

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

E94
Volume 22

Initial Environmental Examination

of the

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

Project No. 20
University of the Philippines, Diliman
Quezon City, Philippines

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EXECUTIVE SUMMARY

The proposed project for the University of the Philippines (UP) Diliman Campus is one of twenty three (23) sub-projects of the Community Sanitation Project Phase I, which is a component of the World Bank-assisted Manila Second Sewerage Project (MSSP).

The project involves the construction of a centralized sewage treatment plant (STP) which will treat the wastewater discharges of the academic and non-academic buildings and residential houses within the UP Diliman Campus. The STP will be located in a 0.5 hectare lot within a 4.28 hectare lot in the vicinity of the National Hydraulics Research Center. The STP will have a capacity to treat 7,000 cubic meters of wastewater per day. A 750-meter sewer line with a diameter of 36 inches will serve as connecting pipe from the existing sewer system to the new STP.

The sewage will be treated to achieve final effluent standards for Class C inland waters as stated in the Department of Environment and Natural Resources Administrative Order (DAO) Number 35.

An ornamental pond will also be constructed around the STP which will receive treated effluent from the STP. During the dry season, portions of the effluent collected in the pond will be pumped via a 1.5 kilometer main to the lagoon adjacent to the UP Administration Building.

In conformity with the requirements of the Department of Environment and Natural Resources (DENR), an Environmental Compliance Certificate (ECC) is also being secured for the project.

I. Baseline Environmental Conditions

The UP Diliman Campus occupies 493 hectares of gently rolling terrain. The campus is bounded by the Central Avenue extension (formerly the Barangay Culiati boundary line) in the north, Loyola Heights Subdivision in the south, Katipunan Road and Barangay Pansol in the east, and Culiati Creek and UP Village in the west. In the northwestern side, the campus is traversed by the Commonwealth Road. UP Diliman has a student population of around 28,000, a faculty population of nearly 1,700, and a support staff of close to 3,000. There are a total of 79 buildings in the campus and an estimated 4,000 residential units.

The sewerage system in the UP Diliman Campus consists of a sewer network of around 16.1 kilometers which was laid in two phases: the first phase was laid in the mid-1960s and the second in the early 1980s. The sewer network was designed so that all wastewater flows will be directed to a centralized STP. However, the plan to construct a centralized STP was not implemented so that

broken portions of the sewer lines now discharge raw wastewater to the Culiat Creek and other buildings constructed their own septic tanks.

Culiat Creek finds its way to the Pasig River through the San Francisco and San Juan Rivers. At present, Pasig River does not meet the Class C standards (i.e., suitable for propagation and growth of fishes, recreational uses and industrial water supply) especially during the summer months when there are no sufficient inflows. At these times, the BOD in Pasig River reaches 120 mg/L, which is 12 times higher than the permitted level for Class C water; DO drops to zero; and total coliforms exceed the MPN/100 ml standard by up to several thousand degrees.

II. Environmental Impacts and Mitigating Measures

Potential Environmental Impact	Mitigating Measures
CONSTRUCTION PHASE	
1. Change in landform (land leveling, road construction, uprooting of vegetation)	<ul style="list-style-type: none"> • Restoration of disturbed land when possible • Planting of trees/plants in the perimeter of the STP and collection pond • Landscape design will consider maintaining the existing trees
2. Air Pollution (dust emissions from civil works/vehicles)	<ul style="list-style-type: none"> • Proper scheduling and phasing of high-dust activities • Regular and adequate sprinkling of water on dust-generating mounds/piles resulting from earthmoving activities and civil works • Provision of adequately and properly maintained storage area for keeping stocks of construction materials and equipment • Prompt removal of excavated materials from construction sites and workplaces • Good housekeeping according to Manila Water Company standards for all construction areas • Use of personnel protective equipment by all workers
3. Noise pollution (operation of construction equipment)	<ul style="list-style-type: none"> • Proper scheduling and phasing of high-noise activities • Use of mufflers and sound proofing for construction machineries and equipment • Use of personal protective equipment by all workers

<p>4. Temporary disruption of traffic flow (excavation works for interconnection to sewer lines)</p>	<ul style="list-style-type: none"> • Coordination with UP Diliman Police Department (Security Office and Traffic Enforcement Office) • Public information campaign • Clear directional signs and barriers in case traffic rerouting is needed
<p>5. Accumulation of solid waste in construction site</p>	<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
<p>OPERATIONAL PHASE</p>	
<p>1. Water Pollution (effluent discharges to Culiati Creek, groundwater contamination from broken sewer lines)</p>	<ul style="list-style-type: none"> • Regular monitoring of wastewater quality from wet well to the effluent in the collection pond (compliance with DAO 35) by the Manila Water Company Central Laboratory • Regular check on sewer lines to prevent contamination of ground water
<p>2. Odor emissions from STP</p>	<ul style="list-style-type: none"> • Proper ventilation and odor control systems for high-risk areas in the STP (wet well, digestive chambers, sludge drying beds) • Regular hauling of dried sludge from STP to designated disposal area (for use as soil conditioner) • Landscape design of collection pond and open spaces to improve aesthetic area surrounding the STP • Provision of odor control mechanisms (deodorizer/adsorbent/masking agent) to prevent malodorous emissions)
<p>3. Noise pollution (STP equipment)</p>	<ul style="list-style-type: none"> • Use of soundproofing systems/housing for high-noise equipment (blowers); noise will not be louder than 55db at the STP site boundary • Use of personnel protective equipment by all STP workers, visitors
<p>4. Physical hazards (collection pond, open aeration tanks and sedimentation basins)</p>	<ul style="list-style-type: none"> • Fence enclosure, appropriate warning signs and lighting around the STP site • Safety precautions such as lighting and warning signs around the collection pond • Use of personnel protective equipment by all STP workers, visitors • Appropriate landscape design of collection pond and open spaces
<p>5. Poor O&M of the STP and sewer network</p>	<ul style="list-style-type: none"> • Regular asset condition monitoring by Manila Water Company personnel • Regular maintenance works for STP equipment (pumps and motors) and sewer network

III. Environmental Monitoring 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 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 • Effluent/Discharge Point 	<ul style="list-style-type: none"> • Annex 2 describes in detail the schedule of wastewater quality monitoring. • Daily
Odor	<ul style="list-style-type: none"> • STP site and perimeter 	<ul style="list-style-type: none"> • Weekly
Sludge accumulation/Clogging	<ul style="list-style-type: none"> • At STP site. • Sewer network • Septic tanks 	

1.0 PROJECT DESCRIPTION

1.1 Basic Project Information

Name of Project : **UNIVERSITY OF THE PHILIPPINES, DILIMAN,
QUEZON CITY
COMMUNITY SANITATION PROJECT
MANILA SECOND SEWERAGE PROJECT**

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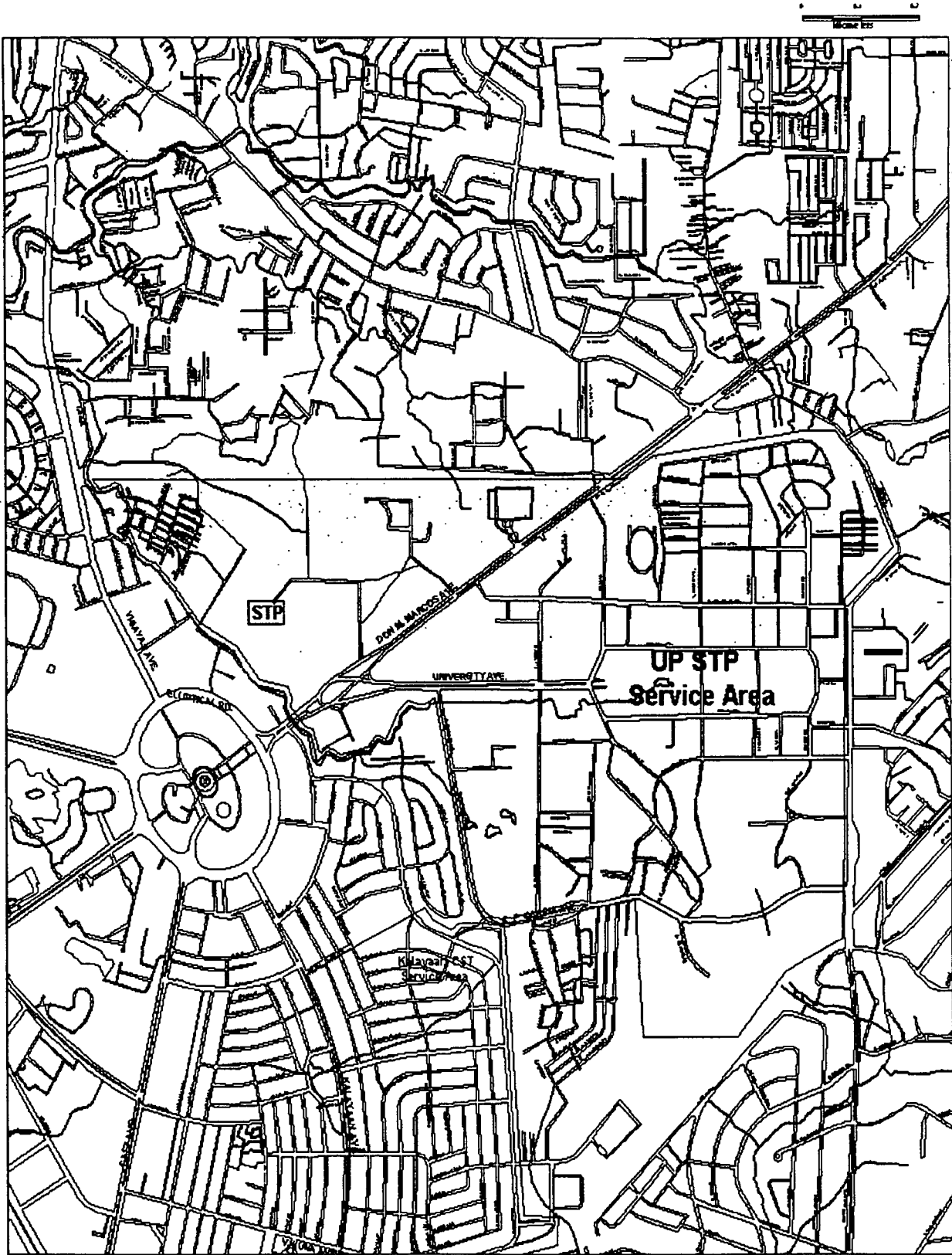
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1.2 Project Location

The UP Diliman campus is located in Quezon City. It is bounded by the Central Avenue extension (formerly the Barangay Culiati boundary line) in the north, Loyola Heights Subdivision in the south, Katipunan Road and Barangay Pansol in the east, and Culiati Creek and UP Village in the west. In the northwestern side, the campus is traversed by the Commonwealth Road. A location map showing the UP Diliman Campus is shown in Figure 1.

The STP will be located in a 0.5 hectare lot in the vicinity of the National Hydraulics Research Center. The STP will treat discharges from all buildings in the campus, Area 1, 2, and 3, Doña Aurora, Employees Village, Area 14 and 17, Hardin ng Rosas, and Hardin ng Bougainvillea. Figure 2 shows the service area of the project.

Figure 1



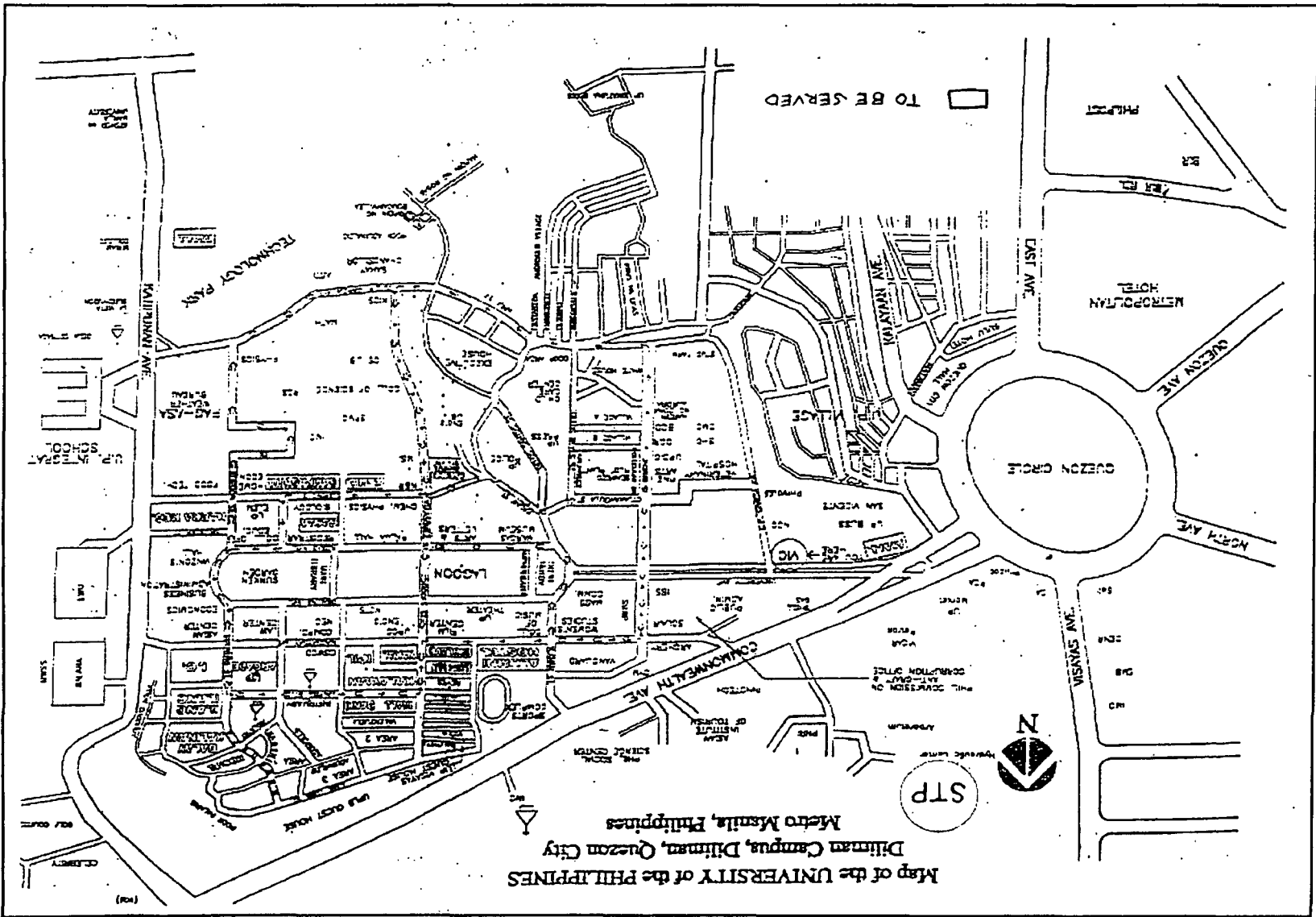


Figure 2

1.3 Project Rationale

A sewer network was laid in the campus in the 1960s and 1980s. The first phase included the laying of sewer lines around the Academic Oval and the Faculty Housing Units in Areas 1, 2, and 3. Wastewater flows from these areas were directed to a small sewage treatment plant located at the corner of Lakandula and Jacinto Streets. With the expansion of the UP Diliman Campus, an anaerobic facultative pond was constructed in J. Luna St., Area 1. Both the sewage treatment plant and the pond ceased operations sometime in the 1980s. During the second phase, additional concrete sewer lines were laid to cover the residential areas in the campus like Pook Dagohoy, Ricarte, Palaris, Pook Amorsolo, Areas 11, 14, and 17, Employees Village A, B, and C, and some parts of Barangay Vicente. The network was designed so that all wastewater discharges will flow into a centralized STP.

However, the plans for a centralized STP did not push through so that broken sewer pipes now discharge raw wastewater to Culiati Creek which finds its way to San Juan River and ultimately, the Pasig River (see Figure 3). Laboratory analysis of samples taken from broken sewer pipes (see Table 1) show that UP is contributing to the pollution loading in Pasig River.

Table 1
Analysis of Wastewater Discharge from Broken Sewer Lines
in UP Campus

Parameter	Limit(s) DENR-EMB	Sample A (along Roxas Ave.)	Sample B (Sunken Garden)
pH	6.5-9	6.7	7.3
Suspended solids, mg/L	70	40	28
Dissolved Oxygen, mg/L	-	1.7	5
Biochemical Oxygen Demand (BOD ₅), mg/L	50	115.2	247.5
Chemical Oxygen Demand, mg/L	100	159.1	118.8
Total Coliform Count, MPN/100 ml	10,000	30 x 10 ⁶	30 x 10 ⁶
Fecal Coliform Count, MPN/100 ml	-	30 x 10 ⁶	30 x 10 ⁶

Currently, 60 buildings have their own septic tanks, while 19 buildings are connected to the sewer network and are discharging untreated wastewater to Culiati Creek. All residential houses are believed to have their own septic tanks.

Figure 3



The overall objective of the project is to improve the sanitation conditions within the UP Diliman Campus by collecting and treating wastewater flows according to DENR and LLDA standards. With this improvement, the immediate environs of UP Diliman will benefit from a cleaner environment. The project will also help reduce pollution loading into Pasig River.

The lagoon located at the back of the UP Administration Building experiences low input flows during the dry season. The project will provide treated effluent which will be re-used for augmenting water flows into the UP lagoon.

1.4 Description of Project Phases

1.4.1 Pre-operational/Construction Phase

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 March 2003.

Figure 4 shows the implementation schedule for the project. Manila Water Company will undertake the project implementation.

1.4.1.2 Total Surface Development Block

The STP for the UP Diliman Campus will serve the areas as shown in Figure 2. It is estimated that there will be nearly 1,100 connections to the sewer network, which will include the residential areas of Area 1, 2, and 3, Doña Aurora, Employees Village, Area 14 and 17, Hardin ng Rosas, and Hardin ng Bougainvillea, as well as all the buildings in the campus.

Provisions for a future expansion of the STP will also be made in order to accommodate additional wastewater flows from the Science and Technology Park, which UP is planning for development in the future.

1.4.1.3 Major Construction/Excavation/Civil Works Activities

1. *Construction and installation of a 7,000 cubic meter per day sewage treatment plant (STP)*

The STP will be an aboveground structure which will have primary and secondary wastewater treatment facilities, sludge processing facilities, a toilet, a conference room, a fence enclosure, and a perimeter buffer zone for trees and other plants. Since the project will be bid out on a design-build basis, the general layout and dimensions of the treatment facilities are subject to the design of the winning bidder. The project may involve some excavation works (of ~1-2 meters depth) for the aeration tanks, clarifier tanks, and disinfection tanks. A small conference room of around 30 sq.m. and a toilet will be constructed within the 0.5 hectare STP site.

2. *Construction of an effluent collection pond outside of the STP perimeters*

Outside of the 0.5 hectare STP site, a collection pond for the treated effluent will also be constructed. A conceptual design is shown in Figure 5. This part of the project will involve excavation works of around 5 meters wide and 0.5-1.0 meter deep.

3. *Installation of 750 meters of sewer line with a diameter of 36 inches to connect the existing sewerage system to the STP*

The existing sewer network in the campus will be connected to the STP via a 36-inch sewer line of around 750 meters from the last manhole of the network to the STP. This part of the project will involve pavement cutting, shoring and removal, pipe laying, filling and compacting, and pavement restoration.

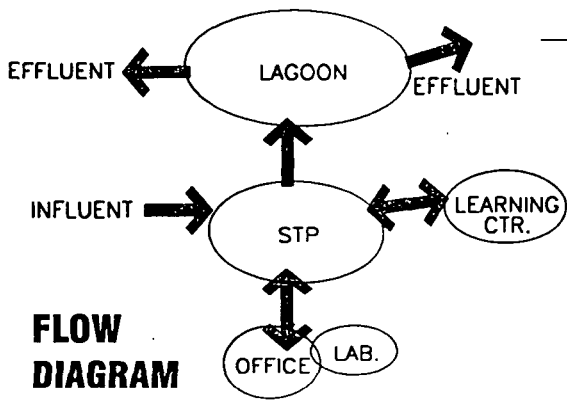
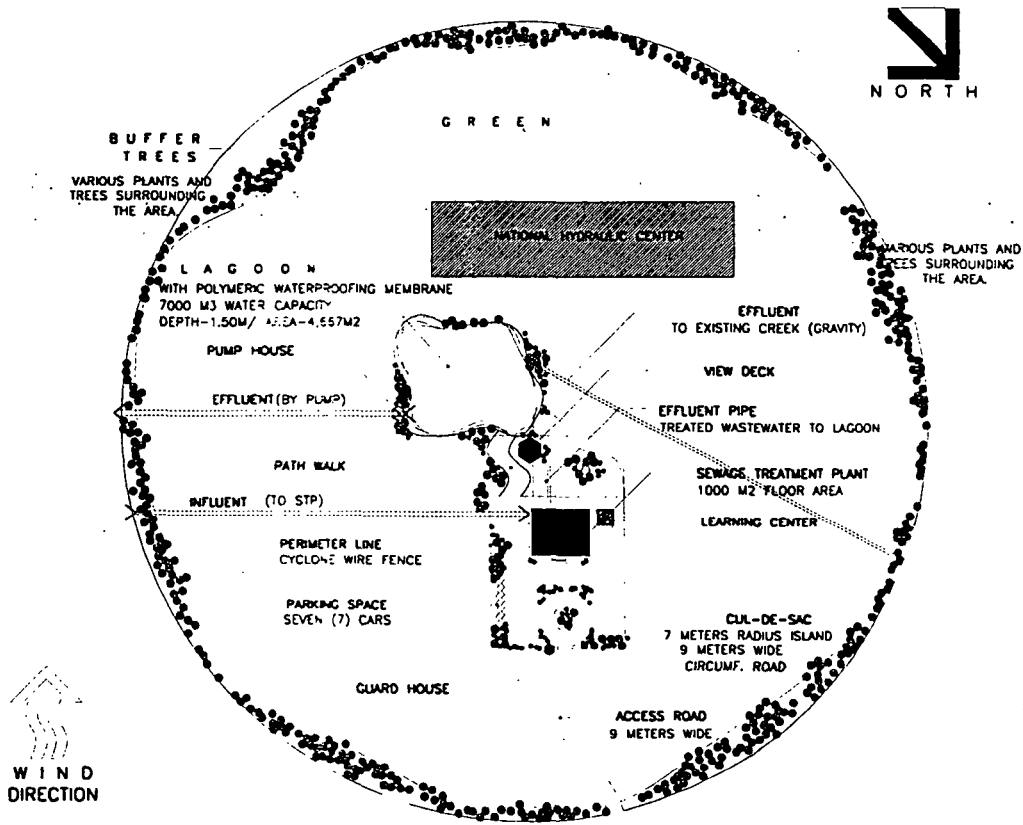
4. *Construction of a mainline and installation of a pump station to convey water from the collection pond to the lagoon located at the back of the UP Administration Building*

A small inch diameter PVC pipe will be installed from the outlet of the collection pond to the UP lagoon (~1.5 kms). This part will likely be done via a trenchless pipe laying technology to eliminate excavation works along Commonwealth Avenue.

5. *Connection of 60 buildings to the sewerage system*

Around 60 buildings in the campus are currently not connected to the sewer network. Interconnection works (pavement cutting, excavation, pipe laying, filling and compacting, pavement restoration) will be done to connect the building to the sewer network. Any existing septic tank will be bypassed.

Figure 5
Conceptual Design of STP and Effluent Collection Pond




SITE DEVELOPMENT PLAN
 SCALE: _____ 1:2000 MTS.

1.4.1.4 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

1.4.1.5 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.

Equipment for the STP may be imported by the contractor.

1.4.1.6 Support Services and Facilities Requirements and Availability

Support services and facilities will be tapped from the available utilities on site. Arrangements with UP Diliman and/or any other locator will be made by the contractor.

1.4.1.7 Estimate of Total Cut Soil Volume

Table 2 below presents the estimated volume of soil excavations.

**Table 2
Estimate of Total Cut Soil Volume**

	Estimated Dimensions (m x m)	Average Excavation Depth (m)	Average Excavation Volume (cum)
STP site	40 x 40	2	3,200
Sewer line	750 x 1.2	3	2,700
Interconnection works to sewer network	2 x 0.6	2	2.4
Collection pond around STP	400 x 6	1.5	3,600
Mainline from collection pond to lagoon	1,500 x 0.4	1	600
TOTAL			10,102

1.4.1.8 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 240 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:

- a. installation works for the sewer network
- b. sewer interconnection works
- c. detailed engineering design and construction/installation works for the STP and its appurtenances
- d. construction works for the effluent collection pond
- e. installation works for the mainline pipe from the pond to the lagoon
- f. landscaping of the STP site and the vicinity of the collection pond
- g. abandonment activities (road restoration, etc.)

1.4.2 Operational Phase

1.4.2.1 Project Operation Schedule and Duration

Commissioning of the STP and its appurtenances is expected to commence in January 2003. The contractor will be required to perform start-up operations within a 3-month period from the date of completion. The operations will be turned over to Manila Water Company upon final acceptance of the completed project.

1.4.2.2 Process Technology and Activities

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

- The capacity of the STP was determined from a calculation of the per capita consumption of 200 liters per day, at 70% wastewater discharge. Infiltration was assumed at 10%. For the UP Diliman Campus, the current estimated population in the service area was used as baseline.
- The influent flow characteristics were based on random laboratory analyses of septic tank effluent and raw wastewater discharges within the UP campus and the other project 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
220	300	500	100	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 300 mg/L to 50 mg/L, at the minimum. This illustrates an STP treatment efficiency of at least 83%.

**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 UP Diliman will be aboveground. A general layout of the STP treatment process includes facilities for primary and secondary treatment and sludge processing. The general treatment process scheme is illustrated in Figure 6.

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

1.4.2.3 Waste Production Scheme

Since the wastewater in UP Diliman will come largely from the academic buildings, it is expected that solid waste (rags, sanitary napkins, etc.) collected from the screenings and grit from the grit chamber will be minimal. These wastes will be collected and carted off site for disposal by a maintenance contractor.

Sludge will be produced in the treatment process. The STP will have facilities for sludge drying, stabilization, and storage. The equipment for these processes (belt press, centrifuge, lime, sludge drier, etc.) will also be subject to the proposal of the winning bidder.

Stabilized sludge or biosolids will be carted off site by Manila Water Company on a weekly basis. The biosolids will be made available to UP Diliman for use as soil amendment in the UP Arboretum. When necessary, the biosolids will be disposed in Pampanga for use 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 of a temporary license issued by the Fertilizer and Pesticide Authority. The license allows the use of sludge in growing similar crops.*

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 cleaning of screens and grit chamber and removal of garbage and biosolids from the STP site. 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.

Manila Water Company will also make arrangements with UP Maintenance Personnel in order to ensure the proper functioning 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.

1.4.2.5 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 Department of Environment and Natural Resources (DENR) Administrative Order No. 96-37, for which an Environmental Compliance Certificate (ECC) is currently being processed by the DENR.

2.2 Land

2.2.1 Land Resource Utilization

UP Diliman Campus has a total land area of 493 hectares which are devoted to the following uses:

4%	Campus Core	16.7%	Faculty and Staff Housing
22%	Academic Units	17.1%	Other Parks and major open spaces
2.6%	Research and Development Services	1.2%	Community Services
11.6%	Technology Park	17.8%	Commercial Development
3.7%	Dormitories	3.3%	Protected Forest Area (Arboretum)

Around 8.4 hectares is planned for the development of a Science and Technology Park. Figure 7 shows the land development plan in the S&T Park in which the STP site will be located.

2.2.2 Physiography and Geology

The campus sits on a gently rolling terrain. The bedrock formation in the campus is mostly Guadalupe Formation which is characterized by thin- to medium-bedded, fine grained vitric tuffs and welded volcanic breccias with subordinate amount of tuffaceous, fine- to medium-grained sandstone.

2.2.3 Vegetation and Wildlife

The proposed site for the STP is in a 0.5 hectare lot in the vicinity of the National Hydraulics Research Center. Figure 8 shows a photograph of the proposed site.

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

Cattails (*Typha* spp.), Common reeds (*Phragmites* spp.), Banana (*Sapientum* spp.), Ipil-ipil (*Leucaena leucocephala*), Mango (*Mangifera indica*), Camachile (*Pithecellobium dulce*), Santol (*Sandoricum koetjape*), Caimito (*Achras sapota*), Duhat (*Syzigium cumingii*), Talisay (*Terminalia catappa*)

There are no animals in the project site.

Figure 7

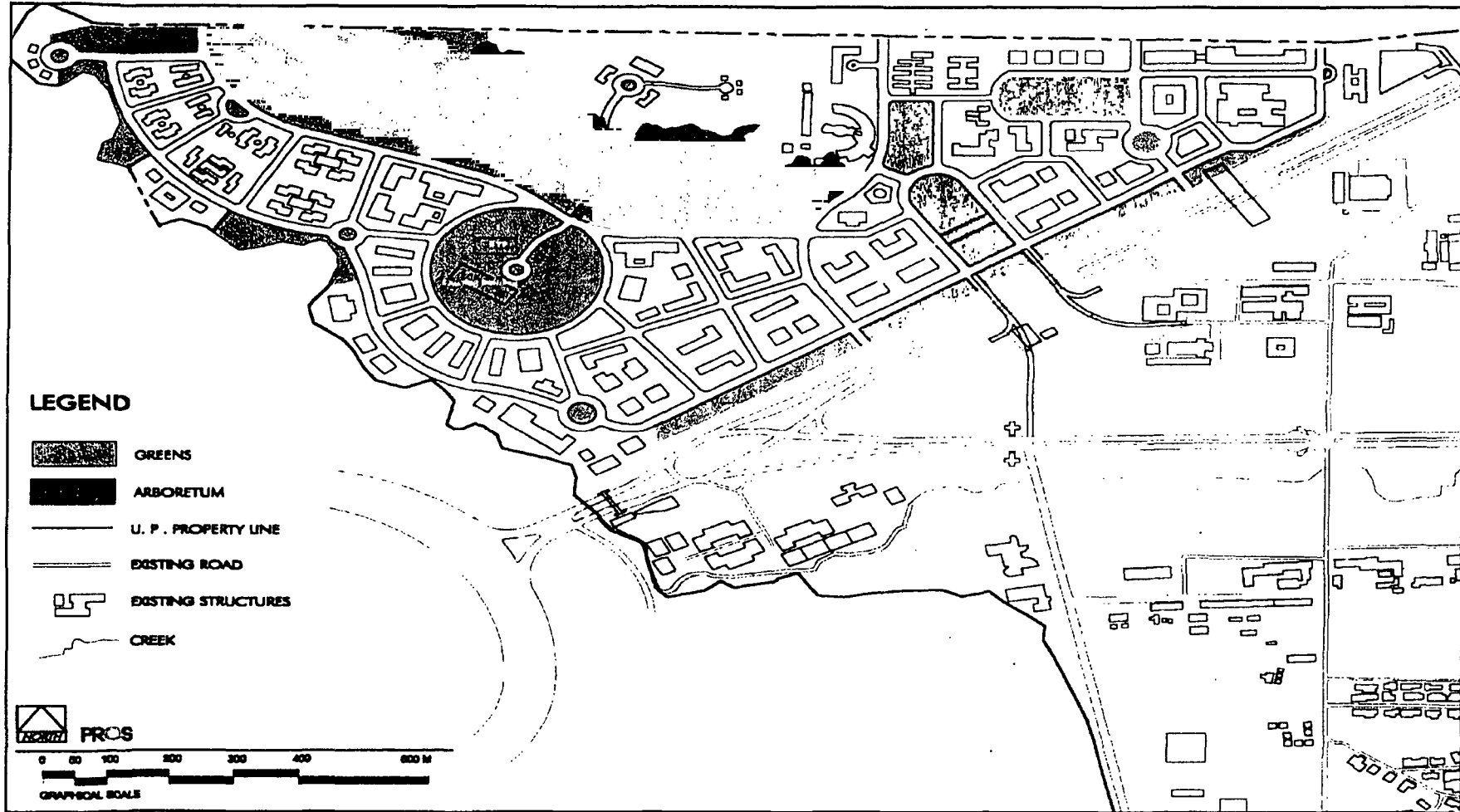


Figure 8



2.2.4 Land Acquisition Assessment

Manila Water will be allowed to use a parcel of land for the STP (~0.5 ha.) by way of a grant of perpetual easement from the UP Campus. At no time shall land be acquired for the project. The STP site is free from informal settlers.

2.3 Water

2.3.1 Inventory of Water Bodies

UP Diliman is bounded on the northwestern side by the Culiati Creek. Culiati Creek joins the San Francisco River which joins the San Juan River. San Juan River drains most of Quezon City and it joins the Pasig River about 9 km upstream from Manila Bay. Figure 9 shows the pathway of the waters from UP Diliman to Pasig River.

At present, Pasig River does not meet the Class C standards (i.e., suitable for propagation and growth of fishes, recreational uses and industrial water supply) especially during the summer months when there are no sufficient inflows. At these times, the BOD in Pasig River reaches 120 mg/L, which is 12 times higher than the permitted level for Class C water; DO drops to zero; and total coliforms exceed the MPN/100 ml standard by up to several thousand degrees.

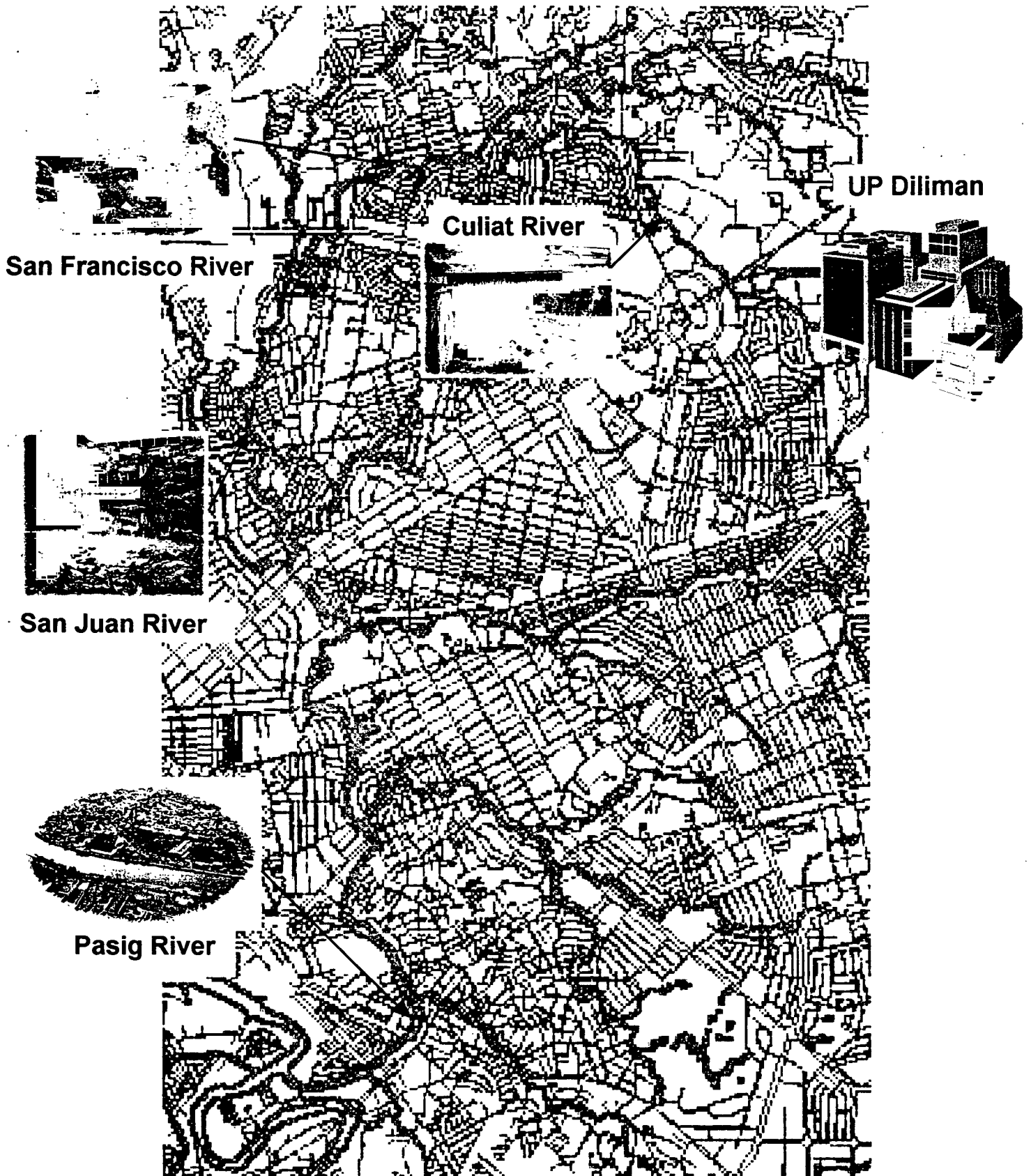
2.3.2 Water Quality (Surface/Ground)

Surface Water Quality. Pollution loading to San Juan and Pasig Rivers will be reduced since septic tank effluent and raw wastewater from the project area will no longer be discharged directly to these rivers. Effluent from the STP will comply with DENR Effluent Quality standards sufficient for Class C waters.

San Juan River in which the UP Diliman Campus drains its wastewater discharges was identified as the tributary which contributes most of the pollution load into the Pasig River. In Pasig River, BOD loading is estimated at 242 tons/day which is 21% above the river's estimated maximum assimilative capacity. Domestic wastewater contributes 168 tons/day of BOD. Without any sewerage or sanitation interventions, the pollution load entering the river is expected to increase to 269 tons/day in year 2005, which is expected to come from domestic sewage.

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.

Figure 9



2.4 Air

Quezon City 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 relative humidity is 77% for Metro Manila.

Air quality within the UP Diliman Campus is moderately unpolluted. However, the Commonwealth Road 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

UP Diliman has a student population of around 28,000, a faculty population of nearly 1,700, and a support staff of close to 3,000. There are a total of 79 buildings in the campus and an estimated 4,000 residential units. Most families within the campus belong to the middle class, however, there are more than 1,000 informal settler families living in the area. Majority of the informal settlers occupies the areas in the vicinity of the UP Arboretum.

2.5.2 Project Affected Persons

During construction, the project will cause noise and traffic nuisance to the UP Campus community, its neighboring communities, pedestrians, and passing motorists. Once operational, the project will directly affect the locators of the UP Campus. The sanitation of the campus and its neighboring communities 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

UP Campus 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 existing sewer network system in the campus is not functional.
- ◆ Some buildings and housing units are directly discharging raw wastewater to the nearby creek.

Among potential sites identified for the STP are as follows:

1. 0.5 ha land adjacent to the National Hydraulics Laboratory near the UP Arboretum
2. 3.78 ha land located south of Commonwealth Ave. and northeast of University Ave., near existing Shell Gas station

Among the sites listed above, site number 1 was agreed with the UP Campus for the STP. The site is devoid of informal settlers and the STP fits into the master plan of UP for the Science and Technology Park.

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	
<p><u>Air Pollution</u></p> <ol style="list-style-type: none"> 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. 	<p>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:</p> <ul style="list-style-type: none"> • Ground level concentration of suspended solids will increase • Air pollutants such as CO₂, CO₁ and NO_x will occur from vehicle emissions.
<p><u>Water Pollution</u></p> <ol style="list-style-type: none"> 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 Culiat Creek
<p><u>Noise Pollution</u></p> <ol style="list-style-type: none"> 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	
<p><u>Water Pollution</u></p> <p>1. Improper operation and maintenance of the STP will result to water pollution.</p>	<ul style="list-style-type: none"> • The project will reduce the wastewater load into the San Juan River and will constitute a positive impact. However, improper operations/maintenance of the STP will result to the discharge of untreated or partially treated effluent.
<p><u>Odor Pollution</u></p> <p>1. Unpleasant odor will result from the anaerobic conditions and improper operation and maintenance of the STP.</p>	<ul style="list-style-type: none"> • Areas in the immediate vicinity of the STP will experience unpleasant odor during periods of odor emission.
<p><u>Noise Pollution</u></p> <p>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.</p>	<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> <p>1. The project will result to proper treatment of wastewater.</p> <p>2. Value of land will increase. STP provisions will be available for establishments in the planned Science and Technology Park.</p>	<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 San Juan River. Also, the treated water will be re-used for the lagoon and the collection pond. The aesthetic screen around the STP site (ornamental pond and greenery) will also serve as a scenic park.
<p><u>Residual and Unavoidable Impacts</u></p> <p>1. Accidents and man-made disasters might occur due to design failure and improper construction practices. The ornamental pond may pose a physical hazard for visitors/passersby in the area.</p> <p>2. Environmental hazards might occur due to natural disasters like earthquakes, typhoon, etc.</p>	<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 STP site could loosen soils and transport of these materials to the drainage will result in siltation or increase in turbidity in Culiati Creek.

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. 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

Work schedule will be carefully planned to minimize disturbance in the campus. Heavy equipment will be monitored to operate only in short periods of time to avoid sustained high level of noise.

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 the UP Diliman Campus. 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 (e.g., deodorizer, adsorbent, masking agent, 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, UP Campus accounts for an estimated 1,800 kg BOD₅/day loading to San Juan and Pasig Rivers. The implementation of the project will contribute to the improvement of the quality of water in San Juan and Pasig Rivers by reducing discharge of untreated/partially treated wastewater. From a pollution loading of 1,800 kg BOD₅/day, loading will be reduced to 140-350 kg BOD₅/day, or a reduction of 81-92%, when the STP becomes operational.

The implementation of the project will contribute to the improvement of the quality of water in Culiati Creek, San Juan River and ultimately Pasig River by reducing discharge of untreated/partially treated wastewater.

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 for the operations and maintenance of the STP and the sewer network. This arrangement was clearly explained to the Chancellor. Additional campaigns will be made to inform the residents who will be affected by the project. Chapter 5.0 discusses the project development process.

The general sanitation conditions in the project area as well as in the immediate environs of the campus will significantly improve. The project will reduce, if not

eliminate the threat of water borne diseases such as diarrhea and typhoid, which are more costly to manage.

D. Sludge Disposal and Management

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/m³)	Estimated STP Sludge Production (kg/day)
Activated sludge	85	595,000
Trickling filtration	70	490,000
Extended aeration	100*	700,000
Aerated lagoon	100*	700,000

**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.

The STP will have facilities for sludge drying, stabilization, and storage. The equipment for these processes (belt press, centrifuge, lime, sludge drier, etc.) will also be subject to the proposal of the winning bidder.

Stabilized sludge or biosolids will be carted off site by Manila Water Company on a weekly basis. The biosolids will be made available to UP Diliman for use as soil amendment in the UP Arboretum or as filling material. When necessary, the biosolids will be disposed in Pampanga for use 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 of a temporary license issued by the Fertilizer and Pesticide Authority. The license allows the use of sludge in growing similar crops.*

4:2 IMPACT PREDICTION AND EVALUATION

Table 8 below presents a summary of the assessment of the impacts of the project.

**Table 8
SUMMARY OF ASSESSMENT OF ENVIRONMENTAL ISSUES/IMPACTS**

Environmental Issues/Impacts	Classification	Impact Assessment		Time Scale	Magnitude
		Probability	Reversibility		
1. Construction Phase					
Air/Dust Pollution	-	●	↑	<	♣
Noise	-	●	↑	<	♥
Traffic	-	●	↑	<	♣
Soil Erosion	-	□	↓	<	♣
Water Pollution	-	□	↑	<	♣
Increased Employment	+	●	↑	<	♥
2. Operational Phase					
Water Pollution	-	□	↑	>	♣
Contamination of drinking water supply	-	□	↓	>	♣
Odor Pollution	-	□	↑	<	♥
Noise	-	□	↑	<	♣
Accidents/hazards	-	□	↑	<	♣
Health benefits	+	●	↓	>	♠
Property Value and Commercial Attractiveness	+	●	↓	>	♠
Environmental sanitation enhancement	+	●	↓	>	♠

+ Positive	□ Unlikely to occur	↑ Reversible	< Short term	♣ Insignificant
- Negative	● likely to occur	↓ Irreversible	> Long term	♥ Moderate
				♠ Severe

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 and in the immediate environs, 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. There will also be the physical hazard posed by the ornamental pond around the STP site. 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
<p>1. Poor quality of construction</p>	<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>To be included in the contractor's scope of work, under the supervision of Manila Water Company.*</p>	<p>Daily</p>
<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 	<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>

	<ul style="list-style-type: none"> • 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 		
3. Water pollution due to wastewater, oil leakage/spills, toxic and hazardous substances	<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 	To be included in the contractor's scope of work, under the supervision of Manila Water Company.*	During construction
4. Noise pollution from operation of construction equipment	<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 	To be included in the contractor's scope of work, under the supervision of Manila Water Company.*	Daily
5. Temporary disruption of traffic flow within the campus	<ul style="list-style-type: none"> • Public information campaign posting schedule of construction • Liaison with the UP Diliman Police Department (Security Office and Traffic Enforcement Office) • Provision of temporary alternative routes, including visible traffic warning signals 	To be included in the contractor's scope of work, under the supervision of Manila Water Company.*	Daily

	<ul style="list-style-type: none"> To the extent possible, sewer lines and manholes will be constructed in common areas not used for pedestrian or vehicular traffic. Scheduling of delivery of materials and removal of excavated material during non-rush hour periods. 		
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
1.Environmental hazards due to accidents, man-made natural disasters eg. Accidental spills, fire, seismic activity, earthquakes, heavy rain/flooding and design failure. Physical hazard posed by ornamental pond around STP site.	<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 Safety precautions such as lighting and warning signs around the collection pond 	Manila Water Company	Observance of guidelines will be done daily.

2. Water Pollution	<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 	Manila Water Company	Refer to Annex 2.
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

<p>5. Odors (organic and sulfur compounds coming from raw wastewater and during desludging of septage)</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>Manila Water Company</p>	<p>This shall be inspected daily.</p>
<p>6, Maintenance and Operation of the System</p> <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 UP Diliman Campus 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 	<p>Manila Water Company</p>	<p>This shall be done daily.</p>

5.2 ENVIRONMENTAL MONITORING ACTION PLAN

Table 10 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
Construction Phase		
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 sites 	<ul style="list-style-type: none"> • Daily
Operational Phase		
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 • Effluent/Discharge Point 	<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

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 3 presents a sample monitoring sheet of effluent quality used by Manila Water Company.

**Table 11
Institutional Monitoring**

Item	Reporting Scheme		
	Reporter	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

6.0 PROJECT DEVELOPMENT PROCESS

The development of the project involved/will involve the procedures listed below:

1. The project was presented to the Chancellor of the University who endorsed the project to the Development and Planning Committee (Annex 5).
2. The project was also presented to the Barangay Captain who issued a Barangay Resolution endorsing the project (Annex 6).
3. A Memorandum of Agreement (MOA) between the University and Manila Water Company is now being processed. The MOA will be elevated to the Board of Regents for final approval. Annex 7 presents a copy of the draft MOA.
4. Since majority of the residential units inside the campus (excluding the informal settlers) is connected to the existing sewer network, interconnection works will immediately connect the residential units into the STP. An information campaign will be launched by the Manila Water Company Wastewater Project Development Section for the benefit of the residents.

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 COD Residual Chlorine	Sample from Aeration tank effluent effluent	daily	Manila Water	25,080.00
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

1 – Name of Air Pollution Installations the Quarter

2 – Number of Hours of Operation of the Installation During

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

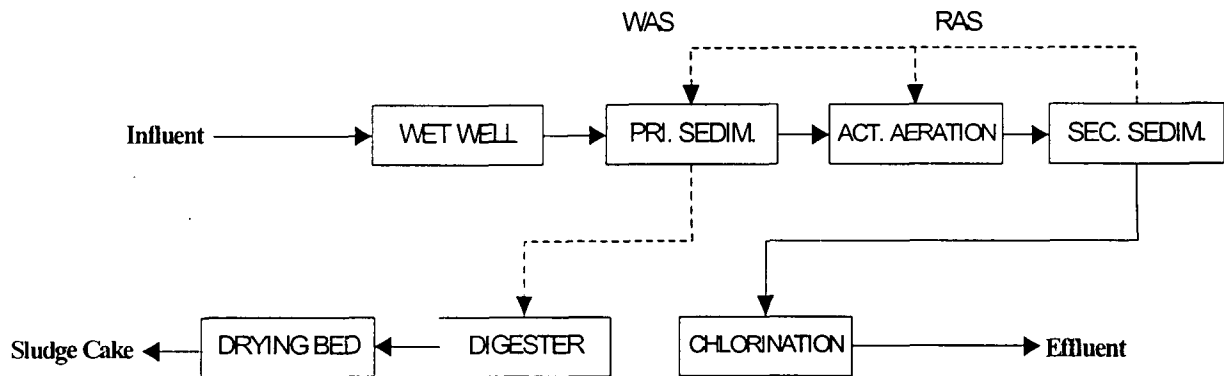
B.1. Sources of Wastewater

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

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
Temperature	
pH	
Suspended Solids	
BOD ₅	
Oil/Grease	

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

ANNEX 4

ANNEX 4. 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.

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

OFFICE OF THE CHANCELLOR

August 2, 2001

REF. NO. ERR—01—510

Mr. Joel C. Molina
Wastewater Project Development Officer II
Manila Water Company, Inc.
Administration Building
Katipunan Avenue Road
Balara, Quezon City 1105

Dear Mr. Molina:

Please be informed that I am approving the proposed Sewage Treatment Plant (STP) Project of the Manila Water Company to be located within the U.P. Arboretum area. The final plan and drawing, however, should be reviewed and approved by our Development and Planning Committee and by our Campus Architect. Kindly get in touch with Prof. Ernesto Pineda for other details.

Thank you.

Very truly yours,


EMERLINDA R. ROMAN
Chancellor

c.c.: Prof. Ernesto Pineda

ANNEX 6



Republic of the Philippines
BARANGAY U.P. CAMPUS
Diliman, Quezon City • Telefax 433-2122

Barangay Resolution No. 196, series of 2001

RESOLUTION ENDORSING FAVORABLY THE IMPLEMENTATION OF THE PROJECT BY THE MANILA WATER COMPANY, INC. FOR THE DEVELOPMENT AND IMPROVEMENT OF THE SEWERAGE SYSTEMS OF BARANGAY U.P. CAMPUS.

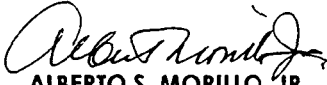
- Whereas, the sewerage system of Barangay U.P. Campus has been in existence since 1966 and requires repair and rehabilitation due to degradation caused by age and natural deterioration;
- Whereas, the present condition of sanitation in the area may present hazards to the health of the residents of the 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 Barangay U.P. Campus.

Now therefore, be it resolved as it is hereby resolved, a resolution endorsing favorably the implementation of the project by the Manila Water Company, Inc. (MWC) for the development and improvement of the sewerage systems at Barangay U.P. Campus.

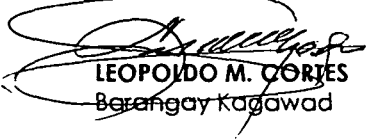
Resolved finally, that copies of this resolution be transmitted to all Sangguniang Barangay members and other government offices/agencies concerned for their information.

Done this 22 day of Oct 2001 during the 105 regular session of the Sangguniang Barangay held at the Barangay Hall, de los Reyes St, UP Employees Village-A Barangay U.P. Campus Diliman, Quezon City.


HUMILIADA E. ADVINCULA
Punong Barangay


ALBERTO S. MORILLO, JR.
Barangay Kagawad


SALVADOR C. BERNARDINO
Barangay Kagawad


LEOPOLDO M. CORTES
Barangay Kagawad


ENCARNACION P. KAMPITAN
Barangay Kagawad


ISABELITA P. GRAVIDES
Barangay Kagawad


LORIEZEL P. TECTURA
S.K. Chairperson

Attested by:


CONRADO G. SAN PEDRO, JR.
Barangay Secretary



REPUBLIKA NG PILIPINAS
NATIONAL CAPITAL REGION
BARANGAY U.P. CAMPUS
LUNGSOD QUEZON

SANGGUNIANG BARANGAY:

Humiliada "Mel" Elona-Advincula
Punong Barangay

25 October 2001

Alberto S. Morillo, Jr.
Barangay Kagawad
Chair, Committee on Infrastructure,
Transportation and Communication (CITC)

Encarnacion P. Kampitan
Barangay Kagawad
Chair, Committee on Education,
Culture and Sports (CECS)

Salvador C. Bernardino
Barangay Kagawad
Chair, Committee on Livelihood and
Cooperatives (CLC)

Isabelita P. Gravides
Barangay Kagawad
Chair, Committee on Health,
Sanitation and Beautification (CHSB)

Leopoldo M. Cortes
Barangay Kagawad
Chair, Committee on Appropriations,
Ways and Means (CAWM)

Loriezel P. Lectura
S.K. Chairperson
Chair, Committee on Youth
and Sports (CYS)

BARANGAY OFFICIALS:

Conrado G. San Pedro, Jr.
Barangay Secretary
MIS Supervisor/Computer Programmer

Myrna C. Lumbreras
Barangay Treasurer

JOEL C. MOLINA
Wastewater Project Development Officer
Manila Water Company, Inc.
Administration Bldg. 489 Katipunan Road
1105 Balara, Quezon City

Dear Mr. Molina:

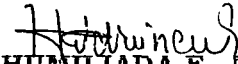
Greeting from Sangguniang Barangay of U.P. Campus!

In reference with your request letter dated 03 of April 2001, attached herewith a Barangay Resolution No. 196 duly signed by the Sangguniang Barangay during the 105th Regular Session last October 22, 2001 entitled "*Resolution endorsing favorably the implementation of the project by the Manila Water Company, Inc. for the development and improvement of the Sewerage Systems of Barangay U.P. Campus*".

For your information and action.

Thank you.

Truly yours,


HUMILIADA E. ADVINCULA
Punong Barangay

©MWC/Razo/Mariza 2001

ANNEX 7

ANNEX 6. DRAFT MEMORANDUM OF AGREEMENT BETWEEN MANILA WATER COMPANY AND THE UNIVERSITY OF THE PHILIPPINES SYSTEM

MEMORANDUM OF AGREEMENT

For the Provision and/or Improvement of Water and Sewerage Services of Manila Water Company, Inc. to the University of the Philippines, Diliman Campus and the Development of a Joint Training Program for UP Engineering Students

This Memorandum of Agreement made and executed on this ___ day of _____ 2001 at Quezon City, Metro Manila by and between:

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 at the MWSS Administration Building, 489 Katipunan Road, Balara, Quezon City, Metro Manila, represented herein by its President, ANTONINO T. AQUINO, thereunto duly authorized, hereinafter referred to as "MWCI";

-and-

UNIVERSITY OF THE PHILIPPINES SYSTEM, a system duly organized and existing under Philippine laws by virtue of the Republic Act / Presidential Decree No. _____ of 19____, with principal office at the 2nd floor Administration Building, Quezon Hall, UP Campus, Diliman Quezon City, represented by its President, Dr. FRANCISCO NEMENSO, thereunto duly authorized, hereinafter referred to as "UP",

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 area which includes, among others, Quezon City;

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, repair, decommission and refurbish all fixed and movable assets required to provide water delivery and sewerage services in the East Service Area (which Service Area includes Quezon City) of the franchise area of MWSS;

This Memorandum of Agreement made and executed on this ___ day of _____ 2001 at Quezon City, Metro Manila by and between:

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 at the MWSS Administration Building, 489 Katipunan Road, Balara, Quezon City, Metro Manila, represented herein by its President, ANTONINO T. AQUINO, thereunto duly authorized, hereinafter referred to as "MWCI";

-and-

UNIVERSITY OF THE PHILIPPINES SYSTEM, a system duly organized and existing under Philippine laws by virtue of the Republic Act / Presidential Decree No. _____ of 19____, with principal office at the 2nd floor Administration Building, Quezon Hall, UP Campus, Diliman Quezon City, represented by its President, Dr. FRANCISCO NEMENSO, thereunto duly authorized, hereinafter referred to as "UP",

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 area which includes, among others, Quezon City;

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, repair, decommission and refurbish all fixed and movable assets required to provide water delivery and sewerage services in the East Service Area (which Service Area includes Quezon City) of the franchise area of MWSS;

WHEREAS, UP has plans to develop a Science and Technology Park within the University of the Philippines, Diliman Campus ("UP Diliman Campus");

WHEREAS, UP owns and holds title to the areas where the sewer lines and septic vaults ("Sewerage System") within the UP Diliman Campus are presently located;

WHEREAS, in line with a program initiated by MWCI in pursuance of the Concession Agreement, MWCI has offered to provide to UP sewerage services to the UP Diliman Campus by means of taking over the operations, management, maintenance, and upgrade of the Sewerage System, including the construction, installation, operation, and maintenance of a Sewage Treatment Plant (the "STP") in a 0.5 hectare lot (the "STP

Area”) located in the 4.28-hectare lot situated within the vicinity of the National Hydraulics Research Center, covered by TCT 192589, and shown in Annex D. *Transfer Certificate of Title* and UP, as the present owner of the Sewerage System and of the STP Area has accepted the said offer, upon and subject to the terms, conditions and stipulations hereinafter set forth;

WHEREAS, UP is mandated to provide sufficient and ample training programs for its students, and MWCI has a large amount of engineering design and works related to the provision of water and sewerage services which can be used as training works for UP engineering students;

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 terms and conditions:

Article I. RIGHTS AND RESPONSIBILITIES OF MWCI

1. MWCI shall, at its expense, construct, install, operate, manage, and maintain the Sewerage System and the STP at the STP Area to service the requirements of the UP Diliman Campus, including the Science and Technology Park which will be developed by UP. MWCI shall be fully responsible for the care and safekeeping of all temporary structures, goods, materials, tools, machinery and equipment brought to the work areas in connection with, or for the purpose of executing and completing the construction and installation of the Sewerage System and the STP, as well as the adequacy, stability and safety of all operations, temporary works, and methods of construction and installation of the same.
2. Prior to the conduct of any construction and installation works for the Sewerage System and the STP, MWCI shall:
 - (a) secure an Environmental Compliance Certificate from the Department of Environment and Natural Resources and all other related governmental permits allowing the construction and installation of the Sewerage System and the STP (collectively, the “ECC and Permits”), shall maintain the same in good standing as and until the commencement of operation of the Sewerage System and the STP, and strictly comply with all the conditions imposed under the ECC and Permits;
 - (b) conduct a survey of all underground utilities which may be affected by the conduct of any construction and installation works for and the operation and maintenance of the Sewerage System and the STP, for the purpose of finalizing and implementing such plans and

specifications for the Sewerage System and the STP with the least inconvenience to such underground utilities, if any;

- (c) undertake soil preparation activities on the STP Area as may be necessary;
- (d) provide UP with the plans and specifications of the Sewerage System and the STP, which are tentatively shown in Annex C. *Technical Specifications* ;
- (e) within 30 days from the execution of this Agreement, MWCI shall submit to UP its proposed construction timetable setting forth therein the milestone dates at which the construction of the STP shall be accomplished;
- (f) obtain a comprehensive general liability insurance from a reputable insurance company in an amount sufficient to cover any accidental for death, bodily injury and property damages arising out of the conduct of the works, such insurance policy to remain in force until the works are satisfactorily completed and the period of the contractual warranties thereon have expired; it is understood that the insurance policy shall continue to be in full force and effect notwithstanding the happening of one or more or all of the following events: (1) the novation of the construction contract entered into by MWCI with the contractor(s) for the works; (2) the change or extension of the period of construction; (3) the modification, increase or decrease in the construction cost of the works; (4) the completion or cancellation of the works if the continuation of the life of the policy is necessary to enforce any liability or obligation of MWCI or its contractor(s); and (5) any other event similar to any of the foregoing.

3. MWCI shall ensure that all acts and measures necessary for the installation and operation of the Sewerage System and the STP and the maintenance and repair thereof shall be carried on with the least inconvenience to the constituents of UP Diliman Campus and shall ensure that the same shall not impede access to, and the use and occupation of, the roads and common areas within or adjoining the STP Area. Further, MWCI shall maintain the STP Area and adjoining areas affected by the construction and installation works conducted thereon in a clean and tidy condition, repairing any damage caused by or consequential to the execution of the works and free from accumulation of waste materials or rubbish caused by its employees, contractors, or agents. Immediately upon the completion of the construction and installation works, MWCI shall remove from the STP

Area all temporary structures, machinery and equipment, rubbish, tools, and other materials used thereon, without need for demand or further action.

4. Any loss and/or damage to the STP Area or any property or facility thereon or adjoining thereto, which may be caused by the construction, operation and maintenance of the Sewerage System, shall be the sole responsibility of the MWCI. In this connection, MWCI hereby holds UP free and harmless from and agrees to indemnify UP against all claims, proceedings, damages, costs, charges and expenses whatsoever arising out of, or in relation to, the performance of any work or activity relating to the installation and operation of the Sewerage System and the STP and the repair and maintenance thereof.
5. MWCI shall ensure the safety and preservation of the Sewerage System and the STP to protect the viability of the service to be provided by MWCI to UP Diliman Campus and its constituents. MWCI shall undertake the necessary repairs and maintenance works to preserve and/or improve the Sewerage System and the STP, as the circumstances so warrant from time to time and obtain the necessary insurances for the preservation thereof. Commencing from the date of commissioning of the STP, the MWCI, as operator of the STP, shall have the sole liability for any charges or fines that may be assessed in case of any violation of national and local environmental laws and standards, provided, however, that such charges or fines are not the result of or due to the acts, fault or negligence of UP and/or any homeowner/locator in UP Diliman Campus.
6. At its expense, MWCI has the option to make any additions and/or modifications to the STP; provided that, the STP Area shall be used by MWCI solely for the purposes of constructing, installing, operating and maintaining the STP; and provided further, that the following acts shall require the prior written approval of UP, which approval may be made subject to such conditions as UP shall deem fit to impose:
 - (a) the construction of any additional structure or the establishment or addition of any amenity or facility within the STP Area other than the STP;
 - (b) any change in use of the STP Area or any additional use to which the STP Area shall be devoted, irrespective of whether, in MWCI's opinion such use constitutes an immaterial or an incidental deviation from the permitted use of the STP Area as expressly provided herein;

- (c) other than as excepted under paragraph 8 of this Article I, the transfer, conveyance, lease, encumbrance or assignment (in whatever manner and for whatever intent) of the authority herein granted to MWCI under this Agreement and/or the Sewerage System (including the STP) to be constructed and installed on the STP Area, or any portion of thereof, or any other arrangement whereby the use and possession of the STP Area and/or the Sewerage System is transferred to any third person, irrespective of whether rental or other consideration is given therefor, and no right, title or interest in and to the STP Area shall be deemed conferred or vested in any person without UP's prior written approval; and
 - (d) the mortgage, encumbrance or creation of any security interest in and to the authority herein granted to MWCI and/or the Sewerage System.
7. The MWCI shall bill, collect and receive payments from UP and/or homeowners/locators in UP Diliman Campus for sewer charges, the rates of which shall be in accordance with the Concession Agreement. The sewer charges shall be incorporated in the MWCI water bill commencing from the date of commissioning of the STP.
 8. The ownership of the STP shall pertain to MWCI during the effectivity of the Concession Agreement. It is hereby understood that upon the expiration of the Concession Agreement, the ownership of the STP shall be automatically transferred to MWSS pursuant to the provisions of the Concession Agreement.
 9. MWCI shall provide a conference room within the STP Area, which shall be made available to the academic personnel of UP for the conduct of classes, learning sessions, trainings, and other similar assemblies related to the design, operations, management, and maintenance of the Sewerage System and the STP and other similar treatment facilities.
 10. MWCI shall, at its expense, construct a collection pond which will be part of the development of the 4.28 hectare open area within the vicinity of the National Hydraulics Research Center as shown in Annex A. *North Site Conceptual Framework* to serve as a reservoir for the treated effluent from the STP. The design of the collection pond shall be subject to the approval of UP. Further, MWCI shall construct a pump station and install a mainline extending from the collection pond to the existing lagoon as shown in Annex B. *Treated Effluent Distribution Scheme*. MWCI shall assume all costs related to the operation of the pump station.

11. MWCI shall, at its expense, provide appropriate landscape to provide a visual buffer zone separating the STP from the collection pond.
12. MWCI shall give priority to UP for the use of the bio-solids that will be generated by the STP.
13. MWCI shall accommodate qualified UP Engineering students who will be interested to work as interns for MWCI.
14. MWCI shall address adequately the sewage treatment and water requirements of the Science and Technology Park when it is finally implemented.

Article II. RIGHTS AND RESPONSIBILITIES OF UP

1. UP shall provide gratuitous easement on the 0.5 hectare STP Area on which MWCI shall install/construct the STP, provided that the STP Area, as well as the site and premises appurtenant thereto, shall be used exclusively for the construction, operation, management, and maintenance of the STP, and provided further that the STP shall be for the exclusive use of the UP Diliman Campus. UP shall retain ownership of the lot whereon the STP will be constructed/installed.
2. UP shall ensure and guarantee to the authorized personnel/representative(s) of MWCI, its contractors, successors, and assigns, free ingress to and egress from the Sewerage System and the STP Area for the execution/performance of all works and activities in connection with the construction of the STP and the operation, management, maintenance, and upgrade of the Sewerage System.
3. In the event that the ownership of or title to any of the areas and other areas on which gratuitous easements and rights of way are constituted and/or intended to be constituted under this Agreement, is transferred or encumbered to another party, UP shall see to it that the rights and obligations of the parties under this Agreement and/or any amendment or extension thereof, shall be recognized, protected and respected by appropriate stipulation.

Article III. REPRESENTATIONS AND WARRANTIES

1. MWCI represents and warrants that it is an organization duly organized, validly existing and has all the necessary power, franchise and authority to carry on its business as presently conducted and perform its obligations under this Agreement. It is duly qualified or licensed to do business in the relevant jurisdiction where it currently conducts its business and operations or where the properties owned, possessed or controlled by it makes such qualification or licensing necessary and where the failure to be so qualified or licensed would impair its ability to perform its obligations under this Agreement or would result in material liability to or would have a material adverse affect on its financial condition, business, operations or prospects.
2. Each of the parties hereto warrants to the others that it has all the necessary power and authority to execute, deliver and perform its obligations under this Agreement, and each of the execution, delivery and performance by it of this Agreement has been duly authorized by all necessary actions on its part.
3. Each of the parties hereto warrants to the others that it has duly and validly executed and delivered the agreement and the same constitutes a legal, valid, binding obligation and enforceable against it in accordance with its terms.
4. Each of the parties hereto warrants to the others that there is no action, suit or proceeding, at law or in equity, or official investigation before or by any government authority, arbitral against or affecting it or any of its properties, rights, or assets, which could reasonably be expected to result in a material adverse effect on the ability to perform its obligations under this Agreement or on the validity of enforceability of this Agreement.

Article IV. DURATION OF AGREEMENT

This Memorandum of Agreement, which shall take effect on the date of its execution by the parties shall be co-terminus with the Concession Agreement and shall be binding also to the successors, assigns and transferees of the parties.

UNIVERSITY OF THE PHILIPPINES
By:

FRANCISCO NEMENSO
President

MANILA WATER COMPANY, INC.
By:

ANTONINO T. AQUINO
President

SIGNED IN THE PRESENCE OF:

ACKNOWLEDGMENT

REPUBLIC OF THE PHILIPPINES

) S.S. .

On this _____ day of _____ 2001, before me, a Notary Public in and for _____, personally appeared the following:

Name	<u>Comm. Tax Cert. No.</u>	Date/Place Issued
Antonino T. Aquino		
Francisco Nemenso		

All known to me and to me known to be the same persons who executed the foregoing Memorandum of Agreement, consisting of ___ (__) pages including this page, each of which has been signed by the parties executing the same and their two (2) witnesses, 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.

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. _____;
Page No. _____;
Book No. _____;

Series of 2001

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:

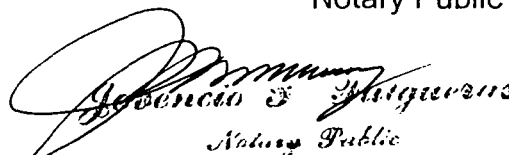


Antonino T. Aquino
President

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.

Notary Public

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



Notary Public

My Commission Expires Dec. 31, 192001

PTORNGA 1973POO QC 1-03-01