19.5 ENVIRONMENTAL IMPACT ASSESSMENT

The general approach adopted in the present study is based on the procedural flow of the Environmental Impact Statement (EIS) System prescribed under Article III of the DENR Administrative Order No. 96-37. The EIA Team followed the Participatory Impact Assessment Method (PIAM) wherein the stakeholders are involved in the conduct of the EIA through project briefings and public consultation meetings. Since the Second Ayala Bridge will involve the construction of a new bridge, unlike the other bridges under the present study, Social Condition Survey was first conducted to determine the extent of socio-economic impacts it would entail.

19.5.1 Social Condition Survey

(1) Land Use Condition Survey

The site survey was conducted from 20 to 28 October, 2003. After the field investigation, a site survey map was prepared, covering the areas of the proposed route with 200 m width, including two (2) intersections at the proposed site of the Second Ayala Bridge. The map covers 100 m each in width on the upstream/downstream sides along both banks, and on both sides of the approach roads on both banks. Various types of structures, including its uses, i.e., commercial, residential, industrial, or institutional, are indicated in the said map. The map is kept on file for future reference.

(2) Survey Related to Land Acquisition

Survey related to Right-of-Way acquisition was completed through the gathering of the following data from the Manila City Assessors' Office: (i) Cadastral Maps; (ii) Schedule of Valuation for Land (based on tax declaration); and (iii) Schedule of Valuation for Improvements. The survey area for land boundary and land price survey for the Second Ayala Bridge covers 100 m each in width the on the upstream/downstream sides along both banks, and 100 m each in on both sides of the approach roads on both banks. The cadastral maps obtained are well kept on file for future reference.

Table 19.5.1-1 presents the summary of information obtained, including the name of the barangays where the bridge and survey area are located, the location (street/avenue), the existing land use or zoning in the area, the price of land (per square meter), and the year the pricing was updated. **Table 19.5.1-2** shows the name of the barangays where the bridge and

survey area are located, the type of structure, the price of improvement/structure (per square meter), and the year the pricing was updated. Please note that the pricing for land and improvements are just estimates based on the "Schedule of Unit Construction Cost for Buildings/Structures" obtained from the Manila City Assessor's Office, and not on the BIR zonal valuation (for land) and replacement cost (for structures). As such, actual costs may vary. In most cases, actual costs can be expected to be higher than these estimates.

Table 19.5.1-1 Land Valuation of Areas Along The Route Corridor (Based on Tax Declaration)

Barangay	Location (Street/Avenue)	Land Use/Zoning	Price (Peso/sq. m)	Year
659-A Zone 71 Ermita	Natividad Lopez (Concepcion) to San Marcelino	3rd Class Commercial	12,000.00	As of 1996
647 Zone 67 San Miguel	Carlos Palanca, Sr. to San Agustin	3rd Class Commercial	13,600.00	As of 1996

Source: Land Valuation from the City Assessor's Office of Manila City

Table 19.5.1-2 Valuation of Improvements Along the Second Ayala Bridge Route Corridor

Location	Barangay	Type of Structure	Price (Peso/ sq. m)		Year
			Upper Limit	Lower Limit	
Arroceros/Natividad Lopez (Concepcion) Side West Bank of Pasig River	659-A Zone 71 Ermita	Office Bldg. (Solid Group of Companies (SGC) General Signal Industries, Inc., renter.)	9,400.00	5,700.00	As of 1996
		Office Bldg. (Solid Group of Companies (SGC)	9,400.00	5,700.00	As of 1996
		Ever-Gotesco Warehouse (United Mix Corp., renter)	5,800.00	2,200.00	As of 1996
		Boy Scouts of the Philippines (BSP) Employees Quarters	6,500.00	2,900.00	As of 1996
		Boy Scouts of the Philippines (BSP) Accessory Building	6,500.00	2,900.00	As of 1996
		MWSS/Maynilad Water Services Inc. Semi-Demolished Bldg.	9,400.00	5,700.00	As of 1996
		MWSS Abandoned 2-storey Bldg.	9,400.00	5,700.00	As of 1996
		Accessory Bldg. (MWSS/MWSI Locker Bldg.)	6,500.00	2,900.00	As of 1996
Carlos Palanca Side East Bank of Pasig River	647 Zone 67 San Miguel	Warehouse (Florofoto Warehouse)	5,800.00	2,200.00	As of 1996
		Florofoto Quarters	5,800.00	2,200.00	As of 1996

(3) Socio-Economic Condition Survey

Interview survey of households in areas affected by the Project was undertaken at the proposed site of the Second Ayala Bridge. During the site inspection, it was noted that the Project-Affected-Persons (PAFs) can be categorized into two main types, namely the (i)

informal settlers, and (ii) private landowners. The number of informal settler's vis-à-vis the private landowners are shown in **Table 19.5.1-3**.

As shown in the table, most of the PAFs (approx. 87%) are informal settlers that are concentrated in Barangay 647, Zone 67 of the San Miguel District, located at the Carlos Palanca side, or the East Bank of the Pasig River. As such it was considered more important to establish the socio-economic status of the informal settlers, rather than those of the more affluent private property owners. In addition, disclosure to these property owners may be too premature at this point, may be misunderstood by other parties, and cause unnecessary confusion. The interview was thus confined to informal settlers from both locations.

Table 19.5.1-3 Type of Occupancy Based on Ocular Inspection and Interviews

Location	Barangay		Informal Settlers	Private Landowners	Total
Arroceros/Natividad Lopez (Concepcion) Side West Bank of Pasig River	659-A Zone 71 Ermita	Interviewed	3	1	4
		Not Interviewed	1	3	4
Carlos Palanca Side East Bank of Pasig River	647 Zone 67 San Miguel	Interviewed	19	0	19
		Not Interviewed	34	0	34
		Total	**57**	**4**	**61**

It can also be discerned from **Table 19.5.1-3** that the number of interviewed informal settlers is less than those that were not interviewed. The reason behind this is that 23 of the 34 informal settlers are located in a compound which was found "unsafe" by the Barangay Captain, Mr. Suharto Buleg. The other 11 were not available at the time of the interview because they are already occupying the relocation site that was provided to them in Kasiglahan Village, Montalban, Rizal, despite the fact that their structures are still intact at the project site.

When the Team asked why there are still informal settlers in the area that was supposed to have been cleared by the Pasig River Rehabilitation Commission (PRRC), Barangay Captain Buleg replied that it was because he requested PRRC to just let the said informal settlers move backwards, away from the linear park to be developed, instead of being relocated. However based on the report of PRRC on the Status of Relocation, it was found out that all the informal settlers in Brgy. 647, Zone 67 of the San Miguel District, have ALL been relocated as of 30 July 2003.

Based on the foregoing, two possible scenarios are assumed. First, it may be that all the informal settlers were indeed cleared by PRRC in 2002, but a new set of informal settlers occupied the area. Second, it may also be possible that the informal settlers that were cleared by the PRRC just came back at the project site for various personal reasons.

19.5.2 EIA Methodology

The EIA study covered the following modules:

- Physico-Chemical Environment
  - Physiography and Geomorphology
  - Meteorology
  - Hydrology
  - Water Quality
  - Air Quality
  - Noise Level
- Terrestrial Biology
- Socio-Economics

(1) Physico-Chemical Environment

(a) Physiography and Geomorphology

The physiographical and geomorphological study for the proposed project was done through field verification of available secondary data. The information used in the preparation of this report were obtained mostly from various government offices/entities among others, the Mines and Geosciences Bureau (MGB), Philippine Institute of Volcanology and Seismology (PHIVOLCS), Bureau of Soils and Water Management (BSWM), Pasig River Rehabilitation Commission (PRRC).

(b) Water Quality

Water quality assessment along the Pasig River, Second Ayala Bridge Section was performed on 24 November 2003. One sampling site was established along the Pasig River, since it is the only water body that would be possibly affected by the proposed construction of the said Bridge. Temperature and pH readings were accomplished on-site. Water samples were also collected and brought to the laboratory for chemical analyses. The methodology adopted to assess the amount of BOD, COD, TSS, Oil & Grease, DO, and Fecal and Total Coliform of the samples was based on the "*Standard Methods for the Examination of Water and Wastewater, 20th Ed*".

(c) River Sediments

Sediments obtained from Pasig River were also tested for traces of heavy metals. The samples were assessed for traces of Chromium Hexavalent (Cr+6), Cyanide (CN-), Cadmium

(Cd), Arsenic (As), Lead (Pb), Mercury (Hg), and Polychlorinated Biphenyls (PCB) Arocolor 1254. The amount of Cr+6 and CN- of the river sediments were assessed by Photometry. Traces of Cd and Pb were detected through acid digestion and quantitation by Atomic Absorption Spectrophotometry. Arsenic and mercury were derived through Hydride Generation.

(d) Air Quality

The conduct of air quality sampling followed the standard procedure according to the prescribed methodology in the Department of Environment and Natural Resources Department Order 2000-81 (DAO). Sampling was performed within a specified time and flow rate. Total suspended particulate matter and carbon monoxide were sampled on a 1-hour averaging time, whereas, NO_2 and SO_2 were evaluated within a 30-minute time period. TSP, CO, CO_2, and NO_2 sampling was done on November 27, 2003, while SO_2 sampling was performed on December 12, 2003.

(e) Noise Level

Noise level monitoring along Second Ayala Bridge was carried out on December 18, 2003. Noise level was directly measured using a standard sound level meter. Sampling location was the same as that of the air quality. Monitoring was done during the morning time, daytime, evening time, and nighttime. Three (3) readings were recorded within a 5-minute averaging time.

(2) Biological Environment

(a) Flora

Identification of the flora species encountered in the project area was done through gross morphology. This is a type of plant identification that relies greatly on the external features of both vegetative and reproductive parts, since these are easily observable. Flora guidebooks and other related reference materials were used during the conduct of the study for verification.

(b) Terrestrial Fauna

Since the project area is situated within a city, terrestrial wildlife identification, particularly birds, was done through actual observation.

(3) Socio-Economic

(a) Consultation Meeting

It is important to note that out of the **57** informal settlers that were identified during the conduct of the Social Condition Survey, only **three (3) Project-Affected Families (PAFs) will be displaced** during the construction of the Second Ayala Bridge. These three (3) families are within Barangay 647, Zone 67, San Miguel, City of Manila. This is because the alignment that was recommended by the JICA Study Team is the one with the least number of persons that will be affected. As such, consultation meeting was confined to the barangay officials who have jurisdiction over Second Ayala Bridge and its immediate vicinities (Please see **Photo 19.5.2-1** and **19.5.2-2**).

Photo 19.5.2-1 Consultation meeting with officials of Brgy. 659-A Zone 71.

Photo 19.2.5-2 Consultation meeting with Brgy. Chairman Suharto Buleg of Brgy. 647 Zone 67.

(b) Consultation Meeting with the City Officials of Manila

Aside from the barangay officials, the EIA Team also held several consultation meetings with the LGU of the City of Manila to discuss the Project and obtain their comments (Please see **Photo 19.5.2-3**). The EIA Team had several consultation meetings with the City Planning and Development Officer (CPDO) of Manila City **Mr. Roberto Amores**.

Photo 19.5.2-3 Consultation meeting with City Planning and Development Officer of the City of Manila, Mr. Roberto Amores (second from left).

Recently, the EIA Team headed by Ms. Annabelle N. Herrera together with the JICA Study Team's Economic/Financial Analyst Mr. Toshio Kimura presented the results of the traffic study and the financial analysis undertaken by the Study Team.

Issues raised by Mr. Amores during the discussion were:

- If the result of the Traffic Study justifies the construction of the Second Ayala Bridge;
- Requested for a copy of the traffic analysis at the intersections of C. Palanca Sr. and P. Casal Sts. and C. Palanca and Quezon Boulevard Sts.;
- Construction of the Second Ayala Bridge in 2014 is too late; Why not construct it ahead of the rehabilitation of the Ayala Bridge? In this way, the government can save a lot since the said rehabilitation will not necessitate the construction of a detour bridge
- Based on the study, is JBIC willing to finance the construction of the Second Ayala Bridge in 2014;
- The Study Team should consider revisions in the cost due to the expected inflation rate in the next 5 years;
- The concept of the City Hall in the proposed construction of the Second Ayala Bridge is to decongest the Quiapo Bridge area; if it stops at C. Palanca St. it will not solve the traffic congestion since the motorists will just still pass through Quezon Blvd., Extension along the congested Quiapo area.

Responses by the Team to the queries:

- Based on the study, there is a need to construct a Second Ayala Bridge because traffic volume at the existing Ayala Bridge will exceed its capacity in 2010;
- Once the Second Ayala Bridge is constructed, traffic congestion within the area will be reduced and traffic will be at acceptable level;
- Early construction of the Second Ayala Bridge, i.e., prior to the target schedule, would depend on the decision of DPWH
- Projects to be financed by the JBIC are studied early so that it will be included in future Yen Loan Packages;
- Based on the study, the lower chords and steel floor system of Ayala Bridge is completely damage and beyond repair, and it has unsatisfactory navigational clearance and insufficient capacity of substructures; and
- The Team is also considering the possible extension of the alignment towards the Recto area as a long term solution to traffic congestion along the Quiapo area

(c) Consultation Meeting with the National Historical Institute (NHI)

In a consultation meeting the EIA Team requested the NHI for their official position regarding the alignment of the proposed Second Ayala Bridge (Please see **Photo 19.5.2-4**). According to Arch. Inovero, there are no historical monuments/sites within the alignment corridor. NHI's official position on this matter is attached as **Appendix 19.5.2-1**.

(d) Perception Survey

As part of the impact assessment of the construction of the proposed Second Ayala Bridge a perception survey was admistered with Project-Affected Families (PAFs) within the Right-Of-Way (ROW) (Please see **Photo 19.5.2-5** and **19.5.2-6**). The main objectives of the survey are to establish the socio-economic profile of the PAFs and determine the acceptability of the project to the stakeholders. There were three (3) PAFs interviewed during the survey.

Photo 19.5.2-4 Consultation meeting with Arch. Reynaldo A. Inovero, Chief of Historical and Preservation Division (HPD) of the NHI

Photo 19.5.2-5 Interview with one of the affected settler within the Maynilad compound on the southwest bank of Pasig River.

Photo 19.2.5-6 A view of the small eateries found on the southwest bank of Pasig River inside the compound of Maynilad

19.5.3 Brief Description of Data Gathering

Baseline information for the preparation of the report was established through primary and secondary data gathering procedures. Series of field investigations, verifications, validations of information obtained from the concerned government offices/agencies visited by the EIA Team were carried out. The offices/entities include the City Government of Manila, Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA), Mines and Geosciences Bureau (MGB), Bureau of Soils and Water Management (BSWM),

and Philippine Institute of Volcanology and Seismology (PHIVOLCS). The Team also coordinated with the Pasig River Rehabilitation Project Commission (PRRC).

With respect to the **ambient air quality, water quality, noise level,** and **socio-economic** aspects, actual samplings and perception surveys within the study area were performed to generate baseline data.

19.5.4 Brief Description of Project Environment

Delineation of the Direct Impact Area (DIA) and Indirect Impact Area (IIA) was based on the possible impacts of the proposed Second Ayala Bridge to the receiving environment, particularly the people. The areas within the ROW of the bridge are Brgy. 647 Zone 67 along Carlos Palanca Sr. St., San Miguel and Brgy. 659-A Zone 71 along Natividad Lopez St., in Ermita. In both barangays, several abandoned buildings and warehouses will be displaced, including **three (3)** residential houses within the compound of MWSS (Maynilad) on the southwest bank of Pasig River and a commercial building along N. Lopez St.

On the other hand, IIAs refer to the areas of Brgy. 647 Zone 67 and Brgy. 659 Zone that will be indirectly affected by the possible increase in noise levels, TSP levels and other air pollutants such as SOx and NOx due to the operation of various equipment and machinery during the construction phase of the project.

(1) Physico-Chemical Environment

(a) Physiography and Geomorphology

The MMA is divided into six (6) physiographic zones, namely, *Manila Bay, Coastal Margin, Guadalupe Plateau, Marikina Valley, Laguna Lowlands* and *Laguna de Bay* (Besana and Daligdig, 1993). The study area is the low-lying flat strip of land between the Manila Bay Zone on its west and the elevated Guadalupe Plateau on its eastern boundary. This is designated as the Coastal Margin zone with an average elevation of less than five (5) meters above mean sea level (amsl). This zone includes the CAMANAVA area (Caloocan, Navotas, Malabon, and Valenzuela), Pasay City, Paranaque City, Las Pinas City, the reclaimed portions of Manila Bay and the City of Manila.

The Pasig River delta plain has an average elevation of less than 5 meters, a roughly concave shape, poor drainage and gently sloping towards Manila Bay. This plain is mainly of beach

and estuarine deposits in the north; and in the south are lagoons and beach sediments derived from the clastics formerly and actively dumped by the Pasig River itself.

(e) Geological Setting

According to Gervacio (1968), Manila extending south to near Pasay City is within a deltaic plain formed by the Pasig River. The plain coalesced southward with the beach and lagoon deposits of Parañaque and northward with the dominantly estuarine deposits and beach and/or sand bar deposits of Caloocan City and Malabon. Previous data show that the delta materials' composition are of sand, pebbly gravel, silt, mud and clay of various colors and plasticity; in areas covered by sand, silt and clay deposits laid down by seasonal floods. The delta deposit is generally stratified to crossbedded. Inter-lobing or intertonguing of various delta material components has also been a common characteristic that was observed. The deposit is over 70 meters thick near the coast and thins out eastward in the Sta. Mesa and Makati areas. Along the eastern border zone, the deposit rests almost conformably on a firm sequence of tuffaceous rocks (Guadalupe Formation) and westward on slightly compacted, intertonguing pebbly gravel, sands and tuffaceous silts.

(f) Seismicity

In areas like the City of Manila, where it is underlain by loosely-compacted, water-saturated fine sediments, earthquakes could also cause liquefaction wherein the underlying foundation temporarily assume a semi-liquid state. Associated liquefaction effects like differential settlement, sand fountaining, lateral spreading and ground undulation may also cause damage to bridges, roads and other infrastructure.

(g) Water Quality

Water quality sampling along the Pasig River at the location of the proposed Second Ayala Bridge was undertaken on November 24, 2003. The sampling was done during the low tide wherein the river is flowing on its natural course towards the Manila Bay.

Result of the field measurements taken showed that the pH level and temperature of the Pasig River is within the normal range. Laboratory evaluations indicated a relatively high amount of TSS. The fecal and total coliform contents of the samples also exceeded the permissible limit set by the DENR for Class C Waters. The rest of the parameters are well within standard (Please see **Table 19.5.4-1**).

Table 19.5.4-1 Physical Properties of the Pasig River, Second Ayala Bridge Section Manila City

	Sampling Results	DENR Effluent Standard For Class "C" Water (DAO 34)
Sampling Station Location	• In the middle of Pasig River between Ayala and Quezon Bridges, where the proposed Second Ayala Bridge will be located	
Date and Time of Sampling	1050–1100 HRS 24 November 2003 (Low Tide)	
Parameters		
Temperature °C	29.33	Max. 3 degrees increase
pH	7.93	6.5 - 8.5
DO, mg/L	4.3 mg/L	Min. 4–5 mg/L
COD mg/L	35.6 mg/L	100 mg/L
BOD, mg/L (5 days, 20°C)	5.9 mg/L	10 mg/L
TSS, mg/L	47.5 mg/L	Max. 30 mg/L increase
Oil and Grease, mg/L	N.D.	5.0 mg/L
Total Coliform, MPN/mL	80,000 MPN/100 mL	5,000 MPN/1000 ml
Fecal Coliform, MPN/mL	50,000 MPN/ 100 mL	

(h) River Sediments

River sediment sampling was also undertaken by the EIA Team to determine the amount of trace metals in Pasig River. Sediments were collected from the River and then brought to the laboratory for assessment.

Results of the analyses shown in **Table 19.5.4-2** reveals that all the parameters tested exceeded the permissible limit set by the DENR for trace metals. Among the heavy metals assessed, trace of Lead (Pb) was observed the highest at 29.2 ppm. Others also went over the standard but not so much. Traces of arsenic (As), cadmium (Cd), and polychlorinated biphenyls (PCB) were not detected from the samples.

The study confirmed the Team's assumption that all sorts of wastes from industries and factories surrounding the Pasig River are directly loaded into the waterway. This also substantiates reports of the PRRC that sediments of the Pasig River are already contaminated with various trace elements.

Table 19.5.4-2 Pasig River Sediment Test Results

Trace Metal/Element	Result Value	DENR Standard
Chromium Hexavalent (Cr+6)	0.10 ppm	0.05 mg/L
Cyanide (CN-)	0.39 ppm	0.05 mg/L
Cadmium (Cd)	ND	0.01 mg/L
Lead (Pb)	29.2 ppm	0.05 mg/L
Arsenic (As)	ND	0.05 mg/L
Mercury (Hg)	0.37 ppm	0.002 mg/L
Polychlorinated Biphenyls (AROCLOR 1254)	ND	–

Note:
"–" Means the standard of the substance is not considered necessary for the present time, considering the stage of the country's development and DENR capabilities, equipment and resources (DENR Administrative Order No. 34, Series of 1990)
ND - None Detected

It may also be possible that some of the pollutants found present may have been influenced by the tidal cycle of Manila Bay, wherein flow reversal from Laguna de Bay reportedly occurs when water levels in the lake fall below eleven (11) meters (Pasig River Rehabilitation Project Feasibility Study, 1991).

(i) Meteorology

The Port Area (MCO) in Manila is the nearest synoptic meteorological station to the Second Ayala Bridge. Based on the Modified Corona's Classification, the climate in Manila City belongs to Type I, which is characterized by the wet and the dry seasons. From December to April, the project area experiences a relatively dry period. The rainy season concurs with the Southwest Monsoon from July to September. The recorded annual rainfall in the area is almost close to **2205.4 mm**. The month of August receives the highest amount of precipitation of **486.0 mm**. As well, this month has the longest number of rainy days with **22**. From a low of **26.5ºC** in January, the mean monthly temperature in Port Area could heat up to a very high of **33.5ºC** during the month of May. The annual average mean temperature is **28.2°C**. The highest relative humidity of **81%** is felt in August, while a low of **65%** is experienced from March to April. The warmest months are from March to June.

(j) Ambient Air Quality

The observed levels of carbon dioxide (CO2) in both stations exceeded the permissible limits based on the DAO 2000-81. Particulate matters (TSP) recorded at Sta. 1 exceeded the standard (289 µg/Ncm), while at Sta. 2, the observed TSP level is at the maximum limit (218 µg/Ncm). The rest of the parameters are within the permissible limits. The high concentrations of air borne dust observed at the sampling sites are attributable to the vehicular emissions in nearby streets. Complete results of the sampling are provided in **Table 19.5.4-3**.

Table 19.5.4-3 Observed Ambient Air Quality Along Proposed Second Ayala Bridge and Its Vicinity

Parameters	Date & Time of Sampling		Averaging Time	Concentration in µg/Ncm		
				Sampling Results		DENR Standards
	Sta. 1	Sta. 2		Sta. 1	Sta. 2	
TSP	27 Nov. 2003 1030–1130 HRS	27 Nov.2003 1030–1130 HRS	1 hr	289	218	230
SO_2	12 Dec. 2003 1030–1130 HRS	12 Dec. 2003 1030–1130 HRS	30 min	9.2	6.0	180
NO_2	27 Nov. 2003 1030–1130 HRS	27 Nov. 2003 1030–1130 HRS	30 min	33.5	45.6	150
CO	27 Nov. 2003 1030–1130 HRS	27 Nov. 2003 1030–1130 HRS		<0.10 ppm	0.10 ppm	30 ppm
CO_2	27 Nov. 2003 1030–1130 HRS	27 Nov. 2003 1030–1130 HRS	1 hr	593 ppm	566 ppm	

(k) Noise Level

Noise level monitoring was performed at the same locations as those of the air quality sampling. Results of the monitoring showed that the level noise recorded at the sampling sites slightly exceeded the standard limit set for areas intended for commercial purposes. The recorded noise can be attributed to instantaneous peaks generated by the vehicles passing the area during the time of sampling (Please see **Table 19.5.4-4**).

Table 19.5.4-4 Observed Noise Level Along the Proposed Second Ayala Bridge and Its Vicinity

		Noise Levels in dB (A)			
Time	DENR Standards	Date & Time of Monitoring		Monitoring Results	
	B	Sta. 1[B]	Sta. 2[B]	Sta. 1[B]	Sta. 2[B]
Morning (0500–0900 HRS)	60	18 December 2003 0820–0825 HRS	18 December 2003 0845–0850 HRS	88.3	85.7
Daytime (0900–1800 HRS)	65	18 December 2003 1205–1210 HRS	18 December 2003 1104–1109 HRS	85.9	88.7
Evening (1800–2200 HRS)	60	18 December 2003 1902–1907 HRS	18 December 2003 1938–1943 HRS	82.6	84.9
Nighttime (2200–0500 HRS)	55	18 December 2003 2210–2215 HRS	18 December 2003 2248–2253 HRS	84.6	84.7

SOURCE: Rules and Regulations of the National Pollution Control Commission (NPCC), 1978

(l) Land Use

Third class commercial (C3) and institutional are the predominating land uses in the project area. The entire stretch of Carlos Palanca Sr. St in Brgy. 647 Zone 67 and N. Lopez St, from Ayala Blvd. to San Marcelino St. in Ermita are classified under the C3 type. The institutional type covers the southwest bank of Pasig River from Mc. Arthur Bridge to San Marcelino St.

(2) Biological Environment

(a) Terrestrial Flora

The vegetation cover found in the area can be classified under the Cultivated Type. Species diversity is very limited.

(b) Terrestrial Fauna

Domesticated animals and birds species are the main focus of terrestrial fauna identification in the project area. It is very apparent that no other wildlife species will be affected by the proposed bridge project since it is located in a highly urbanized city. Dogs and cats are the most common domesticated animals found in the area. Glossy swiftlets (Collocalia esculenta) is the most common species observed. Other bird species noted include brown shrike (Lanius cristatus), black-naped tern (Sterna sumatrana), schach shrike (Lanius schach), and Eurasian tree sparrow (Passer montanus).

(3) Socio-Economic Environment

As previously mentioned, there will only be **three (3) residential structures** occupied by employees of the MWSS (Maynilad) that will be displaced, and thus are considered directly affected. It is important to note that these families are neither renters nor informal settlers. They were given privilege by the water company to occupy the structures for free as part of their benefits as water tenders.

The rest of the interviewees consist of persons who may be indirectly affected as a result of the construction activities such as increase in levels of dust, gaseous emission, noise, and traffic congestion. Thus they are considered to be indirectly affected.

The information discussed here are results of field investigation and interview surveys conducted in the study area. Unlike the other bridge sites where majority of the dwellings are shanty type and are made of light materials, the structures that will be affected by the construction of the Second Ayala Bridge are semi-concrete and concrete. The three (3) main types of structures occupied by the respondents are of the single detached, apartment, and shanty-type. The single detached structures are made of concrete.

(a) Household Size, Income, and Expenditures

About 55.6% and 50.0% of the respondents interviewed in Brgy. 647 Zone 67 and in Brgy. 659-A Zone 71 respectively has a household size of 5 to 7. The rest have 1 to 4. In terms of household income, results of the survey show that 100% of the respondents at Brgy. 659-A Zone 71 and a high 77.8% in Brgy. 647 Zone 67are above the NEDA poverty threshold. Only 22.2% of the interviewed respondents in Brgy. 647 Zone 67 are below the poverty threshold. These results reflect the relatively higher status of living among these respondents compared to the other affected families in the other bridges under study. The survey also revealed that all the interviewed respondents live within their means. They spend only around 60 to 70% of their incomes, unlike in other depressed urban areas where the expenses exceed the income of poor families (Please refer to **Tables 19.5.4-5, 19.5.4-6,** and **19.5.4-7 and Figures 19.5.4-1** and **19.5.4-2**).

Table 19.5.4-5 Household Size of Project – Affected Persons Interviewed

Barangay	1 to 4		5 to 7		8 to 10		>10		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
659-A Zone 71	2	50.0	2	50.0	-	-	-	-	4	100.0
647 Zone 67	7	38.9	10	55.6	1	5.6	-	-	18	100.0
Total	9	40.9	12	54.5	1	4.5	-	-	22	100.0

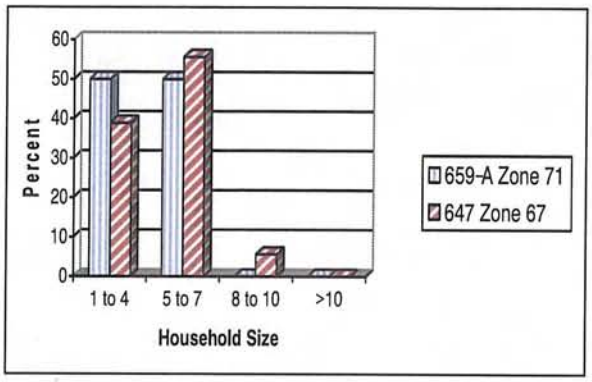

Figure 19.5.4-1 Household Size of PAF's

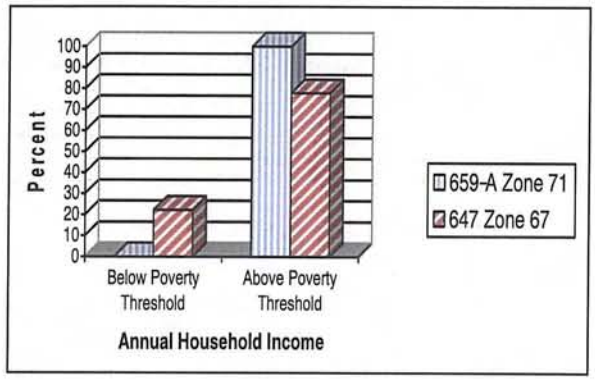

Figure 19.5.4-2 PAF's Annual Household Income

Table 19.5.4-6 Above and Below Poverty Threshold Project-Affected Persons

Barangay	Below Poverty Threshold*		Above Poverty Threshold*		Total	
	No.	%	No.	%	No.	%
659-A Zone 71	-	-	4	100.0	4	100.0
647 Zone 67	4	22.2	14	77.8	18	100.0
Total	4	18.2	18	81.8	22	100.0

Note: * - Based on the NEDA annual per capita poverty threshold as of year 2000 for a family of six (6), which is equivalent to P82,938.00

Table 19.5.4-7 Annual Income and Expenditures of Project-Affected Persons

Barangay	Annual Income	Annual Expenses	Percentage
659-A Zone 71	1,284,000.00	809,700.00	63.06%
647 Zone 67	2,485,670.00	1,757,332.00	70.70%

(c) Residency of Respondents

Among the informal settlers at the site of the proposed Second Ayala Bridge, results of the survey indicated a steady increase in occupancy from 22.7% in the 1970's to 27.7% in the 1990's. Highest occupancy percentage in Brgy. 647 was recorded in the 1980's at 38.9% (7 occupants). Please refer to **Table 19.5.4-8** and **Figure 19.5.4-3**.

Table 19.5.4-8 Residency of Project-Affected Persons

Barangay	1960's		1970's		1980's		1990's		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
659-A Zone 71	1	25.0	-	-	1	25.0	2	50.0	4	100.0
647 Zone 67	4	22.2	7	38.9	3	16.7	4	22.2	18	100.0
Total	5	22.7	7	31.8	4	18.2	6	27.3	22	100.0

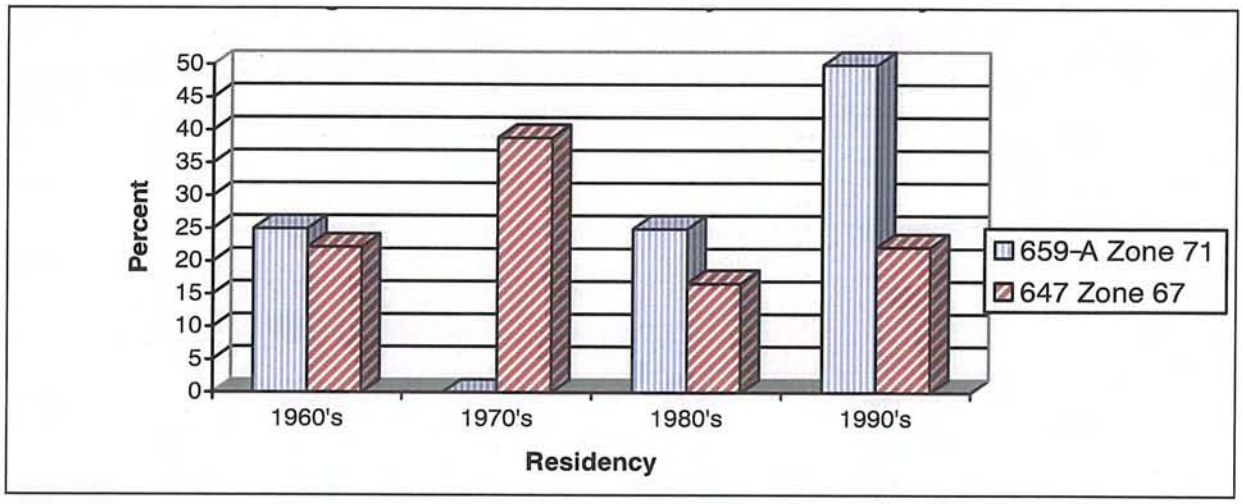

Figure 19.5.4-3 PAF's History of Residency

(d) Availability of Basic Social Services

All the respondents from both barangays obtain their drinking water supply through legal means; i.e., either through purchase (certain price per container of water) or piped connections (Please see **Table 19.5.4-9** and **Figure 19.5.4-4**). Power is supplied by MERALCO also through legal means (Please see **Table 19.5.4-10** and **Figure 19.5.4-5**).

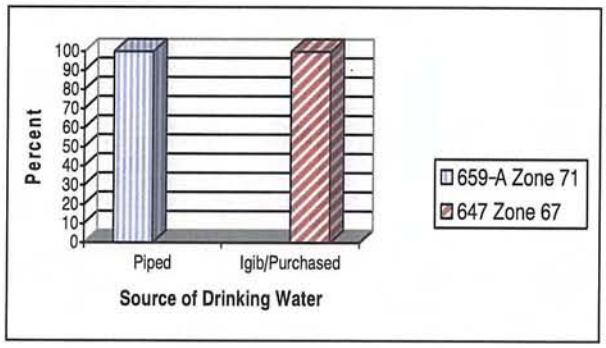

Figure 19.5.4-4 PAF's Source of Drinking Water

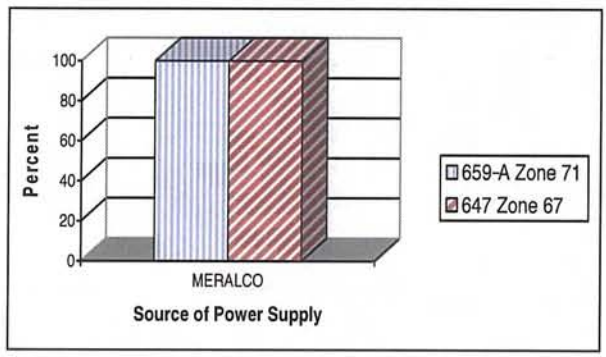

Figure 19.5.4-5 PAF's Source of Power Supply

Table 19.5.4-9 Source of Drinking Water of Project Affected Persons

Barangay	Piped		Igib/Purchased		Total	
	No.	%	No.	%	No.	%
659-A Zone 71	4	100.0	-	-	4	100.0
647 Zone 67	-	-	18	100.0	18	100.0
Total	4	18.2	18	81.8	22	100.0

Table 19.5.4-10 Source of Power Supply of Project Affected Persons

Barangay	MERALCO		Total	
	No.	%	No.	%
659-A Zone 71	4	100.0	4	100.0
647 Zone 67	18	100.0	18	100.0
Total	22	100.0	22	100.0

In terms of sanitation facilities, majority of the respondents have semi-flush toilets, some even have the flush type. This further supports the previous notion that the respondents in the study area are economically better off than the other informal setters found in the other bridges (Please see **Table 19.5.4-11** and **Figure 19.5.4-6**). Based on the interview, all the respondents have access to health facilities that are either provided by the local or the national government, among others barangay health centers, and local and national hospitals. Since the project is located within a highly urbanized city, the respondents have access to all levels of education from pre-school to elementary, secondary, and tertiary education.

A very high majority of the respondents (86.4%) properly dispose of solid waste through the City Garbage Collector. About 13.6% still do it by means of burning (Please see **Table 19.5.4-12** and **Figure 19.5.4-7**).

Table 19.5.4-11 Toilet Facilities of Project-Affected Persons

Barangay	Semi-flush		Flush			Total
	No.	%	No.	%	No.	%
659-A Zone 71	3	75.0	1	25.0	4	100.0
647 Zone 67	18	100.0	-	-	18	100.0
Total	21	95.5	1	4.5	22	100.0

Table 19.5.4-12 Solid Waste Disposal Practices of Project-Affected Persons

Barangay	City Garbage Collector		Burn		Total	
	No.	%	No.	%	No.	%
659-A Zone 71	1	25.0	3	75.0	4	100.0
647 Zone 67	18	100.0	-	-	18	100.0
Total	19	86.4	3	13.6	22	100.0

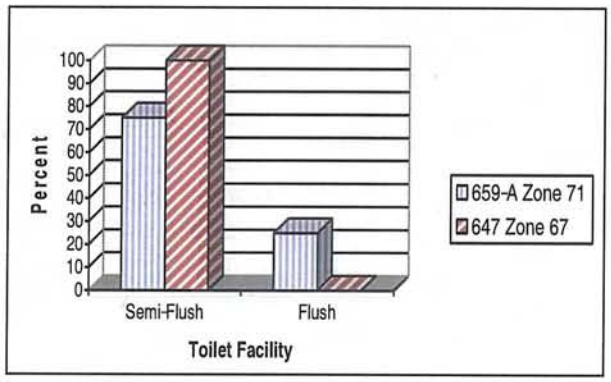

Figure 19.5.4-6 PAF's Toilet Facilities

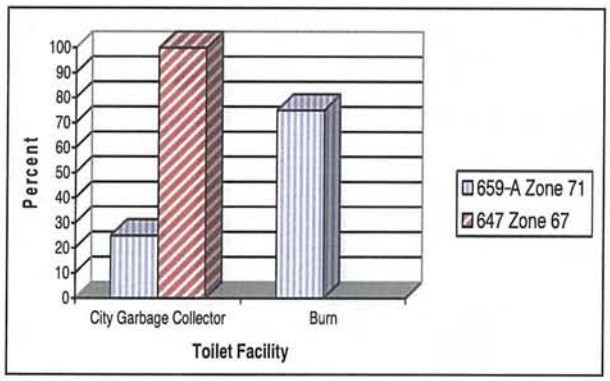

Figure 19.5.4-7 PAF's Solid Waste Disposal Practices

(e) Perceived Impacts of the Project

All the directly affected stakeholders were asked about what they perceive as the positive and negative impacts of the proposed improvement works along Second Ayala Bridge during its

construction and operational phases. The most common perceived positive impact of the project during the construction phase is the increase in job opportunities during the construction period. Apparently this refers to the job requirements in terms of local labor during the construction works. Some 18.2% do not foresee any positive impact of the project In terms of perceived negative impacts, the top answer is "displacement of affected families". This followed by "worsen traffic congestion, and lastly, by "air and noise pollution" (Please refer to **Table 19.5.4-13** and **19.5.4-14**).

Table 19.5.4-13 Perceived Positive Impacts During Construction of Second Ayala Bridge

Barangay	Job opportunity		Will enhance traffic flow		None		Total	
	No.	%	No.	%	No.	%	No.	%
659-A Zone 71	3	75.0	1	25.0	-	-	4	100.0
647 Zone 67	14	77.8	-	-	4	22.2	18	100.0
Total	17	77.3	1	4.5	4	18.2	22	100.0

Table 19.5.4-14 Perceived Negative Impacts During Construction of Second Ayala Bridge

Barangay	Will worsen traffic congestion		Dislocation of families		Increase in air and noise pollution		Total	
	No.	%	No.	%	No.	%	No.	%
659-A Zone 71	-	-	3	75.0	1	25.0	4	100.0
647 Zone 67	10	55.6	5	27.8	3	16.7	18	100.0
Total	10	45.5	8	36.4	4	18.2	22	100.0

The main positive impact perceived by the respondents during the operation stage of the Project is the enhancement of traffic flow in the immediate vicinities of the area, and secondly, the improvement of safety of the motorists who are currently using the Ayala Bridge (Please refer to **Table 19.5.4-15** and **19.5.4-16**).

Table 19.5.4-15 Perceived Positive Impacts During Operation of Second Ayala Bridge

Barangay	Job opportunity		Will enhance traffic flow		Will improve safety of motorists		Total	
	No.	%	No.	%	No.	%	No.	%
659-A Zone 71	-	-	3	75.0	1	25.0	4	100.0
647 Zone 67	1	5.6	13	72.2	4	22.2	18	100.0
Total	1	4.5	16	72.7	5	22.7	22	100.0

Table 19.5.4-16 Perceived Negative Impacts During Operation of Second Ayala Bridge

Barangay	Dislocation of families		Increase in air and noise pollution		None		Total	
	No.	%	No.	%	No.	%	No.	%
659-A Zone 71	1	25.0	3	75.0	-	-	4	100.0
647 Zone 67	4	22.2	13	72.2	1	5.6	18	100.0
Total	5	22.7	16	72.7	1	4.5	22	100.0

(f) Project Awareness

Only 40.9% of the respondents are aware of the proposed construction of the Second Ayala Bridge. This may be due to unwillingness of the barangay leaders, as reported, to inform and discuss the possible displacement of families in the said area. As previously reported, the area that was supposed to have been cleared by the Pasig River Rehabilitation Commission (PRRC), as part of its linear park project along the banks of Pasig River (Please Refer to **Table 19.5.4-17**).

About 33.3% of the respondents disclosed they are aware of the construction of the proposed Second Ayala Bridge because the LGUs informed them. Another 33.3% said that they got the information from ECOSYS Corporation. Others (22.3%) said that DPWH informed them. The remaining 11.1% got the news from neighbors and friends (Please Refer to **Table 19.5.4-18**).

Table 19.5.4-17 Project Awareness Among Respondents

Barangay	Yes		No		Total	
	No.	%	No.	%	No.	%
659-A Zone 71	-	-	4	100	4	100.0
647 Zone 67	9	50.0	9	50.0	18	100.0
Total	9	40.9	13	59.1	22	100.0

Table 19.5.4-18 Source of Information

Barangay	LGUs		DPWH		Neighbors / Friends		Ecosys		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
647 Zone 67	3	33.3	2	22.3	1	11.1	3	33.3	9	100.0
Total	3	33.3	2	22.3	1	11.1	3	33.3	9	100.0

(g) Social Acceptability

Based on the interview surveys, a high **90.9%** expressed full support to the proposed construction of the Second Ayala Bridge. Only 9.1% expressed disapproval over the proposed undertaking. (Please Refer to **Table 19.5.4-19**).

Table 19.5.4-19 Social Acceptability Among Respondents

Barangay	Yes		No		Total	
	No.	%	No.	%	No.	%
659-A Zone 71	4	100.0	-	-	4	100.0
647 Zone 67	16	88.9	2	11.1	18	100.0
Total	20	90.9	2	9.1	22	100.0

(h) Willingness of the PAFs to be Relocated

Results of the interview reveals that one (1) of the three (3) PAFs have been previously relocated at Montalban Rizal. The other two (2) families expressed willingness to be relocated from their present dwelling areas.

(i) Resettlement Requirements

Since there are only two (2) families to be relocated, provision of a relocation site will not be necessary. However, the DPWH must coordinate closely with the LGU of the City of Manila to ensure that these two (2) PAFs are properly resettled.

19.5.5 Impacts and Mitigation Measures

The predicted impacts and corresponding mitigation measures are presented in **Table 19.5.5-1.** The Environmental Management and Monitoring Program is shown on **Table 19.5.5-2.**

Table 19.5.5-1 Impacts, Mitigation, and Enhancement Matrix (1/2)

Parameters to be Monitored	Impacts	Duration and Degree of Impacts	Mitigating/Enhancement Measures
PRE-CONSTRUCTION AND CONSTRUCTION PHASES PHYSICAL ENVIRONMENT			
Hydrology and Water Quality	Bored piling at riverbed and riverbank of Pasig River for the substructure Second Ayala Bridge may cause possible increase in turbidity along the River	Short-term-negative	• This impact is unavoidable but temporary in nature. Condition of the Pasig River will be back to normal as soon as the construction works are completed; and • Excavated materials must be properly stockpiled and regularly hauled at DENR-approved disposal site
	Foundation works such as bored/sheet/concrete pile driving for the bridge will cause alteration and temporary disturbance of riverbed configuration	Short-term-negative	• This impact is unavoidable but temporary in nature. Configurations of the riverbed, subsurface soils, and the underlying rock strata are expected to return to their normal conditions after construction works are completed
	Possible increase in the bacteriological content of Pasig River due, particularly fecal coliform to domestic wastes generated by construction personnel	Short-term-negative	• Temporary sanitation facilities such as portable toilets and garbage bins will be provided by the Contractors to ensure that domestic wastes generated by the construction personnel are properly handled and are not thrown into the waterway to prevent further pollution of the Pasig River
	Possible increase in the level of oil & grease and other water contaminants in the River	Short-term-negative	• Contractors will be required daily routine check up of heavy equipment and machinery to ensure these are in good working condition to avoid spillage of oil and grease into the River; and • Contractors will be prohibited from washing the construction equipment along the River to prevent further contamination of the waterway
Air Quality	Dozing, stripping, earthmoving, and other related activities involved during the pre-construction and construction of the Second Ayala Bridge may possibly increase the present level of suspended particulate matters within the construction and adjacent areas	Short-term-negative	• Exposed and cleared construction areas will be regularly sprayed with water; • Excavated materials will be regularly hauled and disposed to the DENR-approved disposal site/s; and • Temporary stockpiles of excavated materials will be covered with tarpaulin, canvass or sack materials to prevent re-suspension of particulate matters
	Possible increase in exhaust gas emission levels such as SO_X, NO_X, CO, and other hydrocarbons generated by the various pre-construction and construction equipment	Short-term-negative	• Contractors will be required to conduct daily routine equipment and machinery check-ups to ensure that these are in the optimum working conditions; and • Regular tune-up and maintenance of construction equipment and machinery will be complied with to minimize exhaust gas emissions
Noise Level	Noise generated by the various heavy equipment and machinery during the pre-construction and construction phases	Short-term-negative	• This impact is unavoidable but temporary in nature; • Noise suppressors, such as mufflers will be installed whenever deemed necessary to maintain the noise generated by the various heavy equipment and other construction machinery to permissible limits; and • High noise generating pre-construction and construction activities, and improvement works will be scheduled during daytime to minimize disturbance to surrounding residential areas
Flora	Minimal loss of vegetation cover along the new bridge alignment	Long-term, negative	• Impact of the construction Second Ayala Bridge to the vegetation cover in the project area is negligible, since the areas required to accommodate the foundation works are very limited. In addition, the vegetation cover in the project area is considered minimal
SOCIO-ECONOMIC ENVIRONMENT			
	Construction of the temporary detour bridge will entail permanent displacement of three (3) residential houses within Maynilad compound on the southwest bank of Pasig River in Brgy. 659-A Zone 71, Ermita., Manila	Long-term, negative	• Just compensation will be accorded to affected families prior to construction of the Second Ayala Bridge
	Construction of the Second Ayala Bridge will entail displacement of two (2) warehouses and eight (8) office and commercial buildings	Short-term, negative	• Just compensations will be accorded to the owners of the affected structures prior to construction of the Second Ayala Bridge

Table 19.5.5-1 Impacts, Mitigation, and Enhancement Matrix (2/2)

Parameters to be Monitored	Impacts	Duration and Degree of Impacts	Mitigating/Enhancement Measures
SOCIO-ECONOMIC ENVIRONMENT			
	Safety of motorists along the C. Palanca St. on the northeast approach and N. Lopez St. on the southwest approach of the proposed Second Ayala Bridge	Short-term, negative	• A sound traffic management plan will be adopted to ensure safety of motorists plying the route; • Traffic enforcers and flagmen will be assigned at critical construction sites to prevent untoward accidents along these areas; • Illuminated warning and traffic signs will be installed at the construction sites to caution motorist and passersby of the on-going construction; and • Sufficient lighting will be installed at the construction sites to provide illumination, especially during the nighttime to avoid untoward accidents
	Safety of vessels navigating along Pasig Rive	Short-term, negative	• Adequate warning signs and lighting will be installed on barges used for construction to provide illumination during nighttime; and • River navigation safety management schemes will be adopted to prevent untoward accidents along Pasig River
	Generation of temporary employment for qualified laborers within the host communities during the construction phase of the project	Short-term, positive	• Qualified workers and laborers from the host communities will be given priority in hiring during the construction stage of the project
OPERATIONAL PHASE SOCIO-ECONOMIC ENVIRONMENT			
	Improved flow of traffic along Ayala Bridge and Quezon Bridge and its vicinities	Long-term, positive	• Inspection and maintenance of the newly constructed Second Ayala Bridge will be conducted on a regular basis to ensure optimum level service to road users; and • A sound traffic management plan must be adopted to ensure efficient traffic flow in the area
	Decrease in traffic load at Ayala Bridge and Quezon Bridge		• Inspection and maintenance of the newly constructed Second Ayala Bridge will be conducted on a regular basis to ensure optimum level service to road users; and
	Possible informal settling/squatting at the substructure of the newly constructed Second Ayala Bridge	Long-term-negative	• Regular inspection at the bottom structures of new bridge will be conducted by the DPWH with the joint effort from representatives of the Manila City and leaders of the concerned barangays to discourage would be informal settlers

Table 19.5.5-2 Environmental Monitoring Program Matrix

Parameters to be Monitored	Stations to be Monitored	Frequency of Monitoring	Methods of Analysis/Execution	DENR/Other Standards	Implementor
PRE-CONSTRUCTION AND CONSTRUCTION PHASES					
PHYSICAL					
Water Quality BOD, TSS, Oil & Grease	Pasig River	Twice a year during construction period	Standard DENR EMPASS-EQD water quality analysis.	Class "C" **BOD - <10 mg/L TSS- <30 mg/L increase Oil & Grease - <3mg/L**	DENR-NCR
Air Quality TSP, NO_2, and SO_2	Northeast and southwest approaches of the proposed Second Ayala Bridge	Twice a year during construction period	Standard EMPASS-EQD water quality analysis.	TSP – 430 $\mu g/Ncm^3$ NO_2 – 470 $\mu g/Ncm^3$ SO_2 – 375 $\mu g/Ncm^3$	DENR-NCR
Noise Level	Northeast and southwest approaches of the proposed Second Ayala Bridge	Twice a year during construction period	Standard EMPASS-EQD water quality analysis.	Morning – 50 dB(A) [AA] Daytime – 55 dB(A) [AA] Evening – 45 dB(A) [AA] Nighttime – 40 dB(A) [AA]	DENR-NCR
SOCIAL					
Compliance of Contractor to occupational health and safety rules and regulation	Within the construction site	Daily	Site inspection of work areas including sanitation facilities	Based on EMP	DENR-NCR
Safety motorists and passersby along c. Palanca and N. Lopez Sts.	C. Palanca and N. Lopez Sts.	Daily	Mobilization of traffic enforcers and flagmen	Based on EMP	LGU
Safety vessels navigating along Pasig River	Pasig River at the location of the proposed Second Ayala Bridge between Ayala Bridge and Quezon Bridge	Daily	Regular site inspection within the construction area	Based on DPWH and PCG Standard Operating Procedures	DPWH
OPERATIONAL PHASE					
SOCIAL					
Informal settling/squatting	Substructures of newly constructed Second Ayala Bridge	Weekly	Site inspection	Based on EMP	LGUs, and DPWH
Structural Integrity of the Bridge	Second Ayala Bridge	Based on standard DPWH maintenance procedures	Standard DPWH bridge maintenance works	Based on DPWH Standard Operating Procedures	DPWH