(S)	RESULT(S)	
			INFLUENT	EFFLUENT
Color	TCU	150.00		
Turbidity	NTU	-		
Settleable Matter	mL/L	0.50		
Suspended Solids, 103°C	mg/L	70.00		
Dissolved Solids , 180°C	mg/L	-		
pH		6.50-9.00		
Dissolved Oxygen (DO)	mg/L	-		
Biochemical Oxygen Demand (BOD) ₅	mg/L	50.00		
Chemical Oxygen Demand	mg/L	100.00		
Surfactants (MBAS)	mg/L	5.00		
Oil and Grease	mg/L	5.00		
Phenols	mg/L	0.10		
Cadmium	mg/L	0.05		
Chromium (Cr ⁶⁺)	mg/L	0.10		
Copper	mg/L	-		
Cyanide*	mg/L	0.20		
Iron	mg/L	-		
Lead	mg/L	0.30		
Manganese	mg/L	-		
Zinc	mg/L	-		
Residual Chlorine	mg/L	-		
BACTERIOLOGICAL EXAMINATION				
Total Coliform	MPN/100 ml	10,000		
Fecal Coliform	MPN/100 ml	-		

Sample analyzed as submitted

eur-equipment under repair

* Analyzed qualitatively

Certified Correct : *Orig. Sgd.*
ELIZABETH P. SEVILLENO
Sr. Quality & Regulation Officer

Date Test Report Issued :

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ANNEX 5

ANNEX 5. SAMPLE MONITORING SHEET FOR EFFLUENT QUALITY

Quality and Regulation
Laboratory Services
Analytical Services

Ctrl. #: LE-00-06-004

RESULT OF ANALYSIS

Source of Sample :
 Submitted by :
 Collected by :
 Date/Time Collected :
 Date/ Time Submitted :
 Date Analyzed :
 Analyzed by : Analytical Services Personnel
 Analytical Methods Used : ¹Electrometric, ²Cobalt-Platinum Scale, ³Gravimetric, ⁴Azide Modification,
⁵Open Reflux Dichromate, ⁶Multiple Tube Fermentation Technique

PARAMETER(S)	LIMIT(S)	RESULT(S)
pH ¹ Units	6.50-9.00	
Color ² TCU	150.00	
Suspended Solids ³ mg/L	70.00	
Dissolved Oxygen ⁴ mg/L	-	
Biochemical Oxygen Demand ⁴ (BOD) ₅ mg/L	50.00	
Chemical Oxygen Demand ⁵ mg/L	100.00	
BACTERIOLOGICAL EXAMINATION⁶		
Total Coliform MPN/100 mL	10,000	
Fecal Coliform MPN/100mL	-	

REMARKS : Sample analyzed as submitted

Submitted by:

Original Signed
MA VIRGINIA B. PINEDA
Sr. Analyst

Certified Correct :

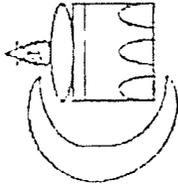
Original Signed
ELIZABETH P. SEVILLENO
Unit Head, Analytical Services

Date Test Report Issued :

This report may not be reproduced in full and may not be used for advertisement or litigation purposes without permission of MWC. This report is certified to have passed the MWC Quality Control procedures for reporting of analysis results.

ANNEX 6

ANNEX 6. ENDORSEMENT FROM BAPANGAY CAPTAIN



Republic of the Philippines
Province of Metro Manila
Municipality of Taguig

BAPANGAY MAHARLIKA

ERLINDA G. PANGANDAMAN
Mayor (Bapangay)

BAPANGAY COUNCILORS:

Marian "Glo" D. Luna

Lita L. Lamid

Narcidin Amarel

Hadji Yusoff Manuacol

Iman Slim Kasmih

Dain Ren Baguwa

Abdul Basit Ebralim

Yasser G. Pangandaman
SK-Chairman

DATE: 27 July 2000

ARTHUR S. GARCIA
Director, DENR-RCR
Manila

TO WHOM IT MAY CONCERN:

With the privatization of MWS, Manila Water Company, Inc. was given the right to exclusively provide water and sewerage services to the Eastern part of Metro Manila. In line with its service obligations, the MWC has elected to develop and improve the sewerage system of Maharlika Medium Rise Housing.

WHEREAS the sewerage system in Maharlika Medium Rise Housing may require repair and rehabilitation due to degradation caused by natural deterioration and/or design consideration;

WHEREAS the present condition of sanitation in the area may present hazards to health of the residents of the community;

WHEREAS, the existing sewer treatment facility needs to be upgraded so that the wastewater effluent will meet environmental standards;

WHEREAS the MWC commits to upgrade the sewer network and improve the treatment facility of Maharlika Medium Rise Housing, and

In recognition of the impact of this project reducing the pollution load to the Laguna Lake as well as the accompanying benefits to the community I, the undersigned, on behalf of the Barangay Council, hereby give my favorable endorsement for the said project.

Respectfully yours,


ERLINDA G. PANGANDAMAN
Mayor, Bapangay

ANNEX 7

ANNEX 7. MEMORANDUM OF AGREEMENT (MOA) BETWEEN MANILA WATER COMPANY AND THE NATIONAL HOUSING AUTHORITY

MEMORANDUM OF AGREEMENT

The Transfer of the Operation and Maintenance of the Deepwell and Sewerage System of Maharlika MRH to MWCI and the Construction of a Sewage Treatment Plant Inside the Maharlika MRH Compound

This Agreement executed at Quezon City, Metro Manila, on this 7th day of February, 2001 by and between:

NATIONAL HOUSING AUTHORITY, a government corporation created and existing under and by virtue of the laws of the Republic of the Philippines, with principal office at Dillman, Quezon City, represented herein by its General Manager, Mr. Angelo F. Leynes, thereunto duly authorized, hereinafter referred to as "NHA";

-and-

MANILA WATER COMPANY, INC., a corporation duly organized and existing under Philippine laws, acting as concessionaire/contractor/agent of the Metropolitan Waterworks and Sewerage System (the "MWSS"), with principal office address at MWSS Administration Building, 489 Katipunan Road, Balara, Quezon City, represented herein by its President, Mr. Antonino T. Aquino, thereunto duly authorized, hereinafter referred to as "MWCI";

WITNESSETH THAT –

WHEREAS, under its Charter (Republic Act No. 6234, as amended), the MWSS has jurisdiction, supervision and control over all waterworks and sewerage systems within its franchise which includes, among others, Taguig;

WHEREAS, by virtue of and pursuant to a Concession Agreement dated February 21, 1997 (the "Concession Agreement"), executed by and between the MWSS and MWCI, MWSS granted to MWCI, as concessionaire/contractor/agent, the sole right to manage, operate and maintain all fixed and movable assets required to provide water delivery and sewerage services in Service Area East (which includes Taguig) of the franchise area of MWSS;

WHEREAS, the NHA owns and holds title to the **Maharlika Medium Rise Housing** (the "Maharlika MRH") in Lot 4 Block 10, Barangay Maharlika, Taguig, Metro Manila, consisting of seven buildings and common areas covered by TCT numbers 32461 to 32473 which common areas include the following:

1. The Deepwell located in between Buildings 4 and 5 (the "Deepwell") located in Lot 4-e within Maharlika MRH.

2. Septic vaults and sewer lines from the outlet of each building to the septic vaults (the "Sewerage System") located within Maharlika MRH;

WHEREAS, in line with a program initiated by MWCI in pursuance of the Concession Agreement, MWCI has offered to operate and maintain the Deepwell and the Sewerage System of the NHA and the NHA has accepted said offer, upon and subject to the terms, conditions and stipulations hereinafter set forth;

NOW THEREFORE, for and in consideration of the foregoing premises and of the terms, conditions and stipulations herein contained, the parties hereto have mutually agreed to the following:

Article 1. RIGHTS AND RESPONSIBILITIES OF MWCI

- 1.1 After ensuring that the **Deepwell** is operable and complies with the MWCI standards and specifications, MWCI shall, at its expense, operate and maintain the **Deepwell**.
- 1.2 Prior to the operation of the **Deepwell**, MWCI shall test and/or replace the master meter located at the discharge pipe of the **Deepwell** which shall serve as a service connection of the Maharlika MRH. In the event that water supply from the MWSS/MWCI water supply system becomes available, MWCI shall, at the expense of NHA/any duly registered homeowners association/legal aggregation of the Maharlika MRH, as the case may be, interconnect the water distribution system of Maharlika MRH to the nearest water line of MWCI and install a mother meter for such water service connection.
- 1.3 Within the period of operating and maintaining the **Deepwell**, MWCI has the option to make any addition and/or modification thereunto or use the **Deepwell** as back-up only, when water supply from the MWSS/MWCI water supply system is available.
- 1.4 MWCI shall, at its expense, operate and maintain the **Sewerage System**, including the Sewage Treatment Plant (the "Treatment Plant") which shall be constructed by MWCI at its expense. Ownership of the Treatment Plant shall be held by MWCI.
- 1.5 MWCI shall provide the NHA with the details of the sewerage plan including the location and size of the land requirement for the Treatment Plant as shown in Annex 1. The consent of the NHA shall be sought in the event that a piece of land more suitable than that initially identified in Annex 1 is found.
- 1.6 Any loss and/or damage to property which may be caused by the construction of the Treatment Plant will be the responsibility of MWCI.
- 1.7 Commencing from the date of commissioning of the Treatment Plant, MWCI, as operator of the **Sewerage System**, shall have the sole liability for any charges or fines that may be assessed in case of any violation of the national and local environmental laws and standards,

which are not the result of or due to the acts, fault or negligence of the NHA and/or any locator in the Maharlika MRH.

- 1.8. At its expense, MWCI has the option to make any addition and/or modification on the Sewerage System and the Treatment Plant.
- 1.9. MWCI shall bill, collect and receive payments from the NHA/any duly registered homeowners association/legal aggregation of the Maharlika MRH, as the case may be, of water and sewer charges. In the Maharlika MRH, the rates of which are in accordance with the Concession Agreement based on the readings registered on the master meters. The sewer charges shall be incorporated in the MWCI water bill commencing from the date of commissioning of the Treatment Plant.

Article 2. RIGHTS AND RESPONSIBILITIES OF THE NHA

- 2.1. Prior to the operation of the Deepwell, any rectification necessary for ensuring that said Deepwell is operable and conforms to MWCI standards and specifications shall be for the sole account of the NHA. The cost of additional water service connection to be installed or any transfer of water service connection shall also be shouldered by NHA.
- 2.2. Subject to Article 1.5 above, the NHA shall provide a gratuitous perpetual easement on :
 - 2.2.1. An appropriate piece of land whereon MWCI shall construct the Treatment Plant as indicated in Annex 1, and
 - 2.2.2. Lot 4-~~5~~ where the Deepwell is located.NHA shall retain ownership of the land whereon the Treatment Plant is to be constructed.
- 2.3. The NHA shall grant a right-of-way or ingress and egress to any authorized representative(s) of MWCI, its contractors, and assigns for the construction/installation, operation and maintenance of the Treatment Plant, Sewerage System and the Deepwell and for the execution/performance of all necessary and related works/activities in connection therewith.
- 2.4. In the event that the ownership or title to any common area subject of this Agreement is transferred or encumbered to another party, the NHA shall see to it that the rights and obligations of the parties in this Agreement be respected by appropriate stipulation.
- 2.5. Within 15 days from the execution of this Agreement, the NHA shall provide MWCI with all historical data and information related to the performance of the Deepwell and the treatment performance of the Sewerage System.
- 2.6. The NHA shall ensure that the homeowners/locators of the Maharlika Medium Rise Housing are duly notified of the turnover of the

operation and maintenance of the Deepwell and/or the Sewerage System.

2.7 A Contract for Water Service Connection shall be executed by and between NHA and MWCI prior to installation of any water service connection. It is understood and agreed that NHA shall seek written consent from MWCI of its transfer of rights and obligations under the said Contract to any duly registered homeowners association, condominium corporation, or other legal aggregation.

Article 3. DURATION OF AGREEMENT

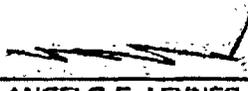
This Agreement shall take effect on the date of its execution by both parties and shall be co-terminus with the Concession Agreement. Any amendment to this Agreement shall be subject to the approval of the General Manager of the NHA and the President of MWCI.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed by their respective officers thereunto duly authorized, on the date and at the place above stated.

MANILA WATER COMPANY, INC.

NATIONAL HOUSING AUTHORITY

By: 
ANTONINO T. AQUINO
President
P.T.A.

By: 
ANGELO F. LEYNES
General Manager

SIGNED IN THE PRESENCE OF:

By: 
JOSE F. MABANTA
MWSS Administrator
J.F.M.

By: 
ARTHUR S. CABANTAC
NHA-NCR Team Head

ACKNOWLEDGMENT

REPUBLIC OF THE PHILIPPINES

QUEZON CITY, METRO MANILA

) S.S.

On this 7th day of Feb., 2001, before me, a Notary Public in and for Quezon City, Metro Manila, personally appeared the following:

Name	Comm. Tax Cert. No.	Date/Place Issued
Antonino T. Aquino	05959688	Jan. 12, 2001/Quezon City
Angelo F. Leynes	05930395	Jan. 11, 2001/Quezon City

both known to me and to me known to be the same persons who executed the foregoing Agreement, and they acknowledged to me that the same is their free and voluntary act and deed as well as the free and voluntary act and deed of their respective principals.

I certify that this Agreement, which consists of five (5) pages including this page wherein this acknowledgement is written, has been signed by the parties executing the same and their witnesses on each and every page thereof.

IN WITNESS WHEREOF I have hereunto set my hand and affixed my notarial seal on the date and at the place hereinabove stated.

Doc. No. 20 ;
Page No. 6 ;
Book No. 7 ;
Series of 2001

[Signature]
Francisco S. Delgado
 Notary Public
 My Commission Expires Dec. 31, 2001
 OTR NO A-1973860 QC 1-03-01

[Handwritten initials]
[Handwritten initials]
[Handwritten initials]

ACCOUNTABILITY STATEMENT OF THE PROJECT PROPONENT

This is to certify that all the information in the enclosed Initial Environmental Examination (IEE) are true, accurate, and complete. Should we learn of any information which would make the enclosed IEE inaccurate, we shall bring the said information to the attention of the Environmental Management Bureau (EMB) of the appropriate DENR Regional Office and the Environmental Department of World Bank.

We hereby bind ourselves jointly and in solidarity with the preparers for any penalties that may be imposed arising from any misinterpretations or failure to state material information in the enclosed IEE.

In witness whereof, we hereby set our hands this 21st day of December 2001 at Quezon City.

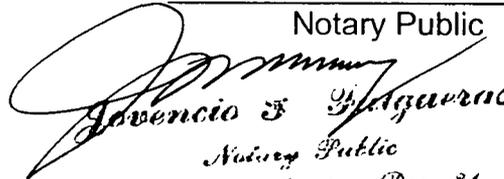
Manila Water Company
Project Proponent

by:


Antonino T. Aquino
President

SUBSCRIBED AND SWORN to before me this 21st day of December 2001, affiant exhibiting to me his Community Tax Certificate No. 05959688 issued on January 12, 2001 at Quezon City.

Doc. No. 407
Page No. 82
Book No. VI
Series of 2001

Notary Public

Jovencio S. Maguorao
Notary Public
My Commission Expires Dec. 31, 192001
PTQ NO A (973800 QC (1-02-01)